Water International

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rwin20

Agriculture and the ideals of urban modernity: the case of Dar es Salaam, Tanzania

Matthijs T. Wessels, Gert Jan Veldwisch, Bas J.M. van Vliet, Alphonce G. Kyessi & Shaaban M. Mgana

To cite this article: Matthijs T. Wessels, Gert Jan Veldwisch, Bas J.M. van Vliet, Alphonce G. Kyessi & Shaaban M. Mgana (2024) Agriculture and the ideals of urban modernity: the case of Dar es Salaam, Tanzania, Water International, 49:2, 219-237, DOI: 10.1080/02508060.2024.2323895

To link to this article: https://doi.org/10.1080/02508060.2024.2323895

Published online: 02 Apr 2024.

WATER INTERNATIONAL
2024, VOL. 49, NO. 2, 219–237
https://doi.org/10.1080/02508060.2024.2323895

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

OPEN ACCESS Check for updates

Agriculture and the ideals of urban modernity: the case of Dar es Salaam, Tanzania

Matthijs T. Wessels [a,b,c], Gert Jan Veldwisch [a], Bas J.M. van Vliet [b], Alphonce G. Kyessi [d] and Shaaban M. Mgana [c]

[a]Water Resources Management Group, Wageningen University, Wageningen, the Netherlands; [b]Environmental Policy Group, Wageningen University, Wageningen, the Netherlands; [c]Department of Environmental Engineering, Ardhi University, Dar es Salaam, Tanzania; [d]Institute of Human Settlements Studies, Ardhi University, Dar es Salaam, Tanzania

ABSTRACT

This article studies the policy dynamics of irrigated agriculture in Dar es Salaam, Tanzania, based on stakeholder interviews and a literature review. We found that irrigated urban agriculture receives a positive reception supported by a discourse that values productivity, but this is increasingly challenged by a discourse that focuses on health and modernity. Whereas authorities aim for modern farming models, most urban farmers contribute to the city's economy and food system based on informal and insecure access to land and water. These two types of urban agriculture exemplify the tension between planning ideals and urban reality.

ARTICLE HISTORY
Received 20 January 2023
Revised 18 January 2024
Accepted 23 February 2024

KEYWORDS
Irrigated urban agriculture; policy arrangements approach; modernity; urbanization; Dar es Salaam

Introduction

Sustainable urban growth features prominently on policy agendas in Africa, where rapid urbanization poses both challenges and opportunities. The role of agriculture in these urbanizing landscapes has been disputed for decades. Critics have often referred to this as a 'backward' practice that detracts from what African cities are supposed to look like (Battersby, 2013; Neergaard et al., 2009; Smit, 2016), whereas others see urban agriculture as progressive due to the different ecosystem services it provides (Langemeyer et al., 2021; Tapia et al., 2021). In Dar es Salaam, Tanzania, contrasting views about urban agriculture and its value are reflected in two distinct Swahili expressions that are each a translation of urban agriculture. There is '*Kilimo cha Maghorofani*' ('apartment agriculture'), which refers to agriculture practised near people's houses or apartments in the form of hydroponics, vertical farming, greenhouses, or container-based types of agriculture, all of which use piped water. This type of agriculture is welcomed and actively supported as having a place in the city. However, most urban farmers practice '*Kilimo cha Mjini*' ('city agriculture'), which is open space cultivation in vacant areas that uses mixed urban water flows for irrigation.

CONTACT Matthijs T. Wessels matthijs.wessels@wur.nl

Agriculture is an integral and well-established part of urban society, yet in many African cities, including Dar es Salaam, it is not formally recognized or even considered illegal (Follmann et al., 2021; Orsini et al., 2013). This raises questions about how planning and governance are constructed in such ways that it enables the continued presence of agriculture in these growing urban centres. To answer this question, this paper studies how policy practices shape and direct irrigated agriculture in Dar es Salaam. Irrigation is often implicit in studies on urban agriculture, but we explicitly address it in this paper because water plays a key role in the relation between agriculture and the city. We use 'city agriculture' and 'apartment agriculture' throughout this paper to refer to the different forms of (and ideas around) urban agriculture to show the presence of contrasting discourses around the desirability of agriculture in the city. By using these two expressions, which both translate as 'urban agriculture' in Swahili, we show why, and how, certain agricultural practices are screened out from the imagined future of the city, which raises questions about who is granted the right to participate in the city's future.

This paper shows modernist convictions around the desirability of urban agriculture, which should first be contextualized. Modernity has played a pivotal role in the pursuit of progress since the beginning of the industrial era. The images and dreams of modernity (in which the state was attributed a position of power) were inter alia materialized in the construction of cities and infrastructures (roads, water, energy, waste, communications). As Europe expanded its imperial power over the southern hemisphere, so did modernity. The dialectic of 'becoming modern' posited ideas about what is 'traditional' and 'primitive', or the opportunity 'to catch up'; cultivating a sense of superiority and legitimizing a developmentalist relationship (Arce & Long, 2003). Modernist discourses in urban development have been widely critiqued by post-colonial scholars, who argue that urban theory should be developed in direct relation to the lived experiences of city dwellers (Pieterse, 2008; Robinson, 2002). However, as we also show for the case of Dar es Salaam, Western conceptualizations and representations of modernity continue to be embraced in the planning and governance of African cities (Parnell & Pieterse, 2014). In the context of this paper, we show how modernist ideas appear in (1) discourses about the functioning of urban society and what it should look like, as well as through (2) the integration of 'modern' elements in existing agricultural practices.

By referring to policy practices and dynamics in our writing, we emphasize the critical role of human agency in shaping and reshaping policy impacts. The policy domain is a space where there is constant interaction between different societal actors who – with varying levels of influence and power – defend or contest the way society is constructed. To study this, the policy arrangements approach (which we introduce in more detail in the following section) is used to link people's day-to-day policy interactions to the broader, structuring elements of urban society. Our study focused on Dar es Salaam, as this city exemplifies the rapid growth of urban centres in Africa and the presence of urban agriculture here has been well-documented over the past few decades (Drechsel & Dongus, 2010; Jacobi et al., 2000; Kiango & Likoko, 1996; Kyessi, 1998; McLees, 2012; Mlozi et al., 2014; Sawio, 1994; Wessels & Mgana, 2024). Data collection for this paper took place between May 2021 and July 2022, but with a particular policy focus in the first half of 2022. As most of the initial ethnographic research focused on irrigated cultivation in open spaces within the built-up areas of the city, less attention has been paid to

backyard farming and peri-urban agriculture. Nevertheless, we believe that our findings also give insight into the policy context of urban agriculture more generally.

In the subsequent section, we elaborate on our research approach by explaining the policy arrangements approach and the methods we employed to study such arrangements. After that, we present the results in two sections. We first look at the historic position of agriculture in Dar es Salaam and characterize contemporary agriculture in the city. We then describe the current-day policy dynamics that we found in our research and specifically zoom in on the role that discourses play in the interaction with actors, resources/power, and rules. In our discussion, we reflect on the discrepancy found between modernist ideas about how cities should work and what they should look like and the 'everyday city' that gets by on its own. We conclude by summarizing the findings and highlighting two points of consideration when it comes to both the engagement with and the planning of urban agriculture.

Research approach

Urban agriculture can be found in different configurations of production, in different areas with particular characteristics, and aiming for different destinations (Mougeot, 2000). This paper studies city agriculture in Dar es Salaam and the opposing views found in apartment agriculture. We study these using the policy arrangements approach which, together with the research methodology applied, we elaborate upon below.

The policy arrangements approach

The policy arrangements approach studies policy dynamics by being positioned between two continua: actor–structure and discourse–organization (Arts & Leroy, 2006). The first describes the extent to which human agency is guided by social structures and how it (re) produces these structures over time. The second relates to how social stability and change can be attributed to either ideational mechanisms (discourses) or material circumstances (materiality). In this way, the approach acknowledges the interplay between everyday policy practices and more structural societal and political processes. This approach has been extensively used for the study of environmental policy and, increasingly, of urban governance (Basile, 2022; Contesse et al., 2018; Majale-Liyala, 2013).

The policy arrangements approach is not exclusive or unique to studying policy dynamics, but we have used it in this context for two main reasons. First, the approach acknowledges the instability of the policy domain and studies the domain in a momentary stabilization of *rules, actors, resources/power*, and *discourses* (Arts & Leroy, 2006; Tatenhove et al., 2000). These dimensions are often depicted as a tetrahedron to emphasize the interrelatedness and how changes in one dimension can reconfigure the policy arrangement as a whole (Figure 1). This is useful when studying the institutional dynamics of cities in the Global South, because urbanization and fragmented growth create diverse socio-material spaces of living that function partially within, and partially outside of, the state's reach. As people can assemble or reshape policy arrangements in a myriad of ways – drawing on whatever materials and resources (including power) that are available to them – it is important to acknowledge the constant tension in the policy domain that influences the actual effects that policy has;

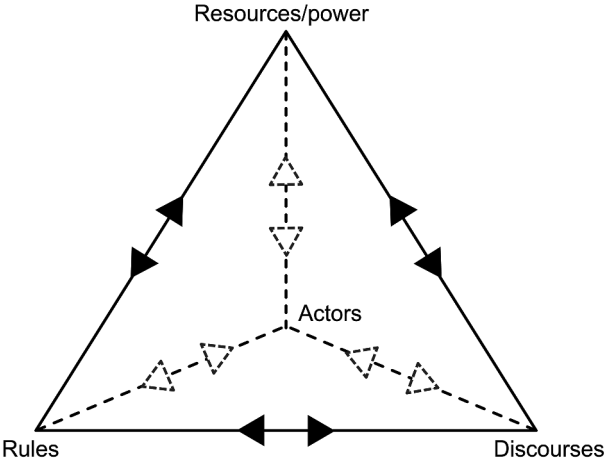

Figure 1. Policy arrangement visualized as a tetrahedron of interconnected policy elements. The arrows emphasize how changes reconfigure the arrangement as a whole. Based on Arts and Leroy (2006).

effects that can differ across space and time. The emphasis on the interrelatedness (as illustrated in the tetrahedron) is the second reason why this approach is useful, as this is believed to give better insight into policy dynamics than providing a mere analysis of different policy aspects. By specifically looking at relations, this paper studies how discourses interact with actors, resources/power, and rules. This is relevant because, during the initial research period, we found that particular ideas about the relation between agriculture and the city are influential on the thinking and actions of different actors, the allocation of resources, and the rules (formal and informal) that shape and direct urban agriculture.

Methodology

Empirical data collection for this paper took place in Dar es Salaam between May 2021 and July 2022. The initial research period (until the end of 2021) focused on an ethnographic study of urban agriculture in Dar es Salaam based on regular visits (every other week, except for two intermissions for data analysis) to six agricultural areas that represent common types of agriculture in the city. Semistructured individual interviews and participant observation allowed the development of a detailed understanding of how agricultural practices are configured in the context of using urban land and water while producing food. By systematically going back and forth between data gathering and analysis, it became evident that there was (and is) a gap between urban planning intentions and urban reality. This formed the basis for further research. From the beginning of 2022, we used a combination of methods to better understand the policy dynamics that shape the relation between agriculture and the city. We interviewed 31 respondents from relevant ministries at the central government, different departments of the local government authorities, and people from relevant government-related, private, community-based, and research organizations, all of whom work on urban planning

issues or urban agriculture in particular. This was combined with 16 additional farmer interviews at the agricultural sites that had been regularly visited since the beginning. We also conducted a desk study of the available policy and research documents around agriculture and urban planning in Dar es Salaam. The combination of methods (interviews and literature) and sources (including interviewing a wide range of stakeholders) has allowed for data triangulation. The tetrahedron with its four dimensions and their interrelations (Figure 1) was used for guidance during the interview design and desk study (analytical considerations are explained in more detail by Liefferink, 2006). For example, when studying the actors involved in urban agriculture, an analysis was done of the actors (and the existence or absence of coalitions), their power position, the interaction with rules, and their views (discourses) about the relation between agriculture and the city. The interview data and available documents were analysed through coding and memo writing and resulted in a comprehensive policy overview, on which this paper has been written. However, we do not give an exhaustive overview of all policy aspects found, but rather focus on understanding discourses and how they interact with other policy elements.

Contemporary Dar es Salaam in context

Although the city of Dar es Salaam exemplifies a wider trend of rapid and continuing African urbanization, it also is the product of its own history. We therefore shed light on the city's geographical and political evolution, as current-day policy practices (which we describe in the next section) are inseparably linked to societal and political trajectories (Arts & Leroy, 2006; Tatenhove et al., 2000). We pay specific attention to the historic position of agriculture in the city and finish this section by characterizing contemporary agriculture within the city of Dar es Salaam.

Geographical development

What started as a small fishing village on the East African coast in the mid 19th century has grown to be one of the largest cities in Africa. The population of Dar es Salaam was recently counted at close to 5.4 million and is expected to continue to grow over the coming decades as a result of natural growth and rural–urban migration (Moshi et al., 2018; NBST, 2022; UN, 2018). Although the latter is strongly driven by people's expectations of a better life in the city, the benefits of living in the city do not uniformly trickle down to improved living conditions for all. The inadequacies of urban planning and service provision due to rapid urban growth have contributed to increased socioeconomic inequality in the city (Moshi et al., 2018).

The urban structure of Dar es Salaam resembles a finger-shaped model pointing from the Indian Ocean into the country's interior. Our spatial analysis of urban expansion, presented in Figure 2, clearly shows the important role of the arterial roads in directing the city's growth. Differences have also been found between settlement types and service provision along the roads compared to the interstitial areas (Schmidt, 2012). Informal urban sprawl is prominent in these interstices and towards the peripheral areas. The city is subdivided into five municipalities and the overarching Dar es Salaam City Council. The latter used to be responsible for the coordination and performance of key services for

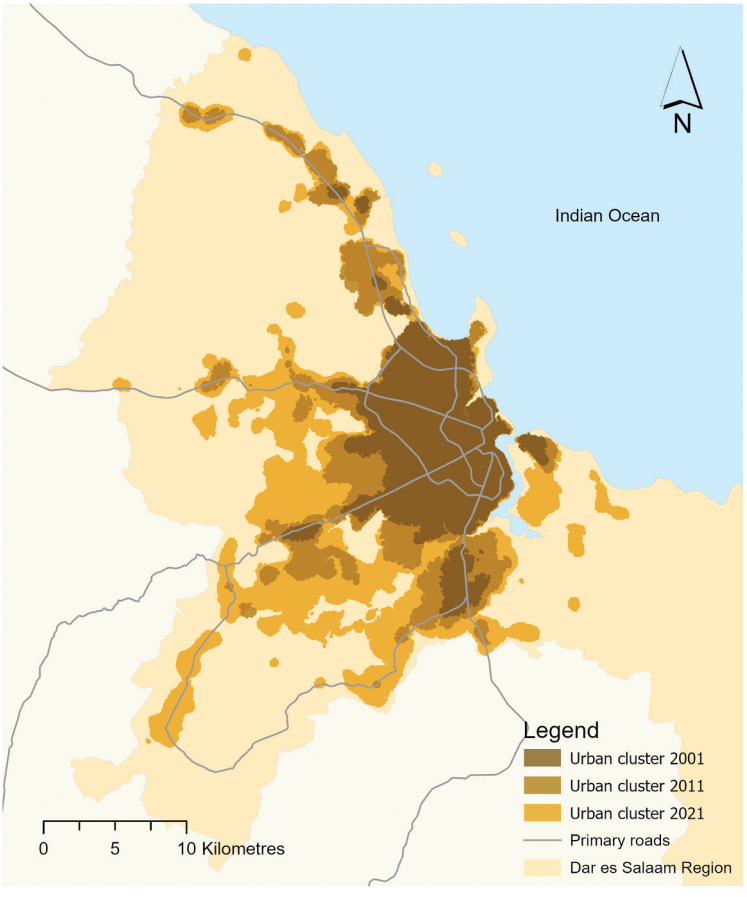

Figure 2. The expansion of Dar es Salaam between 2001 and 2021, largely influenced by the primary roads. The urban clusters here contain (sub)urban areas together with urbanized open spaces, as defined by Angel et al. (2016).

which interdependencies across the municipalities exist (Moshi et al., 2018), but was removed in 2021 to prevent ambiguities in the authorities' responsibilities on the ground; leaving uncertainties about how this affects intermunicipal coordination (e.g., future city planning).[1]

More than half of all households in Dar es Salaam (58.0% according to URT, 2020b) rely on self-organized (informal) employment. Despite the importance of the informal economy for service provision and income generation, colonial and post-colonial (or post-independence) authorities tried (and continue to try) to remove informal living and self-organized economic activities and formalize them (Brennan et al., 2007; Brownell, 2016). During our fieldwork in 2021, consolidated efforts to formalize informal activities took place by removing so-called *machingas* (petty traders) from the streets and relocating them to designated market areas. In conversations with the first author, people raised their concerns about having to travel further for their food and other goods, the loss of employment for vulnerable groups, and the fear of an increase in crime, given higher

rates of unemployment. Others supported the government's decision because 'it [petty trading] does not show the progress that Dar es Salaam is going through' (personal communication K7, 3 November 2021).[2] As with urban agriculture (which we show later), normative ideas about the city are influential in determining people's ideas about which parts of the economy should thrive or are in need of 'progress'.

Political development

The growth of Dar es Salaam started to get planned and regulated under colonial rule through the development of master plans (Armstrong, 1986). Foeken et al. (2004) and Brownell (2016) describe how colonialism brought along Western perceptions of what constitutes 'urban', with a strong divide between the countryside and the city. The first urban agricultural by-laws (enacted by the British and abandoned after independence) aimed '(i) to prohibit people of African descent growing crops and raising livestock in urban areas; (ii) to prevent urban agricultural activities, especially the growing of crops taller than one metre, in urban areas because they were thought to increase the presence of malaria-carrying mosquitoes; and (iii) to maintain a cleaner urban environment and sustain urban aesthetics by preventing people of African descent from growing crops on most open spaces in town' (Foeken et al., 2004, p. 121). Colonial authorities tried to keep agriculture (i.e., the countryside) out of the city through these by-laws.

Following independence, Tanzania's first president Julius Nyerere implemented his development vision (*Ujamaa*, i.e., 'familyhood') that focused on an egalitarian and cooperative society with a strong focus on communal villages rather than urban centres (which was also a critique on industrial capitalism and urban elitism; Brownell, 2016; Hyden, 1980; Owens, 2010). This villagization policy failed to promote agricultural development and gave rise to famine and rising food prices, which led the authorities to encourage urbanites to engage in farming within urban settlements (Foeken et al., 2004; Mlozi, 1995; Owens, 2010). Brownell (2016) describes how this tactic also sought to portray urbanites as producers and diminish their urban privilege. Irrespective of the productive or moral rhetoric behind it, the opportunity was used by urbanites to engage in farming as a way to become more food secure and supplement their incomes from the (nationalized) industries in Dar es Salaam. Agriculture became an integral part of urban space and the city's economy.

From the end of the 1980s, the Tanzanian government started to welcome liberalization and privatization of the economy. Reforms towards market economics and capitalism meant the end of state-based structures based on socialist values (Briggs & Mwamfupe, 2000; Owens, 2010). The city expanded, both physically and economically, in an increasingly informal way (Brennan et al., 2007). Rising land prices resulted in outward growth and difficulty to protect the city's open spaces from encroachment, which put increased pressure on agriculture. For example, Msangi (2011) and Mkwela (2016) both studied the '20,000 Plots Projects' in Dar es Salaam, where peri-urban land was incorporated for residential, commercial, and communal use. Farmers experienced severe disruptions to their livelihoods as their customary land rights (rights granted through customary practice rather than statutory tenure) were inferior to the formal planning procedures and exposed them to urban land grabs. In this way, development (master) plans redefine 'undeveloped' hinterlands based on long-term and large-scale

ideologies for human improvement that are reminiscent of previous colonial and socialist strategies, albeit now based on neoliberal principles.

Agriculture and the city

Urban dwellers who rely on agricultural practices for their livelihood are confronted with both political and physical pressure on their land, despite the periods when the authorities actively stimulated agriculture in Dar es Salaam. Contemporary agriculture in Dar es Salaam mostly exists in backyards and open spaces. Interviewees describe that urban agriculture contributes to locally grown food, creates urban employment, and keeps vacant areas safe and secure through the daily presence of farmers. Our research in Dar es Salaam found two distinct Swahili expressions that are each used as a translation for 'urban agriculture'. These different translations cannot be directly linked to commonly used classifications, but they do represent particular types of agriculture found in the city.

Most urban agriculture in Dar es Salaam can be referred to as 'city agriculture', which is open space cultivation in vacant areas – both within and on the fringes of the city – that are awaiting urban development or are deemed to be unfit for development (e.g., being flood-prone), using mixed urban water flows for irrigation. Leafy vegetables are popular here because they are in high demand and their perishability means that there is less competition from outside the city. This allows for the commercial cultivation of these vegetables, which are distributed throughout the city via a network of vendors. Access to land is based on informal land-use agreements between the owner and user. Without legal land rights, farmers have no formal right to compensation in the case of land acquisition (Wessels & Mgana, 2024). This lowers their incentive to make long-term investments, such as planting perennial crops or installing permanent (irrigation) infrastructure. Although insecure land tenure clearly has an impact on these farming practices, McLees (2011) describes – through a focus on access rather than property or tenure rights – the multiple benefits that farmers (but also land owners) derive from this agricultural land use.

At a smaller scale but given particular attention is the so-called 'apartment agriculture'. Apartment agriculture refers to agriculture practised near people's houses or apartments in the form of hydroponics, vertical farming, greenhouses, or container-based types of agriculture. Although apartment agriculture generally takes place on private property, it is not the same as backyard farming but specifically refers to technology-based types of cultivation. The efficient use of land and safe water plays an important role but requires capital investments and land security, which are not available to the majority of farmers in Dar es Salaam. The consequence is that apartment agriculture is practised by a smaller group of citizens who are, using different techniques, able to produce a range of vegetables for both subsistence and commercial purposes.

Because the water requirements of vegetables cannot be fulfilled by the limited and/or irregular rainfall received, access to water for irrigation is a prerequisite for both types of urban agriculture. For city agriculture, water for irrigation is taken with buckets, watering cans, or mobile petrol pumps from rivers, canals, shallow wells, reservoirs, or taps. Rapid urban growth has resulted in residential and industrial discharges, which can create problems for farmers reusing water downstream

(Wesselow et al., 2020; Wessels, 2023). Apartment agriculture is not experiencing this issue because there is a strong emphasis on the use of clean, piped water for cultivation. Drip irrigation is common here to achieve high water-use efficiencies. As we further explore in the next section, the different forms of agriculture present create tension around what is deemed fitting in the city. Where city agriculture is recognized for its potential to provide food and incomes (and add value to vacant space), this is challenged by water quality concerns and the perception that agriculture is not a principal function within the modern city.

The policy arrangement for irrigated urban agriculture in Dar es Salaam

Agriculture in Dar es Salaam has been alternately prohibited and stimulated and today it is likewise impacted by policy dynamics that both constrain and enable its presence. Here, we use the policy arrangements approach to analyse the policy dynamics surrounding agricultural practices in Dar es Salaam. We first elaborate on city agriculture and apartment agriculture and we show how these agricultural configurations are surrounded by different actors, discourses, and associated resources. We then continue by describing the planning and regulation of urban agriculture in general. In this way, we show how competing discourses (visible in the different types of agriculture) pose a challenge to the continued presence of the majority of farmers in the city.

City agriculture: actors and discourses

Those who are directly or indirectly engaged in city agriculture emphasize the productive benefits and present a discourse that favours the continued (informal) presence of agriculture in the city. A large majority of interviewees in our study (from residents to central government officials in different ministries) feel that city agriculture should be given the space to exist, given that it is important for the people engaged in it. Similar to the example of *machingas* in the previous section, our interviewees pointed out the importance of food availability (nearby and at affordable prices), employment for vulnerable groups, and the maintenance of open spaces (which increases safety). However, many interviewees also emphasized the use of 'proper' and 'good' farming methods in order to minimize health and environmental risks (a point which is also found in the agricultural regulations described later). During informal conversations with residents, farming was commonly referred to as an activity that people take up when unable to secure employment, which illustrates how being engaged in city agriculture is seen as inferior to many other urban jobs. Farmers themselves, however, compare their harvesting cycles (most leafy vegetables have a growth cycle of less than a month) and the income that they bring as similar or superior to the monthly salaries available from other urban jobs. Turning to farming (and leaving other jobs in the informal economy) is motivated by the prospects of generating more income and having more economic stability.

Health concerns associated with vegetables irrigated with urban water (especially in the denser built-up areas) are a big challenge to farmers in the city. Although there is a diverse range of water flows available to farmers, there is a high dependence on flows of urban water originating from adjacent or upstream urban areas. Wessels (2023) describes

how farmers are concerned about how water quality issues undermine the social acceptance of their practices and produce. Farmers emphasized during interviews that the water they use in their respective areas is safe for irrigation purposes, although some also acknowledged that it is hard to find clean water in an urban landscape such as Dar es Salaam. As one of the farmers explains: 'I usually reply with a "sorry", as we do not have any other choice for water. There is no way to prevent discharges from getting into the canal' (Wessels, 2023, p. 570). The Msimbazi River is regularly mentioned as a prime example of how agriculture in Dar es Salaam got its bad image. Research focusing on the river's water quality and media coverage about agriculture in the river valley have contributed to this negative perception (Halloran & Magid, 2013b; Mwegoha & Kihampa, 2010; Sylvester, 2018; Wessels, 2023). This example is often used to challenge the agricultural and economic benefits of city agriculture in Dar es Salaam more generally.

Almost all the farmers practising city agriculture in open spaces within the built-up areas indicated that they did not receive extension services and agricultural officers themselves particularly emphasized on their involvement with off-farm trainings and demonstrations (focused on apartment agriculture). We also noted a shift in the municipalities' focus towards supporting agriculture in peri-urban areas rather than urban areas. Agricultural officers struggle with ambiguities around the formal recognition of farmers using land and (polluted) water for agriculture in the city. This is reflected by a hesitance to offer extension services in 'unauthorized areas' or in areas where irrigation water is polluted (personal communication Z5, 1 February 2022; Y7, 12 April 2022). Some farmers criticize the municipality for this lack of support, although others realize that the agricultural officers face similar challenges in trying to protect agriculture in the city. A farmer recalls: 'the agricultural officer visited us and we discussed how to get another farm, but she also struggles as she does not have any unoccupied farms' (personal communication T3, 14 June 2021). This leaves most farmers in the built-up areas practising city agriculture without support (a similar observation was made by Kyessi, 1998; Magigi, 2008). The agricultural extension officers we spoke with denied that farmers in the urban areas do not receive extension services, although they admitted that most capacity development is done through funded programmes at the agricultural centres and that the capacity to visit farmers is limited, because all extension officers render services to multiple urban and peri-urban wards at once.

Apartment agriculture: actors and discourses

The dominant discourse around productivity (i.e., agriculture provides food and income, and therefore should be maintained) is increasingly challenged by newly emerging discourses around health and modernity. Health issues related to irrigation with urban water flows are increasingly presented as a reason to enforce strict rules or remove agriculture from the city, as 'the health of citizens cannot be jeopardized over agricultural productivity' (personal communication urban agriculture researcher P2, 24 January 2022). As the city urbanizes and land values rise, agriculture in the city is also regarded as an improper use of land, which makes the city look undeveloped and backward. This results in a stronger push to either modernize existing agriculture or remove agriculture in order to 'clean the city' from practices that are regarded as

portraying failed urban development (this shows similarities with the actions taken against *machingas*) (personal communication regional town planner E4, 25 July 2022; Halloran & Magid, 2013a; McLees, 2012; Mkwela, 2013).

Urban specialists from government, academia, private and donor organizations seek to restructure agricultural practices in ways that (in their view) better fit the metropolitan city. These new farming models (referred to as apartment agriculture) emphasize the need for the efficient use of land and safe water, as well as the importance of making agriculture more attractive to the ever-growing young population. Technology, little physical labour and the entrepreneurial nature of agriculture are all emphasized in a bid to attract people to engage in this type of farming. One of the directors at the Ministry of Agriculture described: 'We are making agriculture "sexy" so that people will love it. Youth will be involved in agriculture instead of driving *bodaboda*'s [motorbike taxis]' (personal communication L8, 23 June 2022). In the same vein, an agricultural advisor working for a foreign donor commented that 'you need to put in technology to make it appealing, agriculture of the 21st century!' (personal communication U2, 13 May 2022). The introduction of container-based farming, vertical farming, and drip irrigation aims to utilize technology to deal with smaller plot sizes and the efficient use of clean tap water. Also, greenhouses and hydroponic systems are promoted as advanced types of agriculture that are attractive to urbanites. The coordinator of a grassroots organization on urban agriculture in Tanzania critically pointed out how bilateral development has led to a fixation on technology within the authorities that only serves a small minority of farmers in Dar es Salaam (personal communication D3, 17 May 2022).

The emphasis on progress and innovation seeks to distinguish agriculture in Dar es Salaam from that in other rural regions in Tanzania. This is used as a way of legitimizing the work of the city's agricultural departments, which struggle to get recognition for their work. Agricultural officers are often challenged by their colleagues about the contribution that they make to the development of the city. Several interviewees (both within and outside the municipality) indicated that the municipalities' agricultural officers are fighting for their right to exist within the city. The coordinator of a grassroots organization on urban agriculture noted: 'A big challenge that they [the agricultural officers] have is that the people in the municipal council don't think agriculture can be done in the city. If agriculture cannot be done, that means they don't have work here' (personal communication D3, 17 May 2022). Similarly, the value of urban agriculture is not recognized as contributing to food security at the central government level, because agriculture is generally associated with large tracts of land rather than with small urban agricultural areas (personal communication M4, 20 April 2022; Magigi, 2008; Schmidt, 2012). As an example, one of the agricultural directors recalls a meeting at the Ministry of Agriculture where the chairperson noted during a plenary introduction round: 'I see some people from Dar es Salaam, but I don't know what they are doing here' (personal communication B3, 12 May 2022). Dar es Salaam's agriculturalists actively promote apartment agriculture through presentations and field demonstrations in order to show that agriculture is present within the city, fits the growing city, and requires continued support through funding and planning to secure its economic impact (emphasizing the benefits to women and youth) and the contribution it makes to food availability and accessibility.

Planning, rules, and their regulation

The central government in Tanzania, through its ministries, formulates policy and provides regulatory frameworks, while local government authorities (i.e., the municipal council in this urban case) are responsible for the implementation, regulation, and enforcement of these policies. On a local level, agricultural officers do not feel heard in their calls to reserve (and maintain) land for agriculture in urban planning. Urban planners themselves emphasize the needs of the urban poor to justify the loss of agricultural land in favour of housing and public services (personal communication Z7, 21 April 2022; P5, 15 June 2022; focus group discussion, 22 April 2022). This shows the competition over urban space and which functions and interests should be accounted for.

There are initiatives to maintain green, productive spaces as part of the growing city of Dar es Salaam, but these risk being side-lined in visioning the city's future. In 2012, the city's municipal councils collectively approved a city-wide strategic plan to formally incorporate agriculture as part of the city. Areas were selected for urban agriculture (including plans for financing and regulation) and these ideas served as a direct input for the development of the Dar es Salaam City Master Plan 2016–2036 (Halloran & Magid, 2013a; IMC et al., 2012; SCINAP, 2012; URT, 2020a). Although this achievement was applauded by policymakers and researchers as an important breakthrough in the formalization of agriculture in African cities, the results from this collective bottom-up initiative are yet to appear in the plans that envision the future of Dar es Salaam. The initiative is referred to in the latest Master Plan, but excluding the zoning of the agricultural areas originally and explicitly proposed. Agriculture gets a mention as a land-use type but largely shows to be a left-over category (declining in direct relation to the planned growth of the city; see URT, 2020a, Technical Supplements Volume II) waiting for 'possible future urban growth' (URT, 2020a, Main Report, p. 257–259) rather than a basis for concrete action to secure the position of agriculture in the city.

The continued presence of agriculture in Tanzanian cities is described in various policy documents (Kyessi, 1998; Mkwela, 2013; Mlozi et al., 2014; URT, 2000, 2013, 2017, 2018). As part of these, the Urban Planning Act stipulates the conditions under which urban farming is allowed (URT, 2018). This regulation, as well as other regulations that refer to urban agriculture, recognize agriculture as an important component of urban sustainable development, although they also state that agriculture is not a principal function of towns (see the policy analysis by Mkwela, 2013), is only allowed when it does not 'create nuisance within the urban area' (URT, 2018, p. 3), and when 'improperly practised, conflicts with other urban land uses and leads to land degradation, water pollution, and is a threat to health and safety' (URT, 2000, p. 48). The ambiguities and conditionalities outlined in these policy documents leave room for differing visions because by-laws for urban agriculture are largely non-existent. These ambiguities (and the absence of by-laws) should not just be seen as problematic, as they also offer direct opportunities for the continued presence of farmers in the vacant spaces within the city who make a living while bearing the uncertainties of these informal (non-regulated) economies.

In order to deal with the possible health effects as a consequence of water pollution, environmental guidelines are in place to prevent the uncontrolled discharge of wastewater (Nyanda & Mahonge, 2021; URT, 2004, 2009). Water reuse is acknowledged as a possible 'alternative water source' (URT, 2002, 2022), but specific interventions and regulations have not yet been implemented. A guideline on the reuse of treated wastewater in agriculture has been prepared, but how the implementation of the guidelines in small-scale irrigation systems is supposed to take place remains unclear (TBS, 2021). Given the absence of ways to enforce such regulations, farmers cannot be forced to stop using such water for agricultural practices. Extension officers can only decide to stop offering services to areas that are known to experience problems related to water pollution (personal communication Z5, 1 February 2022; Y7, 12 April 2022).

Local authorities hold the power to decide which agricultural practices they provide support to (or not). In making these decisions, they render some areas institutionally invisible (no extension services to support them) while condoning its continuance (no enforcement against it). Both the existing regulations and their day-to-day enforcement create an ambiguity where urban agriculture is conditionally condoned: farmers are allowed to use space to contribute to the city's economy and food geography but with no support and uncertainty as to whether they can maintain this place in the future city.

Discussion

The preceding sections described the policy dynamics of urban agriculture (as found in city agriculture, apartment agriculture, and urban agriculture more generally) in Dar es Salaam. The policy arrangements approach has proven useful as a tool to understand how discourses work in interaction with actors, rules, and resources/power. With the growing dominance of a discourse around health and modernity as compared to the existing discourse that values agricultural and economic benefits, we show how a change in one dimension of the policy arrangement (i.e., the discourse) also influences other policy elements. Table 1 summarizes the different policy elements discussed in this paper.

Despite an antagonism between agriculture and the city, which originates from colonial ideas about what constitutes the 'urban', there is a continued space for agriculture in urbanizing landscapes to offer economic benefits and food by utilizing idle resources. Supplying food and jobs – something the state or the formal private sector cannot fully cater for – means that agriculture is embraced as an urban practice. However, as the city grows, this prominent discourse around agricultural and economic productivity is challenged by newly emerging discourses around health and modernity. Health issues related to irrigation with urban water are increasingly presented as a reason to enforce strict rules or remove agriculture, and agriculture is more and more regarded as an improper use of urban land. Farmers have limited control over the consequences of these changes and find themselves in a position where they are reactive to opportunities that arise within the city.

The introduction and support of new farming models (apartment agriculture) represent the materialization of urban ideals and seeks to integrate modern elements into existing agricultural practices. In this way, the existing ideas around agricultural realities (associated with traditional, untransformed ways of life) are reconfigured to fit modern

Table 1. Summary of policy elements found for both city agriculture and apartment agriculture.

	City agriculture Agriculture in urban open spaces that uses mixed urban water flows for irrigation. Contributes to the city-wide availability of leafy vegetables	Apartment agriculture Technology-based types of agriculture near people's houses that use piped water for irrigation. Contributes to the availability of vegetables on a local scale
Discourse	Emphasis on the contribution to food availability and employment	Emphasis on food safety and (technological) progress that exemplifies the modern city
Actors	Farmers in coalition with (mostly informal) actors in a city-wide food distribution network. Limited or no coalition with state actors	Farmers in coalition with actors in a small food distribution network. Coalition with local government authorities around the promotion of new farming models
Resources/ power	Farmers rely on the informal use of open spaces to build profitable networks of food provisioning. They have limited control over access to land and the quality of water and have limited power to defend their interests	Farmers have financial capital that enables securing land and investing in agricultural technologies. Knowledge exchange around these farming types takes place during trainings funded by the government and development partners
Rules	At the national level, there is the Urban Planning Act. On a local level, by-laws concerning urban agriculture are largely non-existent. This creates ambiguities and conditionalities around what is allowed	
	Land insecurity and issues of water quality pose risks of enforcement and/or removal. On the other hand, policy ambiguities create room for continuance so long as it is not regarded a nuisance	Security of access to land and clean water, combined with the characteristics of the agricultural practice, makes it regarded as aligning with the city's plans and regulations concerning urban agriculture

narratives of 'being urban' that embody ideas around efficiency, cleanliness, innovation, and entrepreneurship. However, most of these capital-intensive methods imply requirements (e.g., financial resources, legal land rights) that cannot be met by the far majority of people currently practising conventional urban agriculture in the city's open spaces (city agriculture). While apartment agriculture legitimizes the presence of agricultural support and (to some extent) urban agriculture more generally, it simultaneously strengthens the divide between what is transformed and untransformed; leaving the majority of farmers in Dar es Salaam in a delicate space.

Ambiguities concerning the planning and regulation of the use of land and water for agriculture in Dar es Salaam pose direct risks, but also offer opportunities for the continued presence of those who make a living as part of these informal economies. Farmers are exposed to urban land grabs, as well as the deterioration of their irrigation sources because they lack the ability to contest urban water pollution. Meanwhile, they provide for the city by informally utilizing urban land and (polluted) water. Where local authorities hold the power to decide which agricultural practices they provide support to (or not), they can render agricultural areas institutionally invisible (no extension services to support them) while condoning its continuance (no enforcement against it). In this day-to-day governance of urban space, we observe the interplay between top-down forces of control and bottom-up forces of city-making through which people shape the city according to their own demands and interests (Veldwisch et al., 2024; Wessels & Mgana, 2024).

Conclusions

This paper has shown a disconnection between planning ideals and the embodied reality of agriculture in Dar es Salaam. While authorities aim for modern technologies that legitimize the presence of agriculture in the city (*Kilimo cha Maghorofani*, i.e., 'apartment agriculture'), the majority of urban farmers rely on self-organized types of agriculture that are built on informal agreements over access to land and water (*Kilimo cha Mjini*, i.e., 'city agriculture'). Farmers have limited control over the dominant visions about agriculture in the city, but their presence is simultaneously legitimated through the contribution they make in providing food and incomes to the urban citizenry. This results in a state of laissez-faire, where agriculture is embraced as an urban practice so long as its presence and proximity are useful and not intrusive.

As the city grows, the presence of urban agriculture is increasingly challenged, both physically and ideologically. By studying policy dynamics using the policy arrangements approach, we showed how urban agriculture in Dar es Salaam is moving in two directions as a result: one that reflects an attractive model of agriculture that fits modern urban ideals ('apartment agriculture') and one that satisfies everyday demands for food and employment by making use of institutional ambiguities around the use of urban land and water ('city agriculture'). Although these two types of agriculture co-exist in the city, it simultaneously reinforces the divide between planning ideals and urban reality. Authorities promote ideas on progress and development that implicitly position the majority of the current agricultural practices 'outside' of the city's future. This not only applies to those urbanites who have found livelihood security through agriculture but also to other types of informal employment and informal living arrangements.

Based on the findings in this paper, we highlight two points of consideration that are relevant for researchers, planners, and policymakers when engaging with urban agriculture. First, initiatives that are 'making visible' or are 'giving voice to' the continued presence of urban farmers can help to secure the political and material interests of those that are often not considered in development planning. Mapping, quantifying, and describing urban agriculture strengthens the understanding of the sector's dynamics and its impact and, in this way, can support an informed dialogue about what role agriculture can play in light of urban sustainability. Second, we have shown the interplay of top-down (state-initiated) approaches of urban development and bottom-up forces of city-making through which people shape the city. As state and society have different capacities to develop urban space (including the services it requires), a collaborative approach to urban planning is recommended to strengthen the state–society engagement around city-making. A co-production process could be a useful approach here, where diverse types of expertise, knowledge, and actors collaboratively produce context-specific knowledge and pathways towards a sustainable future for the city.

Notes

1. One of the municipalities (Ilala Municipal Council) is nowadays referred to as Dar es Salaam City Council.
2. The names of all interviewees are coded to protect their identities.

Acknowledgements

This paper was written as part of the research project Crafting Effective Sociotechnical Configurations for Managing Water Reuse in Urban Agriculture in Dar es Salaam, Tanzania. We thank the authors of Mudau et al. (2020) for their support by sharing their Python script and Said Maneno for assisting with a spatial analysis of the growth of Dar es Salaam shown in Figure 2. We thank the reviewers and the editors for their valuable comments and suggestions.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the WASS-ESG Excellence Funds.

ORCID

Matthijs T. Wessels http://orcid.org/0000-0002-2376-720X
Gert Jan Veldwisch http://orcid.org/0000-0002-8123-281X
Bas J.M. van Vliet http://orcid.org/0000-0002-7065-0733
Alphonce G. Kyessi http://orcid.org/0000-0002-7058-5070
Shaaban M. Mgana http://orcid.org/0000-0002-9951-2801

References

Angel, S., Blei, A. M., Parent, J., Lamson-Hall, P., Sánchez, N. G., Civco, D. L., Lei, R. Q., & Thom, K. (2016). *Atlas of urban expansion - 2016 edition. Volume 1: Areas and densities*. New York University, UN-Habitat & Lincoln Institute of Land Policy.

Arce, A., & Long, N. (2003). Reconfiguring modernity and development from an anthropological perspective. In A. Arce & N. Long (Eds.), *Anthropology, development and modernities: Exploring discourses, counter-tendencies and violence* (pp. 1–30). Routledge.

Armstrong, A. (1986). Colonial and neocolonial urban planning: Three generations of master plans for Dar es Salaam. *Journal of the Faculty of Arts and Social Sciences*, *8*(1), 43–66.

Arts, B., & Leroy, P. (2006). *Institutional dynamics in environmental governance*. Springer.

Basile, P. (2022). Community self-governance in São Paulo's informal settlements through the PAA framework. *Urban Research & Practice*, 1–22. https://doi.org/10.1080/17535069.2022.2056421

Battersby, J. (2013). Hungry cities: A critical review of urban food security research in Sub-Saharan African cities. *Geography Compass*, *7*(7), 452–463. https://doi.org/10.1111/gec3.12053

Brennan, J. R., Burton, A., & Lawi, Y. Q. (2007). *Dar es Salaam: Histories from an emerging African metropolis*. Mkuki na Nyota Publishers.

Briggs, J., & Mwamfupe, D. (2000). Peri-urban development in an era of structural adjustment in Africa: The city of *Dar es Salaam, Tanzania*. *Urban Studies*, *37*(4), 797–809. https://doi.org/10.1080/00420980050004026

Brownell, E. (2016). Growing hungry: The politics of food distribution and the shifting boundaries between urban and rural in Dar es Salaam. *Global Environment*, *9*(1), 58–81. https://doi.org/10.3197/ge.2016.090104

Contesse, M., van Vliet, B. J. M., & Lenhart, J. (2018). Is urban agriculture urban green space? A comparison of policy arrangements for urban green space and urban agriculture in Santiago de Chile. *Land Use Policy*, *71*, 566–577. https://doi.org/10.1016/j.landusepol.2017.11.006

Drechsel, P., & Dongus, S. (2010). Dynamics and sustainability of urban agriculture: Examples from sub-Saharan Africa. *Sustainability Science*, *5*(1), 69–78. https://doi.org/10.1007/s11625-009-0097-x

Foeken, D., Sofer, M., & Mlozi, M. (2004). *Urban agriculture in Tanzania: Issues of sustainability*. African Studies Centre.

Follmann, A., Willkomm, M., & Dannenberg, P. (2021). As the city grows, what do farmers do? A systematic review of urban and peri-urban agriculture under rapid urban growth across the Global South. *Landscape and Urban Planning*, *215*, 1–12. https://doi.org/10.1016/j.landurbplan.2021.104186

Halloran, A., & Magid, J. (2013a). Planning the unplanned: Incorporating agriculture as an urban land use into the Dar es Salaam master plan and beyond. *Environment and Urbanization*, *25*(2), 541–558. https://doi.org/10.1177/0956247813500903

Halloran, A., & Magid, J. (2013b). The role of local government in promoting sustainable urban agriculture in Dar es Salaam and *Copenhagen*. *Geografisk Tidsskrift*, *113*(2), 121–132.

Hyden, G. (1980). *Beyond Ujamaa in Tanzania. Underdevelopment and an uncaptured peasantry*. University of California Press.

IMC, KMC, TMC, SCINAP, & DCC. (2012). *Dar es Salaam city wide strategic plan on urban agriculture*. Ilala Municipal Council, Kinondoni Municipal Council, Temeke Municipal Council, Sustainable Cities International Network Africa Program, & Dar es Salaam City Council.

Jacobi, P., Amend, J., & Kiango, S. (2000). Urban agriculture in Dar es Salaam: Providing an indispensable part of the diet. In N. Bakker, M. Dubbeling, S. Guendel, U. Sabel-Koschella, & H. de Zeeuw (Eds.), *Growing cities, growing food: Urban agriculture on the policy agenda* (pp. 257–283). Deutsche Stiftung für Internationale Entwicklung.

Kiango, S., & Likoko, T. (1996). *Vegetable production on open spaces in Dar es Salaam city*. Urban Vegetable Promotion Project.

Kyessi, A. G. (1998). City expansion and urban agriculture in Dar es Salaam: Lessons for planning. *Journal of Building and Land Development*, *5*(2), 9–17.

Langemeyer, J., Madrid-Lopez, C., Mendoza Beltran, A., & Villalba Mendez, G. (2021). Urban agriculture — A necessary pathway towards urban resilience and global sustainability? *Landscape and Urban Planning*, *210*, 1–8. https://doi.org/10.1016/j.landurbplan.2021.104055

Liefferink, D. (2006). The dynamics of policy arrangements: Turning round the tetrahedron. In B. Arts & P. Leroy (Eds.), *Institutional dynamics in environmental governance* (pp. 45–68). Springer.

Magigi, W. (2008). *Improving urban land governance with emphasis on integrating agriculture based livelihoods in spatial land use planning practise in Tanzania* [Doctoral dissertation, University of Freiburg]. Freidok. https://freidok.uni-freiburg.de/data/5311

Majale-Liyala, C. (2013). Policy arrangement for waste management in East Africa's urban centres. In S. Silvern & S. Young (Eds.), *Environmental change and sustainability* (pp. 215–231). IntechOpen.

McLees, L. (2011). Access to land for urban farming in Dar es Salaam, *Tanzania*: Histories, benefits and insecure tenure. *The Journal of Modern African Studies*, *49*(4), 601–624. https://doi.org/10.1017/S0022278X11000498

McLees, L. (2012). *Understanding the urban: The role of open space agriculture in Dar es Salaam, Tanzania* [Doctoral dissertation, University of Oregon]. University of Oregon Scholar's Bank. https://scholarsbank.uoregon.edu/xmlui/handle/1794/12364

Mkwela, H. S. (2013). Urban agriculture in Dar es Salaam: A dream or reality. *WIT Transactions on Ecology and the Environment*, *173*, 161–172. https://doi.org/10.2495/SDP130141

Mkwela, H. S. (2016). *Land injustices – Tracing the impact of land development projects on farmers' land justice in Dar es Salaam, Tanzania* [Doctoral dissertation]. Norwegian University of Science and Technology.

Mlozi, M. R. S. (1995). *Information and the problems of urban agriculture in Tanzania: intentions and realizations* [Doctoral Dissertation]. University of British Columbia.

Mlozi, M. R. S., Lupala, A., Chenyambuga, S. W., Liwenga, E., & Msogoya, T. (2014). *Building urban resilience: Assessing urban and peri-urban agriculture in Dar es Salaam, Tanzania*. United Nations Environment Programme.

Moshi, I., Msuya, I. R., & Todd, G. (2018). *Tanzania: National urban policies and city profiles for Dar es Salaam and Ifakara*. Ifakara Health Institute.

Mougeot, L. J. A. (2000). Urban agriculture: Definition, presence, potentials and risks, and policy challenges. In N. Bakker, M. Dubbeling, S. Guendel, U. Sabel-Koschella, & H. de Zeeuw (Eds.), *Growing cities, growing food: Urban agriculture on the policy agenda* (pp. 1–42). Deutsche Stiftung für Internationale Entwicklung.

Msangi, D. E. (2011). *Land acquisition for urban expansion: process and impacts on livelihoods of peri urban households, Dar es Salaam, Tanzania* [Licentiate Thesis, Swedish University of Agricultural Sciences].SLU publication database. https://pub.epsilon.slu.se/8537/1/Msangi_d_120126.pdf

Mudau, N., Mwaniki, D., Tsoeleng, L., Mashalane, M., Beguy, D., & Ndugwa, R. (2020). Assessment of SDG indicator 11.3.1 and urban growth trends of major and small cities in South Africa. *Sustainability*, *12*(17), 1–18. https://doi.org/10.3390/su12177063

Mwegoha, W. J. S., & Kihampa, C. (2010). Heavy metal contamination in agricultural soils and water in Dar es Salaam city, *Tanzania*. *African Journal of Environmental Science and Technology*, *4*(11), 763–769.

NBST. (2022). *Sensa ya watu na makazi ya mwaka 2022: Matokeo ya mwanzo*. National Bureau of Statistics Tanzania.

Neergaard, A. D., Drescher, A. W., & Kouamé, C. (2009). Urban and peri-urban agriculture in African cities. In C. M. Shackleton, M. W. Pasquini, & A. W. Drescher (Eds.), *African indigenous vegetables in urban agriculture* (pp. 35–64). Earthscan.

Nyanda, S. S., & Mahonge, C. P. (2021). Institutional framework in relation to the use of low-quality water for food crops irrigation in Tanzania. *Sustainable Water Resources Management*, *7*(3), 1–13. https://doi.org/10.1007/s40899-021-00511-1

Orsini, F., Kahane, R., Nono-Womdim, R., & Gianquinto, G. (2013). Urban agriculture in the developing world: A review. *Agronomy for Sustainable Development*, *33*(4), 695–720. https://doi.org/10.1007/s13593-013-0143-z

Owens, G. R. (2010). Post-colonial migration: Virtual culture, urban farming and new peri-urban growth in Dar es Salaam, *Tanzania*, 1975-2000. *Africa*, *80*(2), 249–274.

Parnell, S., & Pieterse, E. (2014). *Africa's urban revolution*. Zed Books.

Pieterse, E. (2008). *City futures: Confronting the crisis of urban development*. Zed Books.

Robinson, J. (2002). Global and world cities: A view from off the map. *International Journal of Urban and Regional Research*, *26*(3), 531–554. https://doi.org/10.1111/1468-2427.00397

Sawio, C. J. (1994). Who are the farmers of Dar es Salaam? In A. G. Egziabher, D. Lee-Smith, D. G. Maxwell, P. A. Memon, L. J. A. Mougeot, & C. J. Sawio (Eds.), *Cities feeding people: An examination of urban agriculture in East Africa* (pp. 23–44). International Development Research Centre.

Schmidt, S. (2012). Getting the policy right: Urban agriculture in Dar es Salaam, *Tanzania*. *International Development Planning Review*, *34*(2), 129–145. https://doi.org/10.3828/idpr.2012.9

SCINAP. (2012). *Summary report on the sustainable cities international network – Africa program peer exchange 2012*. Sustainable Cities International Network Africa Program.

Smit, W. (2016). Urban governance and urban food systems in Africa: Examining the linkages. *Cities*, *58*, 80–86. https://doi.org/10.1016/j.cities.2016.05.001

Sylvester, D. (2018, February 21). Dar's river pollution threatens millions. *Daily News*. https://dailynews.co.tz/news/dar-s-river-pollution-threatens-millio.aspx#

Tapia, C., Randall, L., Wang, S., & Aguiar Borges, L. (2021). Monitoring the contribution of urban agriculture to urban sustainability: An indicator-based framework. *Sustainable Cities and Society*, *74*, 1–11. https://doi.org/10.1016/j.scs.2021.103130

Tatenhove, J., Arts, B., & Leroy, P. (2000). *Political modernisation and the environment. The renewal of environmental policy arrangements*. Springer.
TBS. (2021). *Municipal and industrial wastewaters — General tolerance limits for use of treated wastewater in irrigation (TZS 3037:2021)*. Tanzania Bureau of Standards.
UN. (2018). *World urbanization prospects. The 2018 revision*. United Nations.
URT. (2000). *National human settlements development policy*. The United Republic of Tanzania.
URT. (2002). *National water policy*. The United Republic of Tanzania.
URT. (2004). *The environmental management act*. The United Republic of Tanzania.
URT. (2009). *The water resources management act*. The United Republic of Tanzania.
URT. (2013). *National agriculture policy*. The United Republic of Tanzania.
URT. (2017). *National land policy (draft)*. The United Republic of Tanzania.
URT. (2018). *The urban planning regulations. Urban farming*. The United Republic of Tanzania.
URT. (2020a). *Dar es Salaam master plan 2016-2036*. The United Republic of Tanzania.
URT. (2020b). *The 2019 Dar es Salaam informal sector survey analytical report*. The United Republic of Tanzania.
URT. (2022). *Water sector development programme III (draft)*. The United Republic of Tanzania.
Veldwisch, G. J., Amerasinghe, P., Letema, S., & Wessels, M. T. (2024). The practices and politics of irrigated urban agriculture. *Water International*, *49*(2), 129–143. https://doi.org/10.1080/02508060.2024.2325800
Wesselow, M., Kifunda, C., Auerbach, R., & Siebenhüner, B. (2020). Urban agriculture: Challenges and opportunities in urban water management and planning. In R. Auerbach (Ed.), *Organic food systems: Meeting the needs of Southern Africa* (pp. 327–336). CABI.
Wessels, M. T. (2023). What's in a name? Politicising wastewater reuse in irrigated agriculture. *Water Alternatives*, *16*(2), 563–580.
Wessels, M. T., & Mgana, S. M. (2024). Persist or perish. The dynamics of irrigated agriculture in urbanising dar es salaam, Tanzania. *Urban Forum*. https://doi.org/10.1007/s12132-024-09511-8