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Classification of agricultural elements used in buildings

Abstract. The study addressed the utilisation of agricultural elements and applied landscaping in buildings, as current research in the field of architecture is either absent or only tangentially related to the topic. The study aimed to classify the agricultural element in the building structure to provide a basis for further research in this area, to identify the main characteristics of agricultural elements and to establish their interaction with buildings. The study used analysis of literary and scientific sources, logical, decomposition, comparative analysis, graph-analytical method, formalisation, generalisation and abstraction, and induction. As a result of the interdisciplinary research, three main possible ways of distinguishing between agricultural elements and/or applied landscaping were identified. These are: "by purpose", "by use model", and "by location". The classification of the studied buildings was conducted based on the aforementioned characteristics. The first category, "by purpose", denotes the primary function of the agricultural element in the structure of the building and includes the following subtypes: commercial, social, and recreational elements. The second "by use model" category reflects a certain function of an agricultural component: for commercial purposes, it is the food production capacity; for recreation, its visual accessibility, and the number of people it can serve in the case of applied recreation. This category includes subclasses: citywide, district use, and in-building. The third category, "by location" denotes the location of agricultural or landscaping elements in the structure of the building and contains subclasses "in the structure of the plot", "in the structure of the building", and "in the structure of the apartment (floor)". The practical value of this study is that the results complement the conceptual and terminological apparatus and can be used to create recommendations and guidelines for designing agricultural elements in the building

Keywords: housing; apartment; planning; landscaping; agricultural production

INTRODUCTION

New constructions are being formed in architectural practice with the introduction of applied greening and food growth units. This reflects the need and consumer desire for a green natural environment in the conditions of the over-compacted space of modern cities, which, according to I. Hnes & U. Ivanochko (2019), create a perceptive lack of space. The negative impacts of the urbanisation process in the form of overidentification of the urban environment and lack of necessary social services, which negatively affect health and mental well-being, were studied by

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T. Cheung *et al*. (2024) on the example of Hong Kong and C. Sun *et al*. (2023) on the example of Germany. The existing problems of suburbanisation in urban development were considered by J.B. Kocsis & K. Tomay (2024), namely, bloating and increased traffic. A. Sarzynski & T.J. Vicino (2019) noted the insufficient provision of the necessary resources and services, which increases criminogenic activity.

J.K. Mensah (2023) analysed the potential of urban agriculture in local economic development of cities. The study examined the role of urban agriculture in local urban economies in the developing country of Ghana. The study demonstrated that, with proper support, urban agriculture can improve the local economy through numerous benefits in terms of employment, income, improved livelihoods and food security. S. Barron & E.J. Rugel (2023) explored the correlation between young people, the environment and the impact on future decisions and priorities. In a potentially limited space of green areas, a person may experience a weakened sense of connection with nature, leading to less time spent in the natural environment and less sustainable behaviour.

However, despite the large number of existing buildings, as of 2025, no clear classification of agricultural elements (AE) in the building structure is present, which complicates further research on this topic. The study aimed to develop the classification in the building structure. The task of the study was to classify agricultural elements in the building structure based on the analysis of the existing architectural practice of introducing agricultural elements into the building structure. The study addressed agricultural elements as a physical, structural component of the environment to determine the nature urban agricultural element in the development structure, for which, until 2025, no methodological provisions for their planning and regulation was present in the Ukrainian scientific community.

MATERIALS AND METHODS

At the initial stage of the study, the multilevel nature of the problem and the relevance of the research were determined by analysing literature and scientific sources. Due to the complexity of the issue of growing plants in a building, an interdisciplinary research method was used to determine the characteristics of AEs. Previous studies have identified the main characteristics, which were used to categorise and systematise the worldwide practice of AEs in buildings, based on research by L.J.A. Mougeot (2005), M.M. Herrmann (2015), and S. Barron & E.J. Rugel (2023). Studies that describe methods and ways of AE implementation in buildings were prioritised. After clarifying the prerequisites and scientific basis, a sample of objects was formed using the methods of critical and comparative analysis, as well as the method of generalisation, based on the following criteria: typological diversity of buildings, belonging to different geographical areas and time, purpose, location in the city structure, and variability of use.

The next stage focused on the study of existing objects or concepts with AE in their structure. Among the wide range of nations whose architectural practice includes the creation of buildings, including residential dwellings with AE, countries with a temperate climate were selected due to beneficial plant growth conditions. The objects were selected from different periods, with descriptions of their original intent and how they were used. A total of 63 examples of buildings with applied landscaping and/or agriculture in their structure were considered (Google Docs, n.d.). Using the method of deconstructive analysis, the location, principle of functioning, and purpose of the elements of landscaping and agricultural production were identified following the previously adopted classification. By combining the methods of reduction from the individual to the general and abstraction, each element was generalised to a broader concept, which was used for the main classification. To simplify information processing, the method of formalisation was used with the help of ArchiCAD 25 and Adobe Photoshop 21. The studied buildings were recorded in the form of a miniature, according to the appearance, description, or commentary from the designer. The use of images of the same size, style, and construction principle demonstrated the difference between different elements of the classification, which simplified the systematisation of building characteristics. The study described in detail the research algorithm using four separately selected buildings representing the sample width: residential, commercial, public, and industrial buildings. Based on the obtained data, a matrix was formed using the method of matrix construction, which reflected the relationship of selected objects from different periods and locations to the developed classification system. Graphic materials for all the projects under consideration were taken from the websites of the object, technology representatives, or the large electronic gallery of modern architectural objects at AchDaily (n.d.). The final stage of the study categorised AE used in the structures of the building. Three main classifications and nine subclassifications were identified and tested using the diachronic and synchronic methods.

RESULTS AND DISCUSSION

The main aspects and principles of the arrangement of an agricultural element in the structure of multi-story housing are similar to traditional means of creating green architecture. Everything that applies to “classical” landscaping is also true for vertical farming in terms of wind, sun, soil, water, and fertilisation requirements. The fundamental difference between the two is that vertical farming involves an end result of being sold or used as self-sustaining production. The principles of functioning of the agrarian element in the city as a whole, as well as the factors influencing its formation, ware described by L.J.A. Mougeot (2005). The specifics of the formation of AE and their purpose during the Second World War were studied by M.M. Herrmann (2015), while S. Barron & E.J. Rugel (2023) investigated the importance of the impact of greening on young people in contemporary society. J.K. Mensah (2023) addressed urban agriculture as a key to overcoming

hunger and sustainable food sourcing. D. Chen *et al*. (2024) analysed the importance of agricultural production near cities. D. Starr (2021) addressed the impact of fresh air, and P. Reed (2021) analysed the effect of physical labour on health. I. Panțiru *et al*. (2024) also noted the impact of agriculture on health. Based on the above, four key characteristics of AEs were identified: purpose, use (capacity for commercial production), technology, and location.

Based on the primary agricultural element characteristics, the categorisation was conducted during development, particularly, in building. The purpose determines its main function in the building and its priority goal – recreation, social or commercial. The use model depends on the size and type of the AE, and its functionality. Technology determines the technological process of agricultural production. Location describes how the building interacts with the environment.

In 2014, a residential complex with 213 apartments and eight shops in 7 blocks with 4-7 floors above ground was built in Vienna's 22nd district (Fig. 1). The courtyard, which is the centre of this residential complex, is a semi-enclosed area connected to the pedestrian zone. Each building has its courtyard, which is furnished at the request of the residents – either as a simple recreation or as an agricultural element. The latter is widely used for educational purposes for children or elderly people. It contributes to their socialisation and the creation of hobbies. This neighbourhood is well-planned in terms of high-density, medium-rise buildings combined with privacy and comfort (Komar, 2023). The courtyards are divided into gardens and recreation areas. Residents can manage the space in the courtyard independently, which improves overall well-being via sense of property. R. Waldinger & M. Schulz (2023) noted that strong social ties positively influence cognitive functions.

Figure 1. "Wood Housing" by Seestadt Aspern, Vienna
Source: compiled by the authors based on Wood Housing Seestadt Aspern / Querkraft + Berger+Parkkinen Architekten (2020)

Quarterly development, interior-oriented galleries with access to apartments from the middle of the complex, a large amount of greenery, places for recreation, and common spaces positively affect the socialisation of residents. According to T.H. Tan & W.C. Lee (2023), a well-designed, balanced environment improves quality of life, including for the elderly. Lower levels apartments have access to the green roof of the stylobate. The roof has designated space for the residents to engage in agricultural activities. A notable feature is the transition spaces that connect apartments with shared agricultural elements on each floor (Wood Housing…, 2020).

Given that this is a residential building, the AE is designed as a private, applied recreation for residents. This space is intended to provide a variety of agricultural and landscaping elements for the residents. The location of the AE on the external enclosing structures and summer rooms, alongside a barrier and privacy of the adjacent spaces, further enhances the design's purpose. The impact of such a structure is exclusively in-house, due to the specifics of the location of the AE and landscaping, most of which is located inside the building. However, the use of certain measures allowed to creation of a green barrier between the street and private space. This allows the AEs to be observed by passers-by, which works as a short-range visual recreation.

Home Farm (Fig. 2) adapts a simple aquaponics system inspired by the system successfully used in Singapore by the ComCrop initiative, which grows crops on rooftops using off-the-shelf components. In the project, aquaponics is adapted for use on the building facade, linear soil farming at the highest levels, and on the roofs of buildings. This concept provides for various types of employment for the elderly: planting, harvesting, sorting, packaging, tours, on-site sales, delivery, and cleaning. The rewards for this include salary payments, reimbursement of rent or utility bills, reimbursement of medical expenses at a local clinic, or free products. This makes the building accessible to

older people, especially those with financial difficulties. All of this together will help to form a sustainable community and bring people together, which will also improve psychological state and well-being (Rosenfield, 2014).

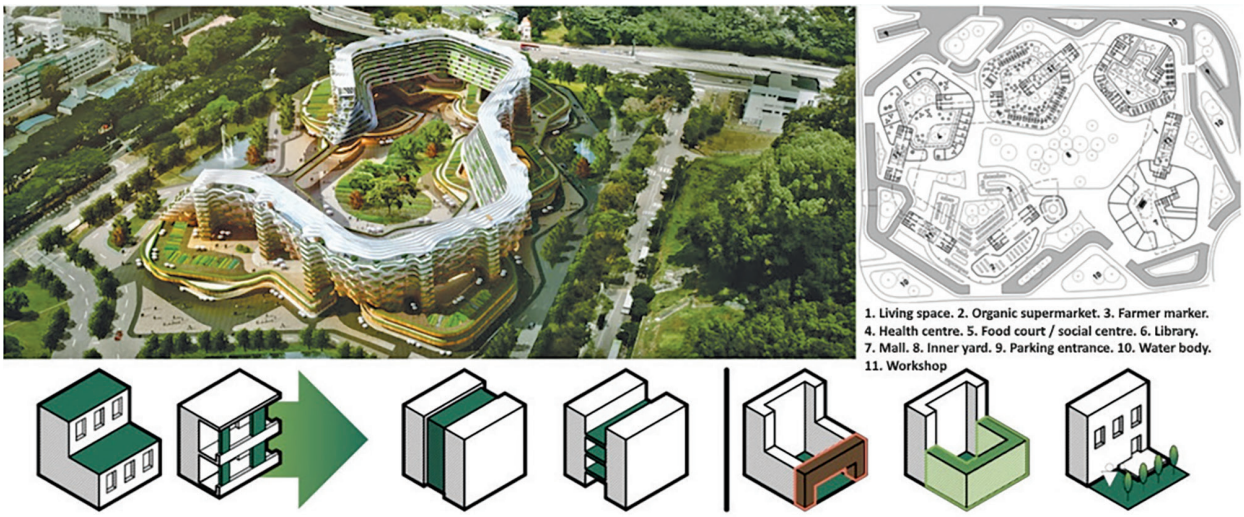

Figure 2. Home Farm by SPARK architects, Singapore
Source: compiled by the authors based on SPARK – HOME FARM (n.d.)

Following the project description, the Home Farm is a private initiative (SPARK – HOME FARM, n.d.). The agricultural element is diverse in terms of technology: hydroponics, linear beds, and planar beds, located on the structure of the building on vertical and horizontal planes. The total area for growing is 14,800 m^2, an estimated 34.9 tonnes of food per month. Based on the building and its functional content, namely the location of several local retailers and an economic zone with unloading functions, it is possible to conclude that the complex is designed for local production and the prospect of providing food for the surrounding areas. Farm upkeep implies complex physical processes over technology, therefore implementing physical recreation, which, according to T.L. Scott *et al*. (2020), improves well-being, especially among the elderly. C.P. Wen *et al*. (2011) have studied the relationship with increased life expectancy. This concept has many benefits, including cost-effectiveness, food security, social interaction, health, sustainability, environmental shaping, and healthcare delivery.

The Whole Foods store (Fig. 3) in Gowanus, Brooklyn, opened in 2013, is unique in that it features an 1,860 m^2 hydroponic indoor farm on the roof, the first commercial-scale greenhouse attached to a supermarket. The retailer serves as a sales outlet for the farm on top. The hydroponics technology and automation of processes enable growth of organic products all year round and for further sale in all nine Whole Foods stores in New York. Moreover, the location in the city addresses the food mileage and shelf-life concerns. Accordingly, from the standpoint of an urban customer, significant improvement of shelf-life is a substantial contribution to quality of life. This generally affects the competitiveness of the business (Gotham Greens, n.d.).

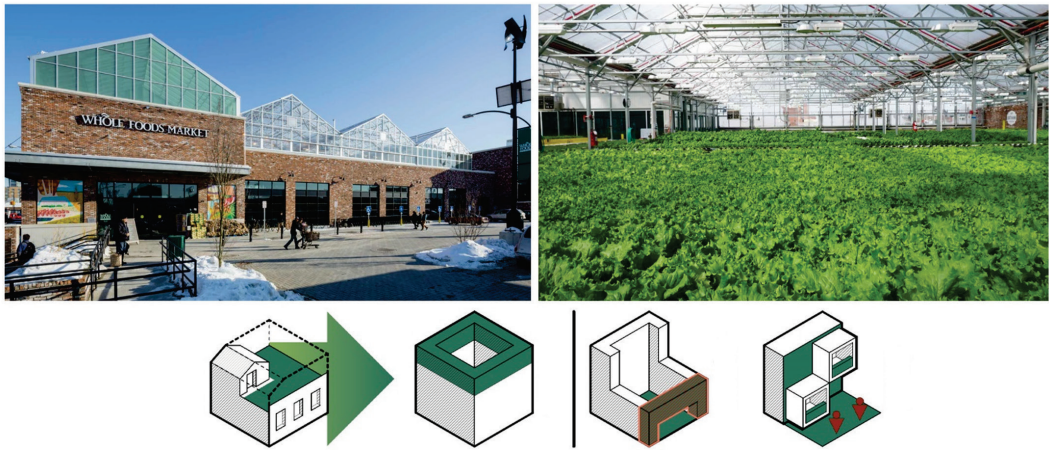

Figure 3. Gotham Greens, on the roof of a Whole Foods store in New York, USA
Source: compiled by the authors based on Whole Foods goes ultra-local with Gotham Greens greenhouse in Brooklyn (2013)

According to the description of the facility, Gotham Greens is an urban commercial project, designed for local production for the affiliated retailer, as well as for export throughout the internal network, which as of 2013 includes six commercial roof farms and more branded retailers, therefore it can be defined as an element of citywide commercial production (Whole Foods..., 2013). From the standpoint of consumers, the facility is a decorative building, prominent for greenery in urban environment.

The Avling Kitchen and Brewery, in addition to the typical elements of such a building, also has a 400 m^2 roof garden. The garden provides ingredients for business in-house use. The company aims to create a sustainable and organic farm with a wide variety of local plants such as herbs, vegetables, cereals, and hops. Flowers are also grown in the garden, which are an important element for a sustainable ecosystem. The type of crop is also selected to ensure the longest possible harvest period throughout the year (Fig. 4).

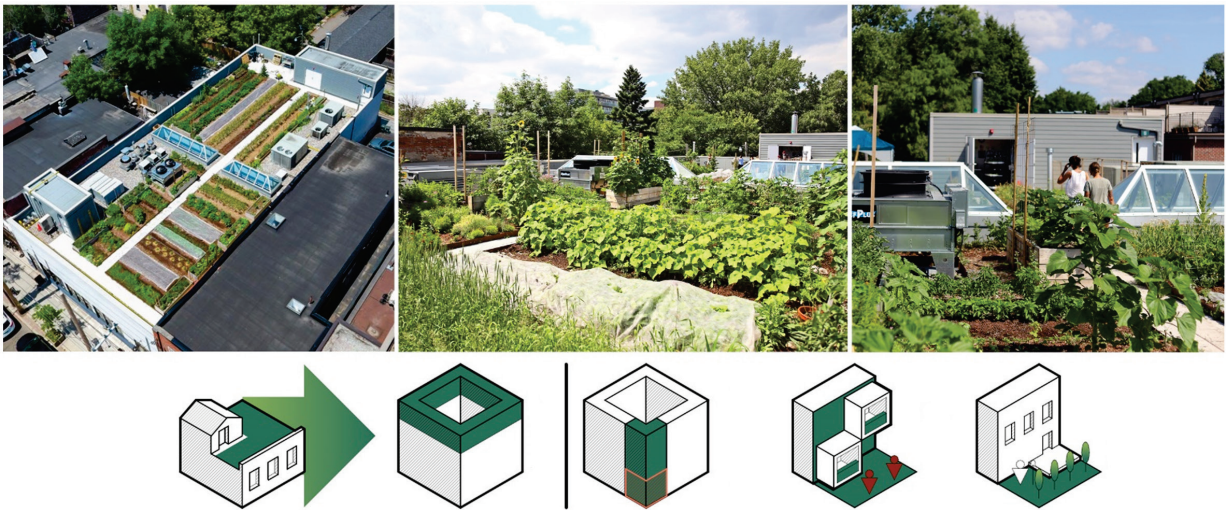

Figure 4. Avling Kitchen and Brewery, Toronto, Canada
Source: compiled by the authors based on Avling Kitchen and Brewery, Toronto (n.d.)

The description of the project annotation to the implementation technology demonstrates that the roof farm is a local autonomous source of food for the establishment. Accordingly, it can be defined as commercial local production. The system is semi-automatic, based on earth masses. Flowers and frequent roof tours for visitors provide visual and applied recreation.

All 63 objects from different periods were studied using the same algorithm of actions, according to the size and purpose of the main building and the use of AE in its structure, using this algorithm of actions with the specified methods. The results of the objects belonging to the classifier are recorded in a matrix Table 1, subsequently used to draw conclusions. During the study of individual objects, their features were grouped by similarities and common features, and these results were formalised. Due to the number of objects under consideration and the width of their sample, this process was carried out in several stages. This was used to derive subclasses based on the created intermediate groups additionally. The article presents the second matrix dedicated to this study, which includes intermediate groups.

Table 1. Matrix of the objects under study with an analysis of the agrarian element and its features

No.	Period	Object, location	Purpose/function of the building				AE function (greening)								Technology		Placement in the structure		
							Commercial		Social			Recreational							
			Housing	Commerce	Production	Public	for sale	For community	For personal use	Socialisation	Rehabilitation	Visual	Individual	Applied	Ground	No-ground	Plots	Building	Floor
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	17th–20th centuries	Villa Gamberaia Florence, Italy																	
2		Villa Belrespiro Sanremo, Italy																	
3		Villa Borghese Rome, Italy																	
4		Villa d'Este Tivoli, Italy																	

Table 1. Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5	17th–20th centuries	Château de Villandry Villandry, France																	
6		Walmer Castle Welmer, UK																	
7		Château de Chenonceau Endre and Loire, France																	
8	20th century	"Schreber Gardens" Leipzig Germany																	
9		Community garden "Quinta da Granja" Lisbon, Portugal																	
10		Peach orchards Gobétue в Montreuil, Paris, France																	
11		London's Victory Gardens London, UK																	
12		The Hill (Inverforth House) London, UK																	
13		Barbican Estate London, UK																	
14		St Catherine's College Oxford, UK																	
15		Rooftop farm (social programme of 1970) Chicago, USA																	
16	21st century	Residential building "79&PARK" Stockholm, Sweden																	
17		Court-housing Cortinghborg Groningen, the Netherlands																	
18		"Edison lite apartment" Paris, France																	
19		"SPARK residental living" Singapore																	
20		"Gotham Greens" at Whole foods store New York, USA																	
21		"Lufa farms" in Quebec, Canada																	
22		Gemeinschaftsgarten Madame Dora Aspern, Vienna, Austria																	
23		"Wood Housing" Seestadt Aspern, Vienna, Austria																	
24		"Parkviertel Giesing" Munich, Germany																	
25		"La Tour Vivante" Paris, France																	
26		"One Central Park" Sydney, Australia																	
27		"Vertical forest" Porta Nova, Milan, Italy																	
28		"ARBORICOLE" Paris, France																	
29		"Living garden" Vienna, Austria																	
30		"Clock House Gardens" Welwyn, UK																	
31		"Origami Housing" Portland, USA																	
32		Rb on Ruben Dario 225 New Mexico, Mexico																	
33		Rb "Sky Villas" Hyderabad, India																	
34		Fira Hotel Barcelona, Spain																	

Table 1. Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
35	21st century	Rb "Wooden Mixed-Use Tower" Bordeaux, France	■		■			■				■			■	■		■	■
36		"Admiralty Kampung" Singapore	■			■		■		■	■	■		■	■		■	■	
37		Acros Fukoka Concert Hall, Fukuoka, Japan				■						■			■	■		■	■
38		Residential building "SkyTerrace" Singapore	■			■				■		■			■	■			■
39		Residential building "SkyVille" Singapore	■									■				■			■
40		Rb "Puukuokka housing block" Jyväskylä, Finland	■									■	■	■	■		■		
41		Rooftop Farm in Zuidpark Amsterdam Netherlands		■		■		■	■	■				■	■	■		■	
42		"Le cordon bleu" Paris, France	■			■	■		■	■		■		■	■	■		■	
43		La Serre (Porte de Versailles) Paris, France				■		■		■		■				■		■	
44		Zinfandel / Field Architecture St Helena USA	■						■			■	■	■			■		
45		Avling Kitchen and Brewery Toronto, Canada				■	■		■	■				■	■	■		■	
46		"Uncommon Ground" estaurant, Chicago, USA		■	■	■	■		■	■	■	■		■		■		■	
47		"One canal apartments" Boston, USA	■									■			■			■	
48		"Harvard square roof deck" Cambridge, USA	■										■		■			■	
49		"Fenway farms" Boston, USA			■		■			■		■		■		■		■	
50		"Whole foods" Linfield, USA			■		■			■		■		■	■	■		■	
51		"Carport roof garden" Brooklyn, USA	■									■	■		■			■	
52		"Boston medical centre" Boston, USA	■			■		■	■	■	■				■	■		■	
53		"Ester restaurant" Dorchester, USA		■	■	■			■							■		■	
54		"Sally's rooftop farm" St. Louis, USA		■	■		■									■		■	
55		"Higher ground farm" Boston, USA			■	■				■		■			■			■	
56		The Inside Home Ammameh, Iran	■					■				■	■	■	■		■	■	
57		Iron Creek Bay Farm Stay Sorel, Australia	■		■					■	■	■		■	■		■		
58		Ushimaru Restaurant Sammu, Japan				■			■			■			■		■		■
59		Molí House Balearic Islands, Spain	■									■	■		■		■		
60		Paul and Monique House Gnet, Belgium	■										■		■		■		■
61		The Corner Building Hegedal, Norway	■						■				■	■	■		■		
62		"Green Seedling" в Tianfu Agricultural Chengdu, China	■	■	■		■					■		■	■	■	■		
63		The Urban Farming Office Ho Chi Minh City, Vietnam		■								■				■	■	■	■

Source: compiled by the authors based on Google Docs (n.d.)

The matrix demonstrates the varieties of the agricultural elements in the structure of the house, meeting the purpose of the study. Accordingly, the classification proposed by the study, based on the newly created matrix, contains three main classifiers, namely, by purpose, by usage model, and by location. The technological characteristic was rejected due to higher relevance to the commercial and industrial sectors. Nine subclasses, three for each of the classifiers, were also created.

Based on the main function (alternative to classic agriculture; creation of new objects of interest for business within the city; influence on the aesthetic of the architectural image and the formation of an attractive environment; creation of new common public spaces capable of contributing to the socialisation of the population, or raising children, or positively influencing the social – unprotected stratum of the population) the agricultural element by purpose can be classified as (Fig. 5):

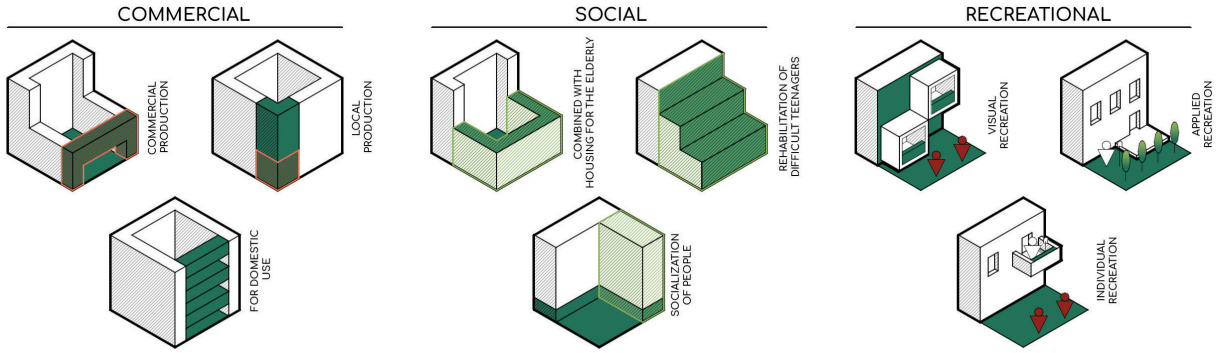

Figure 5. Classification of AE in the structure of the building by purpose
Source: compiled by the authors

1.1. A commercial agricultural element, the main purpose of which is to create alternative sources of food in the city, providing food products to a certain segment of the population. Subclasses:

1.1.1. Commercial production, assumed to be a full-fledged agriculture located in an urban situation. As part of the building and with auxiliary functions, both the production and the product sales centre work.

1.1.2. Local production, represented as the cultivation of a certain type of product with its future sale.

1.1.3. Personal use – a personal or joint place for running one's farm in the structure of an individual, common house or urban space, where the consumer himself decides how to use this plot and what to grow on it.

1.2. The social element, aiming to create a space for passive and/or active socialisation of the population, in particular vulnerable groups, to create open spaces in the city for hobbies with constant interaction with other people. Subclasses:

1.2.1. Socialisation of children from boarding school and child-rearing is an intermediate stage of integration into the social environment, demonstrating simplest social processes on practical examples.

1.2.2. Rehabilitation of troubled teenagers – an opportunity to engage children and teenagers in physical activities, protecting from the negative effects of the environment, providing monetary rewards as additional motivation.

1.2.3. Socialisation for lonely elderly people – creating an environment that helps overcome obsessive thoughts and feelings of loneliness and provides care for the elderly.

1.3. Recreational element. With a high density of buildings in the urban environment, the green areas of landscaping aim to diversify the architectural and urban planning features of the object, as well as to compensate for the insufficient amount of green areas in the conditions of urban development. The subclasses include:

1.3.1. Visual – a distant aesthetic element of architecture for the enrichment of the visual image and biodiversity of the environment.

1.3.2. Applied – an aesthetic element of architecture with the possibility of direct contact with landscaping.

1.3.3. Individual – in the form of a terrace or a special summer room, as its green cell.

Depending on the capabilities of the city and the resources of the integrated agricultural complex, its functions are adapted and developed according to the needs. This complex can be semi-open, serving a large city region from a commercial point of view, adapt to various social processes, or even have a more psychological nature of recreation for the building's residents. Accordingly, the agrarian element can be divided into (Fig. 6):

2.1. City-wide vertical farms – farms of an industrial type in the structure of buildings, in commerce residential buildings, the capacities of which provide cultivation of food products with a reserve and provide long supply chains.

2.2. Farms of district use (or local) – farms of medium and small industrial capacity, capable of providing products to the surrounding buildings, according to the type of farmers' markets. Agriculture is directly connected to the place of sale, which ensures better turnover.

2.3. Farms for domestic use – small personal or public farms located on free spaces of buildings used as recreation for residents.

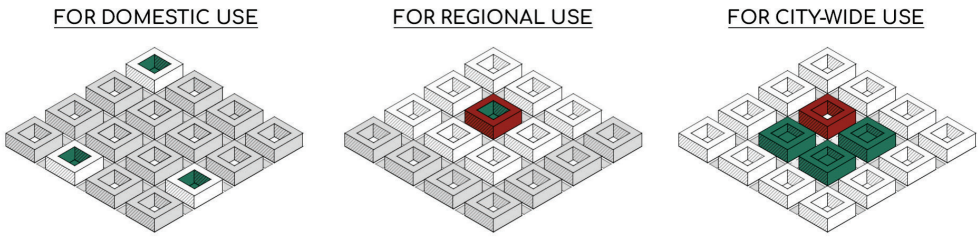

Figure 6. Classification of AEs in the building structure according to the use model
Source: compiled by the authors

A key aspect in planning and architecture is the location of AE in the structure of the building, as it significantly affects the aesthetics of the building and interaction with residents, neighbours, and passers-by through green decoration. This determines how the building interacts with the environment, the development of social processes, the form of recreation, and opportunities for psychological relaxation of the residents. Accordingly, the agricultural elements can be divided by location into (Fig. 7):

3.1. In the structure of the yard – agricultural element is located outside the building itself but integrated into its space.

3.2. In the structure of the house – agricultural element is integrated into the general structure of the building and is a massive part of it.

3.3. In the structure of a floor (apartment) – agricultural element is integrated into the floor structure of the building and exists only within its boundaries.

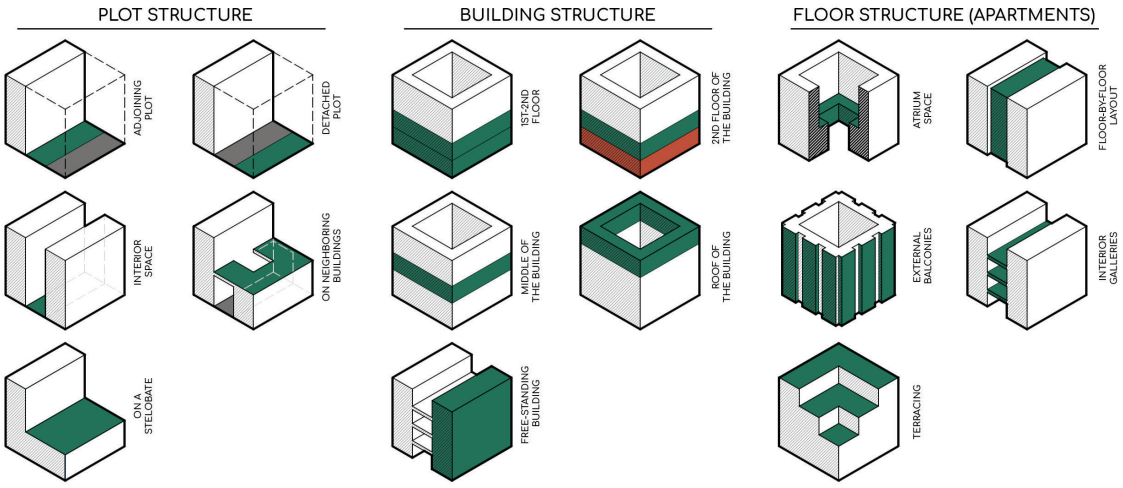

Figure 7. Classification of AE in the structure of the building by location at different levels
Source: compiled by the authors

In general, the feasibility of urban agriculture was described by L.J.A. Mougeot (2005), providing the basis for many researchers in the field of urban agriculture, such as K. Srinivasan & V.K. Yadav (2024). Although current research addresses the technological support of urban agricultural production, the results confirm the statements described in 2005. A. Addas (2024) explored how the introduction of large amounts of urban green space benefits the social fabric of cities. S. Basso *et al*. (2023) examined the convergence of nature and architecture, analysing the phenomenon of vertical trusses as an architectural manifestation of certain modern trends. Specifically, high-rise buildings are functional for agriculture, while demonstrating sustainability features such as reducing supply chains and land consumption. The author conducted a critical analysis of the potential impact of vertical farms on urbanism based on the concept of the right to food.

Analysis of existing experience can be used to compile the possibilities of integration in the structure of buildings of various types. These results correlate with the research conducted by N. Avdieieva & Yu. Zakharov (2021), which addressed the current state of the art of classifying "green structures" in the architectural design and construction of various types of buildings and structures. In addition to the economic characteristics considered in urban agriculture, the differences in classification are in the features of the research objects. AE requires close human contact with the plant to ensure the possibility of farming, which renders variety of AE arrangements in any remote elements of the building impossible, in contrast with the landscaping considered by N. Avdieieva & Yu. Zakharov.

S. Buravchenko *et al*. (2021) investigated ways to solve the problem of a significant reduction in greening in housing construction. The features and types of landscaping on

residential buildings and built-in structures for growing plants are considered. The author examined global trends and features of designing ecological neighbourhoods and residential buildings integrated with greenery. N. Miroshnyk (2023) studied the relationship between urbanisation and ecosystem services of green spaces in the example of the Kyiv urban ecosystem. The author noted that improving the quality of ecosystem services of green infrastructure can be achieved by reducing artificial surfaces, increasing the area of forests and parks within the city is possible through new technologies of vertical gardening, green roofs, rooftop parks, economic incentives for the preservation of large-scale multi-tiered plantations.

Thus, the analysis of integration of agricultural elements (AEs) into urban residential structures created a classification by purpose, usage model, and location. The multifaceted roles of AEs, such as improving food security, fostering social interaction, promoting psychological well-being, and contributing to sustainable urban design were emphasised. The findings demonstrate that well-designed AEs not only address ecological and social needs but also create innovative opportunities for urban communities.

CONCLUSIONS

Based on the existing world examples of the introduction of agrarian elements into the building and the characteristics of the phenomenon of the agrarian element studied in interdisciplinary scientific works, the study highlighted three main classifications in the structure of multi-story housing: 1) by appointment (commercial (full-fledged, local, for personal use); social (socialisation of children, elderly people, teenagers); recreational (visual, applied, individual)); 2) according to the usage model (municipal farms; farms for regional use; for indoor use); by location (in the structure of the yard; in the structure of the house; in the structure of the floor).

The advantages of the agrarian element are an alternative to classical agriculture, the creation of new objects of interest for business within the city, the impact on the aesthetics of the architectural image and the formation of an attractive environment, and the creation of new common public spaces capable of contributing to the socialisation of the population, or raising children, or positively influencing the socially aggressive segment of the population. Depending on the capabilities of the city and the capacities of the integrated agricultural element, it develops following the needs of users: it works semi-openly, serving a large region of the city from a commercial point of view, or it adapts to various social processes (socialisation and rehabilitation), or it aims at a more psychological nature of recreation for internal use by residents of the building.

The location of the agricultural element is the main architectural and planning characteristic of the AE because it primarily affects the aesthetic values of the building and the ability of residents, neighbours, and passers-by to interact with the landscaping. This changes the interaction of the building with the AE and the surrounding environment, the course of possible social processes, the type of visual or applied recreation, and opportunities for psychological relief of residents. Considering the research results and conclusions, the necessary direction of further research in this area should be the development of specific variations of the integration of agricultural elements into the structure, determination of the most suitable types of AE to be introduced into the existing typology of residential buildings, depending on economic, ecological and social aspects.

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Класифікація аграрного елемента в структурі будівлі

Анотація. Дослідження було присвячене проблемі використання елементів агровиробництва та прикладного озеленення в структурі будівлі, оскільки сучасні науково-практичні роботи в галузі архітектури або відсутні, або лише дотичні до теми дослідження. Метою даного дослідження було здійснити класифікацію аграрного елемента в структурі споруди для створення бази подальших досліджень в даній тематиці, а також визначити основні характеристики аграрних елементів та встановити їх взаємодії з будівлями. У досліджені використовувалися такі методи, як аналіз літературних та наукових джерел, логічний та декомпозиційний методи, порівняльний аналіз, графоаналітичний метод, формалізація, узагальнення та абстрагування, індукція. В результаті вивчення міждисциплінарних досліджень було виділено три основних можливих способів розрізнення аграрних елементів і/або прикладного озеленення. Це є: «за призначенням», «за моделлю використання», «за розташуванням». Згідно цих характеристик було проведено класифікацію досліджених споруд. Перший клас «за призначенням» позначає основну функцію аграрного елементу в структурі споруди і містить підтипи: комерційний, соціальний та рекреаційний елементи. Другий – «за моделлю використання» – відображає можливості аграрного елемента забезпечувати певну кількість населення своїми зазначеними функціями: для комерції – це потужність виробництва продовольства, для рекреації – її візуальна доступність та кількість людей, що може вона обслужити, у випадку прикладного типу відпочинку. Містить підкласи: загальноміські, районного використання та внутрішньо-будинкові. Третій – «за розташуванням» – вказує на місцезнаходження елементів агровиробництва або озеленення в структурі споруди і містить підкласи «в структурі ділянки» «в структурі будинку» та «в структурі квартири (поверху)». Практична цінність даного дослідження полягає в тому, що отримані результати доповнюють понятійно-термінологічний апарат, та можуть бути використані для створення рекомендацій та методичних вказівок щодо проектування аграрних елементів в споруді

Ключові слова: житло; квартира; планування; озеленення; аграрне виробництво