ABSTRACT

With population growth predicted for Auckland, there will be a rise in the food production required to feed the city (1). Auckland is already the country’s largest customer of food markets, but the fossil fuel based agricultural system in Auckland is still vulnerable to urban growth and climate change. In order to provide sustainable future for our next generation, the emergence of peri-urban agriculture provides opportunities to improve the city’s food resilience and develop local food system in Auckland. This article will survey various planning concepts for peri-urban agriculture development and evaluate their applicability on a specific site - Special Housing Areas (SHAs) in Belmont.

INTRODUCTION

New Zealand is known worldwide for its primary industries. Auckland is the heart of the country’s food processing industry (2). In the last few decades, the rapidly expanding population in Auckland has accelerated the demand for housing development, which led to urban sprawl. As a result, an increased number of small scale horticulture, viticulture and orchard enterprises have been converted to housing, industry and commercial use (3). Due to the rapid displacement of agriculture, Auckland has lost 8.3 percent of its most productive soil resources (4).
Peri-urban agriculture refers to "production units close to town, which operates intensive semi- or fully commercial farms to grow vegetable and other crops" (5). In Auckland, the peri-urban agriculture is present in the periphery of current urban areas, which are located between the build-up areas and Rural Urban Boundary such as Kumeu, Belmont and Hingala. The emergence of peri-urban agriculture is usually regarded as a premium in Auckland’s food system because most of the land devoted to agriculture is located in rural areas (6). However, with increasing levels of climate change and loss of soil from urbanisation, New Zealand’s agricultural industry suffers unprecedented challenges (7). This paper will argue that to be a sustainable food system, a new peri-urban agricultural system should be created in Auckland region.

INDUSTRIALISED AGRICULTURE & LOCAL FOOD SYSTEM

Auckland has a vision to transform a fossil fuel-dependent, high energy-using and waste society to a sustainable low carbon city (8). However, based on the data from Acres (9), only around 1%, or 124,000 ha out of the 12,500,000 ha of productive agriculture land is certified organic in New Zealand. Most of the land still involves fossil fuel dependent mechanisation and the extensive use of fertilisers, herbicides and pesticides. As a result, over 3000 tons of pesticides are used in industrialised agricultural system every year and most of them are well known to cause cancer and birth defects (10). Furthermore, according to the data from New Zealand Organic Market Report (11), almost 92% of New Zealand grown produce is exported to overseas markets. The distance food travels from farms to consumers (also called Food Miles) intensifies the usage of fossil fuels, traffic congestion and climate change.

An economically strong agriculture may be able to limit the loss of land to urban growth but industrialised farming, especially adjacent to urban areas seems very vulnerable to urban sprawl. The loss of investment and the demand for settlements in peri-urban areas intensifies the tendency to subdivide agricultural land for residential and commercial land uses that will not be beneficial to local sustainable development (12). On the other hand, in the last 10 years, the rise in popularity of farmers markets and ‘buying locally’ has brought a growing public awareness of the social, environmental and economic impacts of the local food system. Farmers markets have emerged as an alternative option for distribution and retail in New Zealand. There are now over fifty farmers markets operating around the country, with an estimated $30 million worth of produce sold through them annually. This has led to a small number of direct marketing initiatives, which have been established by small to medium scale organic growers in urban and peri-urban areas (13). Therefore, the local food system has been accorded a stronger vitality and a sustainable future.

It is clear that the existing agricultural models have not been able to meet the demand for a sustainable low carbon development in Auckland (14). However, the success of farmer markets, government supports and fertile soil provide a particular opportunity to redefine the role of peri-urban agriculture in the culture, economy and ecology of Auckland. So, how can we enable agriculture to adapt to these huge opportunities and challenges in peri-urban areas and if the urban growth is unavoidable, how can we build a sustainable connection between agriculture and expanding urban settlement?

A SUSTAINABLE FARMING - CENTRED RESIDENTIAL DEVELOPMENT

Historically, farming in cities is not a new phenomenon. The direct connection between food production and residents in city plays an important part in human history. Before the advent of the railroad, rapid urbanisation and industrial agriculture, the main food resource in the city was from the local rural areas. In modern society, many planners believe that the country and the city are completely separate entities, and the idea of a rural land use such as farming in an urban area seems laughable. In developed countries, as the value of land for agricultural use decreases, the value for urban development increases and the local growers are gradually replaced by global food suppliers (15). Large-scale urban and peri-urban agriculture have disappeared in the last century as food production has moved to intensive industrial agriculture and farmland is consumed for urbanisation.

GREEN BELTS & GREEN WEDGES

In contemporary urban planning there two types of approaches that try to prevent urban sprawl. The ones that try to limit urban sprawl and preserve agricultural land alone, and the ones which attempt to adapt to urban sprawl and create agricultural land within urban development.

The first of the main approaches is the concept of ‘Green Belt’. This planning concept was invented by Ebenezer Howard in the early twentieth century (16). Rowe defines Green Belt as “a swath of land around a city which is protected from development and construction” (17). Land uses in Green Belt range from farmland and parkland to the construction of urban wetland. Due to the strong adaptability of the Green Belt concept, it has been applied into limiting urban growth in many cities with various degrees of success. Vitoria-Gasteiz is one of the cities that applied Green Belts in order to limit its growth. With the unprecedented expansion, Vitoria-Gasteiz met a series of hazard, such as energy waste, air pollution from transport and the loss of vegetation in peri-urban areas from the demand of industry, housing and infrastructure. As a response, government built a green belt around the city. This green belt, as a buffer zone between urban and rural areas, was supposed to limit urban sprawl and protect the vegetation around the city (18). However, the agricultural land use in this Green Belt did not succeed and was replaced by golf courses, schools, sport fields and public utilities. This was probably due to residents need recreational space rather than productive farmland.
The second planning concept is called ‘Green Wedges’ and consists of preservation regimes of green corridors that penetrate deep into the city. This concept is advocated by Andres Duany (19). Duany argues that productive landscape can be regarded as an essential element of urban infrastructure, just like transport and water supply systems in the city (20). Unlike the Green Belts, the Green Wedges would be more adaptable to site-specific needs and work with urban development. The general idea is that city and agricultural land uses will become integrated, the direct connection between food production and consumption will be rebuilt and as a result the residents would want to protect the land voluntarily (21).

It is clear that although Green Belts are able to protect natural resources and slow urban sprawl, the demand for housing and open spaces still exist and protecting land does not mean saving farmland (22). The main function of the Green Belt is to separate rural and urban areas, but a sustainable local food system cannot be built without the integration of agriculture and people’s daily life. The residents of peri-urban Auckland have weak relationships with small-scale food production then peri-urban land will be easily lost to development. On the other hand, sustainable agriculture is “an integrated system of plant and animal production practices having a site-specific application that will over the long term” (23). The purpose of Green Wedges is to strengthen the connection between the agricultural elements and a city’s environment, society and economy and save the farmland from urban growth. The specific demand of peri-urban agricultural system is to balance the relationship between housing development and food production. As a result, Green Wedge model is a better application that contributes to a sustainable future in peri-urban areas.

PERMACULTURE PRINCIPLE

‘Permaculture’ was proposed by Bill Mollison in the middle 1970’s, and refers to “Consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for provision local” (24). The permaculture system not only minimises energy requirements, but also establishes a low requirement for maintenance because it is self-fertilizing, self-watering, self-mulching, self-pollinating, self-healing and highly resistant to pests. The Permaculture principle has been widely used in Green Wedges, which includes allotments, city farms and community gardens, school and private gardens, eco-village farms and urban-rural interactions (25).

According to Semenov’s research (26), Cuba drastically changed its industrial agricultural system applying permaculture principles and became self-sufficient in the past twenty years. After the collapse of the Soviet Block in 1989, Cuba lost 75% of its petrol supply and 78% of its chemical supply, which limited the use of industrial farming equipment, and broke the distribution chain that was needed to deliver food to the markets. As a result, the Cuban government applied permaculture principles to rebuild the relationship between farming activities and people lives. They believed that food production infrastructure could be woven into the residents’ lives, with interventions that range in size from backyard organic gardens to large peri-urban farms. By the year 2000, urban agriculture in Havana covered 12% of the city’s land, provided 70% of city residents’ vegetable requirement with the local residents. He claims that Havana has become an exemplary model of sustainable agriculture, a precedent that demonstrates both the opportunities and challenges for the transference of urban and peri-urban agriculture to other regions.

In summary, permaculture theory can provide a good solution for the integration of nature, people and agriculture if integrated with Green Wedge Model. If the relationship between people and agriculture takes an important role in maintaining and developing local food system in peri-urban areas, a feasible approach could be to create a farming-centred residential areas based on permaculture principles.

To evaluate the applicability of Green Wedges and permaculture principle, Special Housing Areas (SHAs) in Belmont was selected from because of its long farm history and uniquely productive soils. Belmont is located at the west side of Pukekohe, which produces a significant proportion of fruits and vegetables.
for Auckland and Hamilton (27). In addition to this, Auckland Council intends to make Pukekohe a satellite town that can accommodate 50,000 dwellings, majority of which on productive soils. Special Housing Areas is one of Auckland Council strategies to build more affordable and accessible housing within Rural-Urban Boundary. That means Belmont is in the process of having a large amount of its land re-zoned for housing development (28). The loss of farmland will result in the city having to import food from other regions, and will inevitably mean unsustainable food price and resources for Auckland’s. As a result, the SHAs in Belmont provide an opportunity to explore ways to integrate peri urban agriculture and residential development.

**LOCHIEL PARK**

How could we build a sustainable local food system? Following the permaculture concept, it is necessary to understand and analyse needs and resources in local food system. There is a need to calculate the balance between daily food requirements and the area that can provide the same amount of food. (29) According to Barber (30), the total food energy requirement per person in New Zealand is 5.8GJ per year, and vegetables contribute 10 percent of total energy of the average household. In addition, food productivity for vegetables per square meter of garden plot per year is 0.007GJ. So if it is possible to calculate the energy demand for Belmont, we could know the way to organise the land resources between productive landscape and settlements in the community. Based on the plan from Housing Accords and Special Housing Areas Auckland Order (31), 720 new dwellings will be built within 90 hectare of Belmont’s SHAs. After calculating the population and food energy requirement, it is clear that at least 17.9 hectare of the land within the site need to be protected for creating a sustainable local food system.

In 2004, the South Australian Government planned to transform Lochiel Park in suburban Campbelltown into a compact housing development set within natural parklands, which aimed to improve the connections, integration and relationships between the natural and built environment. The building development was restricted to 4.25ha within the 15ha site, which almost doubled the housing density from the Adelaide average of 13 dwellings per hectare. Meanwhile, the rest of land included over 10 hectares of open spaces urban forest, wetlands and a variety of recreational areas which provided education, ecological and visual amenity. The food forest and allotments in Lochiel Park were the heart of the community because they were the places where community can be outside, engage with nature, and socialised as they raised their own food and sustained their lives. Lochiel Park showed the benefits of compact urban development where greater emphasis was placed on creating a more dynamic and higher quality public and food producing space, which facilitated more frequent interaction with neighbours and the creation of a community rather than just a collection of houses (32).

Based on experience from Lochiel Park, the building areas in Belmont’s SHAs could be restricted to 30.6 hectare within 90 hectare site, which double the housing density from Belmont average of 13 dwellings per hectare. And the rest of land will include over 40 ha of open space for recreation, education and biodiversity, which aim to build a strong relationship between nature and residents. Therefore, it is possible to build a sustainable agricultural system with compact housing development in SHAs of Belmont.

**CONCLUSION**

In summary, the existence of agricultural system in Auckland is suffering huge challenges from urban growth and climate change, peri-urban agriculture will certainly play a more important role in Auckland food system. In order to build a sustainable food system, it is necessary to transform fossil fuel based agricultural system into a locally-based, sustainable model which emphasises the connections between agriculture and residents. With the help of Green wedge model and permaculture principle, a farming-centred residential development will harmonise with peripheral urban growth and lead to a new agricultural revolution. A further study will focus on how to make the local food system integrates with the local society, ecology and economy in SHAs of Belmont.
FOOTNOTES


(9) Acres, B. (2010).


FIGURE REFERENCES

Figure 1: (33) Auckland City Council. (2015). The Auckland plan. Auckland. New Zealand: Author
