Wageningen University

Business Characteristics and Business Model Classification in Urban Agriculture

(photo:

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Abstract

Although urban agriculture is usually discussed as a public-good generating activity for its social and ecological benefits, this research took it as a revenue generating and job creation activity by focusing on more market-oriented urban agriculture projects. The research took a first step and filled in the gap of urban agriculture research on individual business level. It was carried out on a worldwide scope and adopted a statistical based approach. The results presented a list of business characteristics from 46 respondents across the whole world, showed their adoptions to the urban environment, analysed important financial streams based on its operational activity and explored distinctions between cases by classification. Drawing on the business characteristics, an exploratory cluster analysis was done using 8 grouping variables derived from the business model and features of urban agriculture. Five business models were finally identified which are Diversification, Primary Food Production, Value Differentiation, Service Provision and Innovative Operation.

Keywords: Urban agriculture, business characteristics, business model classification, cluster analysis

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Introduction

According to United Nation Population Division (UNPD), in 2008, for the first time in history half of the world's population were expected to live in urban areas, increasing to nearly 70% of world population by 2050 (UNPD, 2008). Rapid growth of cities has brought a lot of challenges such as environmental contamination, waste disposal, climate change, poor health and poverty. Food, as an essential for life, has also became a challenge to cities along with urbanization (FAO, 2011). Recently, urban agriculture has risen up as a complementary strategy not only to solve food problems, but also for cities to meet their social, economic, and environmental challenges (RUAF, n.d.; Starke, 2007).

Today, attentions and researches on urban agriculture are rapidly growing. However, there are limitations on their scopes. Urban agriculture researches are much more concentrated in its social and environmental dimensions, such as public policy, water and waste recycling, land planning and gender issues, etc. In order to achieve real sustainability, however, urban agriculture should also be sustainable itself, which means not only to be social just and environmentally sound, but also to be self-sufficient and economically viable. Information on its economical dimension is still quite limited. Some research has been done regarding the profitability and economical sustainability of urban agriculture, but most of them focus on household or local economy level (FAO, 2007; Moustier & Danso, 2006; Nugent, 2000). Despite the fact that there is a growing trend of urban farmers becoming commercial and they are extremely diversified in practice, little is known at the individual business level especially for the type of entrepreneurial urban agriculture. With this limitation, it is also hard to answer the questionings to financial viability. (Feenstra, McGrew, & Campbell, 1999; Kaufman & Bailkey, 2000).

This exploratory research could be a starting point to look into urban agriculture at the individual business level. The aim of this research is to have a description of urban agriculture business, and to try to find patterns under the diversity and complexity of urban agriculture. There are different theoretical approaches available to study individual businesses. In this research, Business Model Canvas was adopted as a research framework. Using the business model help move beyond description of potential benefits and add explanations of how the values are captured at the level of operation. Business Model Canvas will provide a simplified tool to describe the business model by its fundamental elements. A classification based on these elements will help us form a comprehensive understanding of the diversity and complexity in urban agriculture.

To summarize, the two research questions that will be addressed in this research are:

1). describe business characteristics of different urban agriculture projects

2). classification of urban agriculture business models

This report is divided into six chapters: the first chapter gives a short introduction to urban agriculture, defines the main focus of this research as market oriented urban agriculture initiatives and provides three examples to show their operations as businesses. The second chapter presents a brief review of the business model to clarify its definition and illustrate the research framework, Business Model Canvas. The third chapter explains the research approach and methods. The fourth chapter presents results of the business characteristics of urban agriculture. The fifth chapter shows results about business model classification of respondents' urban agriculture projects. The last chapter discusses the main results and forms conclusions for this research.

1. Urban Agriculture

1.1 Development and Types of Urban Agriculture

Urban agriculture is defined as '*growing of plants and the raising of animals for food and other uses within and around cities and towns, and related activities such as the production and delivery of inputs, processing and marketing of products*' (FAO, 2007). It is estimated that around 800 million people are actively engaged urban farmers and a range from 10% to 90% food consumption is produced in cities (Smit, Ratta, & Nasr, 2001). Although perceived to be a new phenomenon around the world in practice and research, urban farming has actually been a long tradition since the ancient times. Ancient urban citizens developed urban agriculture systems to ensure their food supply, and examples can be found in Ghana, China, India, Iraq, Java etc.(Smit et al., 2001). However, urban agriculture today has much more meaning than what it was in history.

Research has shown that urban agriculture has potential benefits in all three dimensions of sustainability. For ecological sustainability, urban agriculture can provide urban green, improve microclimate in cities, conserve urban soil, recycle urban waste and nutrients, improve water management, increase biodiversity as well as reduce food miles and transportation emissions. For social sustainability, it can improve food security and nutrition, have impact on community welfare, provide education facilities, link consumers to food production, raise environmental awareness and empower people. It also has potential to contribute to economical sustainability by promoting local economy, providing job opportunities and improving food affordability (Deelstra & Girardet, n.d.; Five Borough Farm, 2014; Mougeot, 2000; Specht et al., 2014).

On the other hand, the development of urban agriculture under different cultures and conditions has created a great diversity. Various projects address different sets of functions of urban agriculture. For example, Jolly (2000) mentioned that urban agriculture is a defensive option for the less developed areas, but it might be a way for devolving social responsibility in developed areas. Urban agriculture was touted for its multifunction in improving food security, job creation and solving other environmental problems resulting from rapid urbanization in the southern hemisphere. While in the north, it is also promoted for its ability to build community, reconnect consumers with farmers, create circular local economies and raise awareness of environmental and human health (McClintock, 2010).

Regarding the diversity of urban agriculture, it is necessary to distinguish between certain urban agriculture types. There are various typologies for urban agriculture based on different dimensions, such as production methods, locations, products, economic activities and degree

of market orientation etc. (RUAF, n.d.). Cabannes (2006) has developed a typology based on the purpose of urban agriculture initiatives (Figure 1): the first type is mainly for subsistence purpose and generally family based. It's commonly seen among the poor who live in urban areas provide food and support their own livelihoods without generating cash surplus. The second type is conducted for leisure and recreation. It's more common in developed countries and is usually for reconnecting citizens with agriculture, raising awareness and education purposes. The third type, which is the main focus of this research, is involved in market-oriented activities and mostly entrepreneurially driven. It might happen through the whole food chain from production, processing to marketing. Products are sold directly or through intermediaries and are usually more dispersed than through traditional distribution channels. This type can be organized by individual, family, micro-enterprises, large cooperatives or producer associations. Also, there are mixed types of urban agriculture which combine two or three of the previous types (Cabannes, 2006).
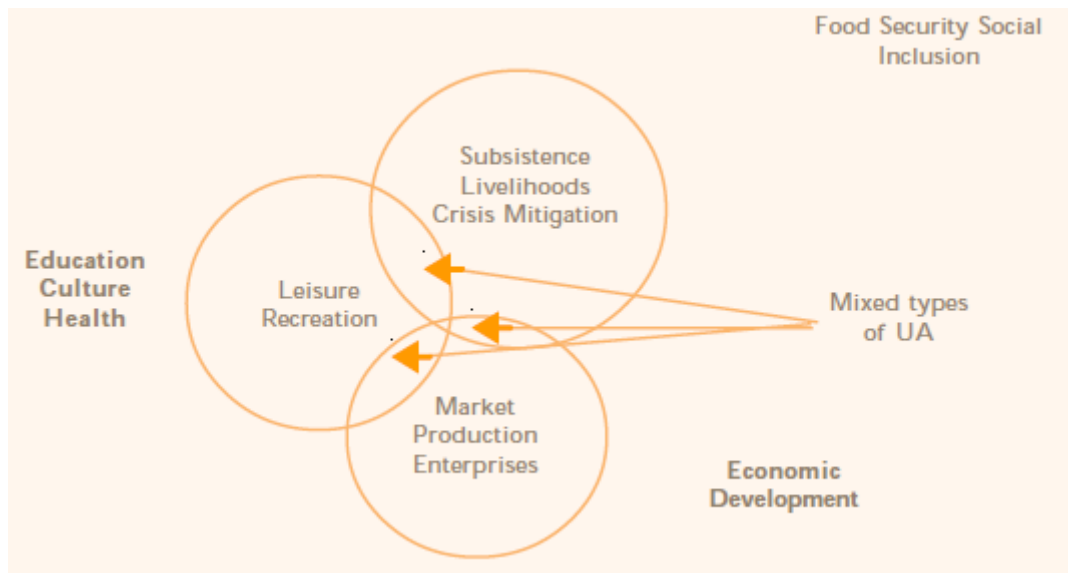
Figure 1 Varies Types of Urban Agriculture(Cabannes, 2006)

Although a lot of research focuses on the first two types (to improve food security or to reconnect citizens with their food), urban agriculture is actually more than a survival strategy or public good. There is an increasing trend of urban farmers becoming commercial and urban agriculture enterprises are quickly emerging. These market oriented urban agriculture initiatives grow food inside the city to generate revenues, which create new opportunities and challenges for the urban farmers and the city. It's still in a starting phase, but there are indications showing that it's becoming more of a reality (Kaufman & Bailkey, 2000). Following are three cases happening in different cities of the world. They operate their urban farms as a business with different strategies and business models.

1.2 Market Oriented Urban Agriculture: Urban agriculture as a business

Bybi - Copenhagen, Denmark

The Bybi city bee association started in 2010 in Copenhagen, the capital and most populous city in Denmark, also the European Green Capital 2014. Bybi is a social enterprise and a non-profit association. They set beehives on the rooftops or yards mostly of businesses, provide job or training opportunities to vulnerable group from the society, and organize education or tours to schools, institutions and other social groups. Their mission is 'to establish a sustainable urban honey industry that creates new opportunities for people on the edge of the work-market and enables a positive encounter with urban nature for all city dwells'. (Bybi, 2014b)

The financing of Bybi comes from around 25% arrangements with businesses, 60% from sales of honey and other products and 15% from projects they run with schools, housing projects and social organisations. They don't receive any public financing for their running cost and all profits are reinvested in social and environmental activities (Bybi, 2014a). Bybi has set beehives on the rooftops or yards of organisations or companies like the Copenhagen City Hall (Figure 2), CPH-Copenhagen Airport, European Environment Agency, Carlsberg City District, and University of Copenhagen etc.. There are already about 20 sites across the city. The companies lend Bybi spaces, pay them a fee to maintain the production and

Figure 2 Beehives on the rooftop of Copenhagen City Hall(CPHMADE, 2014)

win a good reputation for being 'green'. Besides production activities, Bybi organize talk and tours around the city or in their urban honey factory to tell the story or to show the audience honey and by-products processing. They also have education projects with children and schools to help kids discover urban nature, biology and even arts and design by making their own labels for Bybi.

There are professional beekeepers, a secretariat and additionally a social worker in the organization. Other workers in Bybi are typically formerly homeless, long-term unemployed or people with alcohol and drug problems (Bybi, 2014a). This vulnerable group is involved in beekeeping, processing, packing, selling and giving tours. Bybi also work with other social

organizations, for example, with the Danish Red Cross they train asylum seekers in honey production and beekeeping. They also buy frames and beehives made by homeless people during workshops.

Figure 3 A selection of Bybi products(Bybi, 2014d)

Bybi has a great variety of products, from honey to candles made with beeswax (Figure 3). They add a lot of value to their products by processing, packaging, innovation, and making use of everything that come out of the beehives. For example, they designed a gift tube with 5 honey glasses from 5 districts in the city, to show there are variations in the tastes between honeys from different city areas.

They also developed processed products with honey, such as ice cream and beer. Besides, propolis, pollen, bee larvae and honeycomb developed through their experiments are also sold as products(Bybi, 2014c). All products are sold in their urban honey factory through tours, cooperated retailers and to employees of their cooperate organizations/companies.

Since it started in 2010, Bybi has grown steadily. It has reached the biggest production of nearly 5 tons of honey in 2014 and caught attention of national and international media. It has made such a success as a social enterprise for three reasons: firstly, it brings both environmental and social benefits to the city by beekeeping and helping vulnerable groups. Secondly, it has developed a win-win model between itself and other organizations/companies, which brings an additional revenue stream to Bybi as well as a nice story and reputation to involved organizations/companies. Thirdly, activities that Bybi conduct and benefits they deliver have together formed a story. This story is well communicated through tours and nicely designed products, which is well recognized by their consumers. (Personal Communication, 2014 July).

Gotham Greens – New York, USA

Gotham Greens is an innovative urban agriculture company with a mission to grow the highest quality, fresh produce in urban areas nation-wide (DarkRye, 2013). It was founded in 2008 and built its flagship greenhouse in Brooklyn, New York; the first commercial scale rooftop greenhouse in the United States in 2011 (GothamGreens, 2014b). Till now, Gotham Greens has grown from two co-founders to a 50 employees company with three greenhouse farms across New York producing more than 300 tons of high quality, fresh vegetables every year (Akitunde, 2014).

Figure 4 CEA production system

The founder started Gotham Greens as one of the solutions to problems caused by modern agriculture system, and to meet the challenges associated with a growing population. At the same time, he saw a market place opening and a business opportunity for sustainably, responsibly and locally grown food through the popping up of farmer's market, farm to table restaurants in US. (DarkRye, 2013). Thus they choose to provide fresh, pesticide-free, high-quality salad greens to New Yorkers with Controlled Environment Agriculture (CEA) and hydroponics, from the forgotten spaces on rooftops (Figure 4). The production system is technologically-sophisticated and climate controlled, which could provide year round production to the citizens. Besides that, on-site solar panels are used to meet part of their electrical needs, rainwater and irrigation water is captured and reused, heating losses of the building in winter is also captured for the greenhouse. As a result of these innovations, Gotham Green can produce vegetable using one-twentieth of the land and one-tenth of the water of a conventional farm, all with lower energy input (Meier, 2011; Zeveloff, 2011).

Taking advantage of the farm's location, the products are harvested and delivered within a day inside the city boundary. Fresh vegetables and herbs are sold directly to off-line or on-line green groceries, markets and restaurants. In 2013, Gotham Greens started their partnership with Whole Foods Market, the American foods supermarket chain specializing in natural and organic food, to build their second greenhouse on the rooftop of Whole Foods Markets Brooklyn store (GothamGreens, 2014a) (Figure 5). This project is the first commercial scale greenhouse farm integrated into a supermarket. The products are supplied to Whole Foods Market locations throughout New York City.

Figure 5 Greenhouse on Whole Foods Market

Growing food in cities faces a lot of limitations, such as limited land, labour and other resources. In order to compete with other economic activities in the city, technical innovation is very important to help urban farmers grow efficiently. The innovative hi-tech production method that Gotham Greens has adopted not only can produce high quality products inside the city. It also improves the production efficiency and reduces costs, which in return contributes to its sustainability. The quality of their products and its' hi-tech production methods together contribute to the value of Gotham Greens, which catches the growing market for sustainably, responsibly and locally grown food very well. Finally, a distribution model built with a supermarket, Whole Food Market, creates a new type of food chain and ensures a relatively stable revenue stream to the company.

Uit Je Eigen Stad – Rotterdam, The Netherlands

Uit Je Eigen Stad (From Your Own Town, UJES) is the first commercial intra-urban agriculture initiative in Europe (Nationale Federatie Stadsgerichte Landbouw, 2013). It's also one of the largest urban farms in Europe with 2.3 hectare of land located on a vacant plot in Rotterdam. The municipality of Rotterdam provide the land rent free for 10 years (Figure 6). The mission of UJES is to reconnect citizens with their daily food and together contribute to a more

Figure 6 Uit Je Eigen Stad Farm

sustainable food system (Uit Je Eigen Stad, 2014b).

The farm consists of 1.2 hectares outdoor vegetable cultivations, 1500 square meter cold plastic greenhouses, 600 square meters indoor salad, mushrooms and herbs production, and 3000 square meter of soft fruits such as berries. In addition, it has an annual production of nearly 4500 chickens and 6 tonnes of fish (Nationale Federatie Stadsgerichte Landbouw, 2013). Besides selling products directly to consumers and to restaurants, the farm has an on-site restaurant. All foods that served in the restaurant are from their own urban farm or regional producers (Figure 7).

Figure 7 Uit Je Eigen Stad Restaurant

However, UJES is unique not only because of its diverse product range and on-farm restaurant. It is also an urban farm on a commercial basis intertwined with a variety of activities, especially with social objectives. They have an on farm shop and organize a city market every weekend, selling their own products and other regional produce. They have tours for schools and other groups from the society. UJES also offers courses and workshops related to food. Besides, there are events organized irregularly. The farm became a place not only for experiencing agriculture, but also for recreation and as a hub for city food subjects (Uit Je Eigen Stad, 2014a).

The key word of UJES's business model is 'diversification', both on its products range and activities. The varieties of its products, from vegetation to poultry and fish, and from its own farm to regional products, together reached the economics of scope rather than economics of scale (Nationale Federatie Stadsgerichte Landbouw, 2013).,Diverse products made it possible to run a unique on-farm restaurant and to build a complete food chain from production, processing to consuming. In addition, different activities organized by the farm provide unique experience with food and agriculture to their consumers. It also helps to achieve their mission of reconnecting citizens with their food and create more revenue streams to UJES and function as diverse marketing channels to the society.

As shown in the three cases, the urban agriculture businesses are growing, but they are not uniform: Bybi attracts consumers by its unique story and adding values, Gotham Green catches the market by its efficient hi-tech production system, while UJES diversified products and services to reach economics of scope. All of them are entrepreneurship driven, but to a different extent. Public benefits issues are addressed in all the three cases, and this shared interest seems to be an equivalent issue as producing food, while with different focuses in different cases.

There are many more versions of urban agriculture businesses to be observed in the world. Although an amount of urban agriculture cases are available from literatures, only a few of

them are described for their business operations (Schutzbank, 2012; Stolhandske, 2010). Besides some individual cases, there is no pattern available to describe this heterogeneity yet. Thus looking into business operations of cases around the whole world, describing the business characteristics of urban agriculture and classifying their business models could provide a first step to place heterogeneous individuals into homogeneous groups for further researches.

2. The Business Model

2.1 The Business Model Concept

The Business model, a concept that describes how values are created, captured and delivered to consumers in order to make the company profitable, is inherent since business activities emerged. However, the concept caught popular consciousness until mid-1900s, driven by emerging knowledge in economy, growth of the Internet and e-commerce, and other changes in many business activities (Teece, 2010). As from that time, the way in which a company can make money has changed from the industrial era: capturing and delivering value no longer simply comes with producing tangible products and increasing the scale, but also with intangible products such as solutions and services that meet consumer's needs (Teece, 2010). Since then, the concept of the business model became popular in both research and practice.

Although the business model concept is popularized and researched mainly in e-commerce, it is also applied in other industries such as media, manufacturing and biotechnology and agriculture (FAO, 2008; S. C. Lambert & Davidson, 2013). Despite the increasing popularity of the business model concept, there is no general agreement on the definition of the business model. Researchers adopt different definitions that fit their study purposes (Zott, Amit, & Massa, 2011), which might bring confusion on the business model (Morris, Schindehutte, & Allen, 2005; Osterwalder & Pigneur, 2010; Zott et al., 2011). The majority of definition focuses on value creation and value offering with many variations (S. C. Lambert & Davidson, 2013). For example, Table 1 shows 4 definitions from different perspective.

Table 1   A cross-section of business model definitions (S. C. Lambert & Davidson, 2013)

Conceptual focus	Scope	
	Network	Enterprise
Activities	(Zott & Amit, 2010) p216 …a system of interdependent activities that transcends the focal firm and spans its boundaries. The activity system enables the firm, in concert with its partners, to create value and also to appropriate a share of that value	(Afuah, 2004) p.9 A business model is the set of which activities a firm performs, how it performs them, and when it performs them as it uses its resources to perform activities, given its industry, to create superior customer value (low-cost or differentiated products) and put itself in a position to appropriate value

Value	(Weill & Vitale, 2001) p34 A description of the roles and relationships among a firm's consumers, customers, allies, and suppliers that identifies the major flows of product, information, and money, and the major benefits to participants	(Osterwalder & Pigneur, 2010) P14 A business model describes the rationale of how an organization creates, delivers, and captures value

In order to clarify, the definition by Osterwalder and Pigneur (2010) will be used in this thesis: '*A business model describes the rationale of how an organization creates, delivers, and captures value*'. It captures 'Value' as a conceptual focus with an emphasis on the 'Enterprise' itself. Considering the complex, diversified activities and values, both economic and social ones, involved in urban agriculture, using this definition will provide a more simplified tool for analysing. It also can help the participants in this research have a common understanding of the business model concept.

2.2 Business model Canvas

In addition to the diversity of business model definitions, the elements of business model is also not unified. The elements describe what a business model is made of. It is also mentioned as components (Pateli & Giaglis, 2004), functions (Chesbrough & Rosenbloom, 2002), key questions (Morris et al., 2005) or building blocks (Morris et al., 2005; Osterwalder & Pigneur, 2010). According to a review done by Shafer and Smith (2005), one can find 42 different business model elements across 12 definitions (Shafer, Smith, & Linder, 2005). Table 2 shows some example of business model elements.

Table 2 Business model elements (Fielt, 2014; Zott et al., 2011)

Author(s)	Elements	
Afuah & Tucci (2001)	• Scope • Price • Connected activities	• Implementation • Capabilities • Sustainability
Chesbrough & Rosenbloom (2002)	*Technology-market mediation* • Value Proposition • Market segment • Value chain	• Cost structure & profit potential • Value network • Competitive strategy
Morris et al. (2005)	*Entrepreneur's business model* • How do we create value? (factors related to the offering) • Who do we create value for? (market factors)	• How do we competitively position ourselves? (strategy factors) • How we make money?

	• What is our source of competence? (internal capability factors)	(economic factors) • What are our time, scope, and size ambitions? (personal/investor factors)
Osterwalder (2004) Osterwalder & Pigneur (2010)	*Business Model Canvas* • Customer Segments • Customer Relationships • Communication, Distribution & Sales Channels • Value Propositions	• Key Resources • Key Activities • Key Partnerships • Revenue Streams • Cost Structure

Regardless of the diversified components that are mentioned in literatures, there are some notions highlighted to varying degrees. They are value (value proposition, value offering, value stream), financial aspects (economic model, revenue and cost streams), and architecture of the network between the firm and its partners (infrastructure, channels, network relationships) (Morris et al., 2005; Zott et al., 2011). 'Each of these components may constitute part of the generic business model and it could be a source of differentiation among business model types'(Zott et al., 2011).

In this research, Business Model Canvas (Figure 8) will be chosen as a research framework. It is a continual work of the Nine Business Model Building Blocks developed by Osterwalder (2004). The Nine Business Model Building Blocks cover frequently mentioned business model elements and exclude elements related to competition and business model implementation. Four main areas of a business can be covered by the 9 building blocks of Business Model Canvas (Table 3).
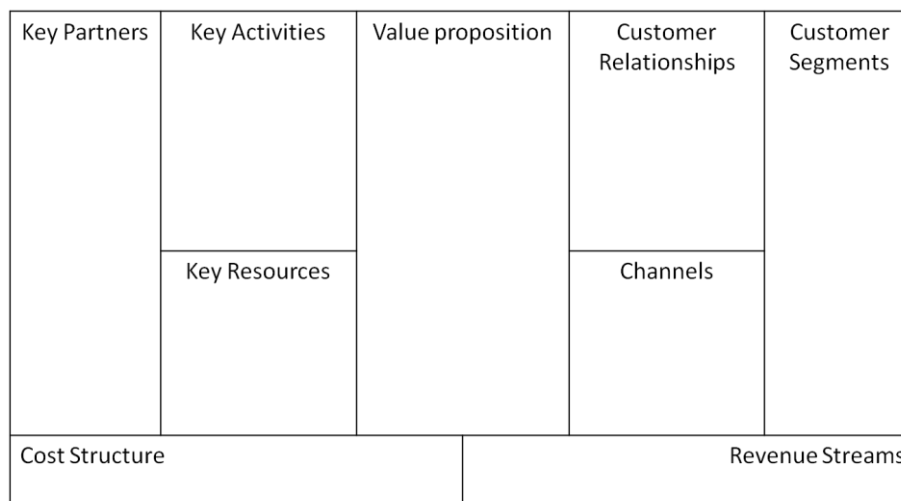
Figure 8 Business Model Canvas (Osterwalder & Pigneur, 2010)

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Table 3 Nine building blocks of Business Model Canvas

Business Area	Building Blocks	Description
Offer	Value Propositions	The bundle of products and services that create value for a specific customer segments
Customer	Customer Segments	The different groups of people of an enterprise aims to reach and serve
	Customer Relationships	The types of relationships a company establishes with specific customer segments
	Channels	Company communicates with and reaches its customer segments to deliver a value proposition
Infrastructure	Key Partnerships	The network of suppliers and partners that make the business model work
	Key resources	The most important assets required to make a business model work
	Key Activities	The most important things a company must do to make its business model work
Financial Viability	Cost Structure	All the costs incurred to operate a business model
	Revenue Streams	The cash a company generates from each customer segment

As shown in Table 3, Business Model Canvas doesn't focus on a specific industry, but offers a generic business model framework possibly for researches from different industries. The canvas provides a visualized tool to describe, analyse, design, innovate and implement business model for entrepreneurs as well as for researchers. It was co-created by 470 business practitioners from 45 countries. It is simple to use, but not to over simplify the business activities. Now, the Business Model Canvas is the most well-known an wildly used business model framework.

This framework was also applied in agriculture researches. Lundy (2012) developed a participatory guide to link smallholders to markets using the Business Model Canvas as a tool. Nguyen (2013) use it to formulate business ideas into an initial business plan regarding organic farming in Vietnam. It is also implemented in urban agriculture researches in recent years. Ganguly (2011) developed a potential strategic plan for a factional UA start-ups using several success factors distinguished in earlier studies in San Francisco. The Nationale Federatie Stadsgerichte Landbouw (2013) used the Business Model Canvas for 12 urban agriculture initiative case studies in the Netherlands. It is also been proposed as a research methodology for clustering business model by the COST-Action 'Urban Agriculture Europe' Entrepreneurial models of Urban Agriculture working group. These previous or ongoing studies have provided evidence that the Business Model Canvas could be a suitable research framework for urban agriculture businesses.

2.3 Business model classification

Business model concept has provided a new unit of analysis emphasizing a system level and holistic approach of how a company 'do business'(Zott et al., 2011). The Business Model Canvas provides a specific tool for analysis. Through a literature review in the field of business model study, Lambert and Davidson (2013) found three themes emerge: 1) the business model as the basis for enterprise classification; 2) business models and enterprise performance and 3) business model innovation. Classification of business model divide companies into homogeneous groups, which can be applied as a precursor in further studies such as the relationship between the business model and business performance and business model innovation(S. C. Lambert & Davidson, 2013).

However, there is a lack of holistic general taxonomy of the business model in researches(S. Lambert, 2006). Firstly, there is a misunderstanding and confusion between the term typology and taxonomy in business model research. Typologies are mainly conceptually derived qualitative specific classification, while taxonomies are general classification derived empirically and based on quantitative cluster analysis. According to this definition, taxonomies of business model classification is very limited in current research (S. Lambert, 2006). Secondly, business model classifications vary widely due to different criteria chosen based on researchers' own perspective and research purposes(S. C. Lambert & Davidson, 2013; Pateli & Giaglis, 2004). Table 4 shows some examples of different business model classifications.

In this research, taxonomy of urban agriculture business model classification will be developed using cluster analysis. Criteria for the classification are chosen combining the theory of business model with characteristics of urban agriculture businesses practices.

Table 4 A selective overview of business model classification (Fielt, 2014)

Author(s)	Classification		Criteria
Timmers (1998)	Internet business models		1)Functional integration;
	• e-shop	• Virtual communities	2)Degree of Innovation
	• e-procurement	• Value chain integrator	
	• e-auction	• Information broker	
	• 3rd party marketplace	• Value chain service provider	
	• e-mail	• Collaboration platforms	
Rappa (2000)	Business models on the web		None
	• Brokerage model	• Affiliate Model	
	• Advertising model	• Community Model	
	• Informediary model	• Subscription Model	

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	◆ Merchant model ◆ Utility Model ◆ Manufacturer model	

Weill & Vitale (2001)	Atomic e-business models
	◆ Content Provider
	◆ Direct to Consumer ◆ Shared Infrastructure
	◆ Full Service ◆ Value net integrator
	   Provider ◆ Virtual Community
	◆ Intermediary ◆ Whole of
	   Enterprise/Government
		1)Strategic objective & value proposition,
		2) sources of revenue,
		3)Critical success factors,
		4)core competencies

Afuah & Tucci (2003)	(Internet) Business Models(Based on dominant revenue models) ◆ Commission ◆ Referral ◆ Advertising ◆ Subscription ◆ Mark-up ◆ Fee for service ◆ Production	1)profit site(role in value network), 2)revenue model, 3) commerce strategy 4)pricing model
Osterwalder & Pigneur (2010)	◆ Unbunding ◆ Free(freemium, Bait & ◆ Long tail Hook) ◆ Multi-sided ◆ Open platforms	Business Model Canvas (9 elements)

3. Research Method

3.1 Literature review

A literature review was firstly conducted in order to understand the diversity of urban agriculture and to define the main focus of this research. Three urban agriculture business cases were studied mainly through literatures available online. Next to it, a literature review was also done on the topic of business model research to give an insight about the business model concept, Business Model Canvas and classification. The literature review helps to formulate questions for the survey and identify grouping variable for business model classification cluster analysis.

Articles referred to in the literature review were searched through Google Scholar and Wageningen University Library search engine. Materials for the case study are mainly from their official website and reports online. Two cases were visited with groups.

3.2 Survey study

1) Survey design

Two research questions were firstly sent to key informants in the field of urban agriculture research around the world through emails in order to gather information based on their observations. The questionnaire was then developed based on literature review and information given by key informants. The Business Model Canvas was used as the framework for the questionnaire design. Characteristics of urban agriculture business itself were also taken into account when developing questions. The questionnaire consists of 6 parts that are: basic information, key resources, key activities, value, customer and complementary information. Question types are mainly single or multiple choices and ordering questions concerning convenience for the participants. The questionnaire can be found in Appendix 1.

2) Data collection

The questionnaire was released on 7th October, 2014 and kept open until 28th November, 2014. It was distributed through several channels. It was posted on City Farmer News website and Wageningen University Rural Sociology Group weblog. The questionnaire was also sent through email lists of several urban agriculture research networks. Besides, about 130 initiatives around the world were directly reached through emails.

3) Data analysis

Basic analysis of businesses characteristics of urban agriculture were done in Excel for each question. Business model classification was done through Cluster Analysis using SPSS. Cluster analysis is used to identify homogenous groups of objects, objects in a specific cluster share many similarities but are very dissimilar to objects from other clusters (Sarstedt & Mooi, 2014). 'The similarity is measured by estimating the distance between pairs of objects' (Sarstedt & Mooi, 2014). As the number of valid respondents was not sufficient for a factor analysis, a two rounds cluster analysis approach was adopted for the classification. For the first round, cluster analysis was used to categorize respondents for each question, which also represent an element of the business. Options under each question were used as grouping variables. The data are either Binary (for multiple choices questions) or Interval (for ordering questions). For the second round cluster, the grouping variables were chosen based on the business model theory while combining characteristics of urban agriculture business practice resulting from the basic analysis. They were codified according to the cluster results based on the first round cluster analysis (Table 5).

Table 5 Cluster analysis approach and procedures

Cluster round	1st	2nd
Grouping Variables	Multiple choices or ordering options from each questions	Chosen factors based on business model theory and urban agriculture business characteristics
Coding for grouping variables	1) Multiple choices: 1-chosen/0-not chosen 2) Ordering: From 3 to 1 with decreasing importance (only the first three answers are analysed)	Category information resulting from the first round cluster analysis
Clustering procedure	Hierarchical Methods	
Clustering Method	Ward's Method	
Distance measure	Squared Euclidean distance 1) Multiple Choices: Binary 2) Ordering: Interval	Squared Euclidean distance Interval
Transform Value		Z scores

In the two rounds cluster analysis, Hierarchical Clustering was used as clustering procedure. Hierarchical clustering develops a tree-like structure in the analysis process. It can be agglomerative or divisive, and most of it falls into agglomerative clustering. In hierarchical

agglomerative clustering, it starts with each objective representing a cluster by itself, and these individual clusters are merged according to their similarity. In the end, all the objectives will end up in one big cluster (Sarstedt & Mooi, 2014). Ward's Method was chosen as the clustering method. Ward's Method generate clusters to minimise within-cluster variance (Malhotra & Birks, 2007). Ward's method and average linkage method have been shown to perform better than other methods in hierarchical procedure (Malhotra & Birks, 2007). Ward's method results in somewhat equally sized clusters (Sarstedt & Mooi, 2014), which could provide a good foundation for the second round cluster analysis. Because Ward's Method was chosen, Squared Euclidean distance was applied as distance measure. For the second round cluster analysis, as the number of categories of each variables was different, data was standardized using Z scores that rescales each variable to have a mean of 0 and a standard deviation of 1.

Finally, in order to exam whether the cluster analysis has differentiate the data well, the means of grouping variables across clusters were compared using ANOVA.

4. Results

4.1 Business Characteristics of Urban Agriculture

4.1.1 Basic information

1) Geographic and demographic Overview

Figure 9 Location of respondents projects

(Google Map: https://www.google.com/maps/d/edit?mid=zPLkAo5yMabY.kPzM1Haj6p4U)

By 28th November 2014, 46 valid respondents were received from all over the world (Figure 9). The diversity of respondents is impressive: it consists projects from 18 countries across 6 continents. 70% of them (n=32) come from North America and Europe (Table 6). Among all the projects, more than half of them (n=25, 54%) are from cities with a density between 1000 to 5000/ km^2. 39% of them (n=18) are located in cities with a population density higher than 5000/km^2. Five of them are located in cities with a population density higher than 10,000/km^2, of which 3 are from China and 2 are from the New York city in USA. The estimated distances between the farm and the city centre (the historical, commerce, cultural, political concentrated area) are mainly below 15km (87%, n=40).

Table 6 Geographic information of respondents projects

Continents	Countries	Number	Sum
North America	USA	12	17
	Canada	5	
Europe	Netherlands	4	15
	Italy	3	
	UK	3	
	Germany	2	
	Switzerland	1	
	Denmark	1	
	Belgium	1	
Asia	China	4	7
	Israel	1	
	Thailand	1	
	India	1	
Africa	Uganda	2	3
	South Africa	1	
Oceania	Australia	2	2
South America	Chile	1	2
	Brazil	1	
Sum		18	46
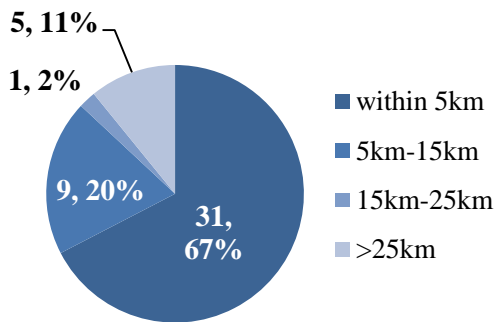
Figure 11 Distance between city centres

Legend: within 5km, 5km-15km, 15km-25km, >25km

5, 11%
1, 2%
9, 20%
31, 67%
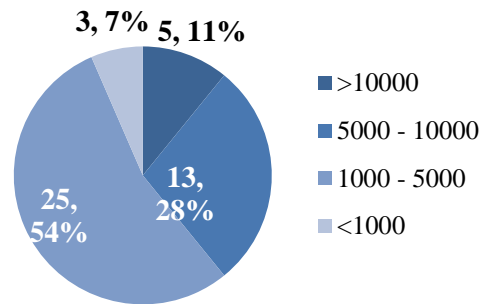
Figure 10 Population density of projects located cities (/km^2)

Legend: >10000, 5000 - 10000, 1000 - 5000, <1000

3, 7% 5, 11%
25, 54%
13, 28%

2) Launched year and farm size
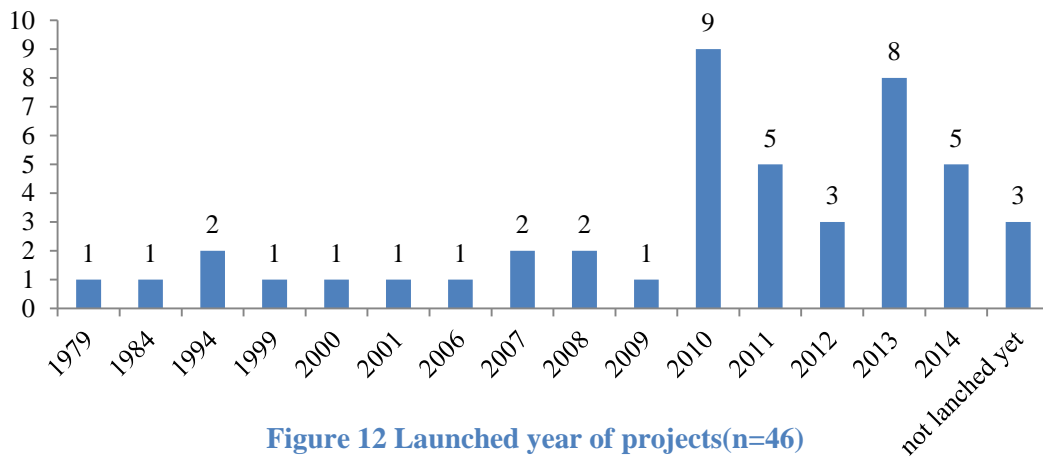
Figure 12 Launched year of projects(n=46)

72% of the projects (n=33) are relatively new and were launched within 4 years, 3 of them are still in planning phase (Figure 12). Regarding the farm size, only 41 valid answers were collected. The other 5 farms only provided average size for containers or didn't provide a valid number. The maximum size of a farm is 40,000 m^2 and the average sizes of farms are 7694.8 m^2. Around half of the farms are below 1000 m^2 (Figure 13).
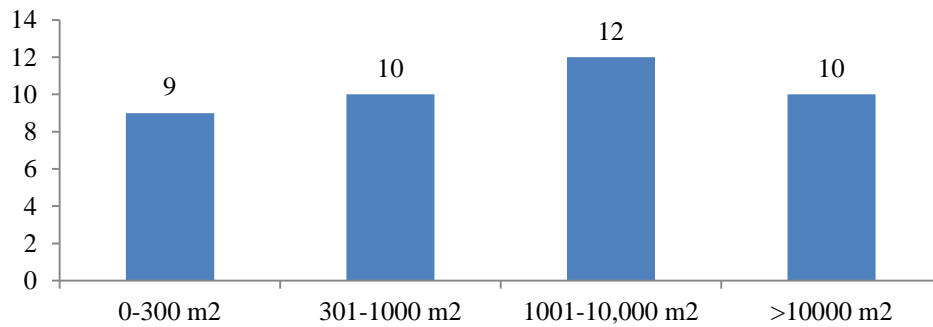
Figure 13 Farm size (n=41)

3) Types and ownership
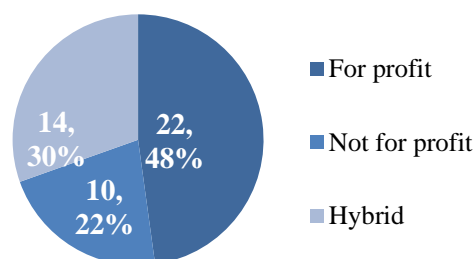
Figure 14 Types of organizations (n=46)

As shown in Figure 14, nearly half of the respondents (n=22, 48%) are for profit organizations, and 30% of them are hybrid organizations. As for ownership, the biggest group is sole ownership (n=13, 28%), next to it is corporation and partnership. Five of them recognize themselves as other ownerships, which are charity, society, public, forum and one LLC (Limited Liability Company) (Figure 15).
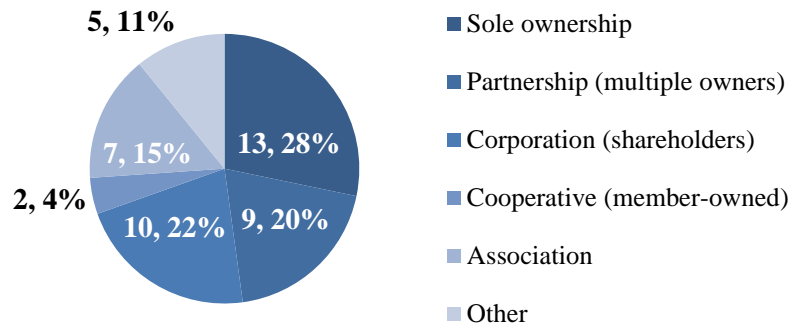
Figure 15 Ownership of projects (n=46)

4) Purpose
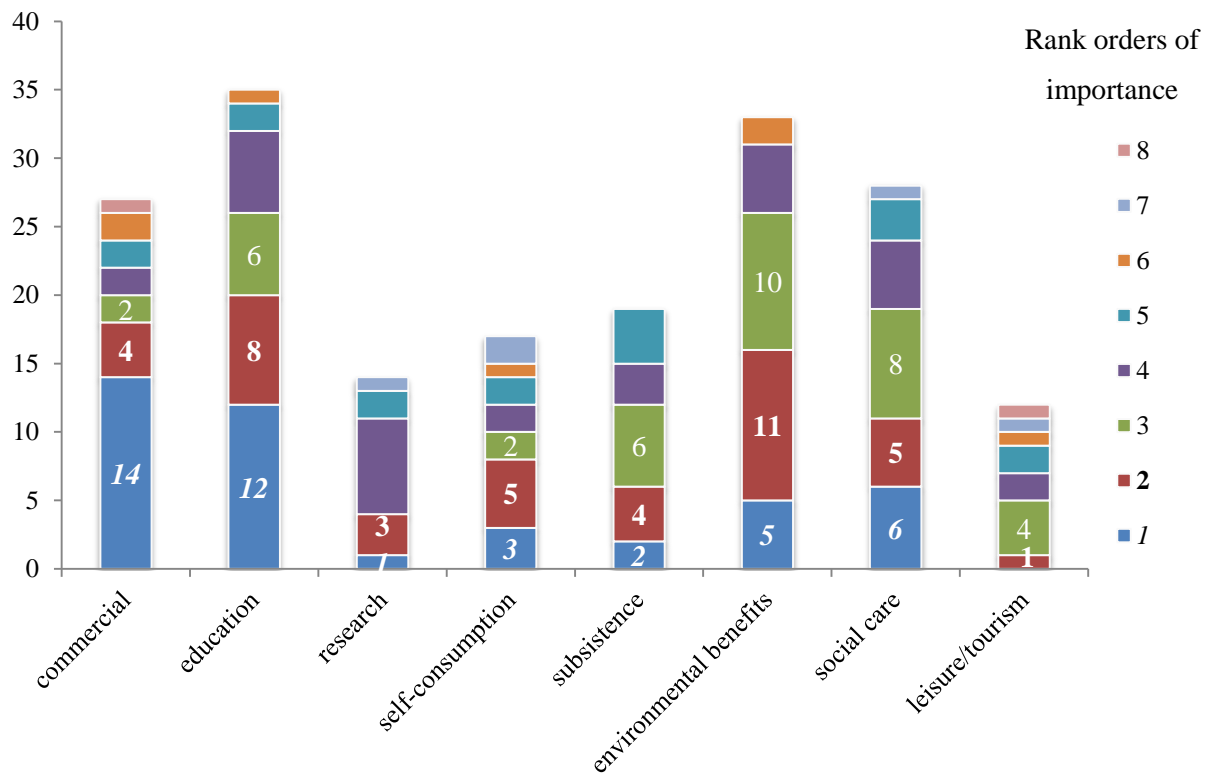
Figure 16 Rank of purpose of projects (n=43)

14 out of 43 respondents (32.6%) ranked 'commercial' as the most important purpose of their projects. 27 respondents (62.8%) recognized 'commercial' as one of its purposes. Among all of the respondents, education(n=35, 81.4%), environmental benefits(n=33, 76.7%) and social care(n=28, 65.11%) are the most addressed purposes in projects, which are all related to public benefits. Close to half of the respondents (n=19, 44.2%) recognized subsistence (for food security) as one of their project purposes (Figure 16).

4.1.2 Key resources

1) Production methods
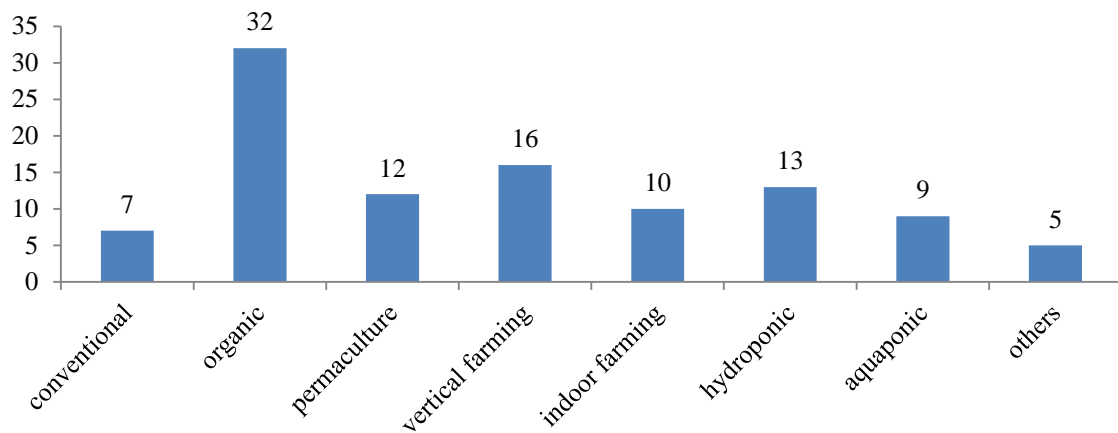
Figure 17 Production methods chosen by projects
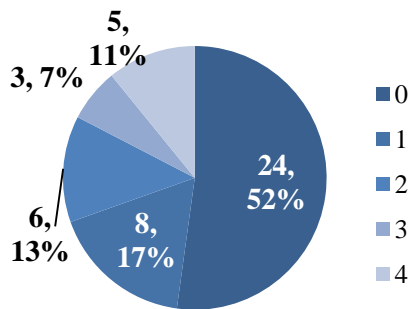
Figure 18 Number of enhanced production methods implemented in projects

Among 46 respondents, 32 of them (69.6%) implemented organic production, of which 5 implement both organic and conventional production methods at the same time. 12 projects implement permaculture in their production system. The five other production methods mentioned in the respondents are: on coffee waste, agro-ecology, bio-intensive. Two farms use containers for production (Figure 17). Among all the production methods, vertical farming, indoor farming, hydroponic and aquaponics can be recognized as enhanced production methods as they all somehow need more infrastructure, investment or innovation. As shown in Figure 18, nearly half of the projects (n= 22, 48%) implement at least one enhanced production method in their production system. According to the respondents, 17 out of the 46 projects conduct technical innovation as an activity of their operation. Two projects get revenue from their technical innovation.

2) Labour and their management/business skills
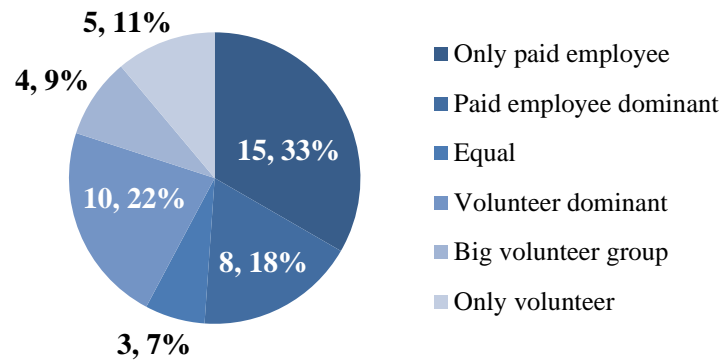
Figure 19 Labour allocation (n=44)

The number of fulltime employees ranges from 1 to 200, with the majority of the projects having 1 to 5 fulltime employees (n=22, 50%). 5 of them have more than 10 fulltime employees, while 19 of them don't have any fulltime employees in their projects. The number of part-time employees ranges from 1 to 13, 17 of them don't have part-time employees. The number of volunteers in each project ranges from 1 to 500, and 15 of them don't have volunteers as a source of labour. Figure 19 shows the labour allocation of these projects. 15 of them only have paid employees, of which 4 have more than 10 fulltime employees, ranging from 15 to 200. 8 projects are paid employee dominant. They have a small number of volunteers and there are more paid employees than volunteers in their projects. 3 projects have equal number of paid employees and volunteers. 10 projects are volunteer dominant; the number of volunteers in their projects is higher than paid employees but less than 100. 4 of the projects have a big volunteer group ranges from 100 to 500. The remaining 5 projects are operated by 5 to 100 volunteers.
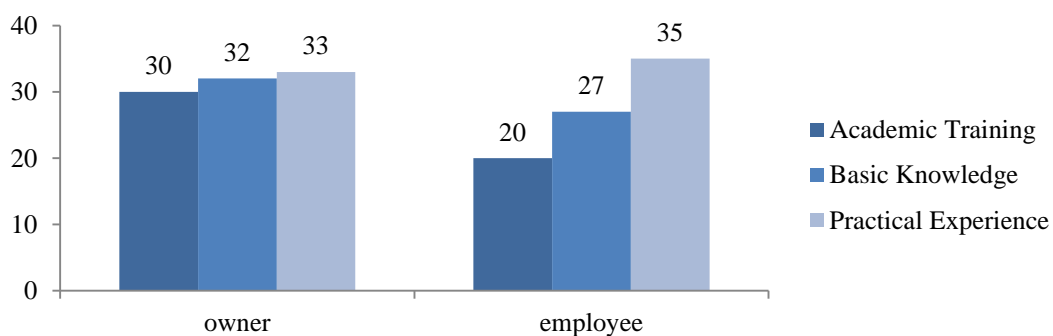
Figure 20 Labour management/business skills (n=46)

The management or business skill levels of respondents' projects are quite high (Figure 20), more than 70% of owners and employees have previous practical experience in management or business. Among all the projects, 6 project owners and 9 projects' employees don't have any mentioned management or business skills.

3) Not-for-Investment Financial Support
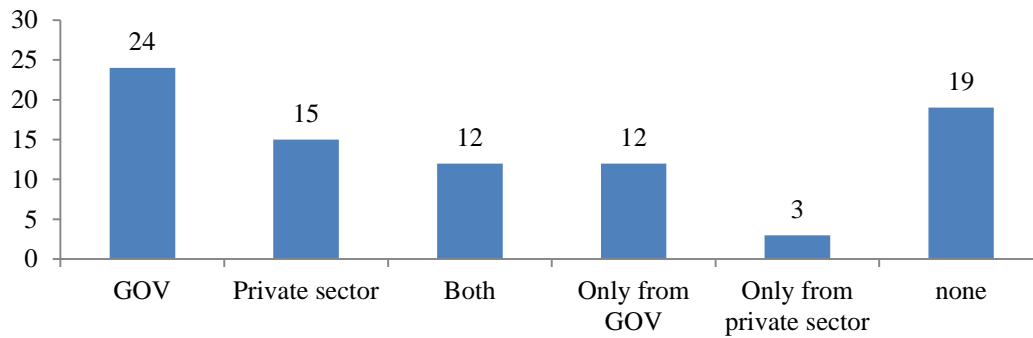
Figure 21 Not-for-investment financial support sources

24 projects (55.9%) reports that they receive not-for-investment financial support (such as subsidies, direct fund, discount on resources or free inputs etc.) from the government. 15 projects receive not-for-investment financial supports from the private sector. Among them, 12 projects receive both sources of not-for-investment financial supports. 19 projects don't
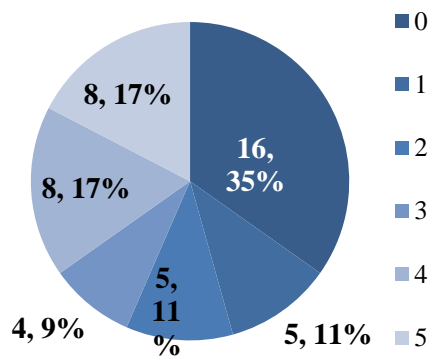
Figure 22 Not for investment financial support importance score

receive any not-for-investment financial supports, neither from the government nor from the private sector (Figure 21). The average importance score of not-for-investment financial support to their projects are 2.2 (0 refers to not important and 5 refers to very important). 35% of them don't recognize not-for-investment financial supports are important to their projects, while the other 65% think it's important to their project regarding its financial viability to different extent. (Figure 22).

4) Resource Exchange
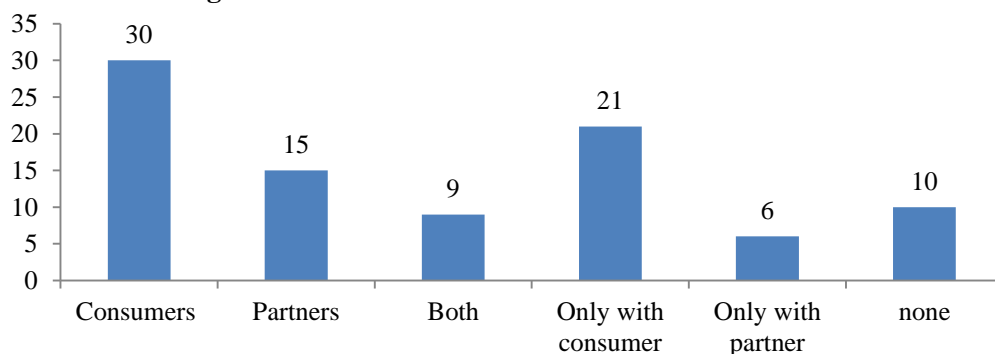
Figure 23 Non-monetary resource exchange with consumer or partners

From this questionnaire, 30 projects report exchanging their products or services for non-monetary resources with consumers. Those resources include labour, land and nutrition (waste) (Figure 23). Some respondents also mentioned relationship and visibility to society as

24

a form of resource exchange. The most common form of non-monetary resource exchanged with consumers is labour. Projects who exchange land or nutrition with consumers are still quite limited (Figure 24). Among the 30 projects that exchange non-monetary resources with consumers, 22 of them exchange only 1 form of resource, 7 exchange 2 different forms of resource, and 1 projects exchanges 4 resource forms including workshop spaces provided by consumers. 3 out of all the projects do not receive money as a form of exchange, and they are all not-for-profit organizations. There are 15 projects that also exchange non-monetary resources with their partners. The most common form of resources exchanged is land or growing spaces. Other forms of resources mentioned are compost/food waste, water, electricity, events, marketing, pickup locations, and relationships. There are 10 projects that don't exchange any form of non-monetary resource with their consumers or partners.
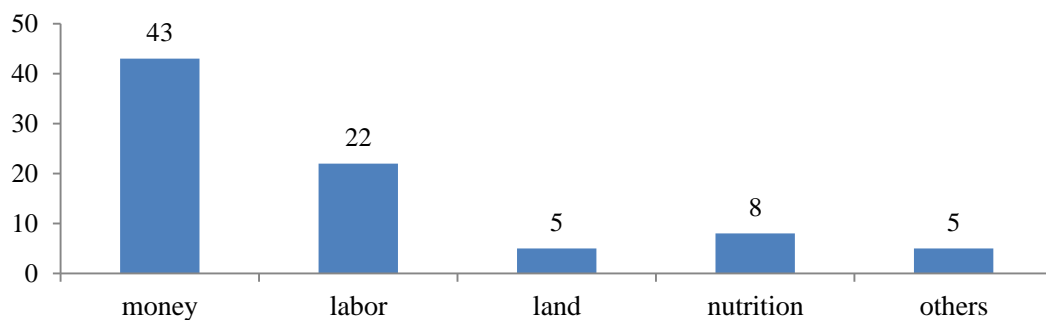
Figure 24 Exchange money or resources with consumers

5) Non-financial Support
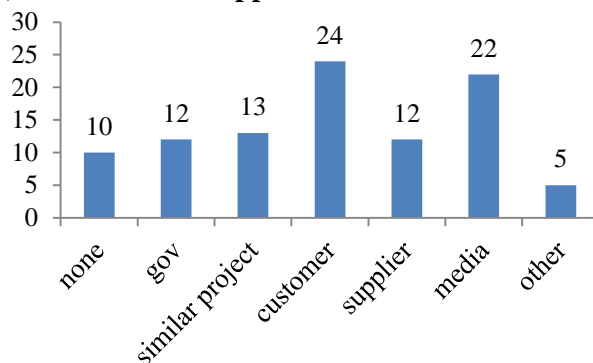
Figure 26 Non-financial support sources
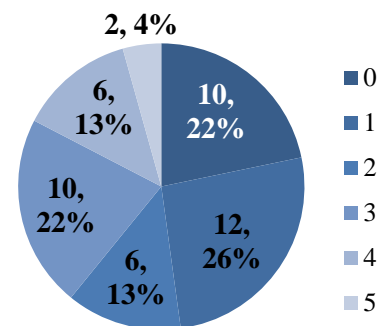
Figure 25 Number of non-financial support sources

Except for receiving financial support or exchanging resources with consumers or partners, non-financial support, such as promotion, advertising, technologies or knowledge etc., provided by different stakeholders are also important sources of support. Although it doesn't directly contribute to projects operation financially, non-financial supports could offer intangible resources. As shown in Figure 25, 36 projects receive non-financial support from one or multiple stakeholders. The most common sources of non-financial supports are from customers and the media. Two projects also mentioned non-financial support from academia. More than half of the respondents received diversified sources of non-financial supports (Figure 26).

4.1.3 Agricultural Products
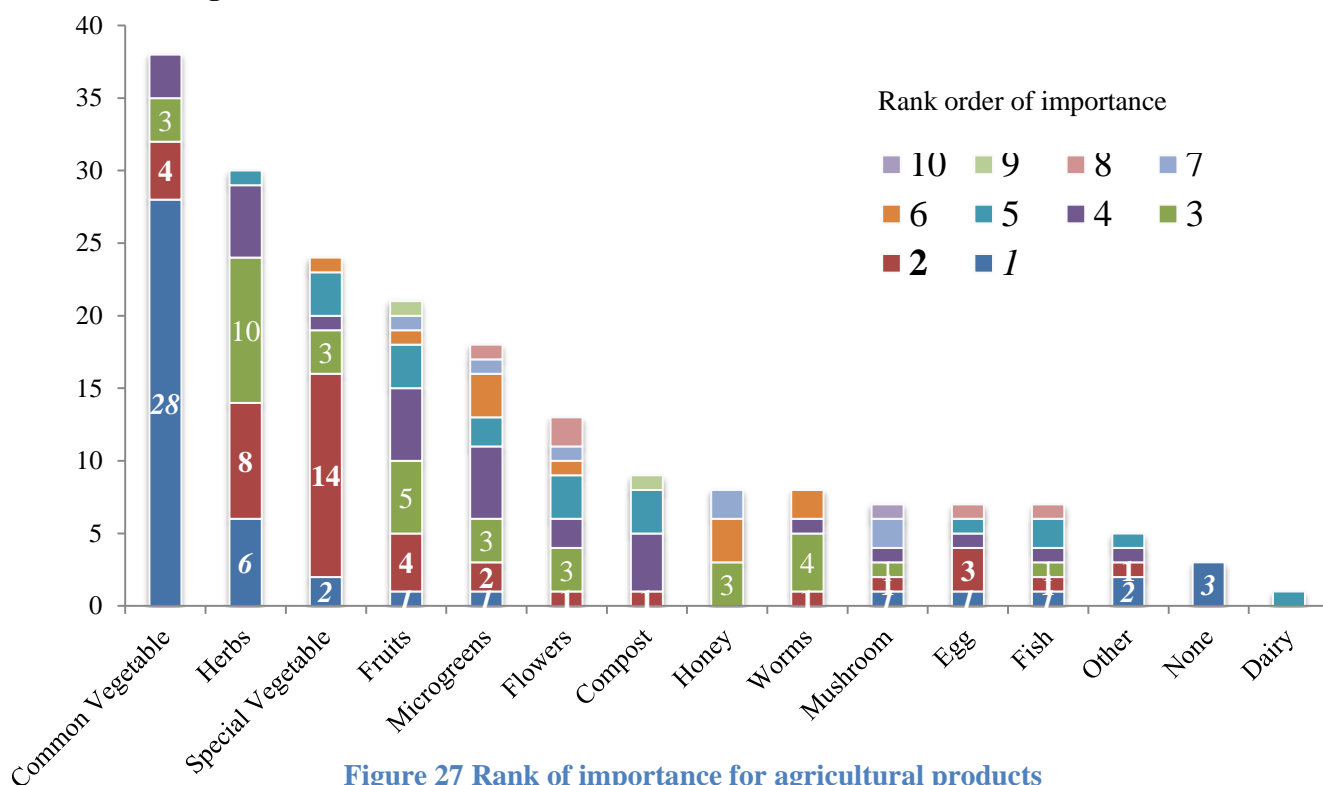
Figure 27 Rank of importance for agricultural products

There are 17 varieties of agricultural products produced by respondents' projects, including enzymes, medical cannabis, grape/wine, sheep and hot source that are mentioned in the choice of other products. Most of the projects grow vegetation, especially common vegetables, as their dominant agricultural products. The rest grow more value added products, such as mushroom, fish, medical cannabis etc. as their dominant products. The 3 most common products are common vegetable, herbs and special vegetables (such as exotic varieties, heirloom vegetables etc.). While meat production is very rare in the respondents' projects. Only one farm ranked sheep as the 4th important products of their production and 7 farms produce fish. Non-food products are also included in some of these projects, but none of those non-food products are dominant products (Figure 27). Despite the diversified varieties of agricultural products, the number of agricultural products also varies from 0 to 10 (Figure 28). Most of the respondents (82%) produce more than one agricultural product. The majority produce three to five different agricultural products

Figure 28 Numbers of agricultural products

(n=24, 53%)

4.1.4 Activities and streams

1) Activities

As shown in Figure 29, the most common activities conducted by respondents' projects are Agricultural product production (n=43, 93.5%), Education services (n=34, 73.9%), Community services (n=33, 71.7%) and Volunteer opportunities (n=32, 69.6%). The latter three activities are all services that could bring social benefits to society. Besides agricultural production and sale their own products, 19 projects also sell products from other suppliers. Activities that relate to environmental aspects are relatively less common among all the projects, except for composting, half of the projects conduct composting.
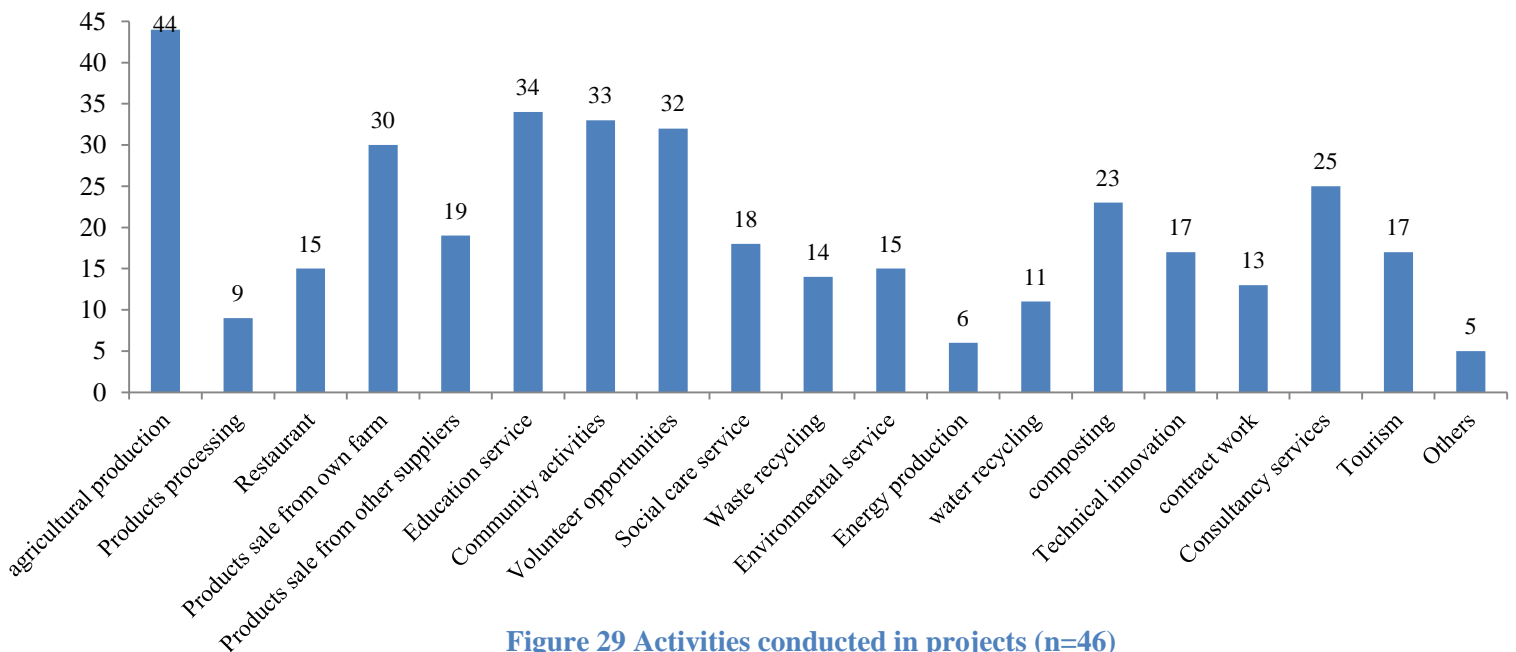
Figure 29 Activities conducted in projects (n=46)

More than half of the projects provide consultancy services. Other activities mentioned by respondents are events, visit and venue. There are three projects that don't conduct agricultural product production. One is a city farm for education purpose, the other two sell products from other suppliers. Almost all the respondents report that they conduct multiple activities in their projects. The majority of respondents (n=33, 67.4%) conduct 5 to 9 different activities in their projects, and the highest covers 17 activities (Figure 30).
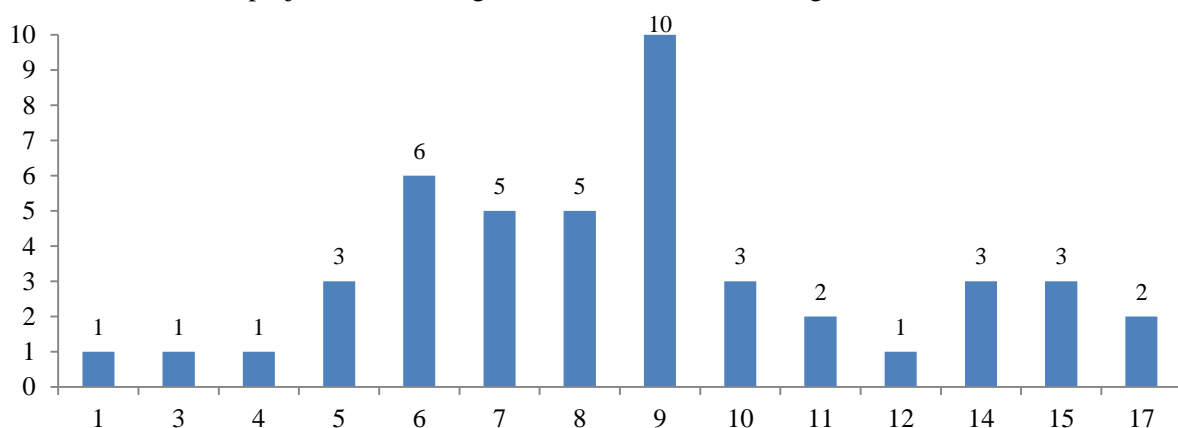
Figure 30 Number of activities conducted

27

2) Main cost stream

From all the activities that respondents conduct, the main cost stream is asked. 41 respondents gave valid answers and some gave more than one activity as answer. 10 activities are mentioned across 41 respondents. The most common main cost streams are from agricultural products production, education services and retail activities including products sold from own farm or other suppliers (Figure 31).
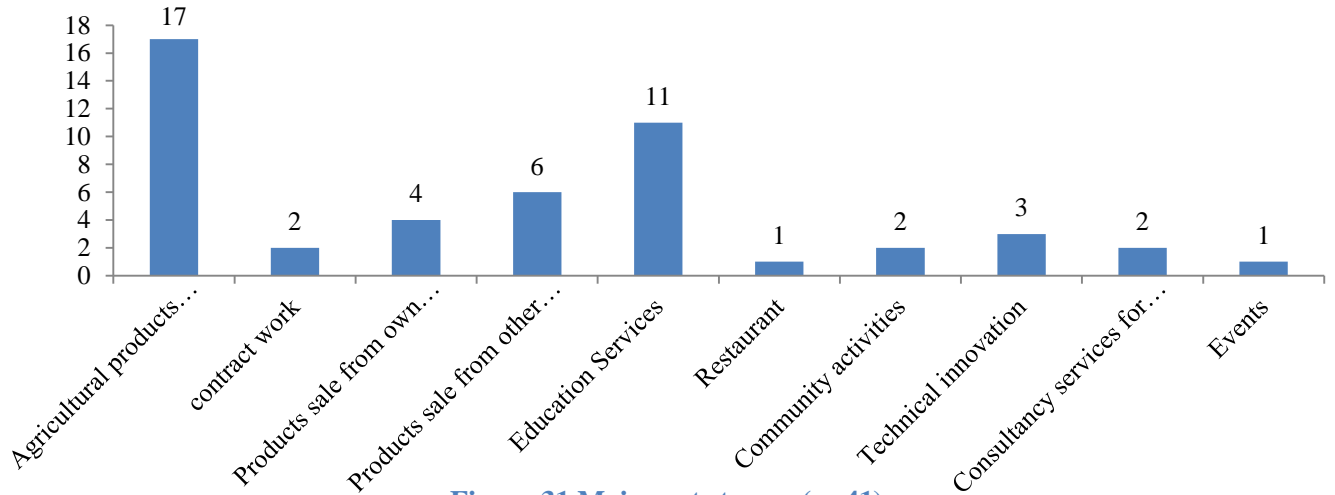
Figure 31 Main cost stream (n=41)
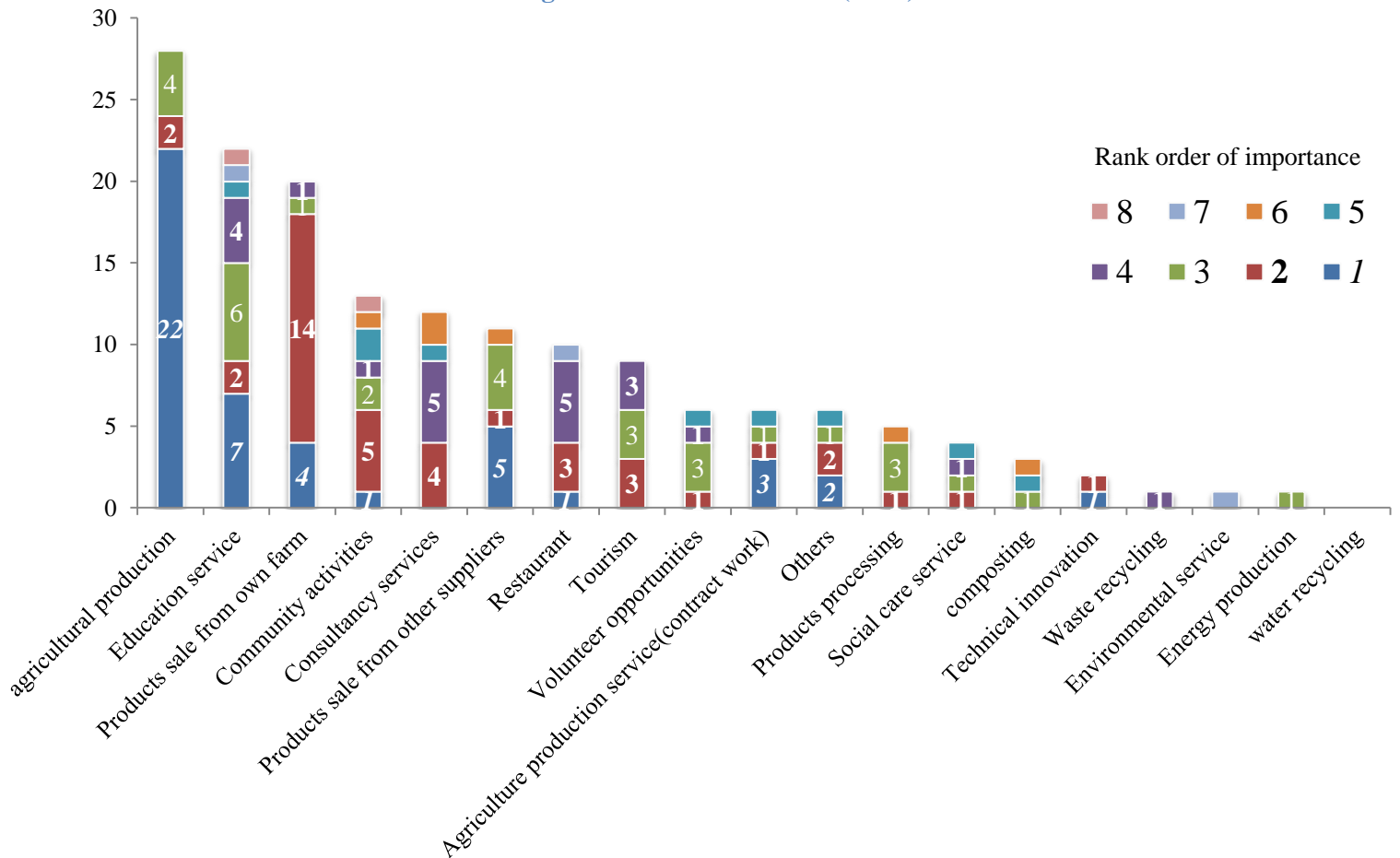
Figure 32 Rank of importance for revenue streams (n=46)

28

3) Revenue streams

Figure 32 has shown that agricultural production, education service and products sold from own farms are three activities that are mostly chosen as a source of revenue streams. 11 respondents don't generate revenue from agricultural production, nor from products sold from own farm. Instead, their revenues mostly come from providing services, valorising their labour and knowledge or sale of products from other suppliers. All the activities conducted in respondents' respective projects are possible to generate revenues from consumers, except for water recycling. Among all the activities, environmental related activities, such as water recycling, energy production, waste recycling etc., are much less important for generating revenue comparing to other activities. Most of the respondents have more than one revenue stream (n=41, 89%), the majority (n=31, 68%) get revenue from 2 to 4 different streams, and the highest 2 projects can have revenue from 8 different activities that they conduct (Figure 33).
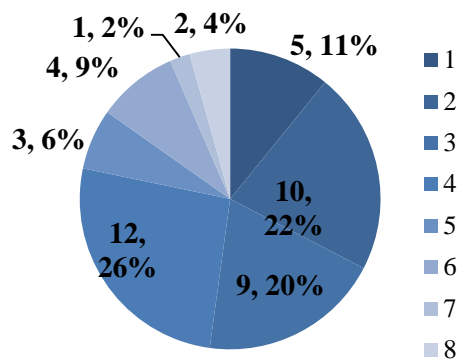
Figure 33 Numbers of revenue streams

4) Subsidy or funding generate activities

7 projects don't get subsidies or funding from activities that they conduct, the majority (n=34, 73.9%) get subsidies or funding from 1 to 4 different activities that they conduct. The highest receive subsidies or funding from 7 activities (Figure 34). The most popular 6 activities that can help projects to get subsidies or funding are education service, community activities, agricultural production, volunteer opportunities, social care services and environmental services, which are all directly related to public benefits except for agricultural products production. Close to half of the respondents (n=21, 45.7%) get different degrees of subsidy or funding from education services they provide. Some projects also identify tourism, technical innovation, consultancy services and contract work as their most important subsidy generating activities (Figure 35).

Figure 34 Number of subsidy or funding generate activities
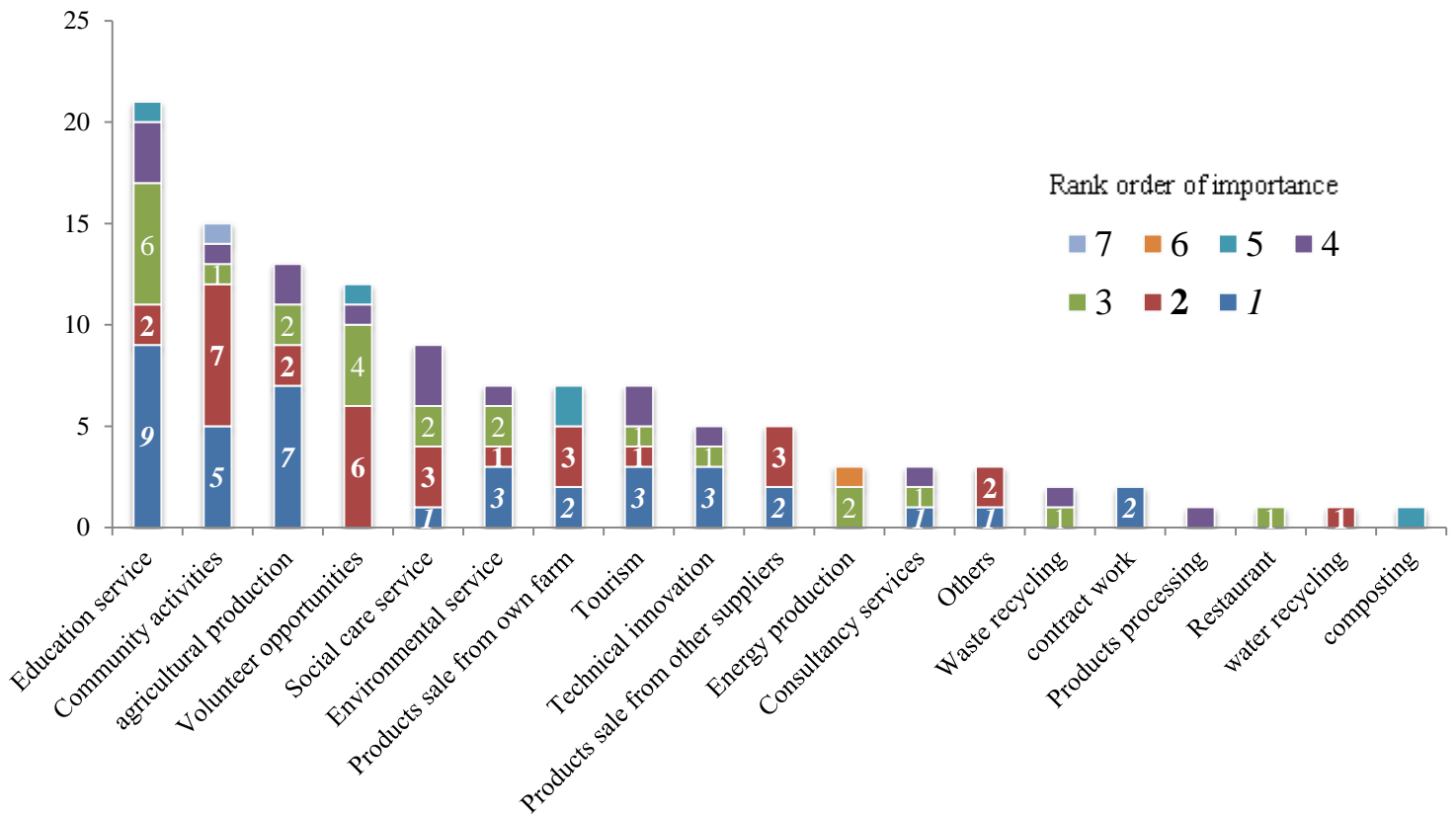
Figure 35 Rank of importance for subsidy generating activities
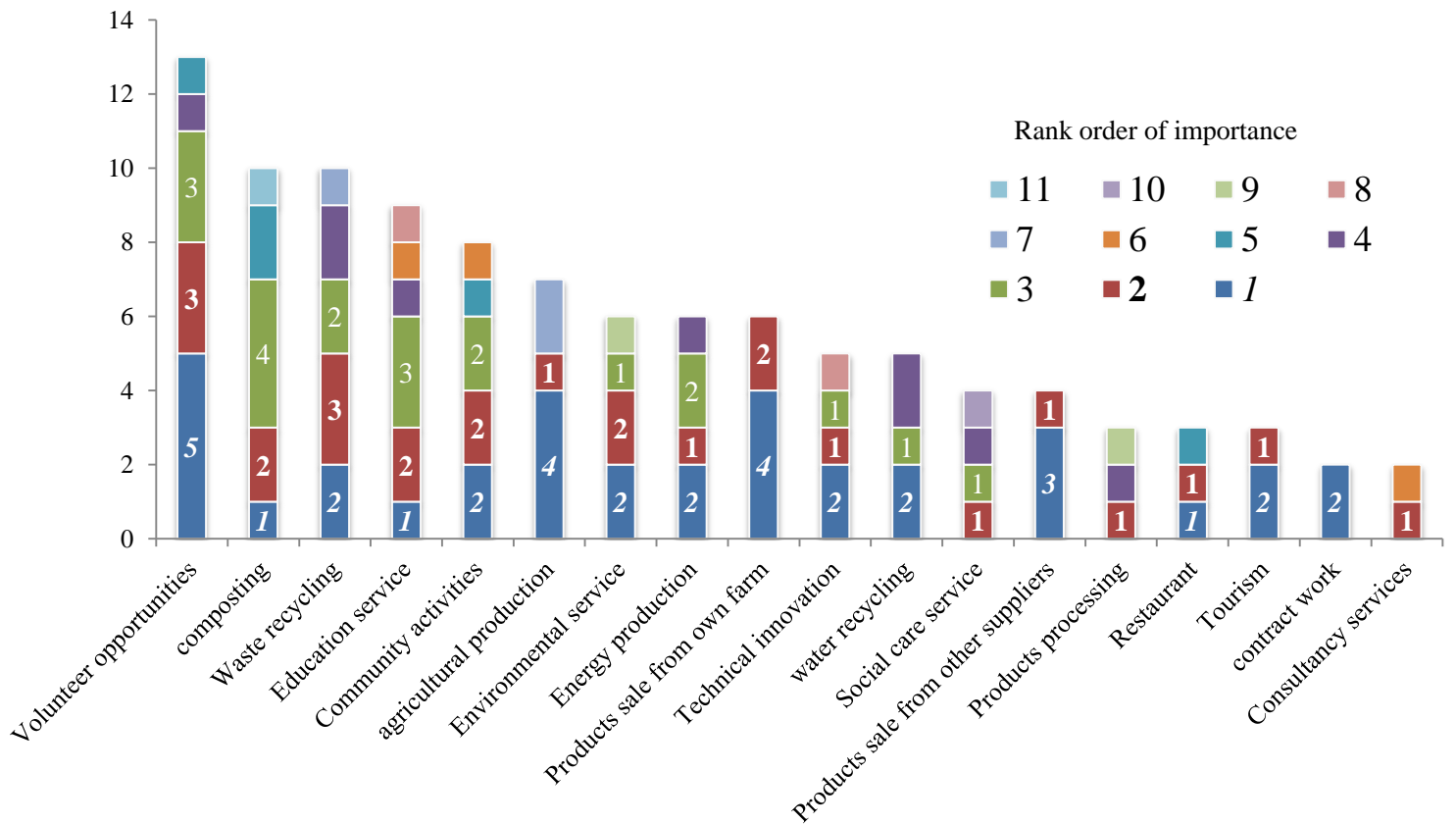
Figure 36 Cost reduction activities

5) Cost reduction

According to Figure 36, volunteer opportunities, waste recycling and composting are three activities most commonly conducted to reduce cost of operation, both regarding the rank of importance and the total number of projects who conduct them to reduce cost. These three activities could possibly reduce labour cost and production input cost for project operation and two of them are related to environmental functions. 12 respondents don't consider any activities could reduce cost for their projects. The majority could reduce their operation cost through 1 to 4 activities (n=36, 64%).

6) Integration

Figure 37 is made to compare different activity streams. The bars show the percentages of projects receiving different financial benefits from a specific activity.. All the activities could be divided into 5 groups based on its general functions. These are agricultural production, adding value (products processing, restaurant, sale from own farm or other suppliers), social services (education, community activities, volunteer opportunities and social care), environmental services (waste recycling, environmental services, energy production, water recycling and composting), and valorising resources such as knowledge, labour (technical innovation, contract work, consultancy services and tourism). The figure shows that revenue generation is more likely to happen in agricultural production, adding value and valorising resources activities. Social and environmental services activities have higher chance to generate subsidy. Environmental services are very helpful for cost reduction, especially for energy production (100%).
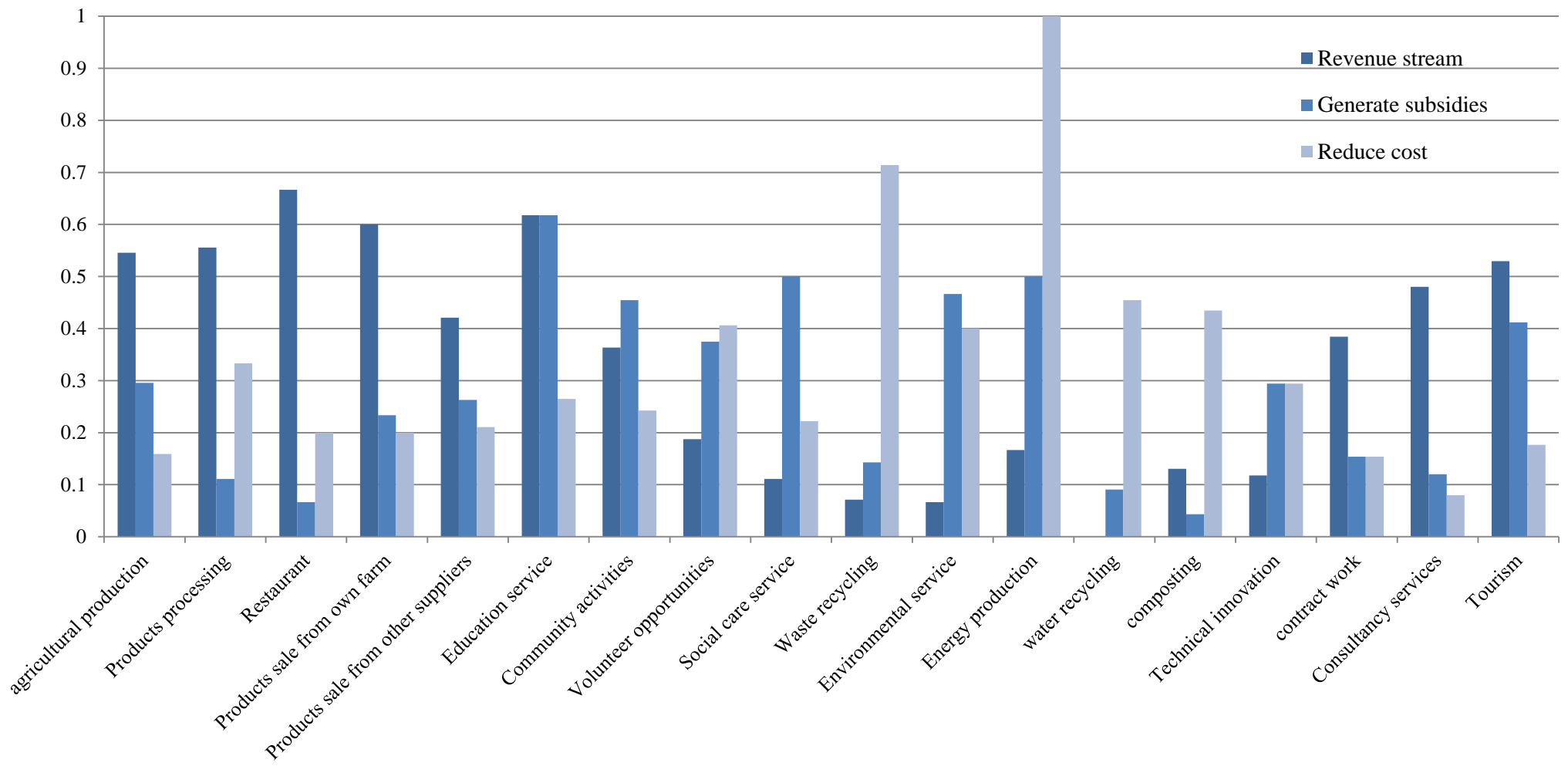
Figure 37 Percentage of projects whose conducted activities has financial benefits to their operation

4.1.5 Value Proposition

As shown in Figure 38, regardless of the rank of importance, the most addressed values are social benefits (n=37, 80.4%), sustainability (n=34, 73.9%), accessibility of local food (n=32, 69.6%) and environmental benefits to the city (n=31, 67.4%). 3 out of the 4 most addressed values are related to public benefits to the society. When only looking at the first three most important values, quality of food, social benefits and good relationship with consumers are mostly chosen. Although 43 out of 46 projects produce food products and two other projects sale products from other suppliers, there are 13 projects that don't identify 'Quality of food' as their value, instead, they recognize public benefits, or relationship-based value such as story of their projects, service and relationship with consumers.
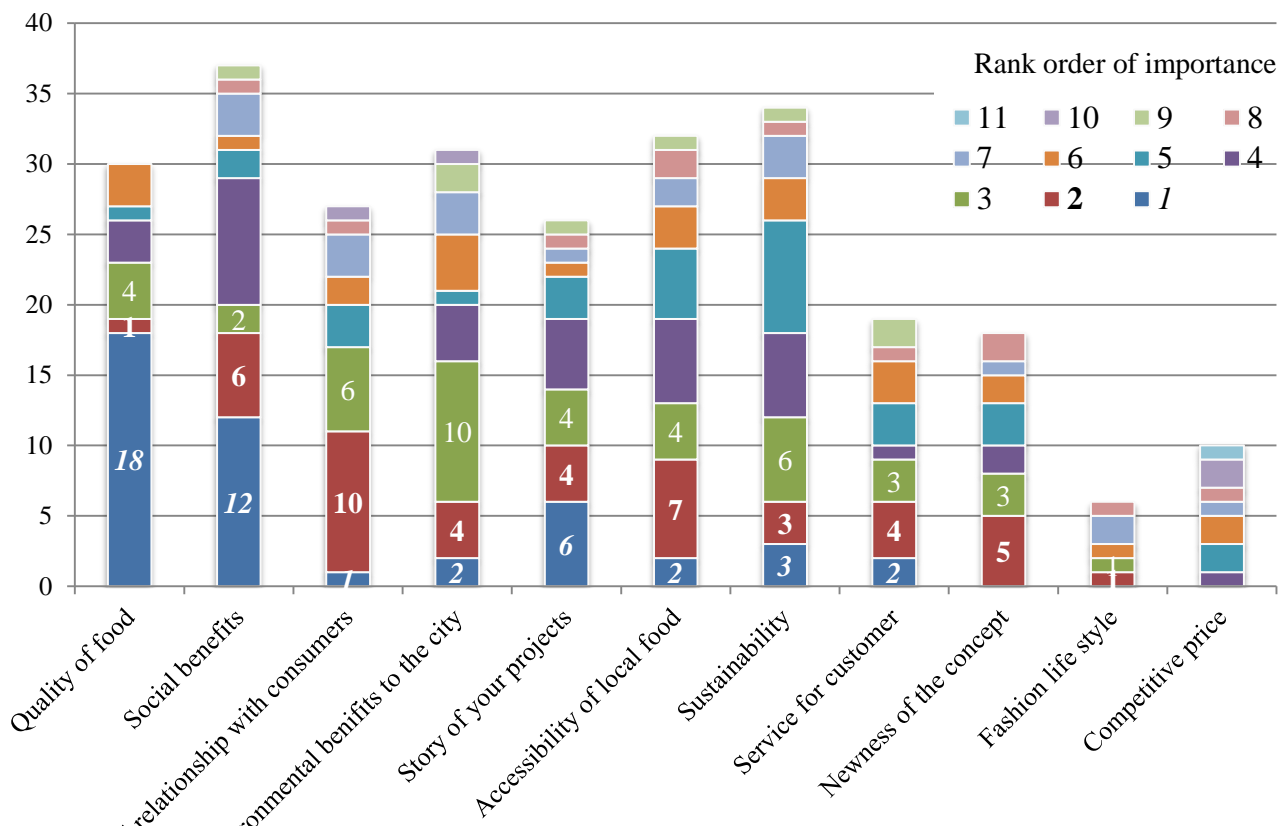
Figure 38 Rank of importance for value proposition

4.1.6 Customer

1) Marketing strategies

Among all the respondents, 29 respondents (63.0%) have targeted customers in their plan, while 17 respondents (37.0%) don't. One respondent is not marketing yet. There are 12 respondents (26.1%) who do not yet have marketing strategies, and 3 of them don't have any form of marketing channels. Most of the respondents (n=34, 73.9%) have more than one

marketing channel to reach their customers. Close to half of the respondents have two marketing channels (Figure 39). The most commonly used marketing channels are through social media and word of mouth (Figure 40), which are relatively low cost and rely much on personal relationships. Other marketing channels mentioned in this questionnaire are email newsletters, school community, public transport hub and in-house customer research.
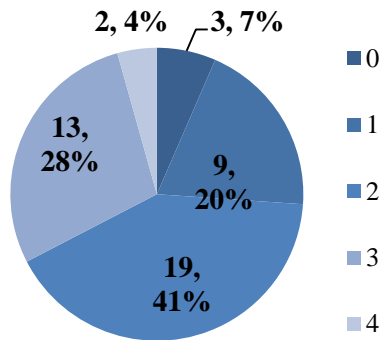
Figure 39 Number of marketing channels (n=45)
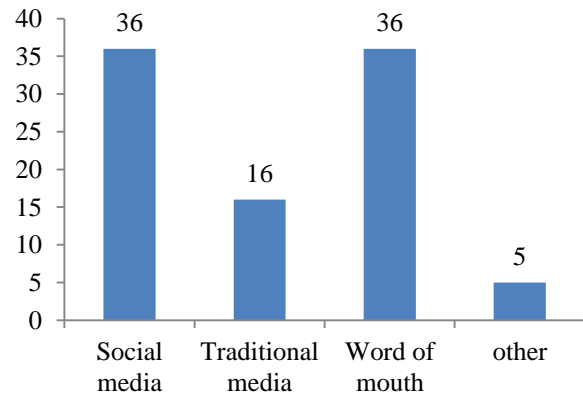
Figure 40 Types of marketing channels

2) Distribution channels
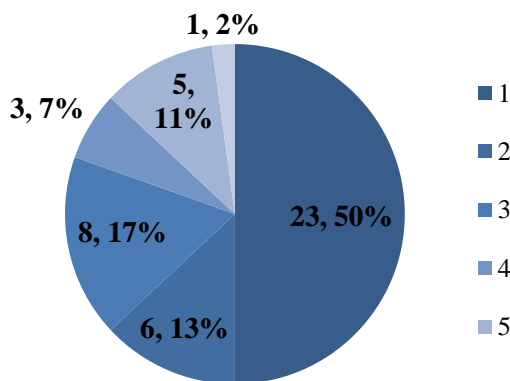
Figure 41 Number of distribution channels

Half of the respondents only implement one distribution channel to reach their consumers (Figure 41), including CSA, self-pick, on farm shop, online sale, vegebag deliver to home, restaurant and other channels. The others implement more than one distribution channel. Figure 42 has shown the diversity of distribution channels that respondents' projects have chosen. There are more than 11 kinds of channels that are implemented across all the projects, most of them are much shorter distribution chains than in rural agriculture. The most popular ones are on farm shop (n=17, 37.0%), CSA (n=16, 34.8%), self-pick (n=14, 30.4%) and farmer's market (n=14, 30.4%), which are channels organized by themselves and directly reach consumers. Channels that need cooperation with the others, such as supermarket, special shops, food cooperative, restaurant and events, are relatively less popular in these projects. Other channels mentioned by respondents include sale table at transport terminus, food banks, distribute by consumers, home delivery resellers and consume at home.
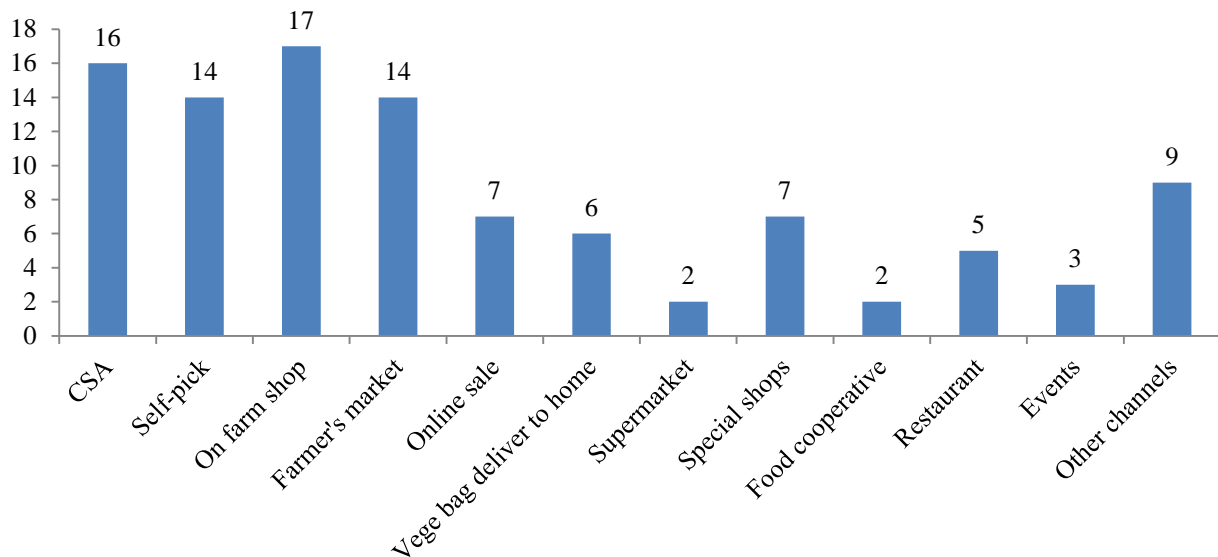
Figure 42 Distribution channels

4.1.7 Complementary information

1) Business Goal Achievement Score

Respondents were asked to give a score from 0 (never achieved) to 5 (always achieved) for business goal achievement for their team, and 39 respondents answered. The average score is 3.21. The majority (n=29, 74%) gave a score from 3 to 4. Only two projects always achieved their business goal, and they are both for profit companies (Figure 43)
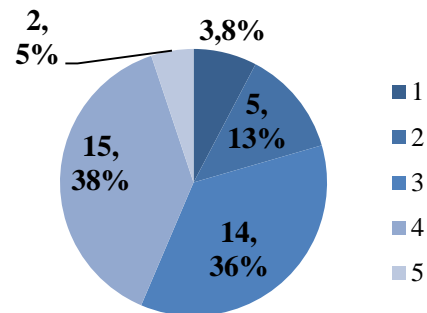
Figure 43 Performance score (n=39)
From 0 (not achieved) to 5 (always achieved)

2) Success factors and challenges

Two open questions were asked about the most important success factors and the biggest limitation/challenges for their enterprise/company. For success factors, the most mentioned three can be summarized as providing social benefits, good operation for their business or production, and financial viability. Besides, innovation and good relationship/connections with consumers are also mentioned, both by four respondents. For the biggest limitation or challenges that respondents are facing, the most addressed one is funding, 13 projects report their difficulties in getting money for initiating or maintaining their projects. The second one is land availability or security mentioned by 9 projects. 5 projects report their challenges in production, such as pest problems and low quality. Financial viability and failures in marketing are both mentioned by four respondents. Other challenges such as lack of policy support, vandalism, limited production scale and lack of consumer participation are mentioned by one or two respondents.

Table 7 Differentiated criteria by organization types

		Organization Types			
		For profit	Not-for profit	Hybrid	Value Interpretation
	Number of projects	22	10	14	
Purpose	Commercial	5.14	0.80	2.86	Rank of importance: Most important=8 Not important=0
	Education	3.59	6.60	5.50	
	Self-consumption	0.77	2.20	4.07	
Employee	Fulltime	0.77	0.20	0.57	Checked=1, Blank=0
	Volunteer	0.50	0.90	0.79	
Management skill	Owner's practice experience	0.91	0.40	0.50	
Not for investment financial support	From private sector	0.18	0.80	0.21	
	Importance score	1.36	3.80	2.21	Score of importance
Non-financial support	From similar project	0.14	0.60	0.29	Checked=1, Blank=0
Resource exchange with consumer	Money	1.00	0.70	1.00	
	Labour	0.23	0.70	0.71	
Activities	Community activity	0.55	1.00	0.71	
	Social care	0.18	0.60	0.21	
	Products sale from other suppliers	0.45	0.00	0.14	
Revenue stream	Community activities	0.86	3.90	1.00	Rank of importance: Most important=8 Not important= 0
	Volunteer opportunities	0.50	2.30	0.00	
Subsidies generate activities	Community activities	1.14	4.90	0.93	Rank of importance: Most important=7 Not important=0
	Volunteer opportunities	0.18	2.00	0.64	
Reduce cost	Community activities	0.55	3.60	1.07	Rank of importance: Most important=11 Not important=0

* $p<0.05$

4.1.8 Differentiated criteria by organization types

Criteria differences by organization types were analysed using ANOVA analysis by SPSS. A list of differentiated criteria and their means of value are listed in **Error! Reference source not found.**. ANOVA analysis results are presented in Appendix 2 Table 16. As **Error! Reference source not found.** shows, the three organization types differs regarding their purposes, employee, level of management skill, interaction with partners and activities. For example, for-profit projects are much more commercial oriented. Most of them rely on fulltime employee and much less on volunteers. Their owners have relatively high management skill regarding practical experience. They have less interactions with partners both financially and non-financially, and financial support is less important to them compare to the others. Social services activities such as community services, volunteer opportunities are less likely to happen and have less impact on their projects. While the situation in not-for-profit ones are mostly on the contrary. They are more educational founded, rely much more on volunteers, have more interaction with their partners and recognize financial support important to their projects operation. Social services activities are widely adopted and have important roles to generate financial benefits to not-for-profit projects. The situations in hybrid projects are mostly in between of the other two types.

4.1.9 Differentiated criteria by continents (North America and Europe)

Another exploratory analysis was conducted to study the differences among continents. Due to the limited sample size from other continents, it is not sufficient to conduct an ANOVA analysis across all the 6 continents. Thus a t-test was conducted to analysis the differentiated criteria only between projects in North America and Europe. The t-text results will be presented in Appendix 2 Table 17. Table 8 shows the average value of differentiated criteria of projects from the two continents. Criteria cover several aspects of their business have statistical significant differences. For example, research as a purpose is more important for European projects than North American ones. Fruits and special vegetable are quite important products for North American projects. Composting is an activity that can reduce cost for North American projects while it is not the case to any projects in Europe. For the value proposition, it is quite remarkable that accessibility of local food is much more important for North American projects than European ones. Besides, some attributes regarding their employee's management skill level, marketing channels, distribution channels and target consumer strategies are also different. In general, North American projects have higher level of these practices in their operation.

Continents		North America	Europe	
	Number of cases	17	15	
		Average rank of importance		Scale
Purpose	Research	0.82	3.27	0-8
Products	Fruits	5	1.47	0-10
	Special vegetable	6.06	1.73	
Reduce cost	Composting	3.65	0	0-11
Value	Accessibility of local food	7.29	4.27	0-11
		Percentage of projects		
Management Skills	Employee basic knowledge	82%	33%	
Activity	Sale from others suppliers	41%	7%	
Marketing channel	Word of mouth	100%	73%	
Distribution channel	On-farm shop	53%	13%	
Target consumer		94%	47%	

* p<0.05

4.1.10 Linear relationship between criteria and business achievement goal

In the last section, complementary information, respondents were asked to give a score for their general business goal achievement from 0 to 5. Respondents were divided into 5 groups according to their given score. Then, a regression analysis was done between average value of all the criteria and the self-assessed business achievement goal, to explore the relationship between their operation and projects' performance. **Error! Reference source not found.** shows a list of criteria that have strong linear relationships with their self-assessed business achievement goal score. The R^2 between some criteria and the score are higher than 0.90, such as whether they have paid employee, whether they get non-financial support from suppliers, whether they have marketing strategy, the importance of herbs and special vegetables as products, and the importance of waste recycling as a cost reduction activity etc..

As shown in this whole chapter, there is great diversity of urban agriculture in practice regarding every aspects of this business. Various projects produce a wide range of products, conduct different activities for diverse purposes and have different relationship with stakeholders. All this heterogeneity brings challenges to describe and understand urban agriculture businesses. Thus in this research, a statistical approach was adopted to simplify the diversity. Classification of business models was done using cluster analysis; the results are shown in the next chapter.

Table 9 Linear relationship between criteria and self-assessed business goal achievement score

Business goal achievement score		1	2	3	4	5	Value interpretation	R^2
Number of cases		3	5	14	15	2	Value interpretation	R^2
Type		2.33	2.00	1.79	1.87	1.00	1=for profit, 2=not for profit, 3=hybrid	0.81
Employee	full time	0.00	0.40	0.50	0.67	1.00	1=checked, 0=blank	*0.96*
	part-time	0.33	0.40	0.71	0.60	1.00		0.83
non-financial support	from supplier	0.00	0.20	0.21	0.40	0.50	1=checked, 0=blank	*0.96*
Products	herbs	2.67	3.20	5.00	7.13	8.00	Most important=10 Not important= 0	*0.97*
	special vegetable	0.00	2.00	4.07	6.13	7.00		*0.98*
Activity	products processing	0.00	0.00	0.07	0.20	0.50	1=checked, 0=blank	0.82
	consultancy	0.33	0.40	0.43	0.53	0.50		0.86
Revenue stream	volunteer	2.00	0.80	0.43	0.40	0.00	Most important=8 Not important= 0	0.82
	consultancy	0.00	0.00	1.93	1.60	2.50		0.83
Subsidy generate activity	environment service	0.00	0.00	0.93	1.40	3.50	Most important=7 Not important=0	0.85
Reduce cost	waste recycle	0.00	0.00	1.64	2.60	4.00	Most important=11 Not important=0	*0.95*
	composting	0.00	0.00	2.50	1.80	4.50		0.82
Value	quality of food	3.67	5.60	5.57	7.67	11.00	Most important=11 Not important=0	0.90
target consumer		1.67	1.60	1.57	1.07	1.00	1=Yes, 2=No	0.85
no marketing strategy		0.67	0.60	0.21	0.13	0.00	1=checked, 0=blank	*0.93*
Marketing channel	social media	0.67	0.60	0.79	0.80	1.00	1=checked, 0=blank	0.80
	others	0.00	0.00	0.14	0.20	0.50	1=checked, 0=blank	0.86
Distribution	special shop	0.00	0.00	0.14	0.20	0.50	1=checked, 0=blank	0.86

5. Business Model Classification

5.1 Grouping Variables for Business model cluster analysis

According to the analysis of urban agriculture business characteristics and combining with literature reviews in the business model, eight grouping variables were chosen for urban agriculture business model classification. The eight grouping variables can represent four business areas under the Business Model Canvas framework. The four business areas are value offer, customer, infrastructure and financial viability (Table 10). A first round cluster analysis was conducted in order to categorize respondents according to their features by each grouping variables.

Table 10 Grouping Variables for Business Model cluster analysis

Infrastructure	Offer	Customer
Number of enhanced Production Methods	Value Proposition	Marketing channels
Level of Products' Value Differentiation		Distribution Channels
Activity Numbers		
Level of financial interactions with partners		
Financial Viability		
Revenue Streams		

1) Value Proposition

Respondents are clustered into three groups according to their identified core values, which are quality of food, public benefits and story of the projects (Appendix 3 Table 19). The first group ranked 'quality of food' very high as their most important value proposition. The second group resulted in higher value for social benefits, sustainability and environmental benefits, and they are described as for public benefits. The third group recognize the story of their projects as very important value proposition. It tends to be more integrated in the third group, as values are packaged into a story to tell. Across all three groups, the value changes from substantial benefits for consumers to more intangible and soft good.

2) Number of enhanced production methods

For this grouping variable, the number of enhanced production methods that need infrastructure, investment or innovation is taken in order to reflect their inputs in production methods. The production methods identified as enhanced ones are vertical farming, indoor

farming, hydroponic and aquaponics. As presented in Figure 18, 22 projects implement 1 to 4 different types of enhanced production methods in their system.

3) Level of products' value differentiation

According to the rank of importance for products, three clusters were distinguished among all the respondents (Appendix 3 Table 20). The first group produce common and special vegetables (such as exotic varieties, heirloom vegetables etc.) as their main products. The second group also produce common vegetable as their main products, whereas it combines with other value differentiated products, including both food and non-food products, in their system. The third group don't grow common vegetables as their main product, instead, it mainly relies on a variety of value differentiated products such as mushroom, herb, fish etc.. As presented in these results, the level of products' value differentiation increases from first group to the third group.

4) Activity numbers

As show in Figure 30, the number of activities that are conducted in one project to the next varies from one to as many as seventeen. It is an important factor to business operation as it influences the way of business operation. For example, conducting a large number of activities in the same project might increase the demand for monetary, labour and other inputs. however, it could also possibly reduce operation cost through interactions.

5) Revenue Streams

Based on the rank of importance for revenue streams, three clusters were identified (Appendix 3 Table 21). The first group generate revenues from agricultural products production, almost all of them ranked this activity as their most important revenue stream. The second group distinguish products sales, either from their own far or other suppliers, as their main revenue source. For the third group, they gain revenues mainly from different kinds of services, such as education, community and consultancy services. Across the three groups, their revenue streams show a transition from production to services oriented activities, which is also a change from transaction- to relationship-based activities.

6) Level of not-for-investment financial interactions with partners

3 groups were identified regarding their financial interaction level with partners (Appendix 3 Table 22). The first group is the lowest, which receive hardly any financial support from the government or private sector. Only some of them exchange resource with partners or consumers. The second group is in between. All the projects get financial support from government but not from the private sector and more projects are involved in resource exchange. Lastly, the third group represent the highest level for financial interaction.

7) Marketing channels

Respondents were clustered to three groups to identify their level of marketing strategy. The first group is the lowest; most of them have no or only one marketing channels. Group 2 is middle level, most of them have two marketing channels that are social media and word of mouth. Group 3 has the highest level of marketing channels, as they implement three or four channels for marketing (Appendix 3 Table 23).

8) Distribution channels

Four groups were identified by their distribution channels. The first group only chose one distribution channel as the 'others' type, in which products are usually distributed through self-arrangements. Thus they are defined as low. The second group all use CSA (Community Support Agriculture) as one of their distribution channels. Some of them also have one or two other distribution channels. All the channels they use are relatively traditional compared to the others. The third group don't have CSA as a distribution channel. Instead, they distribute

mber ases	Value proposition	Number of enhanced production method	Level of products' value differentiation	Activity number	Revenue stream	Level of financial interactions with partners	Marketing channels	distribution channel	Inter

their products through more newly developed channels such as online sale, arrangement with restaurants etc.. The fourth group is most developed for their distribution channel. Both traditional and newly developed channels are implemented in this group and most of them have diverse distribution channels (Appendix 3 Table 24).

5.2 Business Model Cluster Analysis

The second round cluster analysis aimed at categorizing the business models. The eight grouping variables described before were used. They were codified according to the first round cluster analysis results (Table 11). Figure 44 shows the dendrogram resulted from the cluster analysis. It presents the hierarchical clustering procedure. From left to right, the vertical lines are respondents and clusters merged together with the ward's method. The position of vertical lines indicates the distance at which the objects are merged. This dendrogram can provide a rough guidance to decide on cluster numbers. Combined with the cluster interpretation results, a five cluster solution was decided in the end and each cluster took 12, 12 6,7 9 respondents respectively. The average value for grouping variables by each cluster is reported in

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1.83	0.50	1.67	*13.08*	1.83	*2.75*	*2.67*	*3.67*	Dive
1.17	*0.33*	*1.67*	*6.42*	*1.08*	*1.33*	*1.67*	2.67	Prim food
2.86	1.71	*2.86*	8.57	1.86	1.43	2.43	2.29	Valu
1.78	0.67	1.89	7.44	*2.78*	1.67	2.11	1.89	Serv
1.50	*3.50*	*2.83*	8.00	2.50	2.00	1.83	*3.00*	Inno

Table 12. The analysis of variance (Table 13) shows that all clusters are statistically different from each other for all the variables at a significance level (p≤0.05). Based on this classification, an ANOVA analysis was conducted for all the other criteria by the five clusters (Table 14), in order to verify the results and to have more descriptions for each type of business model. The distinct characteristics and interpretations of each cluster is described as below:
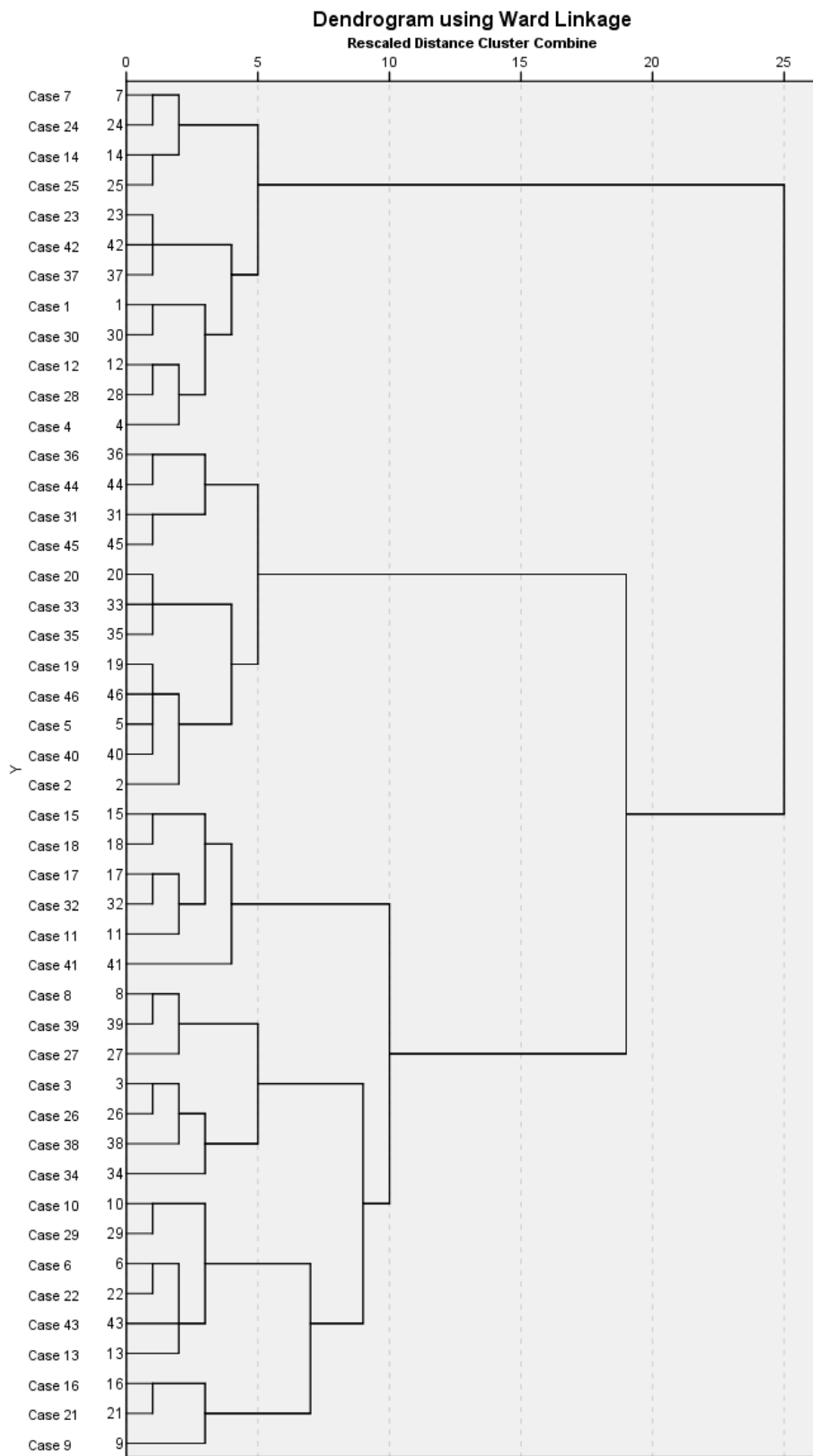
Figure 44 Dendrogram resulting from hierarchical cluster analysis using Ward's Method

Table 11 Definition and codification of grouping variables

Grouping Variables	Codified values			
	1	2	3	4
Value proposition	Quality of food	Benefits to the society	Story of the project	
Number of enhanced production methods	Number of production methods that need infrastructure, investment or innovation (vertical, indoor, hydroponics, aquaponics)			
Level of products' value differentiation	Vegetable	Common vegetable and other products	Other products	
Activity number	Number of conducted activities			
Revenue streams	Production	Sale (from own farm or other suppliers)	Services (education, contract, consultancy)	
Level of financial interactions with partners	Low	Middle (mainly from government)	High (diverse source)	
Marketing channels	Low	Middle (social media and word of mouth)	High (3 to 4 channels)	
Distribution channels	Low	Traditional (mainly CSA)	Innovative	High (multiple and innovative)

Table 12 Clusters obtained and average values of grouping variables

Cluster	Number of cases	Value proposition	Number of enhanced production method	Level of products' value differentiation	Activity number	Revenue stream	Level of financial interactions with partners	Marketing channels	distribution channel	Interpretation
1	12	1.83	0.50	1.67	*13.08*	1.83	*2.75*	*2.67*	*3.67*	Diversification
2	12	*1.17*	*0.33*	*1.67*	*6.42*	*1.08*	*1.33*	*1.67*	2.67	Primary food production
3	7	*2.86*	1.71	*2.86*	8.57	1.86	1.43	2.43	2.29	Value differentiation
4	9	1.78	0.67	1.89	7.44	*2.78*	1.67	2.11	1.89	Service provision
5	6	1.50	*3.50*	2.83	8.00	2.50	2.00	1.83	*3.00*	Innovative Operation

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Table 13 Analysis of variance (One-Way ANOVA) between and within clusters

		Sum of Squares	df	Mean Square	F	Sig.
Value proposition	Between Groups	13.124	4	3.281	10.155	.000
	Within Groups	13.246	41	.323		
	Total	26.370	45			
Inputs of production method	Between Groups	50.209	4	12.552	14.063	.000
	Within Groups	36.595	41	.893		
	Total	86.804	45			
Level of products' value differentiation	Between Groups	12.000	4	3.000	7.730	.000
	Within Groups	15.913	41	.388		
	Total	27.913	45			
Activity number	Between Groups	308.687	4	77.172	11.557	.000
	Within Groups	273.770	41	6.677		
	Total	582.457	45			
Revenue streams	Between Groups	17.156	4	4.289	8.580	.000
	Within Groups	20.496	41	.500		
	Total	37.652	45			
Level of financial interactions with partners	Between Groups	14.586	4	3.647	8.025	.000
	Within Groups	18.631	41	.454		
	Total	33.217	45			
Marketing channels	Between Groups	7.165	4	1.791	4.379	.005
	Within Groups	16.770	41	.409		
	Total	23.935	45			
Distribution channels	Between Groups	18.719	4	4.680	6.062	.001
	Within Groups	31.651	41	.772		
	Total	50.370	45			

Table 14 Differentiated criteria by business models

	Cluster	Diversifi-cation	Primary Food Production	Value Different-iation	Service Provision	Innovative Operation	Value interpretation
	Number of cases	12	12	7	9	6	
Purposes	Education	5.75a/b	3.08b	3.57b	6.89a	4.83a/b	Rank of importance: Most important=8 Not important=0
	Research	1.00b	0.42b	1.71a/b	1.78a/b	4.17a	
	Distance	1.50a/b	2.33a	1.14b	1.11b	1.33b	1=within 5km to 4= >25km
Financial support importance score		3.67a	0.92b	1.71b	2.11a/b	2.17a/b	Score of importance
Activity	Education services	1.00a	0.50b	0.43b	1.00a	0.50b	1= checked 0= blank
	Community activities	1.00a	0.42b	0.57a/b/c	0.89a/c	0.50b/c	
	Volunteer opportunities	1.00a	0.33b	0.71a/b/c	0.89a/c	0.50b/c	
	Environmental services	0.58a	0.25a/b	0.00b	0.00b	0.33a/b	
	Technical innovation	0.50a	0.08b	0.29a/b	0.33a/b	0.83a	
	Products sale from own farm	1.00a	0.42b/c	0.43b/c	0.11c	0.83a/b	
	Water recycling	0.25a/b	0.17b	0.00b	0.00b	0.67a	
Subsidy generation activity	Environmental services	2.58a	0.00b	0.00b	0.56a/b	0.83a/b	Rank of importance: Most important=7 Not important=0
Cost reduction activity	Volunteer opportunities	5.83a	0.75b	0.00b	3.33a/b	3.00a/b	Rank of importance: Most important=11 Not important=0
Employee allocation		3.08a	1.83b	2.43a/b	3.56a	1.83b	1= no volunteer 2= paid employee dominant 3= volunteer dominant 4=big volunteer group 5=only volunteer
Products Number		6.00a	3.75b	3.71b	2.89b	4.17a/b	
Revenue Number		4.92a/b	2.33b/c	4.71a	2.89c	2.67c	
Number of exchange resource form with consumer		2.42a	1.75a/b	1.71a/b	1.56a/b	1.17b	
Marketing Number		3.08a	1.75b	2.43a/b	2.11ba/b	2.00b	
Distribution Number		4.08a	1.92b	1.86b	1.22b/c	1.00c	

* a/b/c: data with different letters means the difference is significant at the 0.05 level using
t-test

1) Diversification

Respondents belonging to cluster 1 carry out a great range of activities, their average activity number is the highest across all clusters. For marketing and distribution, they use more channels that are both traditional and innovative to reach consumers. They also have a higher level of financial interactions with partners. They practice resource exchange with consumers and partners and they are more likely to get not-for-investment financial support from both the government and private sector, which are also relatively more important to this cluster than to the others. Public benefits activities such as education and community services are more often addressed and have functions. Advanced production methods are rarely adopted by this type. Low value differentiated common vegetables are their dominant products, but the number of products are also the highest across all groups. Considering its characteristics of expanding activities, channels, interactions with stakeholders and products categories, this business model is defined as 'Diversification'.

2) Primary food production

Cluster 2 focuses mostly on primary production and do not put much effort in expanding. Their average activity number is the lowest across all clusters. The core value of their businesses are quality of food and they generate revenues mainly from agricultural product production. Less value differentiated products, such as vegetables and some other categories, are favoured using more traditional production methods. Financial interaction with partners is also very low and barely important to them. They have only 1 or 2 channels for marketing and distribution but tend to implement more innovative ones for distribution. In addition, the number of their revenue streams is also the lowest among the other 4 clusters. With its low level of expansion and focus on food provisioning, they are described as 'Primary Food Production'.

3) Value Differentiation

Cluster 3 is labelled as 'Value Differentiation'. The majority of this group recognize themselves delivering higher intangible added values other than simply provide tangible food. They make stories out of their projects as a carrier and package of values for communication. Besides the differentiated general value proposition, they also tend to produce more value added and differentiated products, such as mushroom, herb, fruits etc., other than common vegetables. Although the average activity number is not very high in this cluster, they are able to generate revenues from more activity streams compare to the others.

4) Service Provision

Cluster 4 scores highest for revenue streams. Instead of generating revenues from food production or sale, they earn the revenues mainly from education services, community services, consultancy services and other activities. Education is the primary purpose of this

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type of business. As food production is not the primary activity, the number of products types and the number of advanced production methods adopted in their systems are both very low. Besides, there are barely products sales from the own farm and developments of distribution channels are at a lower level. What's more, volunteering is an important source of labour, and most of them have a volunteer dominant labour or a big volunteer group. Because their revenues are generated mainly from providing services, this cluster is defined as 'Service Provision''.

5) Innovative Operation

Projects from cluster 5 implement several enhanced production methods in their systems. With those innovative methods, they produce higher value differentiated products, such as mushroom and fish etc.., They are much less in favour of traditional distribution channels, such as CSA and farmers' market. Instead, they distribute products through more innovative channels like online-sale, self-pick, restaurants etc., although the numbers of distribution channels are low. These projects are also much more research oriented and the majority of them conduct technical innovation as one their activities. Due to their input for innovation in production methods, distribution channels and other operation activities, this cluster is labelled as 'Innovative Operation'.

The results show that the five business models differs by its grouping variables and also by some other criteria. Additionally, allocation of these five model across continents also varies (Table 15). North American and European projects covers all the five different types of business model, while cases from Africa and South America are all identified as Primary Food Production. Two cases from Oceania are Diversification. Cases from Asia cover three types of models except for Value Differentiation and Service Provision.

Table 15 Business models allocated across six continents

	Diversification	Primary Food production	Value Differentiation	Service Provision	Innovative Operation	Sum
North America	5	2	3	5	2	17
Europe	2	2	4	4	3	15
Asia	3	3			1	7
Africa		3				3
South America		2				2
Oceania	2					2
sum	12	12	7	9	6	46

6. Discussion and Conclusion

6.1 Business Characteristics of urban agriculture

1). Agricultural practices under urban condition

Producing food inside the city has to compete with other economic activities and to face challenges in urban areas, such as limited land, contaminated soil, limited production resources and high labour cost, etc. On the other hand, Mougeot (2000) has concluded that the feature distinguishing urban agriculture from rural agriculture is not its location but its integration into urban economic and ecological systems. Those interactions also bring special opportunities for urban agriculture to meet its challenges and to adapt its operation under urban conditions. Some of the results from this research are consistent with previous researches and present features of urban agriculture under urban condition.

Innovation in production method is a very valuable solution for urban agriculture in order to increase yield and efficiency, reduce cost and meet its urban challenges. Some agricultural technical developments tend to be in favour of urban settings(Smit et al., 2001). For example, vertical farming reduces the need for farmland and increases the yield per square meter. Indoor farming provides the possibility to control climate and generate all year round production. Hydroponic and aquaponics could solve the problem of low quality or contaminated soil in cities, and also reduce labour and other cost by proper design. Among 46 respondents in this research, close to half of them implement at least one of these four enhanced production methods that are competitive in urban environment. Other innovations are also seen, such as growing on coffee waste (draw on urban waste stream) and growing in containers (increase mobility).

The products type and distribution channels adopted by respondents also uncover their adaption to the urban context. Common vegetables are the most popular products among the respondents. It is also the primary product for more than half of the respondents. Next to it are other high value products such as herbs, special vegetables, fruits and micro greens that are all quite perishable. Some non-food products are addressed and animal production is limited to honey, egg, fish. It is often mentioned by researchers that urban agriculture is in favour of perishable and high value products (De Bon, Parrot, & Moustier, 2010; Mougeot, 2000; Smit, Ratta, & Nasr, 1996), which is also the case of this survey research. Smit et al. (1996) pointed out that perishable products could take the advantage of being close to the market and less perishable vegetables usually come from more distant source. De Bon et al. (2010) mentioned Von Thünen's land use model in 1826 to explain this phenomenon: 'the most profitable and intensive land use by unit area, and commodities with high value relatively to transport costs

are found near the city centre'. While animal production is usually limited due to risk of food safety, deficiency of legislation and limited spaces (Golder, 2013). Also, taking the advantage of being close to the consumers, distribution is mainly organized through directly contact with consumers. Especially by self-pick and sale on on-farm shop, the cost is reduced and it brings consumer to the farm.

Another feature is resource exchange with their consumers and networks. Recycled and unused resources are usually taken as input for urban agriculture, which is another example of interactions with urban environment benefiting all the stakeholders involved in the networks. For example, labour is an essential input for agricultural production, both in rural and urban context. Unemployed and volunteer labour are usually important source of labour in urban agriculture projects. Kaufman and Bailkey (2000) have observed that in some cases, the development of the projects relies on volunteer labours. In this survey research, close to half of the respondents have a dominant volunteer group and half of them exchange products or services with consumer's labour. Another crucial input for agricultural production is land. Deficiency of available land is a common issue in urban agriculture, which is also mentioned by respondents in this research as their current challenges. Urban agriculture land use has to compete with high demand for residential, commercial and industrial land, while there is a lack of urban planning policy regarding urban agriculture land use. In most developing countries, urban planning has adopted a blue-print approach, which makes it hard to quickly response to social issues resulting in negative effects on urban agriculture integration (Mubvami, Mushamba, & de Zeeuw, 2006). Exchanging products or services for land with their own networks could provide an innovative solution for urban agriculture without waiting for urban planner's responds. In addition, using urban organic waste in urban agriculture production is also a popular issue. This interaction can help recycle organic matters from the waste stream, reduce waste transportation and improve city's overall waste collection. It can be started with little investment and reduce production cost for the projects(Cofie, Bradford, & Dreschel, 2006). However, despite of all those benefits discussed, projects that practice resource exchange in real, especially for land and organic waste, are limited. As this type of practice needs much effort for arrangement and coordination among different stakeholders, concerns about safety issues and consumers perceptions such as on using organic waste for food production are also a constrain.

2). Activities and financial benefiting streams

Another interesting finding of this research resulted from projects activity and its revenue, subsidy generation and cost reduction streams based on activities. Some previous studies have discussed revenue streams by different products types (Nkegbe, 2002) or sale streams

(Schutzbank, 2012), but no research has investigated on revenue streams and other financial functions, such as subsidy generation and cost reduction, by specific activities conducted in urban agriculture projects. Although detail numbers are not asked considering the feasibility of this research, it provided activity based information on financial operation of urban agriculture projects. More than twenty different activities are addressed in 46 projects, showing the diversity and multi-function possibility of urban agriculture in practice. At the same time, each activity also has possible multi functions to a single project. All the twenty types of activities can be divided into five different types that are agricultural production, adding value, social services, environmental services and valorising resources. The financial benefits vary by different types of activities. Revenues are more likely to be generated by agricultural production, adding value and valorising resources. Subsidies are mostly generated by social and environmental services. Environmental services commonly function as cost reduction activities. This finding could provide a rough guideline on what to do and for what purposes, but it needs to be discussed further under distinct conditions, such as by various locations.

3). Different practices by organization types, continents and performances

More exploratory analysis is also done to identify different practices by organization types, located continents and their self-assessed business goal achievement state.

A census study for Vancouver urban agriculture projects has found that it is a successful strategy for some farms to operate as non-profit organizations. Grants and public/institutional land are available for non-profit urban farms as an exclusive benefits (Schutzbank, 2012). Another case study in USA showed the different labour sources in commercial oriented and non-commercial projects, and wage labour is relatively more concentrated in commercial projects. These distinctions are also identified in this research: non-profit projects are more involved in receiving financial support from private sector and non-financial support from similar projects, and those supports are quite important to their financial viability. Besides, social service activities are very important sources of financial benefits. Volunteer and exchange with consumers for labour are also more common compared to for-profit and hybrid projects. However, according to the self-assessed business goal achievement score, the average score of for-profit projects is the highest, while non-profit projects score is the lowest, although there is no significant difference between the scores.

For the practices among different continents, because limited number of cases from other continents were collected, comparison was made between North America and Europe only. Significant differences were found in their purposes, products type, value proposition and channels. European projects are more research oriented. While North American projects

might be more focus on commercial operation. For example, close to half of North American projects sell products from other suppliers which is all addressed in for-profit or hybrid projects. They also invest more efforts in channels to reach consumer and almost all of them have target consumer. Another interesting difference is that accessibility of local food is an important value proposition for North American projects but matters much less to European ones. Although delocalization of food is discoursed in both of North America and Europe, the embeddedness between producer and consumer is arose in different arrays across the two continents (Feagan, 2007). Examples of European local food chain are shortened food chains, terroir and labels of origin, and the 'quality turn' (Feagan, 2007), which is often discussed in the notion of alternative food. Though growing interest of local food in North America such as in the United States is a result from several movements like environmental movements, slow food movements and community food-security movements (Martinez, 2010). One example of the embeddedness of North American local food chain is 'food circle' process which emphasis on the community (Hendrickson & Heffernan, 2002). The distinctions between the embeddedness might reflect on the differences of value proposition for accessibility of local food between this two continents.

An initiatory analysis was done to investigate on the relationship between operation and business performance using business goal achievement as an indicator. Although the sample size is not very sufficient for the analysis, the results could still possibly provide a rough guidance for future research. Some differences are particularly remarkable such as their efforts in marketing. Projects that identify themselves as having higher business goal achievement all have target consumer and marketing strategies, and implement more types of marketing channels. While situation of projects that scores lower are on the contrary. Insufficient marketing is recognized by some respondents as the challenge/limitation for their projects.

6.2 Business Model classification: discussion, limitation and future research

The business characteristics of urban agriculture reflect great diversity in this business and complexity in research. Using the business model helps to move beyond description of potential benefits and add explanations of how the values are captured at the level of operation. Classification of the business model helps to simplify the diversity and reduce complexity. Five business models were identified by cluster analysis in this research, and some among these five were also observed in previous researches.

Differentiation and diversification were identified by J. W. Van Der Schans (2010) as two strategies that Dutch urban farmers adopted. The differentiation strategy that Van Der Schans has proposed produces quality products differentiated from conventional agriculture produce

or adding value to products by processing, packing and distribution. While the Value Differentiation business model identified in this research refers more to differentiation compared to other urban agriculture initiatives, by producing less commonly presented food or non-food products and also by adding value through further processing. Besides, they are more conscious of their value proposition as a packaged story to tell their consumers. The other strategy, Diversification, is also recognized in this research. Different activities are conducted sharing the same facility, and more functions with diverse sources of revenue stream are able to be generated from the same amount of investment (J. W. Van Der Schans, 2010). Diversification is also a widely discussed strategy for rural agricultures, diversifying into non-agricultural activities help the transition from production to more entrepreneurial model, but it requires additional time and management skills as well (Phillipson, Gorton, Raley, & Moxey, 2004). It is also the case in urban agriculture, while the distinction is that urban agriculture has more sources of diversification by tapping on the urban resources and interacting with their consumers' daily life. Despite its high level of diversification, the revenue stream of this business model still relies on food production or sale. But for the type of Service Provision, with less diversification extent, its revenue relies much on providing education, community or consultancy service rather than food to consumers. The importance of 'other revenues' was identified by some case studies in Vancouver, as these off-shoots revenues are more stable and secure compared to food production. In some cases, it is the primary strategy of earning revenues, while in some other cases it works as a supplement strategy for subsistence (Schutzbank, 2012; Stolhandske, 2010). Another type of business model distinguished is 'Innovative Operation', which is particular for urban agriculture, as innovation can provide valuable solutions for urban agriculture to meet its urban challenge and opportunities. A new issue of Urban Agriculture Magazine was recently published addressing on this important topic, and four dimensions of innovation were proposed as confined land space, urban metabolism, organization of production and participation in urban design and planning (J. W. R. Van Der Schans, Henk; Van Veenhuizen, René 2014). The business model 'Innovative Operation' identified in this research mainly refers to the third dimension: organization of production, emphasizing on the operation of the project itself especially for its production method and distribution channels. The last type of business model is Primary Food Production who takes urban agriculture as a food production founded activity instead of expanding to other functions.

Although the classification results are verified by other characteristics and consistent with some of the previous researches, this research still have limitations in several aspects:

1) The research framework: model is an abstraction of reality and helps us get some clarity. But the model could also possibly over simplify the reality. Although the Business Model

Canvas covers fundamental business elements with nine building blocks, a business model is not only a sum of building blocks but should also draw on relationships between blocks. This relationship is relatively neglected in this research. Besides, the questionnaire has emphasis more on Key Activity but only slightly addressed Customer Segmentation due to feasibility considerations. However, the very right Customer Segmentation block is usually seen as the start of the Canvas, as well as the foundation of a business. Results have shown that it is also neglected by some of the projects in practice. Thus discussion on consumers should be taken into account for both researches and practices for further improvements.

2) Sample: 46 valid respondents from across the whole world were collected in the end, which is quite impressive within the limited time. But it is still not sufficient enough for some statistical analysis. Due to this limitation, no filtration was done for the sample. Cases are still quite diversified regarding its purposes, and some of them are not so business or entrepreneurial oriented.

3) Grouping variables: the results of cluster analysis rely much on the choices of grouping variables. In this research, 8 grouping variables were taken combining characteristics of the business model and some particular features of urban agriculture. However, it's still limited by the availability of data. The cluster results might be improved by adjusting some of the grouping variables such as including cost reduction. Besides, the interpretation of some grouping variable is discussable, such as the 'number of enhanced production methods' was used to present the innovation level of respondents. However, it could also be possible that one project invests their efforts to innovate one specific production methods instead of expanding to different ones.

4) Cluster method: another factor that has influences on cluster results is cluster method (cluster algorithm). Different cluster methods can yield different clusters based on the same datasets, as they are distinct ways to define the distance from a newly formed cluster to an objects or an existing cluster. Ward's method was adopted in this research in order to have equally sized clusters for the two round cluster analysis approach. However, Ward's method 'does not combine the two most similar objects successively' (Sarstedt & Mooi, 2014). Instead, it generates new clusters by keeping the overall within-cluster variance to the lowest possible degree. Considering the purposes of this research, other cluster methods such as complete linkage might generate better results based on the similarity between respondents.

5) Codification: codification of grouping variables for the 2nd round cluster analysis is based on the 1st round cluster analysis results, and some of them are nominal data. The relationship between nominal data is not linear and the distance between them is not measurable. Because the cluster analysis measures the similarity based on the calculated distances, changes might

happen when taking nominal data as metric data. However, cluster analysis is mostly an exploratory technique that can provide rough results for classification, thus it should not be rejected to measure the distance between nominal data using the measurement for metric data (Sarstedt & Mooi, 2014).

6) Limitation of questionnaire research: because respondents are kept anonymous considering the confidential issues and to increase the response rate, further verification by cases is not achievable so far. Besides, as information is collected through distance questionnaire instead of directly interview, interpretation of the information by researcher is inevitable. In addition, although cases are classified into different clusters using statistical based method, the real practice of each case might fall into a mixture of different types of business.

For future research, more respondents are needed in order to improve its sufficiency on statistical analysis. Case studies could be carried out to verify the classification results. Furthermore, detail data on business operations, such as associated numbers on yield, revenue, expenses, grants etc. could be collected to study their performances. Because the business model itself cannot be successful, a sound business model can be managed badly and fail. Thus implementation of business model is also an important issue to be looked into in the future.

To conclude, this research has presented a list of business characteristics of 46 respondents from 18 different countries across 6 continents. Their business characteristics show their adoptions regarding agricultural practices under urban conditions. Diverse activities that are possibly conducted in urban agriculture were analysed for their financial benefits to projects. Different activity groups have distinct financial functions. Comparison between different classifications of the projects were carried out, and the practice varies between projects separated by organization types, continents and performance indicators. Drawing on the business characteristics, an exploratory cluster analysis was conducted for their business models. In the end, five business models were finally identified which were Diversification, Primary Food Production, Value Differentiation, Service Provision and Innovative Operation. All the results provide a rough picture of how initiatives across the world are operating their projects. The classification of business models could be a precursor to further researches such as the relationship between the business model and business performances, innovations of business models, and on the financial self-sufficiency of urban agriculture in order to improve its economic viability.

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Appendix 1: Questionnaire

Thank you very much for attending this survey!

It consists 6 parts regarding: 1)basic information, 2)key resources, 3)key activities, 4)value, 5)customer and 6) complementary information of your enterprise/company.

It might take you around 10-15 min to finish this survey.

All your results will be handled confidentially.

You can check the progress bar at the bottom of each block.

We sincerely appreciate your effort and precious time!

Part 1: Basic Information

1 Please fill in following information for your enterprise/company:
- ❑ Located city & country _____
- ❑ Year of launch _____
- ❑ Size of your farm (in square meters) _____

2 What kind of enterprise/company do you have?
- ❍ For-profit
- ❍ Non-for-profit
- ❍ Hybrid (combine of both two)

3 What's the ownership of your enterprise/company?

- ❍ Sole ownership
- ❍ Partnership (multiple owners)
- ❍ Corporation (shareholders)
- ❍ Cooperative (member-owned)
- ❍ Association
- ❍ Other _____

4 What's the purposes of your enterprise/company? (please put the answers into the box in an order of decreasing importance)

Purpose of your enterprise/company
_____ Commercial
_____ Educational
_____ Research
_____ Self-consumption
_____ Subsistence(for food security)
_____ Environmental benefits
_____ Social care
_____ Leisure/Tourism
_____ Others

5 What's the (estimated) distance between your farm and the city centre(the historical, commerce, cultural, political concentrated area)?

- ○ within 5km
- ○ 5km-15km
- ○ 15km-25km
- ○ >25km please enter the distance below: _____

Part 2: Key Resources

1 What kind of production methods does your enterprise/company implement? (multiple choice)
- ❑ Conventional
- ❑ Organic
- ❑ Permaculture
- ❑ Vertical farming
- ❑ Indoor farming
- ❑ Hydroponic
- ❑ Aquaponic
- ❑ Others _____

2 How many paid employee(s) and volunteer(s) does your enterprise/company have currently?(please fill in a specific number)

- ❑ Full time employee(s) _____
- ❑ Part time employee(s) _____
- ❑ Volunteer(s) _____

3 Does anyone in your team have following kind(s) of knowledge/skill in management or business? (multiple choice)

	Academic training	Basic knowledge background	Practical experience	None
Owner				
Employee				

4 Does the following situation(s) happen within your enterprise/company? (multiple choices)
- ❑ Receive not-for-investment financial support (such as subsidies, direct fund, discount on resources, free inputs....) from the government
- ❑ Receive not-for-investment financial support (such as direct fund, discount on resources, free inputs..) from the private sectors
- ❑ Exchange or share resources(such as land, transportation, waste, water......) with partners. And what are those resources? _____
- ❑ Exchange products/services with consumers for resources (such as labour, waste, land.....)

5 How important are all the not-for-investment financial supports to your enterprise/company regarding its financial viability?

_____ importance of not-for-investment financial supports

6 Does your enterprise/company get any non-financial support (such as promotion, advertising， technical and other forms of supports) from _____ (multiple choice)

❑ None
❑ Government
❑ Similar project
❑ Customer
❑ Media
❑ Suppliers
❑ Others _____

Part 3: Key Activities
It is a very crucial part of this survey. You might need (a little bit) more efforts to think about the questions in this part. Your contribution will be sincerely appreciated!!!

1 What agricultural products does your enterprise/company produce? (please drag answers in to box with an order of decreasing importance)

Agricultural Products
_____ Common vegetables
_____ Special vegetables (such as exotic varieties, heirloom vegetables...)
_____ Fruits
_____ Mushroom
_____ Herbs
_____ Egg
_____ Dairy products
_____ Honey
_____ Fish
_____ Micro greens(seedling)
_____ Pork
_____ Poultry
_____ Beef
_____ Flowers
_____ Compost

_____ Worms	
_____ Others	
_____ None	

2 Which activities does your enterprise/company conduct? (multiple choice)

- ❑ 1. Agricultural products production
- ❑ 2. Agriculture production services (contract work)
- ❑ 3. Products sale from own farm (farm shop)
- ❑ 4. Products sale from other suppliers
- ❑ 5. Products processing
- ❑ 6. Tourism
- ❑ 7. Education services
- ❑ 8. Restaurant
- ❑ 9. Community activities
- ❑ 10. Volunteer opportunities
- ❑ 11. Waste recycling
- ❑ 12. Composting
- ❑ 13. Water recycling
- ❑ 14. Environmental services
- ❑ 15. Social care services
- ❑ 16. Energy production
- ❑ 17. Technical innovation
- ❑ 18. Consultancy services for other initiatives
- ❑ 19. Others _____
- ❑ 20. Others _____

3 Among all the activities that you conduct, which one generate the main cost stream?(Please enter the number of activities showed in question 2)

4 Which ones can generate revenues from consumers (from sale)?(Please drag the answer to the box in an order of decreasing importance)

Revenue stream
_____ 1. Agricultural products production
_____ 2. Agriculture production services (contract work)
_____ 3. Products sale from own farm (farm shop)
_____ 4. Products sale from other suppliers
_____ 5. Products processing
_____ 6. Tourism
_____ 7. Education services
_____ 8. Restaurant

_____ 9. Community activities

_____ 10. Volunteer opportunities

_____ 11. Waste recycling

_____ 12. Composting

_____ 13. Water recycling

_____ 14. Environmental services

_____ 15. Social care services

_____ 16. Energy production

_____ 17. Technical innovation

_____ 18. Consultancy services for other initiatives

_____ 19. Others

_____ 20. Others

5 Which ones can help you get subsidies, direct funding... (as a source of monetary income)?(Please drag the answer to the box in an order of decreasing importance)

not-for-investment financial supports	(as a source of monetary income)

_____ 1. Agricultural products production

_____ 2. Agriculture production services (contract work)

_____ 3. Products sale from own farm (farm shop)

_____ 4. Products sale from other suppliers

_____ 5. Products processing

_____ 6. Tourism

_____ 7. Education services

_____ 8. Restaurant

_____ 9. Community activities

_____ 10. Volunteer opportunities

_____ 11. Waste recycling

_____ 12. Composting

_____ 13. Water recycling

_____ 14. Environmental services

_____ 15. Social care services

_____ 16. Energy production

_____ 17. Technical innovation

_____ 18. Consultancy services for other initiatives

_____ 19. Others

_____ 20. Others

6 Which ones can help you reduce your cost (such as less input, get free or discount on inputs...)?(Please drag the answer to the box in an order of decreasing importance)

reduce cost
_____ 1. Agricultural products production
_____ 2. Agriculture production services (contract work)
_____ 3. Products sale from own farm (farm shop)
_____ 4. Products sale from other suppliers
_____ 5. Products processing
_____ 6. Tourism
_____ 7. Education services
_____ 8. Restaurant
_____ 9. Community activities
_____ 10. Volunteer opportunities
_____ 11. Waste recycling
_____ 12. Composting
_____ 13. Water recycling
_____ 14. Environmental services
_____ 15. Social care services
_____ 16. Energy production
_____ 17. Technical innovation
_____ 18. Consultancy services for other initiatives
_____ 19. Others
_____ 20. Others

Part 4: Value

What is the core value(s) of your enterprise/company?(you can directly drag answers into the box, and please put them in an order of decreasing importance)

Core Value(s)
_____ 1. Quality of food
_____ 2. Services for customers

_____ 3. Story of your project

_____ 4. Good relationship with consumers

_____ 5. Social benefits to the society

_____ 6. Newness of the concept

_____ 7. Fashion Lifestyle

_____ 8. Accessibility of local food

_____ 9. Sustainability

_____ 10. Environmental benefits to the city

_____ 11. Competitive price

_____ 12. Other (please specified)

_____ 13. Other (please specified)

_____ 14. Other (please specified)

Part 5: Customer

1 What do your consumer provide in exchange of your products, services or other forms of providing value? (multiple choices)

❐ Money
❐ Labour
❐ Land
❐ Nutrient (organic waste)
❐ Others _____

2 Do you have specific targeted customers in your plan?

❐ Yes
❐ No

3 How do you market your product/ service/ project? (multiple choice)

❐ No marketing strategy
❐ Social Media (Facebook, Twitter...)
❐ Traditional Media (Newspaper, TV, Magazine)
❐ Word of mouth (by consumer's mouth)
❐ Others _____

4 How do you distribute your product? (multiple choice)

❐ CSA
❐ Self-pick
❐ On farm shop
❐ Online sale
❐ Vege bag delivery to home
❐ Farmer's market
❐ Supermarket

❒   Special shops

❒   Food cooperative

❒   Other channels: _____

Part 6: Complementary Information

1 On average, how much would you give a score for your team for reaching your business goal of each year?

_____ Business goal achievement

2 What's the most important success factor for your enterprise/company?

3 What's the biggest limitation/challenge of your enterprise/company?

4 If you are interested in the results of this research, could you please fill in your email address for further contact:

Appendix 2 ANOVA and t-test results

Table 16 ANOVA results from differentiated criteria by organization types

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
What's the purposes of your enterprise/company? -Commercial-Rank	Between Groups	137.595	2	68.797	6.787	0.003
	Within Groups	435.905	43	10.137		
	Total	573.5	45			
What's the purposes of your enterprise/company? (please put the answers into the box in an order...-Educational-Rank	Between Groups	71.391	2	35.695	4.091	0.024
	Within Groups	375.218	43	8.726		
	Total	446.609	45			
What's the purposes of your enterprise/company? Self-consumption-Rank	Between Groups	93.26	2	46.63	6.378	0.004
	Within Groups	314.392	43	7.311		
	Total	407.652	45			
How many paid employee(s) and volunteer(s) does your enterprise/company have currently? -Full time employee(s)	Between Groups	2.26	2	1.13	5.464	0.008
	Within Groups	8.892	43	0.207		
	Total	11.152	45			
How many paid employee(s) and volunteer(s) does your enterprise/company have currently? -Volunteer(s)	Between Groups	1.352	2	0.676	3.318	0.046
	Within Groups	8.757	43	0.204		
	Total	10.109	45			
Does anyone in your team have following kind(s) of knowledge/skill in management or business??mu...-Owner-Practical experience	Between Groups	2.391	2	1.195	6.659	0.003
	Within Groups	7.718	43	0.179		
	Total	10.109	45			
Does the following situation(s) happen within your enterprise/company? -Receive not-for-investment financial support from the private sector	Between Groups	2.879	2	1.439	8.561	0.001
	Within Groups	7.23	43	0.168		
	Total	10.109	45			
How important are all the not-for-investment financial supports to your enterprise/company regarding its financial viability	Between Groups	40.887	2	20.443	6.509	0.003
	Within Groups	135.048	43	3.141		
	Total	175.935	45			
Does your enterprise/company get any non-financial support (such as promotion, advertising? .-Similar project	Between Groups	1.478	2	0.739	4.049	0.024
	Within Groups	7.848	43	0.183		
	Total	9.326	45			

Which activities does your enterprise/company conduct? (multiple choice)-9. Community activities	Between Groups	1.427	2	0.714	3.692	0.033
	Within Groups	8.312	43	0.193		
	Total	9.739	45			
Which activities does your enterprise/company conduct? (multiple choice)-15. Social care services	Between Groups	1.296	2	0.648	3.471	0.04
	Within Groups	8.03	43	0.187		
	Total	9.326	45			
Which activities does your enterprise/company conduct? (multiple choice)-4. Products sale from other suppliers	Between Groups	1.701	2	0.85	5.101	0.01
	Within Groups	7.169	43	0.167		
	Total	8.87	45			
Which ones can generate revenues from consumers (from sale)? -9. Community activities-Rank	Between Groups	69.813	2	34.907	5.654	0.007
	Within Groups	265.491	43	6.174		
	Total	335.304	45			
Which ones can generate revenues from consumers (from sale)? -10. Volunteer opportunities-Rank	Between Groups	33.27	2	16.635	5.124	0.01
	Within Groups	139.6	43	3.247		
	Total	172.87	45			
Which ones can help you get subsidies, direct funding... (as a source of monetary income)? -9. Community activities-Rank	Between Groups	116.037	2	58.019	9.654	0
	Within Groups	258.419	43	6.01		
	Total	374.457	45			
Which ones can help you get subsidies, direct funding... (as a source of monetary income)? -10. Volunteer opportunities-Rank	Between Groups	65.934	2	32.967	7.509	0.002
	Within Groups	188.783	43	4.39		
	Total	254.717	45			
Which ones can help you reduce your cost -9. Community activities-Rank	Between Groups	108.395	2	54.198	5.014	0.011
	Within Groups	464.757	43	10.808		
	Total	573.152	45			
What do your consumer provide in exchange of your products, services or other forms of providing...-Money	Between Groups	0.704	2	0.352	7.211	0.002
	Within Groups	2.1	43	0.049		
	Total	2.804	45			
What do your consumer provide in exchange of your products, services or other forms of providing...-Labor	Between Groups	2.657	2	1.329	6.477	0.003
	Within Groups	8.821	43	0.205		
	Total	11.478	45			

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
Independent Samples Test										
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		
									Lower	Upper
What's the purposes of your enterprise/company? -Research-Rank	Equal variances assumed	19.740	0.000	-2.636	30	0.013	-2.443	0.927	-4.336	-0.55
	Equal variances not assumed			-2.549	21.433	0.019	-2.443	0.959	-4.434	-0.452
What agricultural products does your enterprise/company produce? ? -Fruits-Rank	Equal variances assumed	5.932	0.021	2.888	30	0.007	3.533	1.223	1.035	6.032
	Equal variances not assumed			2.946	29.05	0.006	3.533	1.199	1.08	5.986
What agricultural products does your enterprise/company produce? ? -Special vegetables-Rank	Equal variances assumed	2.806	0.104	3.328	30	0.002	4.325	1.3	1.671	6.98
	Equal variances not assumed			3.389	29.282	0.002	4.325	1.276	1.716	6.935
Which activities does your	Equal variances assumed	37.358	0	2.374	30	0.024	0.345	0.145	0.048	0.642

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
enterprise/company conduct? -4. Products sale from other suppliers	Equal variances not assumed			2.466	24.373	0.021	0.345	0.14	0.057	0.634
Which ones can help you reduce your cost -12. Composting-Rank	Equal variances assumed	192.046	0	3.077	30	0.004	3.647	1.185	1.226	6.068
	Equal variances not assumed			3.282	16	0.005	3.647	1.111	1.291	6.003
What is the core value(s) of your enterprise/company? -8. Accessibility of local food-Rank	Equal variances assumed	23.25	0	2.515	30	0.018	3.027	1.204	0.569	5.486
	Equal variances not assumed			2.43	21.203	0.024	3.027	1.246	0.438	5.617
Does anyone in your team have following kind(s) of knowledge/skill in management or business?-Employee-Basic knowledge background	Equal variances assumed	4.025	0.054	3.146	30	0.004	0.49	0.156	0.172	0.808
	Equal variances not assumed			3.103	26.9	0.004	0.49	0.158	0.166	0.814
Do you have specific targeted customers in your plan?	Equal variances assumed	47.793	0	-3.393	30	0.002	-0.475	0.14	-0.76	-0.189
	Equal variances not assumed			-3.256	19.339	0.004	-0.475	0.146	-0.779	-0.17
How do you market your product/ service/ project? -Word of mouth (by consumer's mouth)	Equal variances assumed	57.245	0	2.407	30	0.022	0.267	0.111	0.04	0.493
	Equal variances not assumed			2.256	14	0.041	0.267	0.118	0.013	0.52
How do you distribute your product?-On farm shop	Equal variances assumed	18.021	0	2.507	30	0.018	0.396	0.158	0.073	0.719
	Equal variances not assumed			2.566	28.353	0.016	0.396	0.154	0.08	0.712

Table 18 Differentiated criteria by business model cluster

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
What's the purposes of your enterprise/company? -Educational-Rank	Between Groups	96.006	4	24.001	2.807	0.038
	Within Groups	350.603	41	8.551		
	Total	446.609	45			
What's the purposes of your enterprise/company? -Research-Rank	Between Groups	60.744	4	15.186	2.608	0.049
	Within Groups	238.734	41	5.823		
	Total	299.478	45			
What's the (estimated) distance between your farm and the city center	Between Groups	10.558	4	2.64	3.305	0.019
	Within Groups	32.746	41	0.799		
	Total	43.304	45			
How many paid employee(s) and volunteer(s) does your enterprise/company have currently? -Volunteer(s)	Between Groups	2.172	4	0.543	2.805	0.038
	Within Groups	7.937	41	0.194		
	Total	10.109	45			
Does anyone in your team have following kind(s) of knowledge/skill in management or business?-Employee-Basic knowledge background	Between Groups	2.39	4	0.598	2.796	0.038
	Within Groups	8.762	41	0.214		
	Total	11.152	45			
How important are all the not-for-investment financial supports to your enterprise/company regarding its financial viability	Between Groups	47.201	4	11.8	3.758	0.011
	Within Groups	128.734	41	3.14		
	Total	175.935	45			
Which activities does your enterprise/company conduct? -7. Education services	Between Groups	3.112	4	0.778	5.133	0.002
	Within Groups	6.214	41	0.152		
	Total	9.326	45			
Which activities does your enterprise/company conduct? -9. Community activities	Between Groups	2.719	4	0.68	3.971	0.008
	Within Groups	7.02	41	0.171		
	Total	9.739	45			
Which activities does your enterprise/company conduct? -10. Volunteer opportunities	Between Groups	3.255	4	0.814	5.145	0.002
	Within Groups	6.484	41	0.158		
	Total	9.739	45			
Which activities does your enterprise/company conduct? -14. Environmental services	Between Groups	2.37	4	0.592	3.737	0.011
	Within Groups	6.5	41	0.159		
	Total	8.87	45			
Which activities does your enterprise/company conduct? -17.	Between Groups	2.539	4	0.635	3.182	0.023
	Within Groups	8.179	41	0.199		

Technical innovation	Total	10.717	45			
Which activities does your enterprise/company conduct? -3. Products sale from own farm (farm shop)	Between Groups	4.951	4	1.238	7.988	0
	Within Groups	6.353	41	0.155		
	Total	11.304	45			
Which activities does your enterprise/company conduct? -13. Water recycling	Between Groups	1.989	4	0.497	3.884	0.009
	Within Groups	5.25	41	0.128		
	Total	7.239	45			
Which ones can help you get subsidies, direct funding? -14. Environmental services-Rank	Between Groups	50.484	4	12.621	3.195	0.023
	Within Groups	161.972	41	3.951		
	Total	212.457	45			
Which ones can help you reduce your cost -10. Volunteer opportunities-Rank	Between Groups	218.453	4	54.613	3.236	0.021
	Within Groups	691.917	41	16.876		
	Total	910.37	45			
employee allocation	Between Groups	21.799	4	5.45	3.046	0.027
	Within Groups	73.353	41	1.789		
	Total	95.152	45			
Products Number	Between Groups	58.425	4	14.606	3.129	0.025
	Within Groups	191.401	41	4.668		
	Total	249.826	45			
Revenue Number	Between Groups	58.244	4	14.561	7.004	0
	Within Groups	85.234	41	2.079		
	Total	143.478	45			
Number of exchange resource form with consumers	Between Groups	7.588	4	1.897	3.032	0.028
	Within Groups	25.651	41	0.626		
	Total	33.239	45			
Marketing Number	Between Groups	11.969	4	2.992	4.418	0.005
	Within Groups	27.77	41	0.677		
	Total	39.739	45			
Distribution Number	Between Groups	61.58	4	15.395	15.683	0
	Within Groups	40.246	41	0.982		
	Total	101.826	45			

Appendix 3 1st round cluster analysis results of grouping variables

Table 19 Means of values for Value Proposition cluster results

Cluster	Quality	Service	Story	Newness	Fashion lifestyle	Accessibility	Sustainability	Environmental benefits	Competitive price	Relationship with customer	Social Benefits
1	*2.85*	0.55	0.25	0.10	0.00	0.55	0.10	0.20	0.00	1.00	0.40
2	0.12	0.00	0.12	0.35	0.12	0.71	*1.12*	*1.06*	0.00	0.18	*2.06*
3	0.11	0.67	*2.56*	0.56	0.11	0.11	0.00	0.22	0.00	0.67	0.78

* The value represent rank of importance for each value proposition, only the first three most important value proposition were chosen for cluster analysis. And the value is reversely coded, thus 3 mean the most important while 1 represent the third important.

Table 20 Means of value for Products cluster analysis

Cluster	Common vegetable	Special vegetable	Fruits	Mushroom	Herb	Egg	Honey	Fish	Micro-green	Flower	Worm	Compost	Others
1	*2.92*	*2.08*	0.31	0.00	0.54	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
2	*2.89*	0.11	0.39	0.06	1.00	0.39	0.17	0.00	0.06	0.17	0.28	0.11	0.00
3	0.20	0.47	0.33	0.33	1.27	0.13	0.00	0.40	0.60	0.07	0.07	0.00	0.53

* The value represent rank of importance for each product, only the first three most important products were chosen for cluster analysis. And the value is reversely coded, thus 3 mean the most important while 1 represent the third important.

Table 21 Means of value for Revenue Stream cluster analysis

Cluster	Production	Products process	Education service	Restau-rant	Community service	Volunteer opportunity	Social care service	Technical innovation	Products sale form own farm	Products sale from other suppliers	Tourism	Contract work	Consultancy services	Other
1	*3.90*	0.33	0.19	0.24	0.29	0.05	0.10	0.19	1.52	0.43	0.38	0.43	0.10	0.10
2	0.25	0.00	0.25	0.63	0.00	0.63	0.38	0.00	*2.25*	*2.50*	0.00	0.00	0.13	0.38
3	1.06	0.12	*2.59*	0.47	*1.06*	0.24	0.06	0.18	0.65	0.12	0.59	0.47	*0.82*	*0.65*

* The value represent rank of importance for each revenue stream, only the first four most important revenue streams were chosen for cluster analysis. And the value is reversely coded, thus 4 mean the most important while 1 represent the fourth important.

Table 22 Means of value for financial interactions with partners

Cluster	Financial support from Gov	Financial support from Private sector	Resource exchange with partners	Resource exchange with consumers
1	0.00	0.05	0.20	0.55
2	1.00	0.00	0.50	0.75
3	0.86	1.00	0.36	0.71

* the value 1 means this option is checked by respondents while 0 means not.

Table 23 Means of value for marketing channels

Cluster	Social media	Traditional media	Word of mouth	Others
1	0.00	0.11	0.44	0.22
2	1.00	0.05	0.76	0.00
3	0.94	0.88	1.00	0.25

* the value 1 means this option is checked by respondents while 0 means not.

Table 24 Means of value for distribution channels

Cluster	CSA	Self-pick	On-farm shop	Online sale	Vege-bag	Farmer's market	Super-market	Special shop	Food cooperative	Restau-rants	Events	Others
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*1.00*
2	*1.00*	0.00	0.00	0.00	0.25	0.38	0.00	0.00	0.00	0.00	0.25	0.00
3	0.00	*0.31*	*0.25*	*0.31*	*0.19*	*0.06*	0.00	0.00	0.00	*0.19*	0.00	0.00
4	*0.57*	*0.64*	*0.93*	*0.14*	*0.07*	*0.71*	*0.14*	*0.50*	*0.14*	*0.14*	*0.07*	*0.07*