ZESZYTY NAUKOWE POLITECHNIKI POZNAŃSKIEJ
Nr 24 Architektura, Urbanistyka, Architektura Wnętrz 2025
DOI: 10.21008/j.2658-2619.2025.24.7

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TOWARDS A RESILIENT LOCAL FOOD SYSTEM IN OMAN

The sultanate of Oman has experienced 40 years of economy, population, and development booms. Alongside, the country has enjoyed the benefits reaped from globalisation, as it imported a majority of goods, including its food and feed, from international markets. The COVID-19 pandemic highlighted how this exchange – once considered a lavish commodity – has become a dependency for the country, and has hindered the possibility of local produce substitutions to materialise. Thus, calls for change amongst academics and practitioners have emerged, questioning the possibility of creating and honing local food systems, towards resiliencies especially in times of crises. This study adds to this discussion, by interviewing actors in the agriculture industry and trying to understand perceptions towards the challenges and possibilities of local food markets. It uses storytelling as a component to convey ideologies existent in planners, governmental officials, and farmers of the region. In particular, it questions the possibility of mixing the urban development experienced in the capital area of Muscat, with concepts of urban and peri-urban farming. We find that while the concept of farming close to urban areas is still an insecure thought within the agricultural actors, there is already a deep sense of understanding for the need to strengthen local markets. Urban farming, in the case of Muscat, is still looked upon as an experimental project.

Keywords: Urban Farming, Climate Change, Covid-19, Local Food Production, New Food Systems, Urban Innovation, Healthy Cities

1. INTRODUCTION – FOOD SECURITY AND RESILIENCE: A LOCAL RESPONSE FOR A GLOBAL CHALLENGE

As the Food and Agriculture Organization of the United Nations states, climate change poses challenges to food security and the resilience of the global food system. In 2019, 690 million people worldwide went hungry due to the fragility of food provision. On the other hand, food production is responsible for one-quarter of the world's greenhouse gas emissions [FAO 2019]. Thus, increasing food security and

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mitigating climate change are reciprocal. FAO defines resilience as: "The ability to prevent disasters and crises as well as to anticipate, absorb, accommodate or recover from them in a timely, efficient and sustainable manner. This includes protecting, restoring and improving livelihood systems in the face of threats that impact agriculture, nutrition, food security and food safety." [FAO n.d.].

The Covid-19 outbreak in 2020 has exposed the vulnerability of our food systems affecting different sectors and obstructing the supply of agricultural products. It has highlighted problems associated with the heavy reliance on imported food, where long distances between production and consumption areas increase the dependency on transportation and the likelihood to be disrupted by governmental restrictions such as border closures. It proved that long chains might result in massive wastages and lead to a shortage of products for end consumers [Altieri, Nicholls 2020; Lai et al. 2020; van der Ploeg 2020]. Additionally, industrial farms that rely primarily upon immigrant workforces have been more affected by border closures and illnesses (since seasonal workers live together in dormitories). The post-Covid-19 era will be characterized by efforts to establish more resilient food systems providing food security. Consequently, as Altieri & Nicholls stress [2020] we will experience a new push for small-scale farming and locally produced food by urban farms. In the case of the Gulf region, Woertz [2020] stresses that the modern value chain helped GCC countries to overcome shortage, however climate change associated scarcity of groundwater and high dependency on imports are still challenges. The regional political crisis leading to the blockage of Qatar imposed by Saudi Arabia, UAE and Egypt thus exposed the vulnerability of food security policies in the region [Almohamadi n.d.].

Therefore, this paper explores the potential and challenges of establishing a resilient local food system in Oman. It identified in the scholarly literature three main global themes (new food systems, food innovation, food governance and policies) determinants of local food systems and food security. Finally, it investigates the perception of local farmers and authorities to these themes to gain context through their perspectives.

New Food Systems

A resilient Local Food System means more than ensuring access to food to all individuals. It involves multiple aspects ranging from food security, local economy, climate change, and the scarcity of resources [Benke, Tomkins 2017; Ernwein 2014; Feenstra 1997]. Therefore, the agriculture industry must be redesigned to become less dependent on external commodities and more reliant on local food production [Montenegro De Wit 2021; Montenegro de Wit et al. 2021].

Alluding to Pulighe & Lupia [2020] local food systems, especially Urban agriculture, fosters inclusiveness. The allocation of public urban land for agriculture provides "landless" citizens with a frame to grow their food and participate in the food system. Urban farms and community gardens have the potential to become a platform for the dialogue on environmental justice and to create a link between sustainable

agriculture, small farms, and anti-hunger advocates [Gottlieb, Fisher 1996]. However, the contribution of alternative agrifood initiatives to social inclusiveness cannot be taken for granted. Urban Commercial Farms fail to link to community needs and thus create civic engagement, while in Urban Community Farms the decentralization process perpetrated by local food systems depends significantly on the connection between producers and consumers of food [Gliessman 2016; Workie et al. 2020]. Accordingly, direct agricultural markets are the centrepiece of local food systems [Feenstra 1997; Hinrichs 2000, 2003; Poulsen et al. 2017]. They offer an opportunity for farmers to sell products directly to customers leading to a better understanding of their needs [Tsyplakova et al. 2020]. This closer collaboration helps to shift consumers' food preferences from industrially produced "processed foods" to locally produced "fresh food" [Lai et al. 2020]. This leads to the diversification of crops and more culturally appropriate diets [Gliessman 2020], and ensures the supply of fresh food [Altieri, Nicholls 2020].

Ultimately, new food systems help to reduce the use and consumption of expensive, scarce, or ecologically damaging inputs [Gliessman 2016] impacting not only agricultural practices but also social systems and economic development [Feagan 2008; Gatrell et al. 2011].

Food Innovation

Local food production is a driver to overcome the urban-rural dichotomy and natural catalysator of urban innovation.

Hinrichs [2000] suggests that sustainable agriculture involves innovation, development, and diffusion of more environmentally sensitive production practices. On a global scale, the agriculture sector, from production to distribution, has traditionally benefited from the advancements in technology and innovative processes [Naidu et al. 2020]. Connecting food production and cities has an innovative potential for urban agriculture techniques [Armanda et al. 2019; Moragues-Faus, Sonnino 2019] with social and economic opportunities for city inhabitants participating in an ecologic food planning movement [Morgan 2009; Tsyplakova et al. 2020].

Besides the innovations in agriculture techniques, Kumar and Abdin [2021] found that an emergent transition to online services started taking immediate attention during the pandemics. It emphasized the importance of innovation in communication and networking [Farhangi et al. 2020]. Additionally, technological advances are required to improve the access to information about weather, resources, markets (physical and online), and price for farmers, processors, food manufacturers, and traders to allow for more effective business decisions [Fan et al. 2021].

Kasper et al. [2017] have also discussed the importance of the interlink between different actors such as Community representatives, waste collection companies, agricultural wetland cooperatives, inhabitants, and NGOs as crucial in improving agriculture production.

Currently, agroecology is experiencing an increase in acceptance [Montenegro De Wit 2021]. Many innovative initiatives have already started supporting this system, for example, the Digital Urban Agriculture (DUA). DUA involves different actors, contributing to economic diversification while encouraging collaboration between different types of farmers [Carolan 2020].

Food Governance and Policies

When the food system is embedded in the city's spatial strategy it can contribute to achieving sustainable goals [Kasper et al. 2017]. As urban agriculture produces food closer to where it is consumed, it provides cities with the opportunity to reclaim their food systems and promote social connectedness, in addition to helping fight climate change by reducing emissions associated with long transportation distances between production and consumption areas, lowering pressure to expand urban footprint, and employing alternative methods to save water and other resources [Loker, Francis 2020; Thomaier et al. 2015].

However, the success of such endeavors is conditioned by coordinated investments in research to advance techniques to increase productivity and reduce the environmental impacts and policies to provide the necessary infrastructure for agricultural practitioners and farmers. Governments need to promote decentralized food systems based on contextualized solutions, to establish a self-reliant economy [Gliessman 2020; Pulighe, Lupia 2020; Workie et al. 2020]. Zerbian and de Luis Romero (2021) observed urban food governance during global crises, concluding that there is a need for more local and inclusive policies. Additionally, Moragues-Faus [2020] points to the possibilities and benefits of rescaling food governance to a more local level allied to strategies to stimulate participation and representation of individuals, businesses, and institutions [Manganelli et al. 2020; White, Bunn 2017].

Local markets, on the other hand, should be incentivized to shift their focus from imported industrial chains [Fan et al. 2021] to locally produced, healthier food, generated in a sustainable agriculture system [Loker, Francis 2020]. The government needs to allocate public funds for local farmers and small businesses to help them improve their supply chains, increasing their competitiveness against imported food [Workie et al. 2020]. More recently, planners have begun to pay increased attention to urban agriculture as supportive of the main goals of food security policies, and food landscapes in the urban regions [Horst et al. 2017; McClintock et al. 2021; Morgan 2009].

2. BACKGROUND

Following rapid urbanization after an economic boom caused by oil and gas exports in the 1970s, the country's agriculture practices have been greatly affected. While they were once dominant in the mountain ranges and plateau of Northern

Oman, satellite image analysis and ground-truthing have shown a spillage in the urban areas. In Al Batinah, traditionally the largest agricultural area in the country, the size of the cultivated area has been shrinking since 1997 – about 12% in total [Kotagama 2014]. Buerkert et al. [2021] studies revealed an increase in urban areas from 206 ha in 2009 to 230 ha in 2014 and 252 ha in 2018. The analysis also goes on to describe the poorly understood social-ecology as a result of this rapid urbanization. It led to infrastructural developments that provoked – even in the rural villages where dwellers were formerly primarily dedicated to agricultural activities – a major shift to employment in the secondary and tertiary sectors. A culture of "conveniently accessible home gardens"' has replaced the remote terrace gardens of the old oasis systems, bringing agricultural lands closer to urban areas with limited access to groundwater. Consequently, agricultural systems have seen a decrease in the local production of water-demanding crops, and an increased reliance on food and feed from international markets [Buerkert et al. 2021].

The shift of agricultural practices is not confined to Oman's mountainous oases, as the same has occurred in farmlands of low-lying areas distributed along the coastal area such as Muscat and the Batinah regions, especially due to the land use change and the salinization of the soil making it improper for cultivation. This phenomenon inevitably impacts the food system of the nation. Today, Oman's agriculture industry suffers from labor and water scarcity, loss of traditional knowledge and community structures, climate change, and declining species diversity [Oxford Business Group n.d.]. Despite several recent initiatives to boost dairy, red meat, and poultry production, segments with a more sustainable approach such as organic farming remain in need of contextualized regulations [Sultan Qaboos University 2022].

The ongoing urban sprawl, particularly in the Muscat capital, is consistently engulfing new lands and placing farms at risk of being converted to housing plots. This rapid urbanization could be viewed as a factor of development and presents positive impacts to the city morphologically, socio-spatially, socio-economically, culturally and through knowledge innovation; However, this also leads to the expropriation of agricultural lands.

Furthermore, not all landowners and farmers have the means to undergo legal processes to acquire a title – thus accelerating loss of agricultural land and raising concerns for the provision of food to indigent citizens and peri-urban farmers' livelihoods [Coulibaly, Li 2020]. There is a need to implement governmental policies and land registration systems to help in the demarcation of different spaces, mainly areas reserved for agriculture, thus preventing excessive soil erosion, reduced biodiversity, and loss of habitat.

Currently, a few governmental policies are in place for the protection of agricultural farmlands and food security systems. Alongside, the Ministry of Agriculture has created several initiatives to support the inclusion of innovative farming techniques. Nevertheless, limited awareness among local farmers precludes them to reap the benefits of these provisions.

Oman's diversity and agro-climatic conditions provide the potential for agriculture to come back as one of the primary industries in Oman. Additionally, a combination of food security concerns and a focus on economic diversification has made agriculture an area of increased government awareness and investments [Oxford Business Group 2019].

While oasis settlements remain an integral source of the nation's food systems, the need for alternative solutions to reinforce agriculture as one of the primary industries of the nation is becoming increasingly evident, especially in relation to the pandemic.

A discussion among academics from the Sultan Qaboos University on the "Impact of Covid-9 on development in Oman" [Sultan Qaboos University 2022] shows that despite a growth of 9.8% in the agriculture and fisheries sector over the year 2019-2020, the pandemic has emphasized the need for a more holistic approach to the agroindustry. Dr. Muhammed Othman (Center for Environmental Studies and Research, SQU) commented on the impact of the pandemic on crop production systems, supply chains, and food security. One of the key challenges in Oman, is the high dependence on seasonal foreign workforce in the agricultural sector that due to movement restrictions and social distancing rules during the pandemic caused shortages in the cultivation and harvest periods. Further, the difficulties in importing/exporting agricultural products have affected the entire food supply chain, including producers, manufacturers, and transport companies. He further underlined the mass destruction of agricultural and dairy products due to the inability of farmers or traders to transport them from points of production to manufacturing centers. Further discussions acknowledged the renewed importance of expanding strategic sectors, such as food, basic services, and information and technology to overcome long-term turmoil as demonstrated by the pandemic. Changes in the labor market could be an opportunity to reduce formerly existing imbalances within it, increasing the participation of the national workforce and improving productivity.

To facilitate shifts to Oman's agriculture scene, local researchers emphasized the importance of the conservation of urban farmlands and native specimens that are adapted to local conditions. The Oman Plant Red Data book compiled by Annette Patzelt [2006] lists a series of threats to vegetation in Oman [Annette Patzelt et al. 2014] that especially home gardens – that are still used mostly for hobby and aesthetical purposes [Al-Mayahi et al. 2019] – could substantially contribute to preserve.

Kotogama et al. (2017) stresses that only a combination of price management for the water supply and the treatment of grey water can have a substantial impact over the growing demand for water in Oman. Currently, the government is supporting the use of desalinated seawater and treated wastewater, which currently accounts for 5% and 1% of total water consumption, respectively. An initiative to increase the use of treated wastewater in agriculture is being piloted by a private firm Haya Water by building pipelines connecting a sewage treatment plant to the farmlands in the coastal city of Barka [Oxford Business Group n.d.]. Increased use of treated

wastewater for irrigation within the city of Muscat could be a means of bringing agricultural lands closer to urban lands, where 85% of the country's population currently resides. This, in turn, could pave the way towards introducing urban farming in the cities of Oman. However, there exists little to no research about the possibility to integrate urban farming into the country's cityscape and its food system.

Urban farming proposes mutually beneficial coexistence between the rapidly growing urban areas and their equally significant agrarian counterparts. The introduction of urban farms would mean that agricultural systems could be weaved into the ever-stretching urban fabric of the city of Muscat, thus bridging gaps in food security systems while addressing several other factors such as job creation, building community resilience to global pandemics, creation of active urban spaces indulging the participation of its residents, etc. In the period of 2004-2013 Only in the Al Batinah Area farmed land area has declined by about 5%. In a country where only about 7.18% of the soil is suitable for agriculture [Kotagama 2014], all alternatives to preserve and enhance food production are worth investigating. In this study, we employed the term Urban farming in a broader sense entailing any agricultural production taking place within the limits of urban and peri-urban areas in Oman (including commercial farms and community gardens).

With all these particularities, the case of Oman's Food System and its response to the crisis provoked by the COVID 19 pandemic offers an opportunity to reflect on the role of alternative agricultural systems. The local food systems discourse including urban farms is structure in a twofold concept. Its first argument is built upon the environmental aspect: contributions to curb and adapt to climate change through reduction of emissions, compact growth, decarbonization, better resource management, etc. The second bases on the socio-political aspect: food justice, spatial inclusion, sovereignty, local governance etc.

3. MATERIALS AND METHODS

This study is divided into two parts, using two distinct qualitative thematic approaches. The first part was dedicated to localizing central themes of the current scholarly debate on urban farming – including the aftermaths of the covid-19 crisis. The second was focused on understanding and interpreting the perspectives of different stakeholders involved in the process of food production and their impressions on urban farming.

Thematic analysis was chosen as the method for both parts due to its perceived flexibility in new fields of knowledge. The findings were interlinked, and employed for different purposes. For the first phase, we used an approach closer to Boyatzis [1998] where themes generated from the literature review were developed on early stages, rated individually by each author, the results jointly discussed until a final agreement upon themes (higher scores) to include is

reached (cf. appendix 1). The discussion, especially upon the themes with lower agreement between independent scores, helped to reduce individual bias over the choice of the most relevant themes.

The initial themes were rephrased as short statements also known as storylines. Storylines are known as an effective means to conduct inquiries that captures the stance of the interviewee on a specific concept relevant for the field and gives them the chance to further elaborate [Pettersson et al. 2021b]. Our study used storylines to spark discussions instead of questions, as they are considerably less invasive than the latter (cf. appendix 2). These short statements work as an invitation to reflect about the subject in discussion instead of inquiring about the knowledge of the interviewer, something that could hinder the extraction of more in-depth perceptions about a topic that is somewhat absent from the public discussion in the country. Unlike in the US and Europe, urban farms as community projects are not present in the media and have not been discussed widely in the policy making programs in Oman. Agricultural work in general – as the results of this study will show- is stigmatized. Therefore, it was important to understand the perception of planners in a decision-making position that could facilitate or hinder the creation of programs to preserve and create new urban farms. Secondly, we wanted to understand how people involved in the existing food chains would see the main barriers for the establishment of these urban farms.

Accordingly, the initial 56 statements (which here forth we name *stories*) were developed based on the themes extracted from literature review. From the papers pre-selected in the scope analysis, we extracted citations summing up the main finding of the study and reformulated them. We went through several rounds of reading and re-reading until we found initial patterns in the data. Then we started coding and finally we organized the stories that emerged around four central themes: Food security and resilience, New food systems, Innovation and Urban farming, policies and governance. The authors assigned each statement to one of the four themes and additionally rated it individually in terms of its relevance globally and in the context of Oman. That procedure helped familiarize the authors with the subject and define the study framework. This method also helped map existent mental models, as we were able to see interplays and connections within the different topics presented [Pettersson et al. 2021a]. Stories with an average score of 4.0 (5.0 was the maximum score) and below were excluded. Ultimately, 7 stories remained and were compiled by the authors. This approach ensured that the most important and relevant subjects were represented in a condensed way to trigger discussions.

It was important to extract the most relevant concepts to guide the discussion with the stakeholders in the following phase. Once transcripts from stakeholder interviews were collected, Clarke and Braun's [2006, 2021] reflexive thematic analysis was additionally incorporated in coding the findings presented in this paper, explained in the next section.

Qualitative methods within a qualitative approach

In this case coding was fluid, open and guided by the data. The themes have been developed only towards the end of the analysis. In doing so we describe the different relations involved in this essential phenomenon of food production revealed by based on patterns across the data and, when possible, "dig deeper" and start to theorize how people's social constructs interact with the urban farms as closely related with the way food is produced, the way the society and its future are thought upon. It is important to highlight that food plays a central role in rituals and gatherings of the Omani society.

We invited stakeholders of different sectors to participate in interviews. Recruitment was based on the network of the research team since in Oman it is very difficult to gain insight into the internal structure of institutions. We purposefully contacted owners of small and large scale farms from the capital area and the outskirts aiming to access the perspective from the producers on the food system in place. Additionally we invited planners of the Ministry of Agriculture and the Ministry of Housing and Urban Planning (responsible for Oman's National Spatial Strategy) to understand what are the views and values that shape the policy making and land use management that could potentially influence a potential process of creating and integrating urban farms in the food system. Snowballing was employed to guarantee that interviewees expanded the network and brought in additional participants of their own. A total of eleven interviews were held with the. Braun and Clarke [2006] suggest a minimum of six to enable cross case pattern identification.

Tab. 1. Participants of the interviews and their affiliations/functions

#	Sex	Age	Institution	Attributions
P001	m	46	Ministry of Housing	Senior Planner/Spatial Strategy/ Policies Food Security
P002	m	36	Ministry of Housing	Planner/Spatial Strategy/Policy Implementation
A001*	m	34	Ministry of Agriculture	Planner/Livestock Sector
A002	m	46	Ministry of Agriculture	Planner/Livestock Sector
A003	f	38	Ministry of Agriculture	Head Food Security Department
A004	f	40	Ministry of Agriculture	Planner/Agriculture
A005	m	51	Farmers' Association	

#	Sex	Age	Institution	Attributions
A006/ A007*	m/m	49/40	Ministry of Agriculture	Director of Research Department/ Planner
F001	m	55	Large Scale Farm Owner	
F002	m	40	Small Farm Owner	
F003	m	45	Small Farm Owner	

* Face to face interviews; otherwise online.

Some Interviews have been conducted face-to-face (n = 2) while others (n = 9) via virtual meeting software due to restrictions imposed by authorities for gatherings during the Covid 19 pandemics and depending on the individual preference of the interviewees. Except for one interview (see tab. 1) all interviews were held individually. The interview A006/A007 was held in the premises of the Ministry of Agriculture as per request of the participant. In that case, a second interviewee participated unexpectedly. The interviewer agreed to proceed with the new setting since it was a spontaneous request by the interviewee who felt more comfortable as the second person was well informed and helped with some formulations.

Interviews with the farmers were conducted in Arabic, transcribed verbatim and translated by the Arabic-speaking authors, while the planners were interviewed in English. the final transcripts in English were used in the coding sessions.

Interviewees were first introduced to the aims of the study, the research design, methods to protect confidentiality and reminded about the voluntary character of the study. An overview of all statements was presented, and the interviewees were granted enough time to read and decide whether they agreed or not to continue the process. They were explicitly asked about their consent, and all recruited persons (n = 12) agreed to participate.

After the introduction and the consent, the interviewer carefully read the first story. The interviewee would generally agree or disagree with the statement and elaborate on their vision on the specific topic. The Agreement had no analytical purpose. As stressed by Pettersson et al. [2021a] it was a way to help triggering the reflection but instead of using a 5-point Likert scale we left it open and some interviewees agree and disagreed with different parts of the same statement. The interviewer asked additional questions to expand some concepts introduced by the interviewee when applicable. Once one statement was exhausted the interviewer proceeded to the following. Each interview took just over 40 minutes on average to complete apart from the interview with more than one interviewee that was more extended (approx. 120 min).

For the analytical part we followed the six stages of the reflexive thematic analysis [Braun, Clarke 2006] informed by critical realist theory. Analysing the data

occurred in a six phases recursive manner employing an inductive approach. It goes from familiarization with the data while transcribing and reading, and multiple sequences of coding, developing and reviewing themes. Finally, the study concluded with a group discussion with the authoring team [Clarcke, Braun 2021].

4. STORIES OF AGRICULTURAL PERCEPTIONS IN OMAN

Agricultural Renascence a quest to independence

Since Oman's 70's economic boom, key investments include the expansion of international airports and commercial ports throughout the country (e.g. port of Duqm). The economic development was supported by immigrant workforces and attracted international industrial food chains.

The local agricultural sector on the other hand, unlike other sectors, has not benefited so intensively from the economical and societal transformations in the views of some interviewees.

I don't think that incentives were evenly, you know, kind of granted:
I would say the fishery sector was more incentivized than the farm sector.
As they have more ports and more like Muttrah fish market for example.
(P002)

Nevertheless, the awareness from the government on its dependence on imported goods has started even before the pandemic and its aftermath.

...actually, more than 70% of agricultural products are coming from outside.
(P001)

Different strategies to increase food security, especially embedded in the vision for Oman 2040 [Oman 2040, 2004], have been introduced. However, their implementation is not without serious challenges, as commented on by upcoming participant sessions.

Oman can't produce everything

Despite the targets set by the authorities to radically increase local production, some interviewees think that a complete independent food system is not realistic as P001 states:

We cannot – here in Oman – stand alone with agriculture itself...

For various reasons, it is accepted that the agriculture in Oman cannot achieve a larger scale industrial production. Industrial processes, even when questioned on other means of production, are regarded as beyond the internal capacity of production.

...in Oman, the local production is not that sufficient for the food industries. They will have to depend on bringing food and processing it from outside. (A005)

Conversely, some farmers are confident that it is possible to achieve more ambitious goals if investments occur accordingly. In their views, Oman has the necessary conditions to become independent from imports and provide with food security.

Taking this step will help the country to become a massive food producer, which will raise the local economy and we will not need to import food anymore. We have fertile lands, water and technology, we just need support and cooperation from officials. (F002)

All stakeholders seem to acknowledge the importance for Oman to become more self-reliant, to which extent, however, it has varying views.

Vulnerable supply chains

The lack of a robust and flexible infrastructure to collect and distribute the production was also discussed. The pandemic placed a burden on supply chains both internally and internationally.

...the Al Batinah region was closed from Muscat, so the products were stocked, they couldn't be transported from one to another region. This was a problem that I think local farmers are facing during this pandemic situation. (A001)

There is a strongly perceived need to improve the infrastructure and create, as P001 states, "collection centres" for the production. This system should work with different scales of demand and serve the local market first.

They can take, for example, our products and sell it first in Oman, if there is no need... – not only from our Souqs [local markets] – they can sell it even outside the country. (A001)

Dependence on foreign Workforce

The dependence on foreign Workforce is consensually seen as one of the main challenges – not only in the agricultural sector – but in any field involving intensive labor in Oman. Closed borders and migration restrictions has negative effects for labor-output.

...most of the industrial farms here in Oman depend on the foreign labor. This has shown many problems during the pandemic, because of the lockdown the work stopped, and the production stopped or is less production… But some of the businesses started employing more locals and especially women. (A006)

Although the crisis affects all sectors, small-scale producers weren't as heavily constrained by the restrictions, being less dependent on foreign workforce. They can instead adapt and use family/community members as a replacement for the seasonal work. The high degree of dependence on foreign labor precludes policies that invest in the agricultural sector to succeed in creating jobs for Omanis, since the grants are concentrated by a small number of industrial producers who rarely employ locals.

...bigger farms tend to use labour from outside, not from the locals, due to the cheap wages. So, having these commercial farms, we realize they are generating very little jobs in the farms ... the Gulf Countries are still dependent on these cheap labour so actually they don't create jobs as much as they are supposed to. (A005)

Besides the discrepancies of wages between local workforce and foreigners, one of the challenges is to make agriculture jobs more attractive for Omanis given the lower wages and stigma over physical labor.

Now the small community farms started growing and became commercial… but also themselves, they have many problems here in Oman because of the cost of manpower. So their family participates in this, but they are looking for a government job, so depending on that there will be only one person or two, the main things will remain for foreign people to work… (A002)

The strong competition for the market is also associated with the lack of attraction of agricultural jobs since the imported products put pressure on the prices and limit the possibility to increase wages.

...the margin of the profit is not there, that's why so many of these big markets like to get the imported food, as it is supposed to get it from the local

market… Because here to produce fruits and vegetables during the summer, we need to utilize these chilled green houses, which will consume electricity and water, and need special attention. Those products cannot be compared to the products which come from Europe where there are no costs associated with it. And it reaches here cheaper than the cost of the products which are produced locally… (A005)

Modern not "old style"

Agriculture seems to be linked to more traditional activities in the past while the modern urban context is highly valued. That is reflected by the prevailing lifestyle with new, conditioned, comfortable houses, the universal internet coverage and impeccably built highways. In some respects, it also explains the rural-urban migration and the abandoned "old" villages of earthen architecture in the countryside.

The "poor", rural past of Oman, before the 70es, with higher rates of illiteracy might be intrinsically bounded to traditional agricultural praxis as P01 states:

We have to change our mind, change our ways from the old agroecology style to a new one… (P001)

Environment

The prevailing environmental conditions are considered as one of the main barriers to increase local production. The hot climate, scarcity of water and salinity of soils are among the main challenges. They are especially associated with the highly urbanized coastal areas. Despite all traditional systems developed in Oman such as Afalaj (1500 year old traditional water irrigation systems), the planners and farmers suggested that the only feasible solutions are based on modern systems.

...with the scarcity of the water that we are facing and we are seeing here that the hot weather during the summer, we are trying to be adaptive to these conditions and trying to bring new technologies, for example like doing green houses to avoid the summer breeze, going inside the shaded cold and chilled, called [green] houses to grow these fruits and these vegetables. Also moving to a hydroponic system of farming where it can consume much less water than the normal traditional systems… (A005)

The country also relies on technical expertise to expand the agricultural land in strategic areas. Oman is creating a program called the "food baskets" in three different governorates to increase food self-sufficiency (FSS) level from 48% to 70% of internal demands for food production [MoHUP 2020].

The food basket is a huge area of land. [chosen…] depending on the experiments of the soil, of the land and the experiments of the water. (P001)

The proposed areas in Al Sharqiya, Al Dakhlyia, and Dahria are located where land is abundantly available therefore distant from the coast where soil salinization is higher but also from central areas where the consumers are located. That in turn increases the demand for investments to improve transportation – already insufficient to cover the current situation.

...having it far away causes, for example, food to go bad… However, it doesn't have to be physically close to the city because you can provide efficient transport for it. For example, like [...] air-conditioning, maybe trains or freights or supply chain network, I mean that could solve the problem… (P002)

Incentives to Innovation

Governmental incentives are helping farmers to experiment with technology and to adapt to different challenges. Mostly, experimental farms are smaller scale producers located closer to the urban areas or directly on the outskirts of Muscat where investments are needed to bring them to a commercial scale.

Most of the farms which have started with some new techniques are in Barka, because Barka is very near to Muscat. In Muscat, it is not very possible to have it… there are some projects to implement some of these techniques in farms. (A004)

They are supported by different channels to promote the use of new technologies and to train farmers to adapt to new challenges and increase production.

We also sometimes have some type of workshops. I once attended workshops where companies from outside of Oman come to show some types of machines to introduce to the farmers, so they can implement some type of new mechanisms into the production system. So the ministry makes a workshop, where the farmers come there, and they meet with engineers to get to know how to use these machines. So there are events from time to time. (A004)

The Role of planning

A strict land use regulation is protecting farmland to vanish. As they cannot be converted into other sources of income, it works as an additional motivation to boost technological innovation.

...if you have a farm with salty water, you cannot use it for example for building a house. They have to get approval and have a clear reason why they want to change it from agricultural land to building land... therefore they have to change it from one type of farm to another type of farm. (A004)

Moreover, in addition to preserving production capacity, some interviewees entertain the introduction of agriculture in spatial strategies as an innovative way to promote well-being for citizens.

...In the cities like Muscat and Sohar, or big towns you don't find that [agriculture] is within the planning ... you don't find these areas for such activities. I think it just needs a bit of planning into these cities, to make them a bit greener than what they are now. (A005)

Negotiating the new food systems in Oman

The stakeholder engagement is regarded among planners as a central aspect for a successful implementation of policies as P002 stresses: "The core of everything before coming to policies is raising awareness and trying to [make] people understand what we are trying to achieve." Nevertheless, Farmers do not perceive their inclusion in decision making, and the planned ambitious changes in the food systems in Oman are overlooking their needs. Especially when it comes to small property owners who make the largest share of the agriculture dedicated population in Oman.

The farmer always demands and strives for his rights, but there is no one to hear them and understand their suffering in agricultural production. (F002)

F001 as a large scale producer is more incisive while discussing their relationship with authorities

...there are no contributions, and I hope that there will be work on this... Agricultural lands can be diverted to the other side of the street, towards the south, where the mountains are. And making residential and commercial lands near the coast... We have called several times from the competent authorities in the transfer of lands, with evidence, studies, and others, but there is no questioning by the competent authorities.

The main channel for farmers to have a voice are the farmers' associations. Apparently, an imbalanced relationship between different producers makes their relationship difficult.

...we share experiences and knowledge in most agricultural associations, but I do not agree with the cooperation of commercial farms with community or small farms... commercial farms operate in a wider scope covering the needs of the market, then the matter of cooperation with small farms becomes a matter full of envy and suppression of ideas. (F003)

Rebranding

Complementary to involving the farmers in the process of planning, working on the awareness for local products will play a major role in the successful implementation of the future food systems for the country. As F002 stresses

what the Omani farmer is facing is the lack of support in marketing their farms products and the local food.

Beyond policies to increase the local production and to protect from external competition, local producers need a campaign to increase the perception of consumers on the advantages of buying local products, their qualities and characteristics such as seasonality, adaptation to local culture, job creation, sustainability etc.

...this is a good thing for people who work in the local farming system. Because for example, we have production of garlic, Omani garlic. One kg of Omani garlic costs around 3 – 4 Rials, but supermarkets have garlic which comes from China or Iran which cost for only 1 kg for only 600 Baizas. But the difference is, that the local garlic taste is way [better], because we use only organic materials and we do not use pesticides to grow them. (A001)

Self-organization

Farmers, especially small farm owners, cannot rely solely on governmental support. During the pandemics several initiatives emerged showcasing the creativity of the farmers…

For example, we, as farmers in small farms, when there is a surplus in production, we exchange goods with other farmers, or deal with cars that sell vegetables at points known by the community, most of the owners of these cars sell the crops of local farmers and sell them directly to the consumer. (F002)

Small farmers seek to enhance their market access using social media and due to direct contact while large scale farms tend to hire experts to do the marketing. Small scale farmers also seek the local markets to create a direct relation to the customers while commercial farms target supermarkets and exports.

These days, during Covid-19, when the markets were closed and the farmers couldn't sell their products, they started contacting their clients, with social media. So the farmers would announce some of their products, and the consumers would try to get in contact to buy the products. (A007)

Direct sales in the local markets or in improvised areas help small scale producers to avoid mediators to keep the prices competitive and to increase their own profit.

When the prices increase, the consumer blames the farmer although it is not his fault. It is the mediator's fault, as when a farmer deals with a mediator to sell his crops, the mediator increases the price a lot for his benefits. (F003)

Small and big

Small farm owners and commercial farmers do not necessarily compete since they seem to operate in different modes. That does not mean that interactions between these two actors never occur. They might sometimes collaborate when investment opportunities allow. However, a consistent exchange does not ensue for diverging interests.

...as a productive farmer, we do not deal with small farms or community farms directly, because the application and systems of working with us are completely different from other types of farms. But if small or community farms need some guidance and awareness on how to market local food or with farming problems, we welcome assistance. (F001)

The participant's responses point to the sporadic nature of these collaborations. They are therefore reliant on private networking approaches and opportunities, instead of clear guidelines and frameworks.

I know companies that are producing milk, and they are taking the milk from small farms. For example, here in Al Batinah, there are many women who are keeping animals, like cows for milking. Of course they cannot make marketing for their products, so what they do, they sell the milk for the companies. [...] I know one woman who makes cheese, and laban. Orpic company has a shop, and they made some place for this woman, where she can sell her products there. So, this is a small initiative, on making a combination or a collaboration between community and businesses. Also for plants, for example farms that produce dates, they collaborate with date companies, who collect them and produce other products. (A004)

Urban Farming could be a niche!

The concept of urban farming is generally received with empathy. But it is not necessarily seen as a priority or main topic of discussion.

I've never seen Urban Farm quite of – in a traditional sense – Maybe it's not even a niche it just doesn't exist right now. But it could be, definitely experimented with and taken further for sure, I completely agree… and I mean, it wouldn't've been nice if this had been started last year? (P002)

However Urban Farming is starting to gain some momentum, even if they are yet to be widely known, and are not done at a large enough scale to be an alternative just yet.

Yes, there are some small initiatives, they started already, but they are in a small scale. (A002)

On the other hand, some participants discussed a need to bring nature back to the city. Urban farming – they identified – could improve the aesthetics of residential areas and increase the health and well-being of the community.

...agriculture in the city could bring some greenery and increase well-being in the urban areas.

5. CONCLUSION

In Oman and the countries in the vicinity the economic growth, demographic development and unsustainable patterns of urbanization triggered an accelerated process of expansion of the urban footprint. Consequently, agricultural production in the metropolitan areas has shrunk dramatically since land has been claimed for new developments and groundwater reservoirs depleted. Despite the modern food system in place and the planned governmental efforts to bolster the food security programs, its vulnerability has been exposed by the COVID pandemics. In this context, this study explores the perception of planners from different governmental entities involved in the spatial strategy, agricultural development, and farm owners on the potential and challenges to introduce a local food system in the consolidated urban areas of the country and to preserve and upgrade other existing areas under risk to establish a more resilient and sustainable food system.

Considering the methods we followed, we found that employing storylines was very successful for triggering a reflexive process upon key concepts related to urban farming among interviewees. Before accepting the invitation to participate in

the study, many of the participants asked for the "questions" to be sent in advance. Storylines don't have such an inquisitive nature and the process is widely supported by the possibility of agreeing or not with the content of the statement. However, some farm owners were more hesitant to react to the statements. Partially, for not being acquainted with some concepts of urban farming and food systems. In that case, the interviewer had to elaborate on the statements and add a direct question at the end to start the discussion. Still, the responses indicate that the adoption has not compromised the content and the comparability of the results.

Typically, at the end of the interviews, participants would sum up their visions on the storylines discussed as a final statement putting the pieces together and adding their opinions freely. The open-end character of the last part helped to extract some deeper level information of the interviewer's vision on urban farming.

We found that, overall, there is a high degree of agreement in the topics touching food security and to prioritize local agricultural production. This agreement occurs across planners of different sectors and institutions who believe that Oman should become more independent of imports and increase its agricultural capacity. On the other hand, small scale farmers do not seem to be part of the main strategies relegated to a secondary role in the planning of the new system. In terms because small scale farming is not seen as productive enough.

Furthermore, when it comes to the topic of integrated farming and the city, mixed reactions were experienced amongst participants. From whether or not they were aware of such ongoing projects, or wondering about the need of such an approach, the future for urban farming approaches and the greening of urban areas still needs to be further marketed. The participants were, however, aware of the multi-faceted benefits such projects may bring from economic to environmental stances.

Connectedly, there is a strong consensus around the usage of new technologies to overcome different environmental challenges intensified by climate change and urbanization such as the salinization of soil in the coastal area. The idea of modernizing, particularly through the introduction of new technologies, brings forth this interplay of perceptions between "old" and "new", with the latter being held as more productive.

In a broader context, we conclude that a local food system in Oman has huge potential to address the environmental aspect that the local food system agenda targets at. Urban Farms in the major cities of Oman, could help to increase green area supporting carbon sequestration programs and reducing flash flood risks. Bringing food production closer to the consumers will help to reduce the transportation ways and might increase the awareness of people about seasonality and healthy foods. Perhaps, the access to good quality food products is even a more urgent matter given the health caused by the rise of NCDs Oman is facing than food justice. However, the community building aspect of Urban Community Farms could support environmental regeneration projects in monofunctional residential neighborhoods where a haphazard development pattern is associated with low levels of citizen engagement

in the public life. Programs to support Urban Community Farms allied with campaigns for activation of communal spaces in residential neighborhoods have a great potential to increase quality of life and well-being of the local population. They could work as temporary farms in the many vacant plots in these neighborhoods or integrate the spatial strategy that is currently in development stages.

This study was limited by its approach to interview planners and farmers, and thus does not include perceptions from local consumers. This would be necessary in further research on the viability of local foods to substitute international inputs. Especially as a sense of awareness to localised food options is necessary for it to benefit and make a difference.

APPENDIX

Tab. 1. Interviewees and venues

#	Institution	Function
P001	Ministry of Housing	Senior Planner/Spatial Strategy/Policies Food Security
P002	Ministry of Housing	Planner/Spatial Strategy/Policy Implementation
A001*	Ministry of Agriculture	Planner/Livestock Sector
A002	Ministry of Agriculture	Planner/Livestock Sector
A003	Ministry of Agriculture	Head Food Security Department
A004	Ministry of Agriculture	Planner/Agriculture
A005	Farmers' Association	
A006/A007*	Ministry of Agriculture	Director of Research Department/Planner
F001	Large Scale Farm Owner	
F002	Small Farm Owner	
F003	Small Farm Owner	

Interviews performed online except of *face to face interviews.

Tab. 2. Storylines and means

#		**Mean**
54	Community farms help to improve the social environment while commercial farms generate jobs. A combination of both is beneficial for communities.	5
37	A government program that links individual community members, institutions, and businesses directly with local farmers to improve local food economies.	5
1	Post-Covid 19 era will strengthen the need for more small-scale farming and urban agriculture.	4.8
57	local markets are an opportunity to sell products and create direct relation to the customers leading to a better understanding of their needs.	4.8
8	Urban agriculture and community gardens produce food closer to where it is consumed, offering cities the opportunity to reclaim their food systems.	4.6
28	Corporate food chains are more vulnerable to a global crisis than small farmer webs.	4.6
49	The circular economy depends on the collaboration between different actors (government, tech companies, farmers, and local businesses).	4.6
48	The government should ensure that local businesses can participate in large- or small-scale urban agriculture experimental projects in the city.	4.4
23	Urban farming can revitalize abandoned buildings, brownfield sites, and vacant open spaces.	4.4
30	Interlinking different actors (community representatives, waste collection companies, agricultural wetland cooperatives, inhabitants, and NGOs) is crucial in improving agriculture production.	4.4
34	Direct agricultural markets are the centerpiece of local food systems.	4.4
36	Governments should create a framework that includes empowerment of community members, economic development strategies, and more direct relationships between producers and consumers.	4.4
3	Heavy reliance on imported food has also resulted in massive waste due to the inability to transport or purchase crops during the restrictions imposed during the pandemics.	4.4
43	We need to reduce the rural-urban food chain by incorporating innovative urban agriculture techniques in cities. (aeroponics, aquaponics, etc.).	4.4
6	Small-scale farmers suffered smaller impacts from COVID in comparison to large-scale industrial farms because they rely mostly on family labor.	4.4

#		**Mean**
32	When food systems are embedded in the city's spatial strategy and are treated as trans-sectoral and interactive infrastructures, they can foster sustainable agriculture.	4.4
47	We need policies that ensure a just Urban Agricultural system and include all parties involved in the system such as the users, planners, owners/businesses, etc.	4.4
27	The supply crisis during the pandemic provoked a shift towards unhealthier consumption habits of heavily processed items with longer shelf life.	4.4
9	Allocating public urban land for agricultural use would provide "landless" citizens to grow their food and participate in the food system.	4.4
14	Government should allocate public funds to help local farmers and local businesses to improve their supply chains increasing their competitivity against imported food.	4.2
40	Dissimilar to the global food system, the local food system based on agroecology concepts dramatically impacts the local economy, social dimensions, and food security.	4.2
53	Strategies for food security combined with citizen participation play an essential role in sustainable urban development. They are key elements of good governance.	4.2
17	longer distances between production and consumption areas lead to a more dependent food system on transportation, and subsequently the more susceptible it is to international lockdowns or restrictions.	4.2
26	When regions become exporters of a single kind of crop they grow heavily dependent on the global market. They also become more vulnerable as the Covid-19 pandemics have shown.	4.2
15	The Covid-19 experience affirms the importance of promoting research and investing in infrastructure to help farmers to become more resilient against unforeseen disasters provoked by climate change.	4.2
16	It is necessary to improve access to information about weather, resources, markets, and prices to farmers, processors, food manufacturers, and traders to allow for more effective business decisions.	4.2
38	Creating harmonious urban-rural linkages will affect a sustainable farming system based on three main elements: Leadership, collaboration (different stakeholders), and regional food system.	4.2
13	Decentralized food systems support emerging economies to become self-reliant and protect the local food production.	4
21	Urban agriculture addresses emerging issues including food security, dietary diversity, social inclusion, and income generation.	4

#		**Mean**
22	Urban and peri-urban agriculture can help to rethink the spatial arrangement of cities.	4
4	The agricultural industry must be redesigned to become less dependent on external commodities and more reliant on local farmers.	3.8
20	Urban and peri-urban agriculture is a step towards regional self-sufficiency and food security.	3.8
50	Digital Urban Agriculture Involves different actors and contributes to economic diversification.	3.8
56	Farmers are aware of new techniques and programs to modernize production	3.8
18	One key strategy to food chain resilience is to shift consumers' food preferences from industrially produced "processed foods" to locally produced "fresh" food.	3.8
24	Urban Farms and community gardens offer open-air refuges for stress relief, recreation, cultural activities, and social connection in light of the pandemic.	3.8
25	Food should come from small producers to ensure the supply of fresh food.	3.8
41	IT and other technologies are influencing urban farming in our cities.	3.8
42	Small ventures in urban farming have a remarkable impact on the local food market.	3.8
44	We need to examine existing infrastructure and resources and utilize them to allow more innovative practices of Urban agriculture to thrive.	3.8
19	Urban agriculture can make locally produced food cheaper and accessible for all.	3.8
55	Family members became more involved in the farm during the pandemics	3.8
39	Agroecology principles aim to improve conventional farming systems.	3.8
35	A cooperative marketing strategy operating with technical assistance on local markets may help to develop the local food economy.	3.6
45	Urban agriculture offers innovative methods to revitalize vacant buildings and other underused urban spaces (such as Z farming and community gardens).	3.6
2	The current system of industrial food production concentrates the profit in large organizations while losses are shared by society.	3.6
46	Urban agriculture is sustainable because promotes social connectedness and helps to fight climate change.	3.6
51	New urban food policies should become more inclusive operating at a local level.	3.6
52	We need a new framework for analyzing the challenges and advantages of urban food policy contexts.	3.6

#		**Mean**
29	The gap between planning and implementation is an opportunity to create synergies between other industries and stakeholders on a small scale.	3.6
31	Urban farms may offer further synergies such as water reuse.	3.6
7	Industrial food production is more vulnerable to being disrupted by worker illnesses (since they live together in dormitories) and border lockdowns since migrant workers face barriers to travel to their jobs.	3.4
12	The government should implement new risk management programs including cash or food assistance to cover the basic needs of citizens.	3.4
5	Agroecology has a tremendous potential to increase its level of acceptance	3.2
33	Sustainable agriculture involves the innovation, development, and diffusion of more environmentally sensitive production practices.	3.2
10	Local food production offers contextualized solutions to local problems.	2.8
11	Local food production leads to diversification of crops and more culturally appropriate diets, resulting in a healthier lifestyle.	2.6

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W KIERUNKU ODPORNEGO LOKALNEGO SYSTEMU ŻYWNOŚCIOWEGO W OMANIE

Streszczenie

Niniejszy artykuł podejmuje problematykę rozwoju lokalnych systemów żywnościowych w Omanie, opierając się na badaniach jakościowych przeprowadzonych wśród przedstawicieli sektora rolniczego. Celem analizy jest rozpoznanie sposobów postrzegania wyzwań i potencjałów lokalnych rynków żywności przez kluczowych interesariuszy. Zastosowanie narracji (storytellingu) pozwala uchwycić dominujące ideologie i postawy obecne wśród planistów, urzędników publicznych oraz rolników. Szczególną uwagę poświęcono możliwości integracji dynamicznego rozwoju urbanistycznego obszaru metropolitalnego Maskatu z koncepcjami rolnictwa miejskiego i podmiejskiego. Wyniki badań wskazują, że mimo utrzymującej się niepewności wobec lokowania produkcji rolnej w bezpośrednim sąsiedztwie miasta wśród badanych aktorów istnieje wyraźna świadomość potrzeby wzmacniania lokalnych rynków żywności. Rolnictwo miejskie w Maskacie jest jednak na obecnym etapie postrzegane przede wszystkim jako rozwiązanie eksperymentalne.

Słowa kluczowe: rolnictwo miejskie, zmiany klimatu, COVID-19, lokalna produkcja żywności, nowe systemy żywnościowe, innowacje miejskie, zdrowe miasta