Food Green Cities: A Pathway to Sustainable Urban Development of Nepal

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ABSTRACT

Urbanization is undergoing rapidly in Nepal. The causes are rural to urban migration and addition of municipalities by merging a number of rural areas. During the restructuring of the state, Government of Nepal declared 293 as municipalities among 753 local government units. Considering the municipalities as urban areas, urban population has reached more than sixty percent of Nepal's total population. But the urban areas still have rural characteristics and insufficient infrastructures. Due to the increasing urbanization, the maintenance of sufficient open spaces, greeneries and the preservation of agricultural lands has become important urban issues in Nepal. The loss of productive lands has resulted in decrease of food self-sufficiency and green spaces in the cities. To tackle this urban issue, the Fourteenth National Development Plan has emphasized the concept of Food Green City (FGC) by integrating urban agriculture into urban planning. This paper aims to elaborate the concept of FGC and explore necessary policy intervention to realize the concept of FGC in practice based on the study of Godawari Municipality of Nepal. Finally, this study recommends FGC as a pathway for sustainable urban development of Nepal by highlighting FGC contribution in achieving Sustainable Development Goals (SDGs).

Keywords: Food security, Sustainable development goals, Urban agriculture, Urbanization

1. INTRODUCTION

Nepal became a Federal Democratic Republic Country in 2015. The country is surrounded by two big countries, India in three directions (East, West & South) and China in the North (Shrestha 2017). Administratively, Nepal is divided into seven provinces, seventy-seven Districts and 753 local units. Among the local units, there are 293 municipalities and 460 rural municipalities. The Government of Nepal has integrated its long-term agenda "Prosperous Nepal and Happy Nepali" in 15th Five-Year Plan, which also incorporates the Sustainable Development Goals (SDGs) and commits for graduating from the least developed country (LDC) category by 2024 (NHDR 2020).

Urbanization has become a worldwide phenomenon. Only 17.1% of the total population was found to be residing in total 58 municipalities as per the census 2011 (NUDS 2017). But the pace of urbanization is faster in Nepal. Recent urbanization is basically due to increased number of municipalitiesby merging a number of rural areasduring state restructuring (Shrestha 2020). The government has given 293 local units the status of municipalities in the process of federal structuring in 2015 as per recommendation of Local Level Restructuring Commission (LLRC) (Acharya 2018). Since then, Nepal has 293 municipalities among which 6 are metropolitan cities, 11 are sub-metropolitan cities and 276 are municipalities. Now, considering the population of municipalities as urban population, the urban population has reached to more than sixty percent out of total population of the country (Shrestha 2019). But most of the municipalities of Nepal still have rural characteristics with lacking urban infrastructures. Providing access to housing and other basic infrastructure and services to its entire population is a great challenge for Nepal. In developing new towns and urbanizing areas, the major difficulties include accessing land, insufficient budget allocation and limited institutional capacity for the capital investment in urban infrastructure (MoUD 2016). There is shortage of investment for providing the required infrastructure and urban facilities to the municipalities of Nepal (TDF 2018).

Rapid urbanization has raised serious environmental problems creating imbalanced urban ecosystem. In the past, townsand citieshad spaces for agricultural production and now these spacesare limited to peri-urban areas, which are also under threat of converting into buildings due to urbanization (Corvo & Rafaele 2016). Municipalities have been developed as centers for the secondary (industry) and tertiary (service oriented) economic activities without proper care for primary (basically agriculture) economic activities (Shrestha 2011). The rapid conversion of fertile agriculture land into urban use consisting of residential buildings, commercial complexes, industrial blocks and urban infrastructures has greatly affecting the built-uptoopen space ratio, with adverse effects onurban ecosystem (Shrestha *et al.* 2012). The agricultural land of Kathmandu valley has declined from 58.4% to 47.4% between 1990 to 2012, indicating that there was loss of 0.5% or 400ha land area annually in the valley (Genesis 2013 cited in NUDS 2017). It is increasingly difficult to find open spaces in citiesfor healthy breathing and emergency spaces during disasters like earthquakes and fires. Open space occupies only 0.48% and 0.06% of municipal areas in Kathmandu and Lalitpur, respectively (NUDS 2017). Although 9 m^2 per person of green open space for the city residents is the minimum requirement recommended by World Health Organization (WHO) and Food and Agriculture Organization (FAO) (NUDS 2017), the availability of open area in Kathmandu is 0.25 m^2 per person and 4.34 m^2 per person in Dharan (NUDS 2017). Air and living environments are greatly polluted, impacting negatively on the quality of life (NUDS 2017). Hence, it has become a great challenge for sustainable development, particularly for improving urban environment.

Promotion of urban and peri-urban agriculture can ensure food security; convert urban waste into resource for food production; lead to savings in land, energy and water resources; better public health due to greenery and help improve land and urban management (NUDS 2017). Safayet *et al.* (2017) point out that as agriculture lands are getting convertedinto residential, commercial and

industrial land-uses, the resources for growing food have become scarce and conclude that like Bangladesh,other countries can also practice roof top farming to increase greenery and fresh food supply. In Singapore,a highly urbanized city where 90% of food is still imported, Edible Garden City was launched in 2012, with an objective of increasing Singapore's resilience and people's connection to food within the city (Low 2020). UNDP (1996) has highlighted the importance of cultivating food as only means of survival for those who cannot purchase food due to lack of money or disruption of supply. Besides food, many urban farms provide other services such as education and training, tourism and leisure (Van Tuijl *et al.* 2018).

Nepal started to respond to the issues of urbanization with planning and development preparing a comprehensive Kathmandu Valley Development Plan in 1969 and after that government istrying its best with many efforts in the form of policies, plans, strategies and projects to address the urban issues. The Fourteenth National Development Plan emphasized the concept of Food Green City (FGC) (Shrestha 2011) for sustainable urban development by integrating urban agriculture with urban planning (Shrestha 2020). United Nation Conference on Habitat III, National Report Nepal has emphasized for recognizing the role of cities as drivers of sustainable development and the need to incorporate ecological concepts in urban planning like eco-city, smart city, and Food Green City (MoUD 2016).

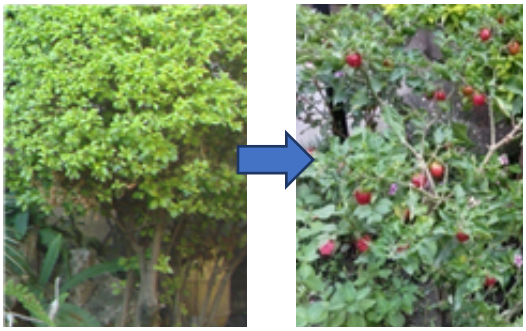
This paper highlights the concept, principles, issues and challenges, initiatives taken, policy intervention required and ways forward in localizing the FGC in practice for contributing to the sustainable urban development of Nepal. This study also elaborates contribution of effective compliance of FGC for the attainment of SDGs.

2. MATERIALS AND METHODS

This paper has been prepared basically confined to desk reviews of reports, journal and books related to Food Green City, urban agriculture, roof top farming, SDGs, urbanization and planning, policy interventions and practices in the context of Nepal. The approach taken to present this paper has been a blend of conceptual description, supportive narratives and subjective assessment of policy and plans forwarded by experts and institutions for attaining SDGs.

2.1 Food Green City and Its Principles

In the context of a fast-urbanizing world and limited resources, a concept called Food Green City was formulated as a planning methodology for 21st century to develop our cities sustainable as an output of Doctorate thesis of Osaka Sangyo University, Japan (Shrestha 2011). Accordingly, it was defined as: "A Food Green City (FGC) is a kind of Eco-city that enables its residents to live a good quality of life with minimum consumption of resources, in harmony with nature, culture and future. It is also a process of restructuring the cities and its ultimate goal is to establish spatial equity, low mobility and perfection in urban ecosystem for the sustainable development with coexistence of man in natural system". The eight guiding PLEASURE principles of FGC are: 1. Plenty of Food Green Space (Urban Productive Greening), 2. Living and Working Together, 3. Ensuring minimum consumption of resources, 4. Attaining sustainable neighborhood, 5. System of 3 Bs (Boot, Bike & Bus), 6. Use of energy efficiency and eco-friendly technologies, 7. Restructuring the cities through Community Participation and 8. Efforts for Zero Waste Emission (Shrestha *et al.* 2012). It is quite crucial to promote multifunctional land use and greater community participation in the management of urban open spaces integrating urban agriculture in urban development programmes (Adedeji *et al.* 2009). The strategy of FGC is to integrate urban agriculture with land use planning to achieve food production and maintain greenery in the city. The logic behind FGC is gaining for converting light energy to food energy (carbohydrate) consuming carbon dioxide and releasing oxygen through means of plants in the city. Hence, this concept helps in converting Carbon dioxide city to Carbohydrate city (Shrestha *et al.* 2012). It is the concept for advocating multifunctionality of green, transforming and promoting green to Food Green (productive green) as demonstrated in Fig.1 and the principles components of FGC are illustratively shown in Fig. 2.



Green | Food Green (Productive Green)

Fig. 1. Multifunctionality of Green

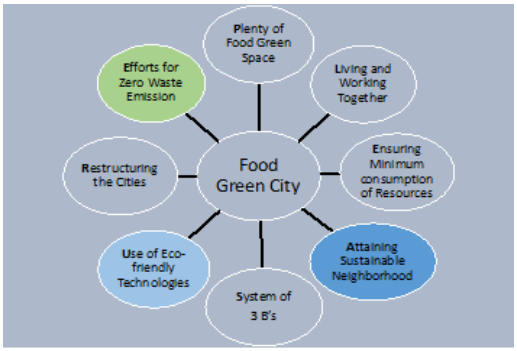


Fig. 2. Components of Food Green City

2.2 Initiatives for FGC in Nepal

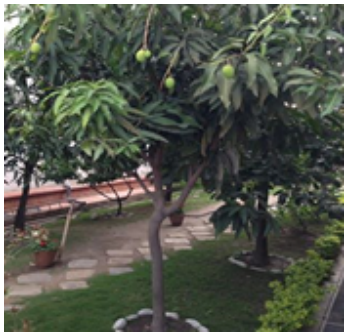
The Government of Nepal, National Planning Commission (NPC) emphasized smart and eco-city for sustainable urban development and identified the concept of Food Green City as a modality for achieving it (NPC 2016) and mentioned in the national planning document to initiate few Food Green Cities as model for sustainable urban development by integrating urban agriculture with urban planning (Shrestha 2020). Nepal's National Habitat Report for Third United Nations Conference on Housing and Sustainable Urban Development (Habitat III) also highlighted the concepts like eco-city and food green city as an urban spatial framework for promoting efficient and mixed type of land use, compactness, and appropriate density through planning interventions (MoUD 2016). To provide working guidelines for the development of Food Green City as mentioned in the document of Fourteenth National Plan, NPC has prepared Directives and Working Procedures for Food Green City in 2017. Ministry of Urban Development, Department of Housing and Urban Development has prepared feasibility study report of Kirtipur Municipality to develop it as Food Green City in 2020. Nepal Academy of Science and Technology (NAST), driving with vision "Science for Society, Innovation for Prosperity", has given continuity to the government policy to localize the concept of Food Green City. NAST has started promoting urban agriculture through policy intervention and incentives by collaborating with Mahalaxmi Municipality to develop it as a Food Green City. NAST has also facilitated preparation of study report to localize the concept of FGC taking case study of Mahalaxmi Municipality. In addition to this, it has also supported urban agriculture activities like community-based Chamomile farming in Khokana, Lalitpur and holy basil or Tulsi farming in Pokhara-33, Kaski.

2.3 The Roles of Urban Agriculture in FGC

UNDP (1996) defines urban agriculture as "an activity that takes placeon land and water of urban and its surrounding areas, which produces, processes and markets food and other products through production methods, and (re) using resources of nature and urban wastes, to yield a diversity of crops and livestock". Urban Agriculture conceptualized in FGC plays an important role for physical, socio-economic and environmental wellbeing of the urban dwellers. It is the method of ensuring food security saving energy within the food production and distribution system and improving environment with much greenery areas to the cities.Being lifeline to pollution, the green spaces in the urban areas should be increased (Corvo & Rafaele 2016). Urban Agriculture contributes to the socio-economic development of towns and cities all over the globe (UNDP 1996). It has been practiced in various forms in Nepal for harnessing its benefits (Fig.3.). Urban Agriculture has multifunctional roles in FGC for urban sustainability (Table 1).

Table1. Roles of FGC for Urban Sustainability

Sustainability Parameters	Roles (Benefits/ Impacts)
Physical	a) supports in revitalizing urban space with city with greenery to the city dwellers utilizing unused and vacant lands(Mackiewicz *et al*. 2018).
	b) increases open spaces and maintains balance between built up and open space ratio.
	c) prevents the surface sealing problem and maintains underground natural system.
	d) allows for emergency spaces during fire and earthquake disaster.
	e) adds aesthetic values to the community (Krishnan *et al.* 2016)
Socio- economic	f) provides affordable food to the city dwellers reducing the food miles (Ackerman *et al.* 2014).
	g) provides access to the healthy and fresh food (Van Tuijl *et al.* 2018), which keeps people healthy.
	h) revitalizes the culture and integrate community (Mackiewicz *et al.* 2018).
	i) provides green jobs to unskilled people and jobless people as well (Mackiewicz *et al.* 2018).
	j) provides urban agro-based business and innovation opportunity (Van Tuijl *et al.* 2018).
	k) increases awareness among citizens about the production of food (Van Tuijl *et al.* 2018).
	l) improves the quality of urban life offering opportunity for recreation, social interaction and improved eating habits (Mackiewicz *et al.* 2018).
	m) supplements household income (Ackerman *et al.* 2014).
	n) improves the property value (Nogeire-Mcrae *et al.* 2018).
Environmental	o) provides green, clean and aesthetic urban environments (UNDP 1996).
	p) utilizes organic wastes produced in the city by converting into compost thus supporting for waste management and soil nutrient recycling (Nogeire-Mcrae *et al.* 2018).
	q) supports to make ecological balance in the natural cycles of water and soil (Mackiewicz *et al.* 2018).
	r) reinforces the relationship between Man and Nature.
	s) increases O_2 (Indrawati 2017) and reduces CO_2 accumulation.
	t) improves microclimate minimizing heat islands (Mackiewicz *et al.* 2018).
	u) helps to decrease air pollution. Maintains ground water table and keeps biodiversity (UNDP 1996).



Fruit Tree growing at residential garden in Kathmandu Metropolitan city.

Still having agriculture practices near urban areas in Kirtipur Municipality.

Vacant land utilizing to grow rice at Godawari Municipality.

Rooftop hydroponics practicing to grow vegetables.

Research activity for aquaponics practices to grow vegetables and producing fish at NAST.

Commercial production of vegetable using hydroponics in Lalitpur.

Producing vegetables at Rooftop using grow bags in Kathmandu.

Growing fruits at home in front yard of a house in Kathmandu.

Community Chamomile farming at Khokana, Lalitpur.

Fig. 3. Various forms of practicing Urban Agriculture (UA) in Nepal

2.4 Challenges of FGC

The challenges behind FGC to implement at ground is to find answers to the three questions: Where to do UA?, How to do UA? and Who will do UA?. FGC can be executed in Private space (House Level), Community space or in Vacant Land (Community Level) and agriculture in bigger size in the cities (Commercial Level) etc. For doing urban agriculture, community, civil society, cooperatives, private sectors can utilize roof top, front yard, backyard of individual houses, the vacant spaces, right of way, river bank, slope lands and institutional vacant lands in the community or city on lease for growing vegetables, fruits, flowers and bee keeping, medical plants or any income generating plants as income generating actives. UA can be done by Middle Natural Farming and adopting 3R (Reduce Reuse and Recycle) policies (Shrestha 2011), and City dwellers can do privately at their leisure whereas private sectors can involve with Public- Private Partnership (PPP) modality and community people can do collaboratively (Shrestha 2011). Individuals can best utilize their time for doing UA and for doing bigger one, people can engage as green employment.Farmers are usually form cooperatives to increase the sustainability of farming activity reducing risks and increasing profit (UNDP 1996).

There is an increasing trend of people thinking towards sustainable development, organic farming and green space. Climate change has become a global issue which is caused by greenhouse gases emission. Cities share about two third of total greenhouse gases emission of world. Hence, unless and until the cities make some intervention, it is very difficult to combat climate change, the greatest human challenge of the present world. People are doing individually as per interest for practicing UA but the result will not be very significant unless and until UA is integrated with land-use planning and municipality make plans and programs to implement in the city levelwith holistic thinking. If it is executed with plan in the whole city then, only it will have huge positive impact. The difficulty is in the adoption of FGC principles in the city plan by the municipality administration. In summary, the challenges of FGC implementation are changing the mindset of the people for practicing urban agriculture, integrating urban agriculture into land-use planning and increase government support system.

2.5 Potential Area for Urban Agriculture

In the study made in Godawari Ward-14, it was identified that available potential rooftop for urban agriculture is about 84 sq. m. per house (Shrestha 2020). Even considering only 50% as potential rooftop space available and 25% available space at front yard and backward, the total space available for urban agriculture in a house is about 63 sq.m.. Let's consider there are 400000 potential roof tops available in Kathmandu Valley for urban agriculture then potential area available is tentatively 25.2 sq. km, which is equivalent to about 5 times of Banepa Municipality and nearly 5% of total area of Kathmandu Valley. This is just the house level potential areas for urban agriculture in municipalities. Besides this, there are many potential areas for urban agriculture like vacant lands, riverbanks, large institutional areas, roadside areas, parks etc. If all these areas are considered for urban agriculture integrating land use planning, it can contribute a lot for food production and green spaces in the urban areas.

2.6 Linkage between FGC and SDGs

The SDGs are an internationally agreed set of common development goals to be achieved by 2030, which are also broadly aligned with the social, economic and environmental aspirations adoptedin the new constitution of Nepal (B.K., A. 2019). Nepal's aspirations towards SDGs which rest on three pillars (economic, social and environmental) are generating, sharing and sustaining prosperity by 2030 (NPC 2017). The PLEASURE principles of FGC are directly or in directly linked with SDGs. This section of the paper elaborates how the FGC concept is linked for the attainment of SDGs with various supporting facts.

SDG 1-No Poverty: The first goal of SDGs is about ending poverty ensuring high human development and per capita income. Food Green Cities with its Principle 1 indirectly supports to achieve this. To improve the livelihoods of the

urban poor, the contribution of UA is obvious (Hubert *et al.* 2010).

SDG 2-Zero Hunger: The second goal targets zero hunger byachieving food security, improving nutrition and promoting sustainable agriculture. Principle 1 of Food Green Cities directly helps to produce food locally with plenty of Food Green Spaces, which ensures access to safe, nutritious and sufficient food by integrating urban agriculture with land use planning in urban areas. Urban agriculture supports to end hunger, achieve food security, improve nutrition and promote sustainable agriculture meeting targets of SDG 2 (Monica 2018). Urban agriculture is a source of food for urban dwellers and the share of self-consumption ranges from 10% to 90% based on the availability of land, purchasing power and the nature of the staples (Hubert *et al.* 2010).

SDG 3-Good Health and Well-being: The third goal ensures healthy lives and promotes well-being for all people of all ages. Principle 1 of FGC indirectly help to progress in the health sector and ultimately to meet the goal of healthy citizens and well-being. UA has positive correlation with health as it helps for consumption of fresh fruits and vegetables to the city dwellers (Nogeire-Mcrae *et al.* 2018). UA provides opportunity for social interaction and recreational opportunity that helps for wellness, urban green spaces improve health with clean and fresh air (Krishnan *et al.* 2016).

SDG 4-Quality Education: The fourth goal is for ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all. Principle 1 of FGC directly help to learn practical way of food production education and connect to nature while principles (3,6,8) indirectly contribute to promote learning opportunities. Through workshops, courses and tours, UA activities can beused for educational purposes in cities to increase awareness about food production (Van Tuijl *et al.* 1996).

SDG 5-Gender Equality: The fifth goal is about achieving gender equality and empowering all women and girls. FGC principles (1,5,7,8) contributes indirectly to achieve gender equality and empowering all women and girls. Women urban farmers are motivated to produce food for household consumption as it not only ends hunger but it also saves money for buying food and saved money allowed them to pay for other needy things (Robertson 2013).

SDG 6-Clean water and sanitation: The sixth goal is focused on the availability and sustainable management of water and sanitation for all. The concept of Food Green City with principle 2 advocates for urban agriculture which ensures for improving ground water table with recharge to increasing access to safe drinking water. FGC principles (1,3,4,6,8) enhances efficiencies, better infrastructure, and energy efficient technology to improved sanitation as well as proper waste disposal, pollution management and good hygiene. Urban green improves quality of water, resilience of aquatic environment and effective in handling storm water (Krishnan *et al.* 2016).

SDG 7-Affordable and Clean Energy: The seventh goal deals with the access to affordable, reliable, sustainable and modern energy for all. Cities being major consumers of energy and contributors to GHG emissions offers greater opportunities for the achievement of SDG 7 through planning, designing and using efficient system for greener and adoption of energy efficiency, reduction of waste and promotion of responsible consumption practices (UN habitat *et al.* 2018). FGC principles 6 enhances efficiencies, better infrastructure, and energy efficient eco-technology that helps to achieve this goal.

SDG 8-Decent Work and Economic Growth: The eighth goal is for sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Community gardens are significant to bring positive impact, especially in the poor community (Voicu and Been 2008). The practices of urban agriculture activities have important role for creation of additional income, business, knowledge and opportunity for new export items (Van Tuijl *et al.* 2018). The presence of urban green spaces increases the economic values of an area and can also promote eco-tourism (Krishnan *et al.* 2016). FGC principles (1,2,6) ensures working environment and principle 1 and 2 provides decent green job opportunity for sustainable productivity.

SDG9-Industry, Innovation and Infrastructure: The ninth goal is for resilient infrastructure, inclusive and sustainable industrialization, and innovation. Van Tuijl *et al.* (2018) has mentioned that urban agriculture is very important for the sustainability of the city covering the activities in different industries and involve many stakeholders including farmers, citizens, planners, policy makers, architects, engineers, educational and research institutes for necessary innovation and infrastructure development.This goal of the SDG is directly linked with FGC principle 1 and 2 as it supports food industry, innovation for urban agriculture like hydroponics, aquaponics, film farming etc. Indirectly principles (3,4,6-8) of FGC are also contributing to achieve this goal.

SDG 10-Reduced Inequality: The tenth important goal is reducing inequality. Since the weak economic group of people(including urban farmers of which 65 % are women) spend in food purchase up to 85 % of their income, UA helps to improve both social inclusion and reduction of gender inequalities (Orsini *et al.* 2013). Principle 1 in FGC provides opportunity to engage female in urban agriculture activities which helps to empower the woman with engaging economic activities.

SDG 11-Sustainable cities and communities: All the components are important to achieve this goal of sustainable cities and communities. With the establishment of city farms, green roofs, vertical vegetable garden, small window and balcony plantations, benefits come to have positive impact on urban areas for sustainable development (Jasionkowski & Czarnecka 2016). Urban agriculture has benefits for reducing the city waste, improving urban biodiversity and air quality, and overall reducing the environmental impact related to urban food system leading to the sustainability (Orsini *et al.* 2013).The principles (1-8) of Food Green cities directly support for better urban planning to housing and sanitation, access to safe and efficient transport systems, green and public spaces, improve air quality, sustainable community, household wastage, and emergency responses to natural disasters in urban areas.

SDG 12-Consumption and Production: This goal belongs to the sustainable consumption and production patterns. More the consumption and production patterns, the more is the damage to the environment. Urban agriculture provides access to food and green space in low-income communities (US Farmers & Ranchers in action 2020). UA as part of sustainable food systems promotes food education and awareness for importance of local food production for sustainability (Nogeire-Mcrae *et al.* 2018). Food Green Cities are eco-cities based on the principle of sharing and minimum consumption of resources adopting sustainable neighborhood practices helps directly to achieve this valuable goal. All the principles are contributing to this goal.

SDG 13- Climate action: The thirteenth goal is concerned with action to climate change and its impacts on the life of the people. Environmental development such as increasing biodiversity and reduction of pollution and greening the cities can be achieved through UA (Van Tuijl 2018). Urban gardens contribute for keeping the urban climate by minimizing the effect of heat islands and support ecological balance of urban environment (Mackiewicz *et al.* 2018). All principles of Food Green Cities help to reduce carbon emissions, energy & other resources consumption and food miles, thereby improving air quality promoting physical activity simultaneously (eg. by replacing cars with walking & cycling) and sustainable food system. Therefore, this is a major pathway towards climate change mitigation.

SDG 14- Life Below Water: The fourteenth goal of SDGs is associated with the sustainable use of the oceans, seas and marine resources for sustainable development but it isnot much pertinent for Nepal as it has no direct connection to seas and marine (B.K. A. *et al.* 2019). But, being a Himalayan country having many perennial rivers, Nepal is the source of fresh water. In this perspective, this goal is also very importantly connected to conserve such resources and life in those water bodies. FGC principles 1, 6 and 8 are helpful to minimum consumption of fresh water and helps for ground recharging supporting for increasing fresh water.

SDG 15-Life on Land: The fifteenth goal of SDGs basically concerns with the sustainable use of terrestrial ecosystems and protecting bio- diversity loss. Principle 1 of FGC helps for maintaining ecosystem and also help for sustainable managing forest with agro-forest practices.

SDG 16- Peace, justice and strong institutions: The second last goal calls for promoting peaceful and inclusive societies for sustainable development. All principles are Food Green Cities are some-how helpful to maintain peace, inclusive and do justice to all. It's principles are oriented to help city dwellers to live in planned and mixed place with close living and working together in more sustainable way. Food availability locally, sustainable transportation system, community & private sector involvement and use of energy-efficient technology making FGC appropriate for the 21st Century.

SDG 17-Partnerships to achieve the Goal: The final goal is all about buildingup the ways of execution and rejuvenation of the partnership for sustainable development globally. It deals with adequate finance, technology, institutions, capacity and partnership which are vital for achieving the SDGs. Available resources are not sufficient to achieve the SDGs, thus it demands partnership to achieve SDGs. FGC advocates for partnerships approach for implementation. Public Private Partnership is being proposed to do the necessary actions. Development partners and the international community support also necessary for financial support, knowledge and technology transfer to meet the necessary capacity building needs, which are envisioned in the principles of FGC for the developing sustainable neighborhood level (Principle 4) to whole urban development.

Policy Intervention to localize FGC

A study made in Godawari Municipality Ward-14 to explore opportunity of Urban Agriculture to realize Concept of Food Green City (Shrestha 2020) reveals that there is huge opportunity for doing urban agriculture using roof top hydroponics evaluation based on eight parameters (Availability of space, Willingness of people, Financial Capacity, Manpower, Technology, Knowledge & Acceptance with incentives). Interested and needy people are found doing roof top farming and kitchen gardening but unless and until some policy interventions are not made, the holistic approach of urban sustainability taken in Food Green City is not realized for sustainable urban development of Nepal. Hence, the policy interventions required to localize FGC are recommended as follows:

1. Land use planning plays an important role for urban sustainability. Living and working together with better land use planning helps for reducing mobility. Similarly, integration of urban agriculture with land use planning improves urban environment with increasing greenery and fresh food to the city dwellers. Therefore, land use planning focusing living and working together and integrating with urban agriculture is highly recommended.

2. Urban agriculture is a specialized and sensitive type of agriculture. Urban Agriculture Promotion and Research Centre is therefore recommended for promoting and doing research in the various forms and technological aspects including hydroponics. This helps for provide practical tools and techniques based on research and promotion including information of urban agriculture to the citizens in the municipalities. Vocational training for UA practices needs to be included in the school curriculum (UNDP 1996).

3. Most of the rooftops of the houses and buildings are unutilized in municipality. Hence, municipal planning should consider converting unutilized roof tops into edible roof tops.

4. Technical and information support should be provided to the interested people for enhancing knowledge of emerging technique like Hydroponic, drip irrigation, aquaponics, rain water harvesting etc. and necessary information for roof top farming. By providing training opportunities for the beginners will add the motivation for practicing UA.

5. Municipality Office should encourage to design (structural & architectural design etc.) incorporating concept of edible roof tops or utilizing some portion of front yard and backyard to practice urban agriculture in proposed new construction buildings. Also, the existing

buildings need technical assessment before practicing rooftop farming as most of these buildings were not constructed with considering rooftop farming.

6. Incentive's plan of municipality like giving subsidy in property tax for those who practices urban agriculture can be a good motivating factor for promoting urban agriculture.

7. Municipal office should facilitate shopping stores itself or make arrangement from private sectors or cooperatives to make easy and affordable access to the UA practicing people of municipality for seeds, fertilizers, tool kits, equipment etc.

3. CONCLUSION

This review paper indicates that concept of Food Green City with it's eight PLEASURE principles are appropriate to address the many issues and challenges of the sustainable urban development of Nepal. More specifically, FGC integrating urban agriculture with land-use planning has many benefits for urban sustainability including provision of fresh and healthy food to the city dwellers and more greenery in the cities. Further, this paper has established the positive relationship between Food Green City and Nepal's potential for the attainment of SDGs. Thus, FGC is recommended as a pathway for sustainable urban development of Nepal.

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REFERENCES

1. Acharya, K. K., 2018. Local Governance Restructuring in Nepal: From Government to Governmentality. Dhaulagiri Journal of Sociology and Anthropology Vol. 12, pp.37-49.

2. Ackerman, K., M. Conard, P. Culligan, R. Plunz, M. P. Sutto and L. Whittinghilll, 2014. Sustainable Food Systems for Future Cities: The Potential of Urban Agriculture. The Economic and Social Review, Vol. 45, No. 2, pp. 189-206.

3. Adedeji, O. H. and I. A. Ademiluyi, 2009. Urban agriculture and urban land use planning: Need for a synthesis in metropolitan Lagos, Nigeria. Journal of Geography and Regional Planning Vol. 2(3), pp. 043-050. Available online at http://www.academicjournals.org/JGRP ISSN 2070-1845

4. B.K., A., A. Mahato , S. Thapa, A. Rai and N. Devkota,2019. Achieving Nepal's sustainable development goals (SDGs) by effective compliance of corporate governance. Quest Journal of Management and Social Sciences: Corporate Governance Edition—Vol.1, No.1,ISSN Print: 2705-4527, ISSN Online: 2705-4535 (Online) Available at: file:///C:/Users/Dell/AppData/Local/Temp/25974-Article%20Text-78156-1-10-20191018.pdf

5. Corvo, P. and R. Matacena, 2016. Nutrition and Food in the Green City, Transnational Marketing Journal, Vol.4(2), pp.62-70.

6. Government of Nepal, Ministry of Urban Development (MoUD), 2017. National Urban Development Strategy (NUDS).

7. Government of Nepal, MoUD, 2016.Third United Nations Conference on Housing and Sustainable Urban Development (Habitat III) Nepal National Report. (Online) Available at:https://www.moud.gov.np/storage/listies/July2019/HIII-Nepal-National-Report_Printed-version.pdf

8. Government of Nepal, National Planning Commission and United Nation Development Programme, 2020. Nepal Human Development Report (NHDR)2020, Beyond Graduation: Productive Transformation and Prosperity.

9. Government of Nepal, National Planning Commission (NPC),2017. Sustainable Development Goals Status and Roadmap: 2016-2030.

10. Government of Nepal, National Planning Commission (NPC),2016. The Fourteenth Plan (2016-2018), Kathmandu, Nepal.

11. Hubert de Bon, Laurent Parrot, PauleMoustier, 2010. Sustainable urban agriculture in developing countries. A review. Agronomy for Sustainable Development, Springer Verlag/EDP Sciences/INRA, 2010, 30 (1), 10.1051/agro: 2008062. hal-00886446. (Online)Available at: https://hal.archives-ouvertes.fr/file/index/docid/886446/filename/hal-00886446.pdf

12. Indrawati, E. 2017. Urban Farming model in South Jakarta, IOP Conf. Series: Earth and Environmental Science 106 (2017) 012052. Doi: 10.1088/1755-1315/106/1/012052

13. Jasionkowski, R. and A. L. Czarnecka 2016. The potential of urban agriculture for sustainability of cities in Poland, Ecological Questions 24/ 2016: 59-64. Http://dx.doi.org/10.12775/EQ.2016.012

14. Krishnan, S. D. Nandwani, G. Smith and V. Kankarta. 2016. Sustainable Urban Agriculture: A Growing Solution to Urban Food Deserts. Pages 325-340 in D. Nandwani Editor. Organic Farming for Sustainable Agriculture. Springer International Publishing Switzerland. DOI: 10.1007/978-3-319-26803-3_15

15. Low, B. 2019. Building sustainable urban farms with government support in Singapore. Field Actions Science Reports (Online), Special Issue 20 | 2019, Available at: http://journals.openedition.org/factsreports/5824

16. Mackiewicz, B., R. P. Asuero and K. Pawlak. 2018. Reclaiming Urban Space: A Study of Community Gardens in Poznan, Quaestiones Geographicae 37(4). Doi: 10.2478/quageo-2018-6383

17. Monica, R. and V. Gupta. 2018. Transforming Urban Farming Approaches to achieve the SDGs. International Journal of Engineering and Techniques -Volume 4, Issue 5. (Online)Available at: http://oaji.net/articles/2017/1992-1537361829.pdf

18. Npgeire-Mcrae, T., E. P. Ryan, B. B. R. Jablonski, M. Carolan, H. S. Arathi, C. S. Brown, H. H. Saki, S. Mckeen, E. Lapansky and M. E. Schipanski. 2018. American Institute of Biological Sciences. BioScience 68: 789-759. (Online) Available at: Doi:10.1093/biosci/biy071

19. Orsini, F., R. Kahane, R. Nono-Womdim and G. Gianquito. 2013. Urban agriculture in the developing world: a review. Agron. Sustain. Dev. 33, 695–720 (2013). https://doi.org/10.1007/s13593-013-0143-z

20. Robertson, C. 2013. The Role of Gender in Urban Agriculture: A Case Study of Cape Town's Urban and Peri-Urban Township. A Master Thesis of The University of Guelph, Canada. (Online) Available at: https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/7760/Robertson_Carolyn_201312_MSc.pdf?sequence=1

21. Safayet M., M. F. Arefin, M. M. U. Husan. 2017. Present practice and future prospect of rooftop farming in Dhaka city: A step towards urban sustainability. Available at:https://www.sciencedirect.com/science/article/pii/S2226585617300407

22. Shrestha, S. B. 2011. A Sustainable City Planning Methodology for 21st Century (Concept of Food Green City), Lambert Academic Publishing, Germany.

23. Shrestha, S. B., K. Sakakibara, O. Taniguchi. 2012. The Relationship Between Food Green City and Low Carbon Society, Annual Research Bulletin of Osaka Sango University, No.4.pp. 69-98.

24. Shrestha, S.B., 2017. Roadmap for the development of Science, Technology and Innovation in Nepal, (Abstract), International Conference on 'Science and the small nations. Bridging the Gaps: A Science Diplomacy Initiative' held during 14-16, November 2017 at IICC, New Delhi.

25. Shrestha, S. B. 2019. Managing Urbanization in Nepal: Challenges and Choices. pp. 79- 87. Managing Urbanization in Asia Proceedings

of the Workshop, 25-26 June 2019, Sri Lanka. (Online) Available at: http://aassa.asia/achievements/achievements.php

26. Shrestha, S. B. 2020. Roof Top Hydroponics: Opportunity for Urban Agriculture to realize Concept of Food Green City (FGC). Nepal Journal of Science and Technology, Vol.19, No.2, pp. 62-67.

27. Town Development Fund, 2018. Annual Report 2016-17.

28. United Nation Development Programme (UNDP), 1996. Urban Agriculture Food, Job and Sustainable Cities. (Online) Available at: http://urban.agroeco.org/wp-content/uploads/2015/12/UNDP-Urban-Agriculture-Part-one-1.pdf

29. United Nations Human Settlements Programme (UN-Habitat), United Nations Economic Commission for Europe (UNECE) and UN Environment, 2018. Policy Brief #14. Interlinkages between energy and sustainable cities. UN High level Political Forum 2018 (Online) Available at:https://sustainabledevelopment.un.org/content/documents/17557PB14.pdf

30. US Farmers and Ranchers in action, 2020. U.S. Agriculture's Opportunities to Contribute to the Sustainable Development Goals. (Online)Available at: https://usfarmersandranchers.org/wp-content/uploads/2020/09/us-ag-sdg-report.pdf

31. Van Tuijl, E., G. J. Hospers and L. Van Den Berg. 2018. Opportunities and Challenges and Opportunities of Urban Agriculture for Sustainable City Development. European Spatial Research Policy, Vol. 25(2). http://dx.doi.org/10.18778/1231-1925.25.2.01

32. Voicu, I. and Been V., 2008. The Effect of Community Gardens on Neighboring Property Values. Real Estate Economics 36(2):241 – 283 DOI: 10.1111/j.1540-6229.2008.00213.x