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Urban Agriculture Retrofitting within Residential Buildings; A Comparative Analysis between New Cairo and Nasr City

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Abstract : Urban agriculture is becoming more prevalent in urban cities all over the world. New methods and techniques have facilitated agriculture activities in the intra-urban areas that have high population density. Those areas suffer the most from urbanization problems and high levels of pollution. This research aims at studying physical applicability and social acceptability of UA retrofitting in intra-urban areas. A comparative analytical study is conducted between New Cairo and Nasr City using site and visits, face to face questionnaires. The results show spatial alternatives for urban agriculture applicability in New Cairo and Nasr city. The results also revealed residents needs for more green areas and their different preferences and concerns on urban agriculture retrofitting within residential buildings.

Keywords: Urban agriculture, social acceptability, retrofitting, green roofs, vertical greenery systems.

1. INTRODUCTION

With the intense ongoing urbanization, people have served their needs by excessive usage of natural resources and trespassing on agriculture lands. As a result of years of nature invasion, huge global issues are threatening our planet. Urban areas are mostly affected with urbanization challenges which negatively impact both human and the environment. Hence, urban agriculture (UA) has social, economic and environmental benefits that helps to face different challenges of society and planet. This diversity and multi-functionality of UA are also considered the main pillars of sustainability.UA has several definitions that alter based on its location, type, scope and scale. It can broadly be defined as the process of growing plants and/or raising animals within or around the city. These agricultural activities take many forms and exist at multiple scales in cities, responding to the needs and preferences of urban residents. However, the radical difference between UA and rural agriculture is that UA is a part of urban systems and follows urban policies (1).

One of the biggest challenges that faces UA, is the high competition on vacant lands between UA and other urban functions. However, UA can go side by side with other urban activities instead of competing with them. New innovative methods of UA like green roofs, Vertical Greenery Systems (VGSs) and soilless agriculture, have enabled UA retrofitting in the intra-urban areas.

UA is grounded in several urban theories, starting from 1898, Ebenezer Howard who began the Garden City Movement, followed by Frank Lloyd Wright who re-imagined the American suburbs and cities by integrating agricultural practices. Later on, Continuous Productive Urban Landscapes (CPUL) was raised to promote the integration of agriculture into public spaces and streets. Comparatively, Agrarian Urbanism by Duany, discusses urban agriculture integration methods through rural-urban transect; a formal model for integrating urban agriculture into new development plans. This model, integrates food and farming into the physical pattern of the new urbanist model (2). Although planners are aiming to create cities that are more ecologically sensitive and, energy efficient and productive (3). However, urban agriculture should not be only evaluated for its production capacity, but for its multi-functionality as well. For example, city gardens may not only produce fresh crops but can also increase biodiversity, micro-climate control,

recreational areas, social interaction, and beautification of the neighborhoods(4). On that account, Stephen Kellert and Timothy Beatley, explained that biophilic theory *"recognizes the essential need for daily human contact with nature as well as the many environmental and economic values provided by nature and natural systems"*. Sometimes, however; the green urban agenda forgets the 'green, 'and the nature itself (2).

First, the physical applicability is investigated by detecting the possible available spaces within residential buildings in the study areas. Second, the social acceptability is measured by knowing residence preferences in UA on multiple dimensions. This research is a combination of theoretical and empirical work. The theoretical part reviews different dimensions of UA including functions, spatial alternatives, methods, techniques and possible challenges. The empirical part is a comparative analysis between New Cairo and Nasr City which is divided into two steps. The first step is analyzing the physical environment of both case studies through site visits and observation. This shall show different spatial alternatives for UA retrofitting and possible physical obstacles that might face it. The second step is knowing the social preferences of different dimensions of UA for the residents of both case studies. This is achieved through face to face semi-structured questionnaire.

2. URBAN AGRICULTURE MULTI-FUNCTIONALITY

Agricultural activities in urban environment can be oriented to more than the food production alone. UA can be designed in many different forms and at many different scales, to provide an enormous range of benefits for urban residents.

2.1. Social benefits

UA plays an important role in social integration and community development by strengthening bonds between youth and the society. That's reflected on decreasing social segregation, increasing self-resilience, developing social skills, and empowering the connectivity of residence to their living place. UA improves human physical and mental health as it provides a way to practice an activity in a healthier outdoor environment. It also offers food accessibility and security by giving an access to fresh and organic food which might not be available in affordable prices in markets. UA increases public awareness of new farming methods and food production process through the educational programs in school and community gardens. (5)(6)

2.2. Economic Benefits

The Economic input of UA is achieved through creating job opportunities for those who don't have one. This includes illiterates, household women and youth (6) .UA can be considered as a second income for those who have jobs. They can sell extra crops which they grow by their homes. UA can also increase land and building value through increasing green areas in neighborhoods (7) (5).

2.3. Environmental benefits

UA has positive effect on climate mitigation that could range from building to city scale (8). It provides protection from extreme weather and decrease heat island effect. This is attained through integration of the green areas with paved and impermeable sites or through building envelopes like green roofs and green walls. UA saves energy consumed by HVAC systems and offers fresh air by the filtration of air particles and airborne contaminants(9) (10) (11). UA also contributes in energy conversation, as growing food in cities. It saves energy wasted in food cooling and transportation from its rural source to urban markets (12) (11).

In addition, UA also contributes in green provision spaces and neighborhood beautification which creates a safer environment (6) (5). UA can increase biodiversity of species in cities which is beneficial for local and regional ecosystems, as well as human health (5) (10).It has the potential to impact storm water runoff, through capturing rainwater and increasing surface area permeability (5).

3. SPATIAL ALTERNATIVES OF UA IN INTRA-URBAN AREAS

Andrés Duany has discussed several ways of farming through a rural-urban transect (Fig1). This transect is divided into 6 T-zones, from natural to urban-core zones (2)(13). This research focuses on methods of farming in intra-urban areas (from T3 to T6), where agriculture is more integrated into the built environment.

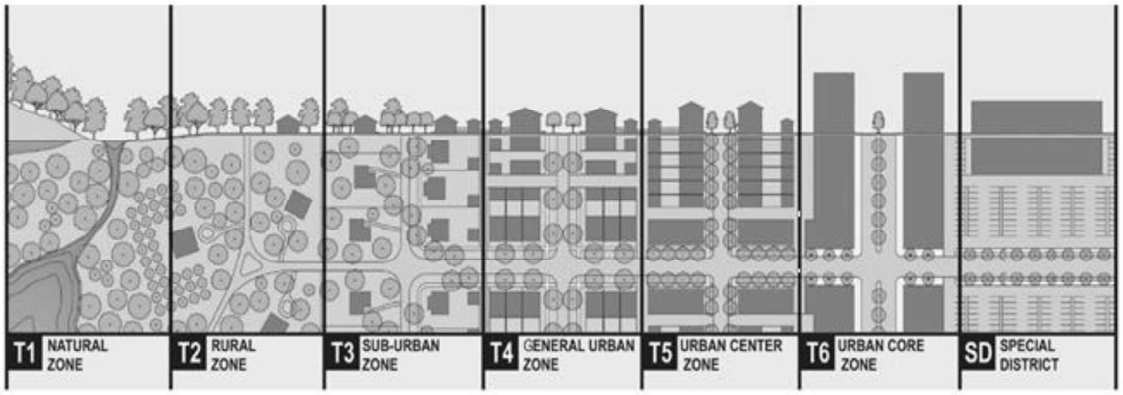


Fig1. The Rural Urban Transect
Source: Duany Plater-Zyberk & Co. http://www.transect.org/rural_img.html

UA integration in intra-urban areas is reliant on its adjustment to the urban functions and the built environment. Hence, "Zero-Acreage Farming" (Z-farming) can offer special placement to UA in intra urban areas. Z-farming can be defined as the process in which UA activities take place in spaces around buildings (like private gardens) or by using the building structure itself as a space for farming (Building-Integrated Farming) (14) (15). Hence, UA retrofitting in the intra-urban can be classified into ground based or structure based UA (**Error! Reference source not found.**).

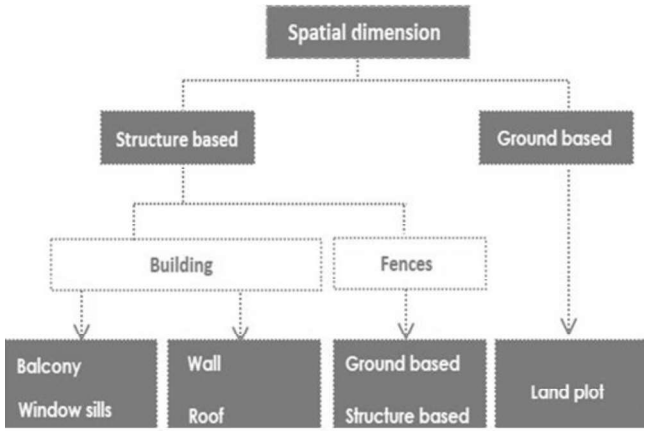


Fig 2. Spatial alternatives of UA in intra- urban area

4. FARMING METHODS IN INTRA-URBAN AREAS

New farming methods and techniques, and better understanding of urban environment, allowed UA to be more applicable in intra-urban areas even with few available vacant lands in cities. The following are common UA farming methods from different practical examples that suits the urban environment.

4.1. Container farming

Container farming is becoming increasingly popular in urban areas. Farming in containers is a form of UA that is suitable for limited spaces, time and other aspects of today's lifestyles. Container farming enables urban residents who live in apartments to grow fruits, vegetables, herbs, flowers, trees, and shrubs. Containers are an easy way to plant especially for non-farmers (16). They are dynamic, easily maintained and can be applied vertically or horizontally (17) (18).

4.2. Farming growing media

A substrate is a medium on which a plant is attached or grows. Soil is the universal substrate for growing plants, but the majority of substrate growers are searching for a better medium. Soilless culture is a man-made media that provide plants with support, nutrients and water. Soilless culture can be defined as *"any method of growing plants without using soil as a medium"*. It is divided into three main systems according the root growing media. Hydroponic is a system used for growing plants in nutrient solutions (water containing fertilizers). Aeroponic is system that uses nutrient solution spray in sealed root chambers. The plants are grown in holes of the panels of expanded polystyrene or other material. Substrate culture is a system that uses a solid medium to provide support for the plants. Those systems are frequently used in green roofs and vertical greenery systems or for productive business urban farming (whether indoors or outdoors). The main advantage of using the previous systems are the following: increase in productivity, control of plant nutrition, water economy and control reduction of labor requirement, control of root environment, and multiple crops per year. However, the main **disadvantages of soilless cultures are high capital investment and the shortage of technicians and skilled labor (19)(20)(21).**

4.3. Vertical farming

Vertical greenery system (VGS) are methods that allow farming on vertical surfaces like fences and buildings' walls. Those systems can be divided into two main types. The first type is green façade, which allows climbing or hanging plants to grow directly on walls or double-skin. This can either be through trellis or cable wires system or mesh system (22)(23). The Second type is living wall; a more complex system that allows more varieties in designs and shorter time to see the results. Living walls have lots of techniques, including: pocket systems, geotextile felt systems, modular trays, and modular vessels and planter boxes (23) (22).

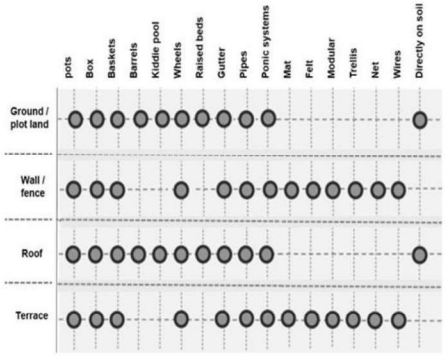


Fig 3. Relation between spatial alternatives and methods of UA

(Fig 3) shows that UA methods can be modulated to fit majority of urban spaces.

This fact allows residents to have more options for UA activities integration within their homes. The majority of farming methods can fit in all intra-urban spatial alternatives With the exception of the following:

- Barrel and kiddle pool in the vertical spatial placements (walls and terraces, fences).
- VGSs (mat, felt, modular, trellis, net and wires) in the horizontal spatial placemats (roof or ground).

5. CHALLENGES OF UA RETROFITTING

Maintenance is one of the biggest challenges that faces urban agriculture. Level of maintenance varies from one system to another. The more complex the planting scheme or the farming technique is, the more care is required. Maintenance activities include watering, weeding, and any additional technical inspections of more complex systems (24) (25). UA might have some difficulties with the initial cost of the installation of some methods like green roofs and green walls in addition to safety issues like loss and damage of crops from birds or animals (24)(26). In case of street verges in public gardens and community gardens there might be theft and vandalism, since they are hard to be controlled (27).

One of the challenges that also face UA is the absences of regional policies that include urban agriculture provision. This leads to losing valuable opportunities and potentials of more UA spaces in cities (28). In case of structured based UA, It's essential to measure the added load by green systems and whether the structure can withstand the added load or not (to guarantee its safety) (29). Another important challenge that faces UA is the social acceptance. Although the physical environment might be adequate for UA to be implemented, yet residents may still have reasons to reject UA retrofitting into their neighborhoods. Some of these reasons will be briefly be discussed in this study.

6. CASE STUDY

A comparative analytical study is conducted between New Cairo and Nasr city to assess the applicability of different farming methods in different intra-urban spaces. The selection was based on the ability of these two case studies to fit in the intra-urban areas of the rural-urban transect. The spaces which are available for farming in the intra urban areas are: front and backyards, fences, buildings' walls, terraces, window sills and roofs. The research scope focuses on UA retrofitting within residential buildings. Hence, New Cairo and Nasr city were selected for the case study; the two districts have different physical, environmental and social characteristics that is going to be discussed in this research. The sampling areas of new Cairo and Nasr city were selected based on two factors. First, eliminating non-residential buildings. Second, selecting an area that is representative for the main case study (dominant building typology).The case study will analyze the physical environment to identify the available spaces and possible physical obstacles. This is achieved through site visits. Afterwards, a semi-structured questionnaire is conducted to understand residents' perception, acceptance, and concerns of urban agriculture implementation.

6.1. Assessing the UA applicability within the physical environment

6.1.1. New Cairo

New Cairo was a plan to get out of the Egyptian capital with all its urbanization problems. In 1993, the nucleus of New Cairo was already existing. New Cairo is 15 km away from Maadi and 5 km away from Nasr City. it is bounded from Northside by the Suez road ,from Southside by (Katameya / Ain Sukhna) road, from Eastside by the Rubik Road , and from Westside by the Ring Road (30).The total area of New

Cairo City is 70580 Fadden while the green areas are estimated to be 1051.58 Fadden.

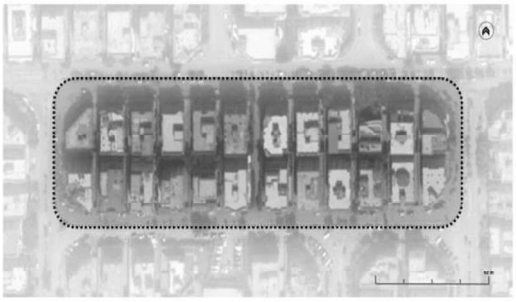


Fig 4. 5th settlement studying area
Source: Author based on Google earth map

The sampling area is a block located in district 2, in 5th settlement (Fig 4).The block area is 15000 m^2. It includes 24 buildings (each row has 12 buildings). All buildings in the block are residential detached villas with no mixed use buildings. Therefore, the main users of the building are either owners, legal tenants or janitors. Based on the site visit, all buildings in the area are in good condition. The height of the buildings in the district doesn't exceed 3 floors. (A ground floor and 2 typical floors) .The street width is around 23m centered with a planted pavement and the sidewalks are usually planted.

Fig 5. Samples of buildings in the studying area in New Cairo
Source: Author

6.1.2. SPACE AVAILABILITY FOR UA RETROFITTING IN NEW CAIRO STUDY sample

spaces	UA Applicability	building Front	building back	building sides
Walls (elevations)	Low possibility			
Terraces	High possibility			
Window sills	High possibility			
Roof	possible			
Ground	High possibility			
Fences	High possibility			

Fig 6. UA applicability in different spatial alternatives
In the study area of New Cairo

There are no specific guide lines for the architecture style of the elevations in the sampling area and the rest of the district (Fig 5). The elevations in the sampling area are full of decorative elements. However the density of using ornamental decorative plasters and panels

vary from one building to another. Some buildings have pediments on the top of the building, or on the top of the entrance to emphasize the central mass. Others have Decorative columns, parapets, including Cornice belt, Ferforje and balusters. The front and back elevation usually have most of the ornamental decorative elements. That decreases chances of spatial applicability on those sides. On the other hand the side elevations (neighboring side) are less dense than the front one and usually have the air conditioning units while terraces are rarely found. In this case the side elevations of the building might be considered as a possible spatial alternative.

The roof built up area is 25 % of the typical floor. The rest of the unbuilt-space is highly considered for UA retrofitting, however more than 50% of buildings in the study area exceed this ratio and could reach up to 80% of floor area. These violations decrease the proposed available space. In addition to outdoor furniture like pergolas, planting pots, grill and outdoor seating areas. The roof floor is sold as private property, and accessed by one owner (not the entire building residents)(31).

The built-up area of the building is 50% of total land area, with minimum setbacks of 3 meters from the front and the neighboring sides and 4 meters from the backside. The front and back setbacks are already being used as a garden (which is a form of UA) for the ground floor unit. (31), the neighboring setbacks are used as an entrance for underground parking. The Fences of the studying area are either solid or perforated with an average height of 2.5 meters. The fences of the 3 neighboring sides are solid to guarantee maximum privacy, while the front fence is usually perforated with a minimum 50 cm solid base.(31) All fences sides are considered a highly possible space for UA (Fig 6).

6.1.3. Nasr city

After the revolution of 1952, Abd El-Nasser declared launching of a new city called Nasr city. Currently Nasr city is bounded from Northside by El Khalifah El Mamoun Street and El Golf area, and from Southside by vacant land affiliated by Cairo government and investment authority. It's bounded from the Eastside by the ring road, and from the Westside by Abbassia, El Ghafir cemeteries and Manshiet Naser slums. Nasr city original master plan was designed to apply a grid pattern type and concept of central services. A new class of a higher income groups, sought better quality in life. This was reflected on the housing sector and increased the value of lands in Nasr city. Hence, new activities had been added to residential buildings to increase their value. The original area of Nasr city was 2646 hectares, then it was expanded to 4500 hectares (which is about 10714 Fadden) (32)(33) while the green area is estimated to be 1520234 m^2 which is approximately 361.96 Fadden (34) (32) .

Fig 7. 8th district studying area
Source: Author based on Google earth

The study area is located in in the eighth district of Nasr City (Fig 7). The block has 24 buildings and its area is about 16000 m^2. The buildings' heights in the block range from 3 floors up to 16 floors with a good building condition. Street width is almost11 m and the pedestrian side walk is filled with obstacles. The buildings' types in the study area (and in Nasr city in general), have currently changed from single-use buildings in the original master plan to mixed-use buildings. Therefore residential building started to host commercial, medical, and administrative services.

Fig 8. Samples of buildings type A in the studying area of Nasr city Source: Author

Fig 9. Samples of buildings type B in the studying area of 8th district Source: Author

6.1.4. SPACE AVAILABILITY FOR UA RETROFITTING IN NASR CITY STUDY sample

spaces	UA Applicability	building Front	building back	building sides
Walls (elevations)	possible			
Terraces	High possibility			
Window sills	High possibility			
Roof	possible			
Ground	low possibility			
Fences	Low possibility			

Fig 10. UA applicability in different spatial alternatives In the study area of Nasr City

In the study area, there are two types of buildings elevations; Type A has no architecture decorative elements and its height ranges from 3 to 15 floors (Fig 8). Type B has lots of decorative elements and its height range from 10 to 15 floors Fig 9). The building walls are considered possible spaces for UA that might be faced with some obstacles like Signs that are placed on top of shops or all over the entrance or even scattered along with the Ac units on building's elevations. Terraces are possible spaces for UA applicability if it's not re-constructed and added to the unit, or used as shop display to add an extra in-door area.

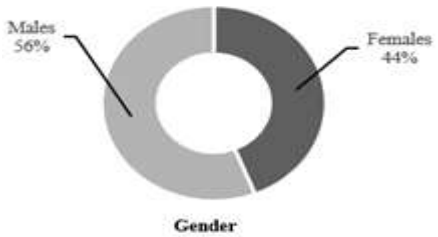
Around 35 % of buildings' roofs in the study area are considered shared property by all building users, while 20% of roofs are semi shared (used by duplex owners only) and 45 % are private property.(29). Roof is a wasted yet possible space (for UA) in Nasr city except those with duplex unit, or if it's used as space for billboards and mobile phone towers. The commercial activities in the ground floor level are decreasing the possibility of spatial consideration for both fences and ground (setbacks).

Some of the side setbacks in study area are built as shops or mosques while others are used as entrances for the building. Moreover there are no trees or street verges on the sidewalks because of the commercial activities that takes place on the ground floors.

A general observation for all the spatial alternatives of the buildings' side and back. They might not be subjected to enough light or even have a suitable visual accessibility. This is due to the narrow spacing between buildings. However different building heights might affect some of those (Fig 10).

6.2. Investigating UA social acceptability

The next part was conducted through face to face, semi-structured questionnaire. A face to face administrative questionnaire guarantees responding of all participants to all the questions. In addition to clarify any data to the participants, after answering the question concerning their previous knowledge of the topic. The questionnaire was composed from close-ended and open-ended questions. The Close-ended questions were used to come up with quantitative and statistical results while open-ended where used for a better understanding and exploratory purposes. The open-ended data were analyzed through coding, using excel program. In order to identify social acceptance of the residents for applying UA, the target population was the residence of both Nasr city and New Cairo. The sampling number was 47 residents of Nasr city and 42 of New Cairo, after eliminating 25 participants of non-targeted population. The sample characteristics are illustrated in (Fig 11).



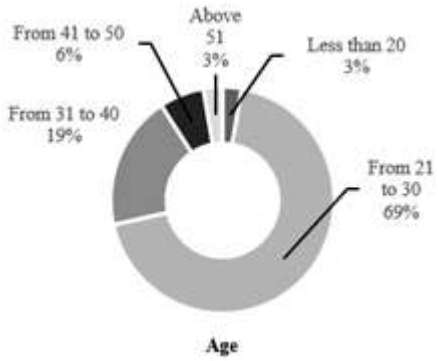


Fig 11. Characteristics of the sample in terms of sex, age.

Source: Author

6.2.1. Residence relation to urban agriculture :

The following (Fig 12) shows the satisfaction level of New Cairo and Nasr City residents with amount of green areas in their neighborhoods. In new Cairo 30% of residence are satisfied and 30% are neutral. In Nasr City 46% of its residents are very unsatisfied and 27% are unsatisfied. As observed from the site visit very few plantation or street verges existed because of commercial activities.

Fig 12. Residence satisfaction level with the amount of green areas in their neighborhoods
Source: Author

(Fig 13) shows particpipants previous knowlge of UA.The results showed that the concept of UA is still rather unknown among the residents of New Cairo and Nasr City. Almost half of the surveyed participants expressed that they had not heard of the term UA before. For those who said they had previous knowledge of UA, they had been requested to express what they thought UA meant. Around 64% of participants referred to UA as street plantation and public gardens. 23% have mentioned private gardens, 15% have used the term of green roofs. Only 1.5% of those who have a related academic background, had linked UA as farming in any place in the city for food productivity and security.

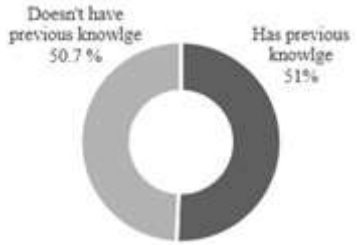


Fig 13. Participants' previous knowledge of UA
Source: Author

6.2.2. Residence preferences of UA types and functions:

As mentioned before, there are several benefits and types of UA that covers different social interests. This questionnaire showed what participants need the most from those benefits (Fig 14). The highest value was for the beautification purpose that shows residents urge to connect with nature. The second highest value was cleaner air and less pollutions. The least value was for creating a second income through productive UA. Although people might be interested in growing fresh, organic crops and herbs for their personal usage but the majority of the participants needn't any additional hassle.

All participants were asked to choose their favorite methods of UA retrofitting within their residential building (with the aid of different photos for different methods of UA methods attached with the survey).The results revealed that, most of the participants prefer UA in the form of traditional farming on ground (back and front yards), followed by raised beds. Also people prefer containers and pots as they are less messy, movable and easy to be maintained. More youth generations prefer the idea of re-used items like barrels or gutters. Although people are pleased with appearance of some of the VGS systems (Mats, modular, nets, and trellis) but they had some concerns if they are to be placed on building walls. Only few numbers of participant's have picked hydroponic systems. As justified, with no need for a complex system installments, if they can achieve a pleasant green environment in a simpler way (Fig 15).

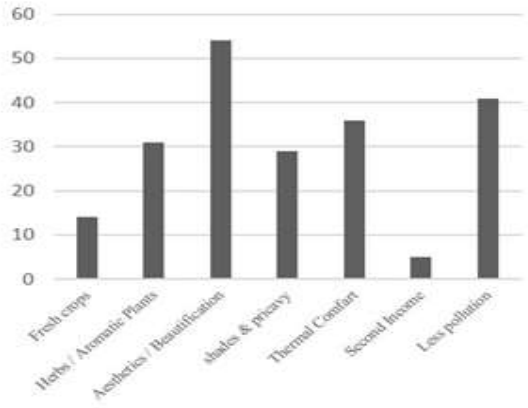


Fig 14. Residence preferences of UA benefits
Source: Author

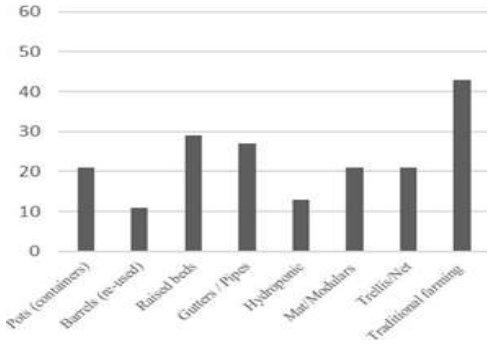


Fig 15. Residence preferences of UA methods within Residential buildings
Source: Author

6.2.3. Residents spatial preferences for UA retrofitting within their residential buildings.

(Fig 16) In case of roofs, more than 90% of the survey participants from both study areas (New Cairo and Nasr city) are willing to plant their roofs. Although in case of Nasr city some people are only willing to plant their roofs if it's their private space. More than 65% (in both samples) of those who agreed to use their roofs as a space for UA, prefer to plant maximum half the available area and leave the rest as hard cape.

Ground space in both sampling areas, is the setback land that surround the building .Almost 100% of new Cairo participants are willing to farm on ground. In fact the majority of them have declared that they already have their own private or semi-shared back (or front) yard. In case of Nasr city, 72% of the participants are willing to plant the setback ground space if it's existed away from public accessibility. More than 85% of the participants of both areas are willing to plant 100% of the available space on ground. As they believe that ground (as a space) is traditionally used for planting, while other suggested places are not necessarily use for such activity.

For Terraces and windowsills, 82% and 78 % of New Cairo and Nasr city participants respectably are willing to use those spaces for UA. As mentioned before, terraces can have more than one option to plant (balcony wall, balcony fence, balcony floor). More than 55% (in both samples) have chosen balcony fence. Participants are willing to plant one or 2 windowsills, but they have also expressed that it would take so much effort to consider all of them. In case of fences, 89% of New Cairo to 82% of Nasr city participants are willing to consider their fence as space for UA. However both participants are welling to plant only the fences which they are subjected to.

Buildings' walls are the most controversial spaces of UA. Almost 50% of all participants are unwilling to consider their buildings' walls as space for UA. They were asked to justify their answer and the reason is one or more of the following: *they don't like how it looks, they don't want any plants near their windows or balcony's doors because of insects, or they don't understand its technicality.*

Around 88% of those who are willing to use buildings' walls as a space for UA, are only considering planting maximum one elevation or just a strip of the whole building. New Cairo participants have chosen the side elevation because of the ornamental elements and terraces in the front or the back elevations. On the other hand, Nasr city participants have chosen the front elevation, as a way of visual enhancement for the building and their neighborhood. Also the side and the back elevations usually don't have any visual accessibility.

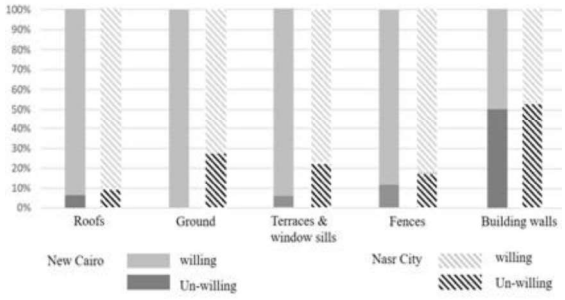


Fig 16. Residents' willingness for UA retrofitting in different spaces within residential buildings.
Source: Author

6.2.4. Social concerns of UA Retrofitting within residential buildings

The following chart shows the possible residents' concerns on UA retrofitting in their neighborhood. In both areas, Insects were on the top of the participants concerns of UA (55%). This was followed by maintenance with the percentage of 14%. This fact increase their desire to keep plants off the buildings wall itself. (Fig 17).

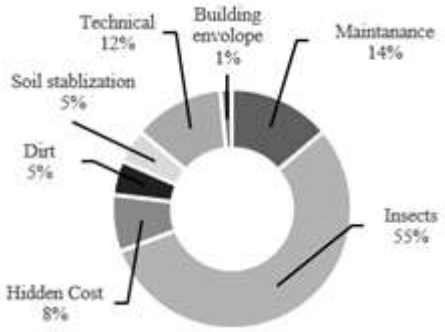


Fig 17. Social concerns of UA Retrofitting within residential buildings
Source: Author

7. CONCLUSION:

The physical environment in urban areas has different characteristics that differ from one place to another. Each district has particular building regulations that state building heights, built-up area, and fences height if existed, setbacks, etc. Unlike farming in open farm lands, the built structures in urban areas can prevent sun from reaching lots of spaces. In case of structure based UA, there are physical obstacles like load bearing, decorative and ornamental elements on building elevations, Ac units and commercial signs. Besides, the violations of exceeding the legal built-up areas of rooftops or building setbacks.

As noted, the area of both study samples was fixed, the number of buildings was similar and the setbacks between the building and property borders are almost the same. The significant difference in the built environment between New Cairo and Nasr City is the buildings height. The gaps between Nasr city buildings are very narrow relative to the buildings height. That fact prevents sun light from reaching most of spaces or even being visually accessible to people. New Cairo sidewalks are almost fully planted. On the Contrary, Nasr City residential buildings usually have mixed-use function. This fact is reflected on absence of majority of fences, some of setbacks, Street verges and trees around the building.

UA is a multidimensional concept that have different scales, benefits, methods, techniques, and different spaces that can be applied in. Therefore, the understanding of the residents needs and preferences, can affect social acceptability of UA retrofitting in their neighborhoods. UA benefits had evolved through years to fulfill human priority needs in certain places and time.

Although both case studies had different ratio of green areas and different population densities, yet there was no significant different in their preferences. Both residents need more beautification and amenity in their urban areas remains their priority benefit of UA. However productive UA and creating a second income was their least desirable option.

UA new methods can fit in different spaces in urban environment, but it might be faced with social rejection. People tend to accept more of what they are familiar with. The majority of participants in both study areas are willing to plant all the available space, if this space is ground. However in case of roof as a space for UA, they only consider planting maximum half of its possible available area. From their perspective, ground are traditionally being used as a garden and a suitable space for farming. Also building-walls had the least social acceptance to be considered as a space for UA. Residents had few different reasons, but the majority didn't accept how it looks.
Insects are the basic concern for all residents of UA retrofitting in general, but specifically in spaces which are close to building openings (building walls, balcony walls).Another influencing factor is the ownership of space, some residents are only willing to plant a space if it's only accessible by themselves.

Basically this study shows that social needs, preferences can be a challenge for UA applicability even if there is available spatial conditions. The key for UA retrofitting in urban environment is understanding the different social perception to UA and their needs, background and living environment.UA multi-functionality and diversity can allow both physically applicability and social acceptability in urban environment in one way or another. In addition to policies that encourage UA retrofitting within residential buildings and the need of public education of new methods and benefits UA.

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