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## 1 Introduction

Urbanization has emerged as a global phenomenon. Between 1950 and 2018, the urban population of the world has increased more than four-fold, from an estimated 0.75 billion to an estimated 4.22 billion (United Nations, 2019: 9). In 1950, the urban population in more developed region (0.45 billion) was higher than that in less developed regions (0.30 billion), but in 2018, the urban population in less developed regions (3.23 billion) is higher than that in more developed regions (0.99 billion) (United Nations, 2019: 9). By 2050, with 5.6 billion urban dwellers, less developed regions are projected to contain 83% of the world's urban population (United Nations, 2019: 12). Urbanization makes various demands on urban spaces. In this context, urban planning and policies are prioritized in the policy domain of central and local governments (Park and Youn, 2013). Less developed countries need to pay more attention to urban planning and design to control urban environmental, economic, and social problems.

The proportion of urban population in the Democratic People's Republic of Korea (DPRK), considered one of the less developed countries, increased from 40.20% in 1960 to 61.90% in 2018 (World Bank, 2019). The rural population of the DPRK is projected to decline approximately by 29% between 2018 and 2050 (United Nations, 2019: 46). In view of the increasing urbanization, political approach to improve the living conditions of urban people emerged in the DPRK. Policies for establishing and managing green spaces in urban areas were introduced and implemented (Park and Lee, 2014). This report focuses

on food supply for better living conditions in the urban areas of the DPRK. This report aims to analyze urban agriculture related activities and policies and legislations. Cuba is a representative model of successful urban agriculture in the developing countries. We try to find some lessons of urban agriculture from Cuba to develop urban agricultural policies in the DPRK.



## 2 Theoretical Background of Urban agriculture

According to FAO, urban agriculture and peri-urban agriculture (UPA) is defined as the growing of plants and the raising of animals within and around cities 2018 (FAO, 2019). Since the potential contributions of UA, the concept of UA has captured the imagination of growing number of poverty activists, urban planner, and environmentalist alike (Henn and Henning, 2002). The UA has great capacity to deal with a various number of environmental and social pressures that arise in urban areas, and it has become a worldwide UA movement. UA is comprised with great varieties of forms, both between and within countries, including the ways in which agricultural activities are organized and how they respond to market needs (Sieverts, 2017). Examples of UA abound, existing in many forms including: community and backyard gardens; rooftop and balcony gardening; growing in vacant lots, right-of-ways, and parks; aquaculture; hydroponics; fruit trees and orchard; market farms; raising livestock and beekeeping (Orum and Michelle Glowa, 2019). Importantly, urban agriculture is context specific, meaning that its forms and practices vary according to the conditions of the local environment-social, cultural, economic, physical and political.

Regardless of the development of urban agriculture, the term UA was described in different ways by presenting social, environmental, and economic impacts on the city, and its function are emphasized differently by regions due to each state has distinct targets and motivations of practicing UA. There is an example UA definition, saying

“urban agriculture is defined as food growing initiatives that include the production of edible plants and livestock in urban areas (Audate et al., 2018).” This definition covers UA practicing areas only in urban areas and includes only the production of ‘edible’ plants and livestock. Unlike this, there are another example of UA definition saying, “urban agriculture is the growing, processing, and distribution of food and nonfood plant and tree crops and the raising of livestock, directly for the urban market, both within and on the fringe of an urban area”. This definition includes the urban agriculture boundary both in and around urban area, and covers urban agriculture products not only edible plants but also nonfood plants. The latter urban agriculture definition is broader than the former. Likewise, the different definition of urban agriculture was used depending on researchers due to the absence of define definition of urban agriculture, and this issue creates confusion for understanding what urban agriculture is.

Ecosystem services are defined as the benefits to humans that arise from the interactions between components of an ecosystem, which include provisioning (e.g. food), regulating (e.g. flood control), and cultural (e.g. recreation) services (Ring and Schröter-Schlaack, 2011). The provisioning ecosystem services is directly used by people with most direct and tangible support to humans such as food, materials and energy. While the regulating ecosystem services cover the way ecosystems regulate other environmental processes or media, and it enables and facilitate the provisioning ecosystem services. The cultural services, at last, are related to people’s cultural or spiritual demands (Geogr, 2018).

As an environmentally friendly solution, UA is increasingly proposed to global challenges such urbanization, public health, food security and climate change. There are researches

which investigate the potential ecosystem services distributed by UA that could potentially escalate the sustainability of the UA ecosystem. Furthermore, UA is crucial for local food production (provisioning service) especially in global South, and it has a role in regulating green and blue water flows and organic waste flows (regulating service). In addition, a general agreement tells us UA has important socio-cultural values such as an advanced quality of urban life and boosted local community capacity (cultural service). Other than this, there are abundant potential function of UA in terms of ecosystem services (Table 1).

Different role of UA is emphasized under various circumstances depending on the purpose of practicing UA in certain area. Identifying the highlighted UA role in certain resources, it is possible to infer the particular regions' environment and the condition of the state. Thus, this paper will investigate the emphasized role or function of UA with UA related documents and sort the selected UA functions into ecosystem services categories.

**Table 1. Potential contribution of urban agriculture on provisioning, regulating and cultural services of urban systems**

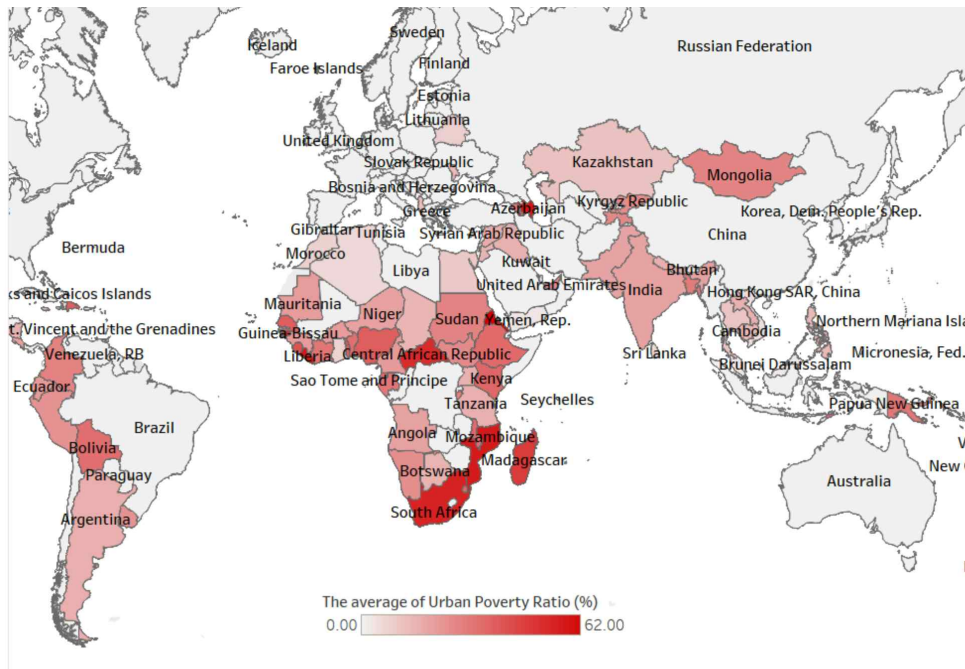
<b>Type of service</b>	<b>Functions</b>
Provisioning services	Food, Fiber, Fuel/Energy efficiency, Genetic resources, Biodiversity*, Income/Saving*, Biochemicals, Medicines, Fresh water
Regulating services	Air quality regulation, Climate regulation, Water regulation, Erosion regulation, Flood prevention*, Water purification, Waste treatment, Human disease regulation, Health benefits, Pest regulation, Pollination
Cultural services	Social relations/Building community, Knowledge system, Gender equality*, Aesthetic values, Education, Human wellbeing*, Recreation*

[Note] \*Modified from Aerts et al. (2016)

World has been experiencing rapid economic and social transformation over the decades, and wealth tends to be concentrated in cities, along with many higher-level services (Bartlett, 2012). There is saying that more than half of world's population will live in cities by 2030 (Moreno and Warah, 2007), and excessive urban growth and concentration of people and economic activities in the large urban areas will lead to not only increasing urban diseconomies but also resulting in uneven distribution of development benefits (Siwar, 1997).

The massive increase of urban populations brings severe problems of coping with the demands for basic needs from a huge population of poor households. Urban area, especially, have less access to agricultural products due to lack of agricultural land within the cities, and hard to cultivate the agricultural production for their self-sufficiency than rural areas. According to FAO (FAO, 2010), most of the world's fastest growing cities are found in low-income countries of Asia and Africa, and the urbanization in developing countries is accompanied by high levels of poverty (Figure 1), unemployment and food insecurity. Furthermore, in most developing countries, urbanization has become virtually synonymous with slum growth (Lahariya, 2008), and most cities in lower income countries encounter great difficulty to provide adequate basic services for the rapidly growing population (De Zeeuw et al., 2011).

Figure 1. Urban poverty ratio (average after 1990)



Source: World Bank, Global Poverty Working Group

The urban poor spend most of their income just to feed themselves to survive, and millions of slum dwellers have started to growing their own food on every piece of available land: in backyards, along rivers, roads and railways, and these practices are called urban agriculture. Urban Agriculture (UA) is a concept that has captured the imagination of a growing number of environmentalists, poverty activists and urban planners alike, with its capacity to deal with a number of environmental, economic and social pressures that arise in urban areas (Henn and Henning, 2002).

UA has different objectives such as food security, poverty alleviation, public health, and sustainable resource management, and these are actively associated with the problems of urbanization. The leading forces for farmers to turn into engaged in urban farming are income generation and food security. Apart from these, urban agriculture is crucial for

public health and sustainable resource management. Plenty vitamin and protein diet from the agricultural products improve health conditions among urban farmers and urban dweller. In addition, sustainable resource management entails efficient use of resources, by reusing the waste as fertilizers in urban agriculture.

Therefore, UA contribute to achieving several SDGs; Goal 1. No poverty, Goal 2. No Hunger, Goal 11. Sustainable Cities and Communities, Goal 12. Responsible Consumption and Production, Goal 13. Climate Action and Goal 15 Life on Land (Figure 2).

Figure 2. SDGs related to urban agriculture



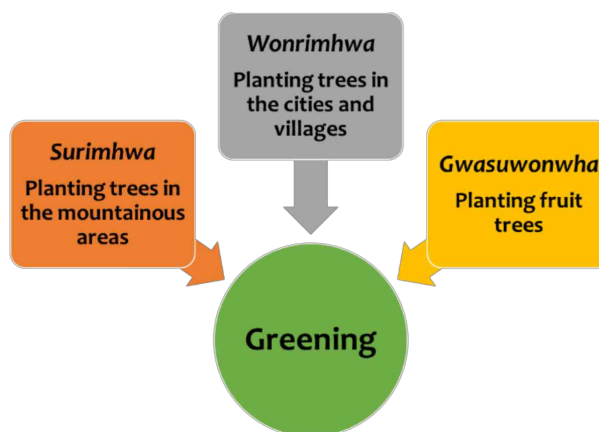
### 3 Urban forests and urban agriculture in the DPRK

Since the late 1990s, North Korea has been emphasizing forest management for land protection (Park and Lee, 2014). In 1998, the Ministry of Land and Environmental Protection was created for land protection and management. According to an analysis of DPRK newspaper *Rodong Shinmun* (Song et al., 2012), the number of forest-related reports, including those on land protection and management issues, has increased since 1998. In 2000s, greening policy was emphasized in DPRK forest management. In particular urban greening was presented as the core forest policy of the Party several times by *Rodong Shinmun* (Song et al., 2012).

DPRK government pays attention to provisioning service of urban green spaces, food and non-food materials were mentioned, including edible and medicinal berries, firewood, paper, and tree oil. DPRK authorities encouraged planting fruit trees to produce persimmons, apples, pears, peaches, apricots, and cherries in urban areas (Park et al., 2020). Cities and counties supply saplings of fruit trees to residents and execute the projects for planting more than five fruit trees per household (*Rodong Shinmun*, April 28, 2004). Apricot trees, chestnut trees, acacia trees, and ginkgo trees were recommended for planting in urban areas. The recommended trees provide urban dwellers with fruits and honey. In the residential areas, forest cover rate is recommended as 25-30% and forest cover per capita is 7-8 m<sup>2</sup> (Cheon and Lee, 2017).

According to the *Rodong Shinmun* on April 7, 2011, necessity and importance of transporting vegetables and fruits to the Pyongyang City is emphasized. It indicates that supply of vegetables and fruits worked not well even in the capital city of DPRK. Based on the context, in the mid of 2010s, DPRK introduced one more core policy with *Surimhwa* and *Wonrimwha*, “*Gwasuwonhwa*” which literally means making the land orchards (Figure 3). *Gwasuwonhwa* focuses on plantation of fruit trees. It is conceptually linked with *Surimhwa* and *Wonrimwha* under the shared goal of national greening. *Surimhwa* and *Wonrimwha* has a different characteristic in the place to be covered with trees. *Surimhwa* regard all lands as target area but concentrates on mountainous areas. *Wonrimwha* concentrates on greening the cities and villages as living spaces. *Gwasuwonhwa* concentrates on tree species, especially trees which produce fruits as food for people. Combining *Gwasuwonhwa* and *Wonrimwha* means planting fruit trees in the villages and cities. It can be interpreted as urban agricultural policy in DPRK.

Figure 3. Three approaches to greening in DPRK



DPRK started to emphasize food production in urban areas for food security. Kim Jong Un



highlights planting trees which produce edible fruits (Lee and Lee, 2015). Fruit trees are recommended as target trees in greening for producing foods and improving landscape. Technical approach including allocation of fruit trees and pest and insect control of fruit trees is considered (Lee and Lee, 2015).

## 4 Legislation of urban green space management in the DPRK

Media discourse analysis indicate urban greening policies emphasize food and non-food materials from urban trees including edible and medicinal berries, firewood, paper, and tree oil as the provisioning services for green spaces the DPRK (Park et al., 2020). Urban greening policies can include urban agriculture. Therefore, we analyzed current legislation focusing on Acts for understanding urban green space management policies in the DPRK.

- The Forest Act (1992)
- The Green Space Act (2010)
- The Urban Planning Act (2003)
- The Urban Management Act (before 1992)
- The Environmental Protection Act (1986)
- The Urban Beautification Act (2012)
- The Park and Recreational Area Management Act (2013)

### 4.1 The Forest Act

The Forest Act plays a significant role as a framework act in forest management in DPRK.

Article 5 of the Forest Act specified “*Surimwha—Wonrimwha*” as the core policy in establishing forests in DPRK. *Surimwha* is aimed at planting trees to protect national lands and *Wonrimwha* is aimed at greening urban and rural areas, including provision of recreational and cultural spaces (Park and Lee, 2014: 5170). It means *Surimwha* and *Wonrimwha* is a leading direction of forest policies in DPRK. In particular, introduction of *Wonrimwha* can be interpreted as specialization of target areas to be covered with trees – mountainous areas and residential areas including cities and villages. *Wonrimwha* reflects increased policy interests in improving living conditions for people’s well-being in DPRK.

#### **4.2 The Green Space Act**

The Green Space Act, adopted on November 25, 2010, comprises 37 articles, which contain relatively detailed information on green space planning, establishment and management of green spaces, and rules and control of green space management (Figure 4). According to Article 2 of the Green Space Act, green space is defined as the green area required in cities and villages to meet the needs of cultural life and environmental protection. It includes parks, amusement parks, greenery surrounding roads and buildings, urban landscapes, environmental protection forests, botanical gardens, greenhouses, and nurseries.

Figure 4. Structure of the Act of Green Space



Urban greening is a policy that considers not only the creation of green space but also services such as landscape, culture, and health provided by green space. In forest management and management, the approach of forest ecosystem service is introduced, and policies to distinguish provisioning, regulating, supporting, and cultural services of forest ecosystem and strengthen the functions of each service are being promoted. Against this backdrop, urban greening policy has a strategic approach to management of provisioning services such as food supply as well as cultural services, such as landscapes and recreation, supporting services such as forest protection. Under the Green Space Act, the DPRK has established an urban green space plan, which states that each city should systematically create urban green spaces and expand investment in urban green space projects. In addition, Establishment and management of urban green space was emphasized as a mass movement. *Rodong Shinmun*, as the most representative newspaper among the DPRK media, described urban greening as a

patriotic activity requiring people to be responsible for national development (Park et al., 2020).

### ***Creation and management of urban green spaces***

In Chapter 2 of the Green Space Act, it is written that an urban green space plan should be prepared and the forest should be created as planned. Urban green space planning should be prepared based on national urban development policies. The urban green space plan consists of the Comprehensive Plan and the Detailed plan and Parcel plan according to the Comprehensive Plan. The Urban Planning Design Agency prepares the Comprehensive Plan, and the Urban Management Design Agency prepares the Detailed Plan and the Parcel Plan. When drawing up the urban green space plan, street trees, green spaces and flower fields should be arranged in accordance with the street structure, taking into account the natural geographic conditions, climate condition, residents' demands for cultural life, and the requirement for protection of the urban environment (Article 12).

The Comprehensive Green Space Plans of the Pyongyang City and Metropolitan Municipalities are approved by the Cabinet and the Comprehensive Green Space Plan by the cities and counties are approved by the Central Urban Management Guidance Organization. The Detailed and Parcel Plans are approved by the Local People's Committee (Article 13). According to the urban green space plans, the People's Committees and the Urban Management Agencies establish parks and additional facility

for sports and entertainment (Article 14). Organizations, enterprises and associations expand the green spaces through planting vines at the building and facilities and establish forests for environmental protection and noise control around the industrial zones, factories and enterprises (Article 15). Trees should be planted in the daycare center, hospitals, nursing homes, sanitariums and their surroundings (Article 16). Landscape forests should be planted near to railroads and rivers within the cities for environmental protection and disaster control. Ground cover plants should be planted in areas with steep slopes for preventing soil erosion (Article 17). After the construction work is completed, the green spaces are established according to the urban green space plan. Completion inspection cannot be carried out unless a green space is established (Article 18). The organizations which established green spaces including enterprises and associations should guarantee the survival rate for six months from the date of planting the plants (Article 19), and urban management organizations should establish well-stocked gardens, nurseries, arbories, and greenhouses and distribute trees, flowers, grass, and cover plants at appropriate times (Article 21).

People's Committees and Urban Management Agencies shall designate the forest management areas to the relevant institutions, enterprises and organizations, and shall register and manage the forests and the forest management facilities in the assigned area with the responsibility (Article 24-25). In urban green space management pests are controlled (Article 27), trees are protected (Article 28), and some activities are prohibited such as the construction of facilities, changing species, harvesting fruits and seeds, and

farming activities (Article 30).

### ***Rules and control of green space management***

Rule and control over the projects are the main way for the government to enforce its policies in DPRK. The rule of the forest sector projects is undertaken by the Central Urban Management Guidance Organization under the Cabinet. Labor Administrative Organizations, Financial Institutions, and relevant institutions supply the manpower, equipment, materials, funds, fertilizers and pesticides necessary for green space management (Article 33). Institutions, enterprises and organizations that have built construction in the forest area shall restore the forest area to its original state after the construction (Article 35).

## **4.3 The Urban Planning Act and the Urban Management Act**

The Urban Planning Act proposes urban greening to prevent environmental disasters and pollution as a principle in designing urban planning (Article 12). Urban Green Space Plan is based on urban management policy. To create more convenient living conditions and cultural living environment is aim of urban management (Article 1 of the Urban Management Act). Urban greening policy also follows the direction of urban management policy. Chapter 5 of the Urban Management Act contains articles on the creation of urban green space such as expansion of green areas (Article 38), creation of street trees (Article 39), management of parks, amusement parks, zoos and botanical

garden (Articles 40 and 41), production of seedling and young flowers (Article 42), management of trees, flower and grass (Article 43) and management of urban green space zone (Article 44).

#### **4.4 Other Acts**

Several Acts state activities and responsibility in creating and managing urban green spaces in DPRK. The Environmental Protection Act states that in order to protect the natural landscape, urban areas should be covered with excellent trees and ground cover plants (Article). The Ministry of Land, Infrastructure and Environment, Urban Management Agencies, related organizations, enterprises, and associations shall create cultural areas such as parks and recreation areas with modern style and manage and operate them. They shall plant trees, flowers, and grasses of good species in open land or public places around roads, railroads, rivers, buildings, and districts to perform various environmental protection functions (Article 17 of the Environmental Protection Act).

The Urban Beautification Act also states urban greening. Urban Management Agencies, related organizations, enterprises, and associations shall plant various trees with excellent species, create flower gardens, and plant grass and other ground cover plants so that land cannot be seen. Citizens shall not do things that can be used to cut trees and flowers, or to devastate grasses and other land plants (Article 14). The Act states administrative responsibility of urban greening. In the case that Urban Management Agencies, related organizations, enterprises, and associations perform urban greening



projects not well and interfere the city beauty, they take administrative punishment (Article 41).

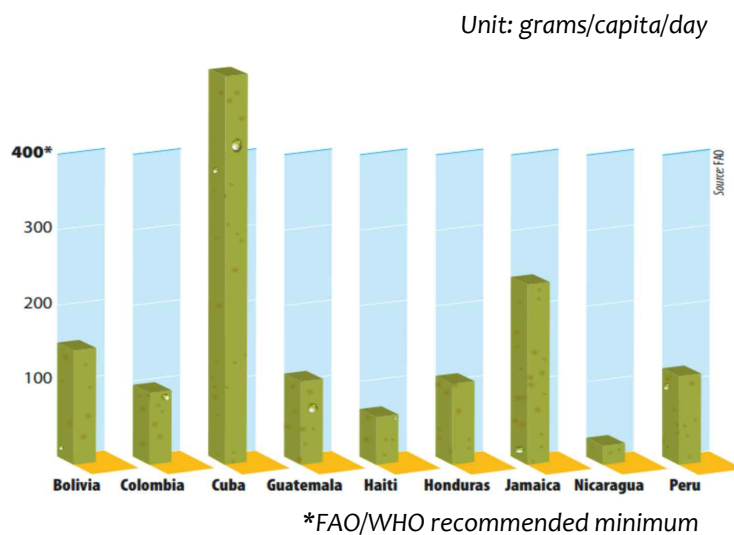
The Park and Recreational Area Management Act states urban green space design agencies shall design the parks and recreational areas based on the Comprehensive Land Development Planning and the Comprehensive Urban/Rural Development Planning (Article 11). The parks, the recreational area management agencies and enterprises shall plant and manage trees with excellent species, flowers and land cover plants (Article 22).

In the case that organizations, enterprises, and workers manage urban green spaces not well and interfere maintenance of urban green spaces, they take administrative punishment (Article 47).

## 5 Urban agriculture in Cuba

Urban agriculture (UA) in Cuba has been developed as a strong popular movement, promoting an organic and sustainable agriculture in urban areas. In this effort, Cuba has achieved considerable success, especially in the production of fresh vegetables. Cuba has promoted intensive UA and UPA since the early 1990s, and Cubans' per capita intake of fruit and vegetables exceeds the FAO/WHO recommended minimum (Figure 5). In this chapter, Cuba urban agriculture will be briefly explicated through the background and history of UA appearance, its types and methods.

**Figure 5. Daily fruit and vegetable consumption in selected countries of Latin America and the Caribbean in 2005**



Source: FAO (2010: 6)

## 5.1 Cuba's agricultural history

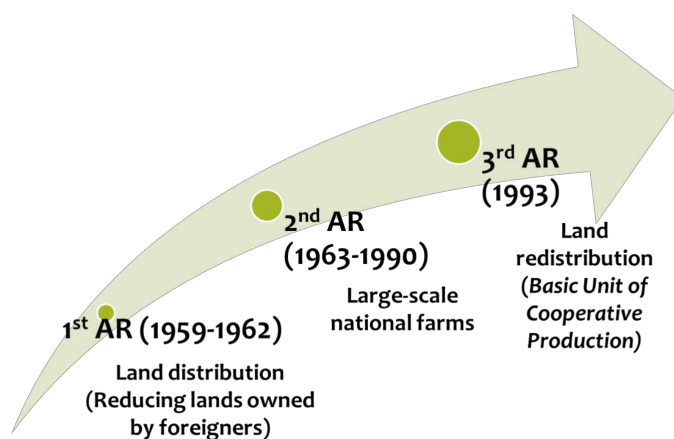
Cuba based its food production system on large, Soviet-style, industrial state farms. During the period, from the 1960s to about 1990, Cuban agriculture was moreover highly dependent on monoculture of sugar as an export crop and the petroleum and manufactured goods was not produced internally. With the collapse of the Soviet bloc in 1989-1991, Cuba lost 85% of its export markets and its economic support, and U.S. economic blockade made Cuban economic situation getting worse. Fuel to run agricultural machinery, spare parts and replacements for the machinery itself, and petroleum-based pesticides and fertilizers became essentially unavailable, precipitating Cuba into a national economic crisis.

The Cuban economic crisis in the 1990s was acute in the production of food, due to the lack of resources in agriculture in that period, which was characterized by the use of imported chemical products and high fuel expenses. In response the country experienced a dramatic and unprecedented reorganization of its agricultural system, turning to the agroecological production of food in or near cities and to a focus on growing food for local consumption rather than crops for export. The government's goal is to make the island self-sufficient in meeting the nutritional needs of the population through small-scale agriculture reliant on human labor rather than machinery and chemicals.

There were mainly three Agriculture Reforms (AR) in Cuba (Kim and Ha, 2015): the first AR was in 1959-1963, the second AR was in 1963, and the third reform was in 1990s

(Figure 6). The first round of AR was implemented with the aim of selling off large private farmland to redistribute land for small famers. This was the most important reform adapted in the early days of the revolution, which carried out individual distribution of land to 100,000 family farmers and had a huge impact on foreign countries that owned Cuban land. In the second round of agricultural reform, the government intended to confiscate farmland of a certain size and set up large-scale state-owned farms. State-owned farms were organized for the production of various crops, and productivity gains were made through the input of new technologies. The third of Cuban agricultural reform was carried out during the collapse of Soviet bloc in 1989-1991 to cope with the domestic economic crisis. Through the third round of agricultural reform, there were largely 4 things enacted. The third AR was designed to reduce the size of state-run farms, which were not efficient, established a new cooperative, UBPC, in order to foster small-scale farming, at a time when the soil quality became deteriorated by single-cropping and the existence of large-scale farms became impossible. Moreover, land was also distributed to tobacco and coffee producers, and today, urban farming was expanded into organic farming to carry out leasing of vegetable gardens improve the food self-sufficiency rate.

Figure 6. Agricultural Revolution (AR) in Cuba



## 5.2 Cuban agricultural practices and types

The definition of “urban agriculture” in the Cuban context has two components: geographical and technological. First, in terms of geography, urban agriculture refers to agriculture carried out in or near urban settlements, including some quite rural looking suburban environments. Second, in terms of technology, essentially all of this production is “agro-ecological” or “organic” and avoids the use of petrochemicals (Koont, 2008). In accordance with these characteristics of Cuban UA, the types and methods of Cuban UA came in many different forms in a variety of ways (Table 2).

Table 2. Types of Cuban urban gardens

Garden type	Description	Ownership
Intensive gardens	Located in areas with high quality soils, drainage, and adequate water supply Seeds are planted directly into fertilized soil.	Mixed state and private ownership
Organopónicos	Located in areas with poor soil unsuited for agriculture	Same

	Seeds are planted in nursery then transplanted to garden Cultivation occurs in containers or raised beds filled with organic matter and soil mix.	
Suburban farms	Located in the periphery of densely populated urban areas. Larger units (exceeding 2 ha.) which have a more highly integrated system of production. Use methods of cultivation that utilize locally produced inputs and minimize synthetic inputs.	Same
Popular gardens	Cultivated by community gardening organizations. Established in reclaimed dumps and vacant lots in urban and suburban areas Managed by local individuals or groups.	Generally private use of state or private land
Enterprise and factory gardens	Located on or near the property of factories and businesses Produce used to promote self-sufficiency by feeding factory workers and their families.	Owned by enterprise or factory
Hydroponics	Plants cultivated indoors in a nutrient rich solution, which is run through an inert planting medium.	State owned
Household gardens	Least extensive type of garden due to higher costs Gardens cultivated by individuals in their own yards with a high variation in size and type of produce.	Privately owned

Source: Altieri et al. (1999)

**Figure 7. Organoponico**



**Figure 8. Huerto intensivo**

More than 90% Cuban population lives in and around cities (Koont, 2011 and 2008), and Cuban food system had been heavily relied on import from foreign countries. The disintegration of the Soviet Union led Cuba to find new forms of agricultural technology for continuing their society, and Cuban government had faced a challenge to supply the population with adequate nutrition, given the shortage of petroleum for food transportation. In this context, the UA were presented as a possible solution. Growing food near where people live reduce the need to use gasoline and other kinds of natural resources for transportation, and implementing of UA shorten the time lag between harvest and kitchen which can be benefits for preserving the quality deterioration in the foodstuffs. In addition, Cuban government decided to use organic and agroecological agriculture method in their agriculture practices by using organic manures, compost, and worm humus, and little use of machinery. Through these efforts, the soil quality in Cuban urban area has become fertile and restored, which increased agricultural productivity, and this makes Cuban UA more sustainable.

**Table 3. Vegetable and Fresh Condiment Production in Urban Agriculture**

Year	Production (Millions of Metric Tons)
1994	0.0042
1995	0.016
1996	0.058
1997	0.14
1998	0.48
1999	0.876
2000	1.68
2001	2.3601
2002	3.345
2003	3.9312
2004	4.1948
2005	4.0745
2006	4.2134

Source: Rodríguez and Companioni Concepción (2006)

**Table 4. Types and names of urban agricultural products in Havana**

Type of urban agricultural product	Name of urban agricultural product
Vegetable	Beets, Cabbage, Celery, Chard, Chives, Corn, Cucumber, Eggplant, Garlic, Green Bean, Lettuce, Okra, Onion, Peanut, Pepper, Radish, Spinach, Squash
Fruit	Avocado, Banana, Plantain, Chirimoya, Coconut, Grapefruit, Grapes, Guava, Sour orange, Soursop, Lime, Mandarin, Mango, Mamey, Cantaloupe, Orange, Papaya, Pineapple, Passio fruit, Tamarind, Tomato
Tubers / roots	Cassava, Sweet potato, Taro
Legume	Pigeon pea, Black beans, Red beans, Soybeans, Chick peas
Other	Rice, Sugarcane

Source: Novo and Murphy (2000)

Among the elements of the process of urban agriculture, “agricultural practice” was mentioned significantly in the examined previous research, and the major contributing factor of Cuban UA was frequently described with agroecological theory (Cederlöf, 2016). In the context of transition, Cuban UA indicates a shift from fossil-fuel dependence to renewable energy sources, and this enables to minimize the use of fossil energy sources throughout the agricultural production process (Bridge et al., 2013; Nadaï and Van Der Horst, 2010).



As significant Cuban UA practices, the organopónico agricultural practices were revealed in lots of paper as a successful agricultural technology. The “organopónico” system is collections of roughly 30 meters by 1 meter rectangular walled constructions containing raise beds of a mixture of soil and organic material (Ruz, 1997). Through this organopónico technology, Cuba has achieved substantial yields especially vegetable production roughly one-thousands fold increase from 4,000 tons to 4.2 million tons between 1994 and 2005 (Table 3) corresponds to an annual growth rate of about 78 percent (Rodríguez Nodals and Companioni, 2006).

Moreover, other than agroecological approach and organopónico system in Cuba, city centered to the UA movement is promisingly mentioned (Premat, 2005). Havana, the capital of Cuba, has not only been praised for its UA performance, but it also is the place where most UA-related research, decision-making and support networks are based. The short distance between the agricultural knowledge research institution and the grounds where UA practices were implemented make it possible to carry out more effective and successful Cuban UA (Hernandez and Medina, 2001). Without doubt, the success of UA in Cuba has been greatly facilitated by extensive government support. This support has taken various policy instruments, including the allotment of state lands to be used as garden lots in usufruct; the promotion of research on sustainable technologies; the dissemination of related knowledge by agricultural delegates appointed to every level of government; and the provision of affordable agricultural inputs to urban farmers (Premat, 2005).

### 5.3 Policy instruments for urban agriculture in Cuba

#### *Legal and regulatory instruments*

The legal and regulatory instruments of Cuban UA policy were observed in the articles with 4 different laws: The Law Decree 142, 187, 259, 300. The Decreed Law 142, adopted in 1993, specifically addressed the agricultural sector, introducing substantial institutional changes (Koont, 2011). This law acknowledged that a system of production based on state farms had simply become impossible. Its first article announces the breakup of state farms under the control of the Ministry of Agriculture (MINAG) and the Ministry of Sugar (MINAZ), and their replacement by now, much smaller cooperative productive units, called UBPCs to stimulate production by encouraging local autonomy in decision making and by linking the incomes of cooperative members. Furthermore, article 1 of Decreed Law 142 lists the principles sustaining UBPC activities, and the implementation of Decreed Law 142 was actively functioned formulating more than 3,000 UBPCs by the mid-1990s.

The Law Decree 187 was made in 1998, and this law accomplished to apply PE in all state enterprises (Koont, 2011). The PE is defined as improvement of management containing with appropriate material incentive systems, and about 30% of all state enterprises were applying PE by 2007 by leading to higher salaries, profits, and efficiency. Under the Law Decree 187, workers will be paid according to the socialist principle “from each according to his abilities, to each according to his work”, and the incentives have been paid based

on the efficiency achieved by contribution to the national economy.

The Law Decree 259 was introduced in 2008 in order to increase domestic food production and reduce imports (Leitgeb et al., 2016). This law, renowned land reform Act, were made to facilitate access to land and regulate the distribution of land in usufruct (Nova González, 2012). Under the Law Decree 259, the Cuban government registered 110,000 applications for land, and 690,000 ha of agricultural land were distributed in 2009, and it facilitated access to land, and as a result, improved the self-sufficiency and income opportunities of the producers.

Lastly, the Law Decree 300 was established in 2012, and this law included several improvements for applicants by providing the right to construct buildings on the land or the right to plant forests and fruit plantations (Leitgeb et al., 2016). This made the farming application more attractive in urban areas, and guarantee advice for newcomer farmers upon entering a cooperative.

### ***Organizational instruments***

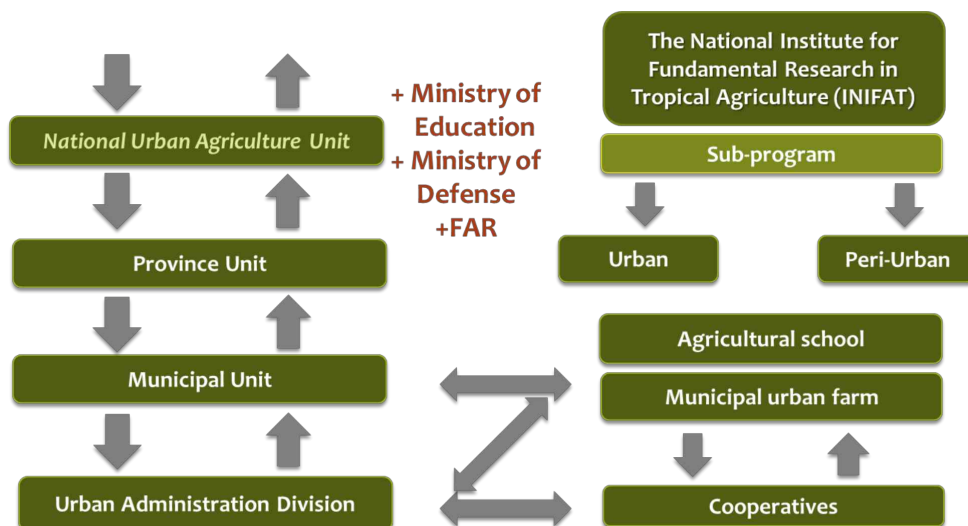
The Cuban UA policies were implemented throughout various organizations, and the most important aspect of Cuban UA success is organizational based policy approach. The strong, disciplined, coherent central direction and guidance are combined with decentralized action in input provision, marketing, production through UA related organizations (Koont, 2008). The different Cuban institutional structures were able to respond with technologies, policies, and practices during the Cuban economic crisis, and

with a stable and organized policy structure made possible the effective Cuban government’s urban planning and policies.

In 1998, the Cuban Ministry of Agriculture established the National Urban Agricultural Unit, which is composed of representatives from relevant ministries such as the Ministry of Agriculture, Ministry of Education and Ministry of Defense, to promote the direction and active management of urban agriculture (Figure 9). Cooperation and coordination among several ministries for urban agriculture are named as horizontal policy integration. Policy integration is a process of uniting and harmonizing separate policies to produce an integrated and coherent policy system (Briassoulis, 2005: 50).

The sub-programs of urban agriculture were developed at different levels, with urban reforestation programs in the center of the city; organophonico in the middle of the city; cultivated gardens, herbs, flowers, livestock raising programs, and suburban activities in the suburban areas. The final 29 sub-programs cover a wide range of areas, including production, sales, value added, natural resource conservation and support projects.

Figure 9. Urban Agriculture System in Havana



Source: Ha (2016)

The analysis results of Cuba's organizational policy instruments showed that the Cuban UA organizations were formed by village, regional and country level, thus systematically forming the role of the organization according to their scope of influence (Table 5). Chepe (2006) identifies the four key elements of the Cuban UA effort, and the first elements is that the bringing together and 'organization' of all who practice agriculture in and near cities (Chepe, 2006). This effort can be recognized in the results of the analysis of Cuban UA organizational instruments. Not only the large number of UA organization, but the role of each organization is significant, and each organization plays different distinctive role in the urban system. Each organization or institution implement their certain subprograms such as research, distributing seeds, marketing, and providing agricultural techniques by crop type (Koont, 2008). All these institutions serve as supporters to ensure that UA in each region can proceed as desired.

**Table 5. Organizational Chart for Urban Agriculture**

<b>Territorial Unit</b>	<b>Urban Agriculture Agent</b>
Nation	GNAU (National Group for Urban Agriculture)
Province (14 total)	GPAU (Provincial Group for Urban Agriculture)
Municipality (169 total)	GMAU (Municipal Group for Urban Agriculture)
Consejo Popular (1,452 total)	Representate de la Agricultura Urbana

Source: Koont (2008)

### ***Social and information-based instruments***

The analysis of UA policy instruments in Cuba confirmed that Social and information-

based instruments were mentioned dominantly in the research paper at the highest rate, and most of social and information-based instruments were found to consist of things related to education. Many schools and academies that educate urban farmers with providing urban agriculture skills and technologies within such research institutions, including ACC (Cuban Academy of Science), INCA (the National Institute of Agricultural Sciences), and Agricultural Research Teams at the University of Havana. Furthermore, it is confirmed that movements, slogans and educational activities are actively being carried out to promote public awareness about urban agriculture.

Several studies support the hypothesis that educational system in particular country has great impact on political regimes, and say the government may use education to establish its criteria to determine identity and directly intervene in the contents of the training system to form people's ideology (Fuchs-Schündeln and Masella, 2016). In the case of Cuban UA, particularly in socialist countries, the role of education is significant, and the results of social and information-based policy instruments in Cuban UA show that education related policy instruments are actively applied for effective implementation of UA in Cuba.

Moreover, the social based instruments like cooperation, CPAs (Agricultural Production Cooperatives) (Koont, 2011), are formed at the center of an organization. Not only associations but the training programs are provided by organization, and most of them are managed and controlled within the institution purpose. Indeed, education and institutions appear to be highly interconnected in Cuban UA system.

### ***Planning instruments***

The planning policy instruments of Cuban urban agriculture were confirmed that various types of sub-policy instruments were implemented, including strategies, guidelines, programs and projects, and among them, the most common sub-policy planning tools were projects and programs, many of which were found to be organization-centered. The detailed planning policy instruments are listed up in the appendix part. However, the planning policy instruments were not shown in the preceding study for the implementation of Cuban urban agriculture. Therefore, this paper will not discuss in detail about Cuban UA planning policy instruments.

### ***Economic and financial instruments***

The development of UA in Cuba is based on six fundamental concepts, and among these there is “adequate economic incentives to producers” (Koont, 2011), and appropriate material incentive system are important component of improvement of UA management. The pago por resultados (pay according to achieved results) is one of the well-organized economic policy instruments in Cuba (Koont, 2011 and 2008). The system is operated if the company makes a profit, all workers receive the same bonus, and the incentive payments are individually distributed. In addition, various “moral” incentives exist for urban agriculturalists in Cuba. On an individual level, they are offered substantial

opportunities for more formal education and a healthy, supportive, and dignified work environment. The moral incentives do not directly impact on economic and financial activities, but it could be described as one of the tools that has an indirect impact.

Not only economic and financial policy instruments provided by the government, but also non-governmental organizations contribute to Cuban UA through funds and donations. The horticulture club received benefits and donations from domestic and more recently international NGOs with agricultural tools and seeds, and this have been powerful incentive for gardeners to start or join a club. Even, some clubs exist only for receiving and distributing the NGO's donations (Chaplowe, 1998).



## **6 Discussion and conclusion**

### ***Urban Food Forestry***

In terms of the provisioning service of the ecosystem, fruits and oils from trees were considered as food resource in urban areas. Urban agriculture and urban agroforestry were combined by cultivating woody perennial plants in conjunction with crop or animal farming. The term “urban food forestry” was thus coined in integrating elements of urban forestry, urban agriculture, and agroforestry. Urban food forestry is defined as “the intentional and strategic use of woody perennial food-producing species in urban edible landscapes to improve the sustainability and resilience of urban communities (Clark and Nicholas, 2013:1652). Urban food forestry improves food security and enhances resilience of the food system by 1) increasing physical food availability with the new planting of food trees, 2) increasing economic and physical access to food by providing low-cost food from local sources, 3) improving food utilization by providing a free source of nutrient-dense foods, and 4) buffering shocks to food supplies (Clark and Nicholas, 2013). Therefore, urban food forestry can contribute to urban sustainability by overcoming urban poverty.

### ***Lessons from Cuban Urban Agriculture***

In practice, some developing countries have been using urban agriculture to reduce poverty. Cuba has a successful experience of urban agriculture as a way for increasing food availability. Cuba faced a big challenge of food supply in the 1990s. Almost three-fourths of Cuba's trade was with the Soviet Union. The collapse of the Soviet Union in 1991 and the United States' trade embargo in 1996 prevented importing foods and agricultural materials such as pesticides, fertilizers and machines. Cuba tried organic agriculture with less materials such as fertilizers and pesticides against deficiencies of foods and agricultural materials. Production of food in urban areas through urban agriculture contributes to improving balance of distribution of agricultural products at the national level. Foods were produced and consumed locally due to the transportation costs. Agricultural activities were conducted with the small scale instead of the large scale due to the lack of agricultural machines. The Cuban conditions are very similar to the current conditions of DPRK. Against political and economic crisis, DPRK can adopt urban agriculture for overcoming food shortage by producing vegetables and fruits in urban areas. It is deeply linked with DPRK core policies, *Wonrimhwa* and *Gwasuwonhwa*. In addition, Cuban case of urban agriculture shows good combination of policy instruments. Cuba settled legal framework of land use right and benefit sharing through agricultural reforms. It brings lessons to DPRK for creating foundation for successful urban agriculture. DPRK has a legal foundation of urban green space management. DPRK can link the urban green space management system with urban agriculture. Several Acts can include contents of planting fruit trees in urban areas with multiple and specific perspectives such as urban planning, urban management and urban beauty. Cuba also

paid high attention to research and education on urban agriculture. Cuba is leading education and training of urban agriculture. DPRK needs research and education on urban agriculture for the long-term perspective.

### ***Urban Agroforestry***

Planting fruit trees can be connected with the concept of urban agroforestry as agriculture that incorporates trees in the urban and peri-urban areas. The DPRK has successfully implemented an agroforestry project supported by the Swiss Agency for Development and Cooperation (Xu et al., 2012) and has established the Agroforestry Strategy and Action Plan 2015-2020 for implementation (Kim et al., 2016). This research finding indicates that the DPRK emphasized planting perennial wood fruit- and nut-producing species in urban areas. Therefore, it may be concluded that agroforestry policy was an integral part of the urban greening policy in the DPRK.

## 7 Conclusion

Urbanization, emerging as a global phenomenon, requires urban policies to improve the living conditions of urban dwellers, both in developing as well as in developed countries. In cities across the globe, hundreds of millions of people exist in desperate poverty, and global poverty has become an urban phenomenon (Fernandes, 2007). To solve the urbanization of poverty, lots of possible solutions were discussed and UA has been provided as a possible solution playing a significant role in addressing urban food insecurity problems and relieving environmental stress (Zezza and Tasciotti, 2010). This report examined urban agriculture-related status, policies and legislations in DPRK. It analyzed Cuban successful case of urban agriculture for designing urban agriculture in DPRK in the near future. This report indicates that DPRK established and implemented urban greening policies and created legal structure of urban green space management through several Acts. In particular, urban greening policy includes planting fruit trees for supplying food in urban areas. *Gwasuwonhwa* as a new core policy is facilitating increase of fruit trees in urban areas. In urban planning and urban management, urban greening is considered with urban agriculture focusing on fruit trees. Therefore urban agriculture can be designed in the urban green space planning in DPRK. Urban agroforestry can be also an approach to link urban agriculture with urban forest management.

In practice, urban agriculture projects can be a theme for cooperation projects between DPRK and other countries or international organizations such as FAO for food security.

More case studies of urban agriculture in developing countries can give some lessons for designing an urban agriculture model in DPRK.

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