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# The Symbiotic Food System: An ‘Alternative’ Agri-Food System Already Working at Scale

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Academic Editors: Giaime Berti, Moya Kneafsey, Larry Lev, Irene Monasterolo and Sergio Schneider

Received: 7 June 2016; Accepted: 16 August 2016; Published: 24 August 2016

**Abstract:** This article is an analysis of the agri-food system that feeds most of the over four million residents of the fast growing city of Dar es Salaam in Tanzania. It is based on qualitative research that has traced the sources of some important foods from urban eaters back through retailers, processors and transporters to the primary producers. Particular attention is given to the functioning of the market places and how new actors enter into the food system. These reveal that more important to the system than competition are various forms of collaboration. Of particular interest is how a wide range of small-scale and interdependent actors produce the food and get it to urban eaters at a city feeding scale without large vertically- or horizontally-integrated corporate structures. This “symbiotic food system” is an existing alternative to the corporate-dominated agri-business food system; it can and does deliver at scale and in a way that better responds to the needs of people in poverty who are buying food and the interests of food producers. It is not perfect in Dar es Salaam, but the food system is working and is a model that should be built on.

**Keywords:** food; food system; symbiotic food system; markets; agriculture; cultural repertoires; ethnography; Tanzania

## 1. Introduction

This article is an analysis of a food system that feeds most of the residents of the fast growing city of Dar es Salaam in Tanzania. Dar es Salaam is the ninth fastest growing urban center in the world, with a population of around 4.6 million today, up from less than 2.5 million in 2002 [1,2]. The city is typical in many ways of the urban centers of the developing world where almost all new population growth is going [3]. Sustainably feeding such cities, where many of the residents live precarious lives in poverty, is a growing challenge that any food system will have to meet [4,5].

Tanzania produces most of the food, especially basic foods, that it needs, and most of this production is done by small farmers in the six million households that are engaged in agricultural production with an average of just 1.3 hectares of land each [6]. Total production has been rising over the years, but low productivity and lack of access to land and inputs are constraints [6]. There is some importation of rice and maize into Tanzania, but also some exporting to neighboring countries. More significant amounts of wheat, soy and cooking oil, as well as other processed foods are imported [7]. Meat, eggs and green vegetables, which are looked at in this article, are almost all produced within the country. Food is available for those who can buy it, and indicators for levels of hunger have improved

steadily for the last ten years; however, despite improvements, chronic undernutrition continues; for example, stunting in children under five was 32% in 2015, with the rates highest in rural areas [8–10].

The Methodology section of this article explains how data were collected and analyzed. The Results section, “The Food System in Action” and “Getting Started”, gives an overview of how the food system including food markets provides food for the city. Markets are an essential part of this process and illustrate most clearly the symbiotic nature of relations that are the social infrastructure holding the system together in a way that is markedly different from the corporate agri-business system. How people enter into different parts of the food system is explored as a critical issue for the reproduction, therefore sustainability of the system. This also reveals much about the way actors collaborate and grow the system in a relatively inclusive way.

The Analysis section, “Interpreting the Dynamics”, draws on the preceding sections and existing literature and theories to highlight the main findings and to explore the nature of the food system and how and why it works. If we wish to fully understand food systems and markets in places like Dar as Salaam, we need to go beyond a neo-classical economic perspective, which lays emphasis on so-called mature or perfect markets. Such a perspective identifies the markets that are subject to analysis in this article as imperfect and as markets that will disappear in the long run. In contrast to starting a priori with such a linear view of development, we rather take on the task of looking at what exists and trying to understand its logic. In doing so, we need to explore the diverse sets of social and cultural norms and relations along with the economic relations involved in shaping these markets and the nature of transactions taking place when food is procured, sold and eaten [11]. In doing so, we build on the so-called formalist-substantivist debate of the 1980s [12–14].

The use of the term ‘system’ in relation to the food system is not used in the sense of a systems perspective emphasizing cause and effect relations in linear ways. It is simply used to mean a combination of related parts organized into a whole. We are also not assuming or arguing that it is purposively organized by any people or institutions. Neither are we referring to the predominant characterization ‘informal’ since there is not the assumed hierarchy to which the use of such a term often implies [15,16]. As Hart who first coined the term “informal economy” has asked, “is the informal economy in fact a term for the unregulated markets that spring up under conditions of rapid urbanization? If so, we need to understand better what are the positive principles organizing these markets.” [17] (p. 152).

Like Granovetter [14] and others [18,19], we have identified that economic and market relations are embedded within social relations. It is clear we need to look beyond the neo-classical economics model with its assumptions of rational economic actors and rather try to understand the functioning of “bundles of conventions that have emerged as pragmatic solutions to economic problems and have become reified as normal.” [18] (p. 458). As the food system is not a corporate dominated system, we address what it is that holds it together. Despite the ubiquitous nature of such food systems, there has been little such research and theorization on how they work.

We do not engage here with all the varied theories that sociologists and others have developed in trying to understand the functioning of economic systems and markets. We focus on applying Ostrom’s ideas of “common pool resources” (CPR) management to help understand the way actors who are competitors in the system collaborate together [20] and also look for explanation in the recently developing concept of “nested markets” that attempts to explain why and how certain new market relations are functioning and contributing to rural development in different parts of the world [21,22].

Ostrom drew on extensive empirical experiences to show that people, even with competing interests in the same finite resources, can manage them effectively and sustainably and do so, through their own organization and polycentric governance, often more effectively than market forces or imposed efforts at control and conservation [20,23].

A series of conferences and papers have since 2011 been exploring how rural development is happening through the creation of “new markets which have ‘structurally’ different characteristics than ‘mainstream’ markets.” [24]. These “nested markets” are seen as a response to mainstream market

failures, globalization and the hegemony being exerted by food empires [21,22]. They have evolved out of the development of new combinations of activities and products on farms that have led farmers to seek new ways of cooperating and linking with consumers to improve their incomes [21].

Thus, in this article, we are looking at the range and nature of relations between actors—competitors and collaborators, food producers and consumers and how they are linked—that make the food system work. In doing so, we find that a core ordering principle is that of symbiosis, the mutually beneficial actions of interdependent actors that underpin what we refer to as a “symbiotic food system” (SFS).

In the Analysis and Conclusion, we reiterate that this SFS is in many ways extremely “distributed, interconnected and democratic” and as such has much offer to our thinking, policy and practice on rural development and sustainable agri-food systems that can connect the countryside, ecosystems and the city in more equitable ways.

## 2. Methodology

Intrinsic to our interpretative framework has been a field methodology of following the food [25,26]. By following the food, we are able to follow the human and non-human actors that come to play a key role in moving food from sites of production to consumption. This resembles following the actant and actors as described by Latour [27]. During the research, a range of foods that are the main sources of protein and vitamins in Dar es Salaam have been identified and followed from the sites of consumption to the sites of processing and production. These foods include maize, rice, eggs, milk, green vegetables and meat. In this article, for the sake of brevity, we share more from the findings on maize, green vegetables and meat, while for the analysis, we also draw on findings from other foods, to give the reader a sense of the symbiotic nature of this evolving food system in Tanzania. This is a system that is a concrete assemblage of traders, eaters, food and market regulations, but also of food products, abattoirs, markets, market stalls, trucks and roads (cf. Delanda [28]). We treat markets as being enacted by human and non-human actors whereby markets stand for both space and place, as well as processes of interaction and exchange between actors in the food system [29,30].

A qualitative ethnographic approach was deemed most suitable for understanding and describing how the food system works [31]. The field research was carried out by the first author from November 2011 to the end of July 2015 and combined observation, accompaniment and semi-structured and informal interviews and conversations with social actors involved in food supplies, as well as a range of eaters in Dar es Salaam [32]. We use the term “eaters” because our research takes an interest in people and how and what they eat. We attempt to view their situations without falling into conceptual categories, such as “consumer” and “household”, which run into definitional and practical challenges in Dar es Salaam [33].

The main researcher lived in the primary research site, Dar es Salaam, immersed in, using and observing the food system daily for seven years. Living in the area, he could take advantage of being to some extent part of the culture and extensive opportunities for observation and interaction with the social actors involved [34].

In-depth information has been gathered from 172 respondents from different parts of the food system. All respondents were interviewed; many of them were accompanied in their work and some engaged with through repeat visits over the years. Accompaniment of people combined with observation has been invaluable and involved going into fields, spending time at markets, traveling with transporters and, of course, eating with people. Along the way, numerous informative conversations were held with additional people in the food system in conditions, such as busy markets, where in depth interviews were not feasible.

## 3. The Food System in Action

The intention of this section is to: (1) describe the food system feeding Dar es Salaam and how in many ways it is effective in responding to the food needs of the majority of urban residents, as well as providing markets for producers and economic opportunities for a large number of people;

(2) provide information that shows the overlaps and differences with the concepts of “nested markets” and “common pool resources” management; and (3) reveal the symbiotic character of the relations between a wide range of actors that we argue underpins the functioning of the food system.

This overview of parts of the food system uses vignettes of the social actors involved to reveal how the system works and descriptions of markets that are important nodes of the system where the social and economic relations are more easily seen.

### 3.1. Maize

It is 6.30 p.m. Mama Lina leans over two charcoal stoves in the yard surrounded by small low zinc roofed rooms that she, her husband and extended family members live in. On one stove, a pot of water is waiting for sembe (maize meal) in order to cook ugali (maize porridge), the staple dish for this and many other meals across Tanzania. Mama Lina’s husband and son get a modest and inconsistent income from odd bits of work as dalalis (agents), finding people rooms or houses to rent and selling charcoal [35].

Mama Lina waits for her husband to come home with sembe or the money to buy sembe, but after a while, she gives up and sends one of her sons to the duka (small shop). It is less than 50 meters away and owned by the shopkeeper who knows her whole family. He returns a few minutes later with 1 kg of Enjo sembe obtained on interest free credit. All of the sembe is immediately cooked for whomever from among the extended family and friends may pass by to eat. If Mama Lina’s son had walked another 200 meters, he would have found a duka selling Chapa Asili sembe and been able to buy 1 kg for the same price as the Enjo and also on credit, as he and his family are well known to that slightly more distant shop, as well.

They could also have got sembe from a supermarket, but they never do. Supermarkets are more expensive than local shops for staple foods like sembe and they only sell packages of fixed quantities with their more affordable prices (still higher than the duka) only available if one buys larger quantities. Getting to the supermarket also requires transport for the majority of eaters and they certainly do not sell on credit. A senior manager with Shoprite Supermarkets in Dar es Salaam confirmed, when interviewed, that they serve a minority. He explained that they were competing for the 20% of the food market that he referred to as ‘formal’. This was before Shoprite pulled out of Tanzania in 2014.

Mama Lina could, if she had time, have gotten sembe for a slightly lower price from shops specializing in selling grains. Her son could even have walked to a maize mill where she takes maize to grind when her husband or another relative brings it from the village.

Mama Lina buys food in a similar way to millions of others in Dar es Salaam who, like her, live in a difficult physical environment and depend on an uncertain and low income [36]. For her, food accessibility is essential and involves: low prices; flexibility of quantities; proximity to place of residence; long opening hours of shops; and availability of credit when needed. The challenge in obtaining food in Dar es Salaam is not the absence of food, it is having the means to acquire the food; thus, for a food system to help address hunger, it needs to maximize income-earning opportunities, not just supply food. The food system that delivers most food to Dar es Salaam and that this study is focused on responds well to the needs and circumstances in which Mama Lina and the majority of eaters in the city find themselves. The corporate food system of which the supermarkets are a key part does not.

The sembe Mama Lina cooked is a brand called Enjo that was started by two sisters and their brother. They mill maize, package and distribute to wholesalers and direct to some dukas. They pay to mill with a machine used by eight other sembe traders, mostly women, although the machine owner is a local business man. This is one of thousands of such mills across Dar es Salaam. Enjo buys maize from several agents and traders, most of it coming from the Morogoro and Dodoma Regions. Enjo hires a small truck to distribute the ground and packed sembe to their clients.

The company, Chapa Asili, that sells maize to the duka slightly further away from Mama Lina, have their own mill used only for their sembe. They also have a three-ton truck used for distributing

to wholesalers, but it is still a family business run by a husband and wife with 11 staff. If they need maize, they call Maureen, or another of the three traders they normally buy from, and she can have a truck load of maize in Dar es Salaam the following day. They mill enough maize to be able to buy a 30-ton truck load themselves.

Often when Enjo buy maize, they share a truck load with other sembe traders, as they cannot fill a truck themselves, even the smaller ten-ton trucks they frequently use. This cooperation is with other traders that the Enjo sisters are often sitting chatting with on a low wall in the shade of a tree outside the mill. The arrangements are made verbally and the transactions concluded with cash payments or, in some cases, where the seller is far away, a bank or cellphone-based cash transfer.

In the Kinondoni District of Dar es Salaam, the Tanzania Revenue Authorities have registered 792 grain millers (information supplied by Tanzania Revenue Authority office in Kinondoni). They estimate that there are a similar number in the other two districts of Dar es Salaam, so over 2000 millers in the city, many of whom serve a number of different sembe suppliers, like the eight that use one mill along with Enjo. There are some concentrations of mills, such as around Manzese, but they are also scattered across the city. We can see with this example the broad-based nature of the food processing with numerous actors and the creation of many economic and ownership opportunities.

Over 300 km from Dar es Salaam in the village of Zombo, in Morogoro Region, Daniel in his early thirties and his wife, assisted at times by casual laborers, work six acres of land. Four acres, just over 1.6 hectares, were requested from and allocated by the village. This is just a little more than the average of 1.3 hectares of land that farming households have in Tanzania [6,37]. Maize is the dominant staple crop in Tanzania and it is grown “almost exclusively by small-scale farmers” [7] (p. 32).

Daniel rents the other two acres from other land owners in the village. In 2014, the rain was not good, but Daniel got 20 sacks (approximately 126 kg each) of maize. This 2.5 tons of maize harvested amounted to a yield of 1.5 tons per hectare, which is in line with the average yields in the region and country. Daniel is not the largest or smallest maize farmer in Zombo. In terms of yield and land size, he is fairly typical of maize farmers in Tanzania and was certainly typical of other farmers in Zombo who were found to be selling maize to Dar es Salaam. He also grew rice and sesame, most of that on the rented land, which was in the valley with better water. Daniel sold 12 sacks of maize for cash to a trader who came to the village from Dar es Salaam. Many other farmers in Zombo and other villages sell in the same way. The trader comes to the village and finds a local person, normally a farmer themselves, to act as a dalali (agent), who goes around the village identifying and collecting maize that farmers have to sell (Figure 1). When enough is collected, the trader comes back to get it.



**Figure 1.** Trader buying half a sack of maize from a woman farmer in Kiteto District.

Another important cash crop in Zombo is sesame. Interestingly, Daniel and other farmers who grow sesame organize together to jointly hire a truck when they have enough sesame, and they go themselves to Dar es Salaam to sell it. They are aware of the possibility to sell directly in the city and have done so. Daniel has used his trips to Dar es Salaam to also check the maize markets. At the end of the day, these farmers are making an informed decision to sell to the maize traders who come to the village, rather than selling more directly.

In the village of Kitaita, Ezekial grows maize alongside beans and livestock keeping on 20 acres of land (much drier land than in Zombo). Ten acres were allocated by the village council in 2000; the other ten he bought from someone else in 2006 as the village had no land left to allocate. In 2015, he harvested 26 sacks of maize and sold 16 sacks for cash to a trader who collected it from his house. This trader is from Kitaita and also farms for himself mostly on rented land. He buys from the farmers in the area until he can fill a truck and then sends it on the 360-km journey to Dar es Salaam. In 2015, he was sending an 18-ton load direct to Dar es Salaam about once every three weeks. This size truck is a pragmatic compromise. Smaller trucks are less viable in terms of the costs of transport per ton, but the larger semi (articulated truck trailer combination capable of carrying between 30 and 33 tons) would not get down the bad road to the village and would also cost the trader too much to fill. This trader used to collect maize and sell it at the market in Kibaigwa, about 70 km away; now with the capital to buy more and the contacts in Dar es Salaam, he sends it directly.

Further away, Godfrey farms maize on 20 acres of land in Kiteto District. On the day we first met him, he had travelled all night on a tractor to deliver 6.6 tons of maize to Kibaigwa market in the Kongwa District of the Dodoma Region. Almost a ton belonged to a woman farmer in the same village and the rest was Godfrey's. The tractor also carried sacks of sunflower seeds that three farmers were selling in Kibaigwa and a plough that needed to be repaired. It did not take Godfrey long to find a buyer and sell the maize.

Mama Jane sits under a tree with several other women in Kibaigwa market (Figure 2) buying maize in amounts from 20 kg up to several tons. Farmers and small local traders come with sacks on bicycles, in push carts and in ox carts. On a busy day, Mama Jane buys from up to 150 different sellers. She arranges to pack the maize into standard sacks, and when business is good, she sends two 30-ton truck loads a week on the 340-km journey to Dar es Salaam. There are a number of other buyers of maize in the same part of the market as Mama Jane, all of whom are buying the smaller quantities, which are being weighed on a manual scale operated by the market. The people bringing the few sacks at a time of maize to the market are farmers themselves and local small traders. The traders, like Mama Jane, play a key role in aggregating the small amounts to make up larger quantities that can be sold to Dar es Salaam or to other traders who are aggregating at a larger scale. There are frequent collaborations between these small traders, such as when one trader has an order to fill urgently and she or he gets maize from other small traders to fill the truck and make the delivery. The next day, it may be another trader who needs assistance to meet a large order.

Maureen, who is a regular supplier to Chapa Asili (mentioned above), sits chatting with other traders on a bench near the gate through which maize arrives. She is wearing a red sun hat, sun glasses and a scarf covering her mouth and nose to keep out maize dust. There are approximately 50 such traders who are regular buyers at the Kibaigwa market. These traders do not buy from the very small sellers Mama Jane does; instead, they buy from the bigger sellers, like Godfrey, who come with a few tons of maize, mostly with tractors or Fuso trucks. These get weighed on the computerized weigh-bridge. A trader like Maureen still needs to buy from several sellers to fill orders and trucks. Sometimes, if they need to make up a load, they will buy from other traders, and often, they share a truck to get their respective loads to Dar es Salaam. These traders spend many days sitting together and chatting and often have lunch together; some meet up for drinks or dinner later in the many eating places around Kibaigwa. They are also competitors; they are all trying to buy maize; they all need to find buyers, and most of those buyers are in Dar es Salaam. As one of the traders put it: "we

are competitors and friends, we apologize when beating someone in a business deal and also help each other.”



**Figure 2.** Maize traders at Kibaigwa market.

Involved with many of the transactions are the dalalis. These differ from the traders in that they are not buying with their money; they are instead bringing buyers and sellers together and then getting a commission, paid by the seller, for setting up the deal. When farmers were asked why they do not go straight to the traders, they said they knew the dalalis, and they did not know or trust the buyers; they felt that they could be cheated by the buyers. Others involved agreed with this; the market manager said “the farmers are used to/familiar with the agents more than with the traders”. Some of the farmers phoned dalalis they already knew before coming to the market, and some found the dalali at the market. The traders also rely on the dalalis to find sellers; while Maureen and her fellow traders sit on the bench, the dalalis are more often walking along the line of trucks and tractors checking the maize available and finding farmers who want to sell. The dalalis work all the time at the market and have time to get to know people; the traders come only when they need to buy, and they go to other markets, as well.

When Mama Jane, Maureen or another trader needs transport, they call a transport dalali (agent) working around the market. He (they are all men) finds and arranges trucks from many different companies (Figure 3). Sometimes traders share trucks; the transport dalalis arrange with a few traders and the truck driver until the truck is full. The trucks that do this work are all going back to Dar es Salaam after dropping loads further along the same road. Most are coming from Rwanda and Burundi and some from Dodoma. If they did not have the maize to carry, they would go back empty to the suppliers and, most importantly, the harbor in Dar es Salaam to pick up another load to carry inland. There are a few big truck companies, but many are quite small. One that the researcher traveled with from Kibaigwa turned out to be owned by a business man from Kibaigwa who had four trucks.

There are many different actors in and around the market. There are dozens of traders and agents working there. There are also food sellers, women picking maize fallen from trucks to take home for their children, casual laborers packing sacks and unloading trucks. Some specialize in tying the loads and the tarpaulins onto the trucks. Very important are the “cargo porters” who load the trucks. Their association of 200 members also arranges security, replaces any stock lost and covers healthcare and some education costs for the members and their families. There are the management and 20 staff employed by the market, which include accountants, people gathering statistics and the gate, weigh-bridge and scale operators.



**Figure 3.** Trucks being loaded with maize at Kibaigwa market.

Almost all of the people working in the market work for themselves, apart from the staff employed by the market itself. The cargo porters cooperate in an association, but each one is independent; they work for themselves using their asset of association membership to assist with their livelihoods that often involve other activities, as well; for example, many of them farm, and some also trade. Most of the traders have some kind of assistant; these assistants are not exclusively tied to work with that trader and invariably aspire to be traders themselves. The traders spoken to said they were training their assistants, showing them how the business works; they are conscious and supportive of the assistant getting into business themselves. Many of the traders started out as assistants to others.

The market contributes substantially to the local economy. Across the village, or now small town, of Kibaigwa there are businesses that serve the users of the market. There are guest houses used by traders and transporters, restaurants and bars, stationery shops and clothes shops that benefit from the flow of people and money going through the market. The market also collects taxes on behalf of the governments and is one of the largest contributors of revenue to the Kongwa District Municipality that is heavily dependent on tax paid for agricultural produce.

There are many other informal associations and collaborations, including the groups of traders who tend to stay together, the laboring groups who unload the trucks coming in and the ones who fill sacks and sew them closed. There are also more formalized organizations including the: Cargo Porters' Association; the Dalali Association; and the market itself with a Board of Directors and staff.

The Board of the market is made up of three representatives identified by the national farmers' union, MVIWATA (Mtandao wa Vikundi vya Wakulima Tanzania—National Network of Farmers' Groups in Tanzania), and two from the Kongwa District Municipality. The three from the farmers' union are made up of a farmers' representative, a trader representative and a representative of the cargo porters. There have been tensions between the Board and the management of the market and complaints from various quarters, including criticisms that the District takes too much tax and provides few if any services, as well as that the farmer representative is not interested in the small farmers and is not from the area.

### *3.2. Mikoroshoni: People's Market and Green Vegetables*

The Mikoroshoni market is situated in the middle of a densely-populated *uswahilini* (informal settlement) area. The location of the market makes it accessible to the many people living in the surrounding areas who can walk to the market and often walk past the market on the way to and from places of work or trade. The market is also fairly close, within a few minutes' drive, of some wealthy suburbs; however, the roads to get to it are narrow and in poor condition.

The Mikoroshoni market started operating in 1978 as an initiative of 50 traders. They asked for land from a farmer and cleared the land to build the market. They pooled their money, collected different building materials and worked together to build the first structures. Now, they are one of 24 markets registered with the Kinondoni Municipality who record the market as having 90 members out of a total of 4900 members across all of the registered markets. This includes the shopkeepers and the market stall holders, but not the other family members, workers and casual laborers who assist. The current main structure was built in 2003. The only help from the government was the provision of 700 sheets of zinc out of a total of 1600 used for the rooves of the market. The rest of the materials and labor were arranged by the market members.

The different products being sold at the market are: fresh fish, dried fish, dagaa (small dried fish), fruit, vegetables, beef, goats, live chickens, slaughtered chickens, live local chickens, cooked food and household goods, like cooking equipment. The market is deliberately arranged with different areas for the different types of products being sold. At the back of the main market area are several dozen demarcated spaces, with rough benches and tables where women cook and serve food; many of their customers are others working in and around the market.

On one side of the main market building are two rows of small butchers' shops, each a few meters wide with large chopping boards and meat hanging on hooks in the windows. On the other side of the butchers is another roof with an open space under it and tables where in one section there are chickens and in another section fish. At the back of the rooved area is a space where the slaughtering is done, and a wood fire is always burning to heat a drum of water used for the removal of feathers and the cleaning of the chickens.

There are a range of suppliers and service providers, some of these fellow members of the markets, others from outside, who serve the traders in the market in ways that respond well to their particular circumstances. There are: the women who serve fresh milk, tea and food to their fellow traders; sellers of soaps and other household products; the men who carry and deliver the stock, etc. All of these provide services on credit and normally receive payment later the same day. In this they follow the cycle of the market and accommodate the low level of capital available to most of the traders. A woman selling vegetables puts all of the money she has into stock in the morning, but she still has it carried and has breakfast and lunch; she pays in the afternoon, after she has sold stock.

To join the market, a trader applies to the elected committee and, if accepted, pays a joining fee of TSh50,000 (\$30). This is seen as making their contribution to the construction of the building, for which the original market members paid. There is a daily fee of TSh100 (\$0.06) for the market and a tax of TSh100 (\$0.06) for the Kinondoni Municipality. These amounts are TSh200 (\$0.12) each for the shops, and the butchers pay TSh100 (\$0.06) to the market and TSh200 (\$0.12) to the municipality. When someone is given a place to trade, they are shown a table in the appropriate section of the market for their product. They need to build their own structure from which to sell. Another way that people get to join is by being given or buying a table from someone who is leaving the market. They still need to register with and pay the market, but the space is secured.

The only service the municipality provides is bulk rubbish collection once every two weeks, the rest, including the collection of taxes daily from the traders, is arranged by the market.

There is a 12-person market committee elected every three years at a general meeting open to all members of the market. There is a general meeting of all market members every six months. The Kinondoni Municipality sends a person to preside over the elective members' meetings and to act as the electoral officer.

Besides the formal organizational structure of the market, there are a myriad of other forms of collaboration going on. There is a common approach between traders of the same foods. They sit together in areas for each food stuff (i.e., vegetable sellers together, meat sellers together), and they tend to all sell for the same prices with no easily discernible efforts to distinguish their goods from the others. They all arrange things in a similar way, wash and sprinkle the vegetables with water, so they look fresh, stack the nice tomatoes to be seen, etc. They are all doing pretty much the same things, and

none are advertising. There are no signs offering special prices or claiming particular qualities for their goods. The traders chat to their neighbors, share jokes and help each other in many small ways. This does not mean there are no arguments or tensions between traders, but the overwhelming norm is one of cooperation although each has their own distinct business.

In the market place, when a trader is not present, the neighboring traders watch their stock and will sell to customers, taking the money and giving it to the trader whose stock was sold when they return. As they sit together, this is most often being done by traders who sell the same stock, for example green vegetables. Quite a few of the traders bring their children to the market with them, and one can observe traders assisting with each other's children, especially if the mother (it is more often the mother than the father) is busy or has to go somewhere.

The most numerous of the traders are selling fresh vegetables and fruit. The green vegetables being sold include mchicha (an amaranth leaf crop), spinach, cassava leaves, pumpkin leaves, sweat potato leaves and mnavu (black nightshade). These crops form an essential part of the diet of millions of the residents in Dar es Salaam and are the mainstay of urban horticulture in the city. Flood valleys alongside rivers, larger peri-urban plots and any empty bits of ground not built on around the city are frequently found with small fields of mchicha.

In addition to the numerous sellers, in markets like Mikoroshoni, the other two main sources of green vegetables for the majority of Dar es Salaam residents are the small vegetable and fruit selling stalls, known as genge, scattered throughout the city, and the door to door deliveries by people moving on foot or by bicycle. Lingo is one of these. He cycles slowly along a set route every day with a woven reed basket on the back of his bicycle full of bunches of green vegetables, stopping when customers come out of their houses [38]. Lingo buys his mchicha every morning directly from a woman who grows it on the land surrounding the small apartment building where she lives. Mchicha takes 28 days to grow, and as she plants daily in small plots, she is able to harvest and sell almost every day. Lingo also goes on a daladala (a medium-sized bus used for public transport) every morning to a large vegetable market in Ilala where he gets the other vegetables that he sells. From the early hours of the morning (3 a.m. onwards), the streets around the main Ilala market buildings are crowded and noisy with sellers and buyers. Lingo is not a member of the Mikoroshoni market, but at the end of each day, he sells his remaining stock on the side of the road a few hundred meters from the market.

All of the traders at Mikoroshoni are collaborating in some way in the procurement and fetching of stock. This mostly happens in different groups. For example, a group of 16 (14 women and two men) who live in the same area have a minibus that picks them up at 3 a.m. every morning to go to the Ilala market to buy stock. A slightly different group, including most of those 16, but also others, comes back together in a specially-arranged daladala arriving at Mikoroshoni a little after 6 a.m. When they are dropped on the main road, there are young men with push carts who, for a small fee, carry the stock to the market itself. These young men carry for all of the traders, loading stock for different people and then being paid later in the afternoons. Other groups of traders share different transport to the market. Some combine to hire motorized three-wheel vehicles together; others hire small pick-up trucks. Some of these arrangements are more fixed, like the same mini-bus picking up people at 3 a.m., a time of day when there is not much public transport around. Some arrangements are constantly shifting, such as the joint hiring of the three wheeled transporters that are always available outside the Ilala market. These are all arrangements between people who know and work alongside each other every day. They all know the norms and expectations. None of these arrangements are written down or contracted.

The traders in Ilala, who supply those in Mikoroshoni and elsewhere, either buy vegetables from trucks that are on the side roads around the market and came overnight or they buy direct from farmers in peri-urban areas, such as Kitunda, Kibaha and Kigamboni. The trucks, mostly the ten-ton Mitsubishi Fuso, are loaded with vegetables from a number of small farmers and traders in areas such as Morogoro and Tanga (all several hours, but not days away). The sale of the goods is facilitated in Dar es Salaam by dalalis working for a commission. A few farmers come to the market to sell for themselves.

### 3.3. Beef

It was a Sunday afternoon. Larry and Samuel who are meat traders and butchers sat at a table drinking beer and eating a grilled goat's leg. They were at the Pugu cattle market on the edge of Dar es Salaam to buy cattle. From their table in the shade, they could see groups of cattle and observe negotiations going on and the odd fight between bulls and arguments between traders [39].

Two days before, about 400 km away, Ezekiel walked with his son, herding two of his 20 cows from his village of Kitaita to the larger village of Chakwale 15 km away. Cattle, goats and some sheep were gathered in large numbers in the open ground in Chakwale, more often used for football, but every two weeks converted into a livestock market. Local farmers and pastoralists brought their livestock to sell, and traders came, some from far afield, to buy. The gathering attracts more business with food, clothes and other items being sold. Ezekiel sold the two cows to a Masai trader. People often say the Masai do not sell cattle, but this Masai trader made his living from selling and buying cattle.

At the end of the day, the trader had his cattle herded to the town of Gairo, where, with the help of cattle pens and a loading ramp, the cattle were put on trucks, along with those belonging to other traders, to be driven to the Pugu market in Dar es Salaam. Now, Ezekiel's cows were probably somewhere in the large market where Larry and Samuel sat.

After some time, the meat and more beers finished, Larry had bought four cattle from two different sellers and arranged to have them loaded on a truck, each one with his number written on its side. When the cattle were unloaded at the Ukonga-Mazizini abattoir, a few kilometers away, Larry's workers would use the numbers to identify and separate these from dozens of other cattle on the truck and tie them up at Larry's place in the slaughtering area. Larry went to Ukonga-Mazizini to see the trucks starting to unload hundreds of cattle in the dusty ground where they would meet their end. This is the biggest abattoir in Dar es Salaam. It consists of a large walled ground within which there are three slaughtering sheds, some cattle pens, a small office, toilet facilities and some shops. Each slaughter shed is a concrete slab with a zinc roof over it and rows of metal rails with hooks on which to hang the meat.

After going home to rest, Larry returned to the Ukonga-Mazizini abattoir after 11 p.m. that night; the place was filling up. Over 200 hundred butchers are members of the butchers' association and working at the abattoir most nights. Each has several assistants, and there are numerous other traders and service providers all there creating a business from different parts of the animals. The slaughter sheds were full of cattle, tied up, waiting uneasily. A few bare light bulbs cast shadows on what was becoming a crowd of people busy with different activities. The street outside the ground had filled up with women and men selling food and drinks and other traders selling cell-phone vouchers and more.

There was no space to move between the over 200 cattle in the slaughter area where Larry worked. At one side, a tall man, showing his muscular body to good effect in cut-off jean shorts and a sleeveless t-shirt was talking loudly to a group of men who watched his work. The axe blade at the end of a meter-long axe handle was glinting in the dim light as he scraped it fast on the concrete and then inspected it.

More men were arriving (only four of the 200 butchers are women and even their assistants are all men), and cattle were being wrestled to the floor, their legs tied together. The men then gathered around the slaughter areas, everyone with a sharp knife, many sitting or leaning on the low walls that ran down two sides of the concrete floor where the cattle stood.

Quiet descended on the cattle lying in lines on the floor and the men around, a pause. Then, at midnight, two men held a cow at one side of the shed, while a third wearing a round, brimless, embroidered hat slit the cow's throat with such a swift motion it was hard to see, but the cow gasped and the blood was real. Then, there was a stab in the chest that released another stream of blood, and the man was already slicing the throat of the next in line, stepping, slicing, stabbing with swift and economical movements. The butcher's assistants scrambling to have the next cow held still, with throat exposed, ready for the knife. The blood spread on the slightly sloped floors running into gutters and forming small warm crimson streams running to concrete pits at the edge of the shed. Behind the

man with the hat was a trail of dead cattle quickly being skinned and dissected. The tall man with the sharp axe swung into noisy action chopping off the horns and then returning later to split each carcass in half straight down the length of its spine with accurate, practiced blows. Another axe man was stepping from cow to cow, doing the same task in other parts of the shed.

Larry was overseeing the dissection of his cattle and negotiating who would get which bits for what price. By this stage, the feet and heads had been taken away; the stomach was carried off by someone else; the skin already sold. Soon what was left of the cow would be in quarters hanging from large hooks and rails about two meters high running the length of the slaughter areas. All of the miscellaneous bits that had helped the cattle in different ways in life had been removed and become part of another business from which multitudes of different traders, some with workers, some working alone, all derive a livelihood.

There are many bits to sell and many costs, as well. For every animal slaughtered, Larry pays the owners of the abattoir, an association of five of them descended from those who started the operation in the early 1970s. He pays for the slaughter done by people from the Muslim association, who do the actual kill in rough conformity with requirements for it to be halal. He pays a tax for the municipality, pays the axe man and pays his workers who handle the cattle when alive and later skin and cut up the beasts.

In another part of the ground, a concrete slab about a meter above the ground level was covered with rows of stomachs; these were being energetically cleaned. Not far away, the stomach lining was being strung up on sticks for cleaning. A little way from there, the penises from the bulls were being cleaned and piled up on sacks ready for sale to Chinese businessmen. The testicles had become part of another business. Two men sat on crates, one holding the testicles of a fallen bull for the other to slice the skin from around the top, throwing the resulting bracelet of skin and hair into a pile that will be sold as treats for dogs to chew. The testicles themselves are then scraped clean with the knife before being put on another pile ready to go to market. Nearby, cows' heads were being thrown onto the back of a three-ton truck; many would later end up in beef soups.

Back at the slaughter shed, some beasts were still being cut up, men lifting heavy carcasses to hang on hooks and pushing past each other in the crowded space. A young man stood knee deep in blood in a pit at the edge of the shed, using a bucket to scoop the content up and pour it into a 200-liter drum on a push cart. More than 10 of these 200-liter drums would be filled that night, from this one of three slaughtering sheds; the blood later cooked, dried and sold as an ingredient for chicken food.

In one of the corridors of hanging meat, there was an attractive young woman in a bleached white coat, her braided hair under a white hair net almost covering her bright orange earrings. In her hand was a knife as long and sharp as any of the men's; she made deep slices into slabs of meat in front of her, then moved to the next. She flashed silent stares, knife in hand, at anyone daring to call to her or argue with her pronouncements. Following behind her, a man held a large stamp and ink pad; on her nod (she never spoke), he stamped the meat as government inspected; fit, or reasonably so, for human consumption. She is a university graduate in veterinary sciences, one of the government employed health inspectors who work every night providing some form of oversight and regulation, although they are the first to admit this does not conform with ideal or internationally-accepted standards. If the inspectors are not satisfied, the meat is condemned; not a common occurrence, but it happens. The cows had already undergone at least a cursory health examination before being allowed to be slaughtered; hence, a few lost and lonely cattle that did not satisfy the vets were still standing in a pen to the side. Not surprisingly, this abattoir, along with all others in Dar es Salaam, has been the subject of health concerns. The government has shut it a few times and instructed that improvements be made [40,41]. The saving grace of the system is the speed of it all. The live animal is slaughtered after midnight; beef is in the shop by dawn; and most is sold the same day.

The floor was still red, but the lines of hanging meat were beginning to look almost orderly, buyers were arriving and walking down the lines, inspecting carcasses, squeezing dead thighs, sometimes

cutting a bit to get a better look and feel. The trading became a cacophony of voices as people negotiated and argued over prices and meat quality.

By 3 a.m., there were more than a dozen two-ton trucks and another ten smaller vans, all painted white in conformity with at least one part of the regulations. Leaning on one truck was a smartly-dressed owner and driver watching a movie on his iPad. He obtained an accounting degree at university; after a year employed in a car company, he started his own business, importing a few cars, farming chickens and then branching into meat transport. He has two trucks; one he drives himself. He carries meat for a number of traders every night delivering normally to ten butchers in different parts of town.

By 4 a.m., trucks are leaving down the narrow crowded road, and the slaughter sheds are getting emptier. By sunrise, the place is empty and shutting down.

The formal organizations we see at Ukonga-Mazizini are the association of the owners; the meat traders/butchers' association; the market management and the health inspectors from the government. The market management is a minimalist operation that employs a security guard at the gate and collects and hands over taxes. Most of the operations and interactions are happening through multiple sets of relations with the different economic actors, all dependent on the other parts of the business, but with no planned coordination.

#### 4. Getting Started

This section focusses on how people enter into different parts of the food system. This is a critical issue, as it relates to the reproduction, therefore the continuity of the system, but even more interestingly, it shapes the nature of accumulation and inclusivity within the system. It will impact issues such as social formations and alignments in struggles within the system. What has been found is that there are accessible pathways for people without many resources to get in and progress within the system, and these pathways depend on the support of others who one could argue are competitors.

##### 4.1. Shopkeepers

The main route to becoming a duka or small food shop owner is to work in someone else's shop and through that, gain the experience and save the money to be able to start one's own shop. Interestingly, this is very similar to the approach used by Indian traders who were at points in history dominant in Tanzanian trading [42]. Mangi, a typical duka owner from Dar es Salaam that we have written about elsewhere [33] (pp. 3755–3757), worked for years in a shop owned by someone from the same area that he is from near the town of Moshi. He and the owner are both Chagga, an ethnic group renowned as shopkeepers. He saved and then started his own shop. The practice does, however, extend beyond ethnic links with the same approach involving collaborations between people who are not necessarily related, but get to know each other in the cultural melting pot of the big city. This may be particularly the case in Tanzania with its long history of nation building, including the promotion of the common language of Swahili.

In some cases, people obtained capital from elsewhere to start a shop, such as from farming; when a good harvest combines with good prices, farmers can get a windfall and be able to invest elsewhere. In one case of a grain shop near Mikoroshoni market, the business was started by a security guard working at the USA embassy and his brother. They had capital, but still received advice and information from other shop owners. They explained how another shop keeper who had a similar shop just across the road from them assisted and showed them where they could buy rice and maize.

##### 4.2. Truck Drivers

The truck driver traveled with from Kibaigwa to Dar es Salaam, carrying a load of maize, had started his working life as a "ton-boy" (assistant, or driver's mate). He had asked for a job at a truck company and spent years as a ton-boy before getting enough money and assistance from one of the

drivers to get a license. Spending time as a ton-boy turned out to be a common route followed by drivers in order to learn about the job and then to drive, as well.

Riding in another truck with 30 tons of rice on the more than 800-km journey from Mbeya Region to Dar es Salaam, there was plenty of time to talk to the driver and his ton-boy. The driver started working as a ton-boy in 2004. “I learnt many things about trucks when I was a ton-boy” he said. Later, he was assisted by another truck driver (he described as “a friend”) to learn to drive, and in 2008, he got his own driver’s license and a job as a driver. The ton-boy started in 2013 (two years ago at that point). He is paid by the driver, not by the company. He is not paid much, but also gets food and a place to sleep, normally in the truck. The ton-boy wants to become a driver and for now, seems satisfied to be learning the ropes and doing the dirty work of changing tires, cleaning the truck, etc.

#### 4.3. Traders

Most of the traders, such as those at the Kibaigwa market, have some kind of assistant or assistants. The relationship between the traders and their assistants looked in many ways similar to the apprentice-like relationship that the drivers and their ton-boys have. The assistant does much of the dirty work; they get supported by the trader and get some bits of extra money, especially when a deal has been done. Importantly, they are learning the business and making contacts.

All of the traders who were traveling to Kibaigwa for maize had initially been shown the place and how the system works by someone else. The same thing was found with rice traders traveling even further to buy rice. This makes sense; you are unlikely to just get on a bus and travel across the country to a place you do not know and start walking around looking for people selling maize or rice. You also would not hand over large amounts of cash to someone you just happened to meet there. As others have found, the personal links and references build trust and are an important part of how the business works [43]. These are passed along, as well as information. The people who assisted traders starting out were sometimes relatives, but also friends without any family or ethnic links.

Even the experienced traders still spent much time with each other, eating lunch together, staying in the same guest houses, some traveling together. Inevitably, much information is shared in the processes. When poor weather and conflicts resulted in less than expected maize availability in Kibaigwa in 2015, the traders were talking amongst themselves about where else to go to find more maize and better prices.

Samuel, who delivers eggs by bicycle from peri-urban Dar es Salaam to dukas in the city [33] (pp. 3756 and 3761–3763), started delivering eggs in mid-2011. He was told about the business by another person already doing the same egg deliveries. Samuel described the person as “a friend” and when asked, confirmed the person was not a relative. This person not only suggested that Samuel should try it, but also went with Samuel to show him an area and shops where he might be able to sell. Other egg delivery men told a similar story; they were told about the business by friends or people they knew in the business.

## 5. Interpreting the Dynamics

### 5.1. The Food System Is Working, But Why?

The food system that we described may not be perfect, but it delivers food every day at a scale that meets the food needs of eaters in Dar es Salaam. It does so in a way that responds well to the needs and circumstances of those eaters, especially the majority of poorer residents. Importantly, it creates a wide range of accessible economic opportunities throughout the system. The primary actors are small scale, involving owner operators from the farmers who produce the food through to the traders, processors and retailers. Production has increased to keep pace with the demands of a city that has grown by over two million people in the last 14 years. The increased production has happened primarily through the replication of actors of a similar scale, rather than the ‘scaling up’ of any particular actor.

This is a sector that contributes to local economies and pays taxes that are an important contribution to the revenue of local and district government structures. The actors in our research received little or no direct support from the government or non-government organizations, but they do benefit from a level of protection of the Tanzanian agricultural sector from international competition. Important crops, such as maize and rice, are identified by Tanzania, along with the rest of the East African Community, as “sensitive items” due to their food security and economic contribution and, thus, are protected with high import tariffs of 50% and 75%, respectively [44,45]. A plethora of agricultural policies in Tanzania over the last years have increasingly focused on large agricultural investments, despite these showing limited success, alongside continued statements of the intention to support small-scale farmers who are recognized as the main producers of food [46].

Despite the resilience that this food system has shown, it could be undermined if large-scale and capital intensive agri-business models are promoted in Tanzania [46]. Such models, which are dominant in Europe and North America and closer to Tanzania in South Africa, may produce food, but they also result in the increasing concentration of land and processing capacity in fewer hands, displacement of producers and limited market space for the smaller producers and retailers who remain [47–49].

To develop and protect this food system, it is essential to understand the way it works. It does not conform to an orthodox economics perspective and noting that its functioning is based on social relations is also inadequate. The empirical findings left us with a number of questions.

For example: why do dozens of traders sit next to each other all selling the same products with little or no effort at differentiation on the basis of price or quality? Should they not be competing with each other to take a greater share of the market and make more profit? Perhaps the more ambitious and enterprising should push the inefficient traders out of business and then employ people and grow bigger themselves. But they are not doing that and we do not see the strong emergence of elites. Instead, just as King found in research on the “informal economy” in Kenya [50], people are helping each other and, through this, sustaining their operations over time. A women trader having to go and care for her child who is sick is being economically inefficient, and this could be a business opportunity for another trader able to take over some customers and grow. Instead of taking advantage of the situation, however, the neighbor, who is selling the same products, sells the goods belonging to the mother of the sick child on her behalf and gives her the money when she comes back. We are not saying that instances of exploitation and taking advantage do not happen, they do, but the dominant mode is different, yet resilient. This resilience is shown by, amongst other things, the reality that these women traders have been sitting together and trading for years, in some cases for decades (Figure 2).

Despite the lack of competitive behavior, the food system is not static; in fact, it is growing fast to keep up with the fast growing city; there is a level of change going on.

There are a range of ways that sociologists have over the years attempted to answer some of these questions and explain ‘non-standard’ [51] economic and market activities. These range from the earliest work of Max Weber to network theory, convention theory and more [18,19,51,52]. It is beyond the scope of this article to address all of these. What we focus on is the work of Ostrom on “common pool resources” management, as this helps explain the particular phenomena of market competitors who collaborate together [20]. We also address the idea of “nested markets” that has been developed recently by a number of writers to explain rural development that is happening through the development of new markets, including for food [21]. Building on these and our empirical findings, we further elaborate the concept of a “symbiotic food system” (SFS) before suggesting implications for research that arise from this.

## 5.2. “Common Pool Resource” Management and “Symbiotic Food Systems”

The work done on studying “common pool resources” (CPR) management by Elinor Ostrom [20,23] and others helps to explain how groups do work together in the utilization of CPRs in their mutual interest. This has been identified by Van der Ploeg et al. [22] and Schneider et al. [53] as applying to

and part of the ordering principles for “nested markets”. We see this functioning in many parts of the SFS and, based on the analysis of our research findings, would develop the idea further in three ways: (1) we believe the notion of CPR management applies very well to the market space, especially in more structured markets; (2) the market demand for particular products is a form of CPR; and (3) Ostrom’s concept of “internal norms” that are developed in parts of the food system as part of CPR management seem to be influential in other parts of the SFS and may help explain the prevalence of symbiotic relations even beyond the particular CPR environments. These arguments are explained in more depth below.

One, the market space and its related commonly-used infrastructure is a clear CPR with different actors all investing in and utilizing the CPR of the market place and its infrastructure. The management of these market places fits remarkably well with Ostrom’s design principles for long-enduring CPR institutions [20] (p. 90).

1. “Clearly-defined boundaries” for membership and the CPR.
2. “Congruence between appropriation and provision rules and local conditions”. Rules fit context.
3. “Collective-choice arrangements”. Rules set by those affected.
4. “Monitoring” done by monitors accountable to appropriators.
5. “Graduated sanctions” for violations set by appropriators or those accountable to them and take into account context of offence.
6. “Conflict-resolution mechanisms”. Rapid access and low cost.
7. “Minimal recognition of rights to organize”. Not violated by external authority.
8. “Nested enterprises”. All functions are organized in layered “nested enterprises”.

The organized markets we have looked at all operate with some form of membership and limitations on entry to membership and operate in a defined space. They very much operate within the social norms of the society and tend to have rather informal and low cost ways of operating as befits the context. The rules are set, formally and informally, by those involved.

Interestingly, across the markets looked at in this article, the biggest complaint about the organization of the markets came from users who argued that the leadership on the Board of Kibaigwa was not representative of the members and users of the market and was not from among them. This was a situation where the rules were not being set or monitored by those affected.

The monitoring in most of the markets was formally through the elected leadership and informally through fellow members with a degree of mutual accountability. Sanctions included social isolation, fines, loss of use of services and, ultimately, expulsion. There are conflict resolution processes, again more formalized ones, such as disciplinary action by committees, and more informal, such as fellow members intervening. At Kibaigwa, the Market Manager often directly intervened and talked to the parties when conflict broke out or looked like it could.

There is little interference from any outside authority in these markets that for the most part get on with their own operations. The state involvement does, however, provide an important endorsement that legitimizes the market and its leadership, but otherwise, they are fairly absent. The health inspections at Ukonga-Mazizini abattoir was the most direct form of state involvement in the examples shared in this article, but even this, in the midst of all of the activity there, felt like a very light touch. The health inspectors were also very much integrated in the market/abattoir and had a good rapport with the members and leaders. Again, the complaints at Kibaigwa seem to confirm the theory through what was seen as not working. There were tensions at Kibaigwa, precisely related to the feeling that there were too many external people on the Board and too much tax taken by the state.

All of the markets looked at include good examples of “nested enterprises”. There are many different groups and layers of organization in each market, such as at Kibaigwa, where almost all of the traders are individual operators, but also participate in collaborations and informal groups with other traders. The cargo porters, themselves divided into 25 teams, the dalali association, the teams of

bag packers and sewers, to name a few. At Ukonga-Mazizini, there are numerous small and individual enterprises; there is the butchers' association and the association of owners.

Second, the very market demand is a form of CPR. If we consider a group of traders all selling green vegetables, in a market like Mikoroshoni, they all depend on the same and essentially finite demand (combination of need and purchasing power) for their products. This demand may fluctuate a bit, perhaps in response to price changes, to improvements in the economy or actions the market takes as an organization to promote itself to a wider population. All of these changes, however, still leave the same traders depending on the same finite, even if varying, demand. Therefore, if one trader were to sell to far more customers, they would be taking a larger proportion of the unchanged demand and money available and leave less for the others. This is just the same effect as the one cattle owner over stocking common lands as in the classic 'tragedy of the commons' argument originally put forward by William Forster Lloyd in the early 1800s or one of the water users' groups all depending on the same aquifers in California pumping more than their share [20]. Efforts and related costs to improve the market and demand will tend to be borne by all; thus, if the benefit is not borne by all, the group management starts to breakdown. An interesting dimension of the CPR management of demand is that it appears to be largely governed by informal and implicit arrangements more rooted in peoples' cultural repertoires and norms than in formal agreements. There are no meetings of the traders to set common prices, no rule saying you cannot advertise, but there are social rules and norms that are followed in defiance of the logic of accumulation. Ostrom uses the concept of "internal norms" and identifies this as one of the four main basis for people's decision making in CPR settings. She goes on to argue that "[w]hat types of internal norms an individual possesses are affected by the shared norms held by others in regards to particular types of situations." [20] (p. 37).

Third, building on the last point, we believe that the "internal norms" that contribute to the cultural repertoires that people in the SFS operate from are a core component of the ordering principles of the system. Even where the formal structures of CPR management do not exist, the "internal norms" continue to play a key role, as they are strongly established among people in different parts of the system who have a broad range of shared experiences. These "internal norms" are not only functioning within defined groups who organize themselves for the effective management of the CPRs, but they are carried out across the food system into a wider set of interactions and contexts where they continue to anchor the symbiotic relations.

The notion of polycentric governance that Ostrom has been developing also has an application in the SFS. These are clearly complex economic systems that are polycentric in nature, having many centers of power that are formally independent, but ultimately part of an interdependent set of relations [23]. Almost all parts of the SFS involve polycentric governance, which is another reason why we should not be surprised to find some characteristics of CPR management across the SFS.

### 5.3. Are These "Nested Markets"?

In exploring and trying to understand emerging markets that have different characteristics from the dominant agro-food system, a group of scholars have over the last few years been developing the concept of "nested markets" [21,22,54]. The food system we found to be feeding the majority of people in Dar es Salaam showed a number of characteristics that looked similar to "nested markets".

Like "nested markets", as described by Schneider et al. [54] (pp. 193–196), the SFS links with other segments, including beyond the agricultural and food sectors. It is strongly institutionally embedded and relies on a particular socio-material infrastructure that enables particular product flows. The SFS not only involves elements of CPR management, but has this as a central element that permeates and underpins the system. There are within the SFS discursive relations and many spaces where individuals congregate to discuss and transact, but this does not necessarily involve the 'public sphere'.

While finding similarities with elements of "nested markets", we also found important differences that required a new concept, the SFS, to explain them.

The SFS is not necessarily created for a purpose or constructed to provide an alternative to a dominant system as Van der Ploeg et al. have argued nested markets are [22]. The SFS is a historic form that continues to evolve. It is defined and shaped primarily by the particular characteristics of its own ordering principles and sustains due to the intrinsic value and advantages of these principles, whether in relation to another dominant market form or not. The SFS feeding Dar es Salaam has changed over the years, but one can find practices that go back to the earliest days of the city and have survived through myriad political and economic changes [42,55].

Unlike “nested markets”, the SFS does not necessarily have a “circular” rather than “radial” pattern of operation, nor does it rely on “short versus long distances” [54] (p. 194). The SFS, as shown with the example of maize in this article (the same has been found for rice), operates over long distances and is frequently “radial” in the flows in that there is no particular direct feedback or link between the eaters of the food and the producers.

A further essential characteristic of the SFS is that it involves a large number of actors with a high level of equity among them. Importantly, while there are inequalities, some parties are not rising to such positions of dominance that they push others out. The system is based on interdependence involving mutual benefits and a fine balance between actors. This counters the emergence of elites and the relations of domination and dependence.

The concept of the SFS brings a new dimension with its focus on the core ordering principle of symbiosis and applying this beyond markets to the food system as a whole.

#### *5.4. Symbiosis as a Core Ordering Principle*

The data that informs this article show the way that cultural repertoires are shaping market relations and the food system as a whole, but this is not a full explanation. This does not identify the particular characteristics of the cultural repertoires in which these markets are embedded. It does not tell us the underlying ordering principles that find expression in particular conventions and internal, as well as social norms in the food system. It is in trying to address these questions that we offer the concept of a “symbiotic food system” (SFS).

Across the SFS, there are a range of forms of symbiotic relationships that include more horizontal relations among people performing similar roles, more vertical relations between actors performing different roles in the supply of the same commodities and complimentary relations between different activities, which are mutually enabling or reinforcing.

There is the mutually-beneficial cooperation between similar actors in the system who perform the same services, such as the vegetable sellers in the market sitting next to each other and helping each other out. They go together to the wholesale markets and watch over each other’s stalls and even children; a practice that has obvious advantages as long as it is reciprocated. When asked about why they are not competing, some of the traders in the market identified the negative consequences of trying to compete on price: “If I reduce the price the other traders will too and we will all get less” one woman at Mikoroshoni said, and others expressed similar sentiments. There are the sembe traders sharing a mill (making the mill viable for them all), sharing a truck to bring their maize to the city more cost effectively and sharing much time in the shade of the same tree. The farmers who grow the same crops, share information, sometimes work together, sometimes join up to sell jointly.

If traders in the same commodities are not competing on price or distinction, how do they attract customers? How does the customer decide from whom to buy? During the research, one response to questions on this came up again and again “tunazoeana”, meaning “we are acquainted/familiar with each other”. It implies that people are used to each other and that there is a level of mutual trust. The expression is mutual, implying reciprocity and symbiosis. The actors spoken to did not say “I am familiar with them” or “they are familiar with me”, they refer to “we”. People in the food system give food on credit, buy from someone, share the cost of common transport for their goods, show them how the business works, all because they are acquainted/familiar with the each other. As one key informant put it: “people bank on relationships”.

There are actors who occupy different parts of the system performing different roles: transport providers to the maize traders, sack sellers at the Kibaigwa market, the food sellers who feed the cargo porters, traders and dalalis (agents) in the market places. These different types of businesses depend on each other. Bicycle repair men on the routes traveled by bicycles delivering eggs depend on the bicycles and enable the smooth operation of the bicycle deliveries [33]. Food and drink sellers on the same routes and in the market places all live from and support the traders in the food system. The provision of the services is also shaped to fit the circumstances of the customers. It involves being in the right place at the right time, giving credit to people they know and receiving payment at times that work for the business cycles on which their customers depend.

There are the complementary relations, such as the purchase of pumba (the chaff/bran) from the maize mill and blood from the abattoir to supply the chicken feed factories. The sembe (maize meal) industry as a whole is in a mutually beneficial relationship with the urban and peri-urban chicken industry around Dar es Salaam. The maize and rice industries benefit from the harbor in Dar es Salaam and transport routes that take other goods to neighboring countries, creating a situation where trucks are coming back empty. Without this, there would not be such an easy availability of transport, and the costs would increase, potentially changing the viability of the operations.

In the cattle market and abattoir described in Section 3.3, we see clearly how many actors complement each other's operations; similar dynamics have been found in chicken markets [56]. Every part of the process and the animal is turned into a business of its own. This is not surprising, but what is interesting is that it is not part of a centrally-organized business or government-planned operation. There are no plans drawn up, no contracts and no central management of the myriad different actors and relations. Rather, there are many different actors who all find their place and work together without plans or formalized agreements. They are truly interdependent, as the whole and individual parts of the operation would not work or be viable without the others. What does hold them all together is a well-developed sense of their mutual interests and common cultural repertoires. These do not have to be explained to people or renegotiated all of the time; most people come into the system with a sense of them and are quickly assimilated into the way of working. As others have found, economic actors operate "from a repertoire of alternatives that reflect social structural constraints" [18] (p. 450). Asking the different actors to explain how the system works and what makes it work often elicited strange looks and shoulder shrugging; "we just do it like this". Biggart and Beamish also note that "[e]conomic activity is carried out in repeating cycles and, over time, economic routines become lost to conscious reflection." [18] (p. 452).

There are actors who supply to and buy from each other the same commodities; the farmer sells maize to the local trader; Lingo buys green vegetables from the Ilala market and sells to his customers, etc. We can look at these simply as economic transactions, but what makes them symbiotic is the type of social relations they are embedded in and the mutually-beneficial nature of the transaction, including an equitable benefit sharing. Crucially, these are transactions between actors of similar social and economic status that operate within a common set of cultural repertoires. There are of course inequalities, but not so extreme as to result in great power imbalances or social disconnection. When there is no equity in the relationship, we are more likely to see one party taking over more and more of the operations of others, whether through vertical or horizontal expansion.

The transactions remain symbiotic when there is a mutual benefit between the specific actors in the specific transaction and a dependence between the types of actors in the system. The maize mill owner does not need Enjo to mill their maize at his mill, but he needs sembe traders like Enjo to use his mill; just as Enjo does not need that particular mill, but does need a mill owner willing to mill maize for others. The duka owner does not need Enjo, but does need a sembe trader working at a scale and in a manner that fits his operation. The element of having other options, not depending on that specific trader, keeps the negotiations between two parties real; either can walk away if the deal does not work for them. At the same time, each party knows that they will need to deal with someone providing a similar service with similar interests, so they are going to have to accommodate

those interests. These are the conditions of interdependence that are essential to the maintenance of a symbiotic market relationship.

It would be naive to think that there is no competition and no economic forces at work. In this system, we see the laws of supply and demand most clearly every year in the seasonal changes in prices. The maize prices drop when more comes onto the markets following harvests. The prices go up when the supplies reduce. Dry years and conflicts in maize growing areas reduce supplies, and the prices go higher.

The socially-embedded symbiotic relations also effect the transactions and shape the way transactions happen and who benefits from them. The social relations are providing the glue that holds the system together, and the symbiotic ordering principles are setting parameters within which economic decisions are made; just as the economic ordering principles are setting parameters within which specific socially-embedded relations are maintained.

The symbiotic nature of the relations extends to the way in which people assist each other to get into the food system, as described in Section 4. When the employed shop keeper knows he or she will, if they work well, be assisted by the owner to start his or her own shop in the future, he or she has a powerful incentive to work diligently and honestly. This is essential to the owner who cannot be there supervising all of the time. Shopkeepers, traders and truck drivers who assist others to get into the business strengthen their social network and benefit from having an ally to work with in the future. At a minimum, they get a competitor who they are familiar with, rather than ones they do not know. We can speculate that there may be a sense of contributing to the wider system they work in just as academics peer review articles without payment, not because the person whose article they are reviewing will directly reciprocate (they do not even know who the reviewer is), but out of an understanding that this is part of what makes the system that they benefit from work. There can also be non-material reasons to assist others, such as it being a way to leave a legacy and gain social status, which we know is important in most, if not all, societies [57,58].

It is interesting to observe that these types of arrangements found across the food system mirror many that exist on the small farms that produce the food going to Dar es Salaam. All of the farmers learnt farming first on the farms of their parents or other relatives. Some reasonably successful farmers take in young men as general assistants working on all aspects of the farming operation. They are rarely paid much if anything, but are given food and shelter, and they learn and fully expect to farm themselves if they do not find other work. Many of the piece work laborers found on the small farms in our research sites are themselves farmers working to get enough capital to develop their own fields. It seems reasonable to believe that the set of norms prevailing on farms are carried into the wider food system along with the food produced, especially as many people across all parts of the food system, or their parents, come from similar farms.

The ton-boys are not organizing to get better conditions from the truck drivers. The employed shopkeepers are not organizing to get shorter working hours from the shop owners. In both cases, the hours are indeed long and the pay low, but these workers are aligning themselves with their employers in order to get into the business or start their own. As long as the process creates those new business opportunities, those involved do not perceive themselves as exploited, and the emergence of elites is also limited.

Traders, farmers and others in the SFS are assisting each other and collaborating in ways that clearly value collaboration over competition. They are making decisions all of the time to collaborate with rather than try to outdo the other, and in doing so, they are creating a level of security for themselves and resilience in the system as a whole. Despite the limitations on competition and accumulation, overall production in the SFS increases through replication rather than through the 'scaling up' of particular enterprises.

### 5.5. New Directions in Research

We have identified a food system that empirically exists and have begun to explore the nature of that system, what enables and shapes it and how and why it exists. It appears that what we have found is not unique to Tanzania, and therefore, the findings, as well as further exploration of these phenomena, in particular symbiosis as an ordering principle, could be of value in a range of other settings. Work on urban food planning, alternative food networks and “nested markets”, as mentioned elsewhere in this article, has gained traction in the last few years, largely in Europe and North America, but also beyond. These have some similarities with the SFS, but they have tended to focus on local—short supply chains, direct links with farmers and planning within local administrative boundaries—as well as niche and higher value markets [3,21,59–61]. The findings of this paper suggest that there would be value in giving more attention to non-corporate food systems that bring food from further afield and can meet the food needs of large numbers of people, including the less wealthy.

Despite a lack of literature on food systems specifically, we know that many elements of what we have described in Tanzania have long been in operation in other countries in Africa and continue to show resilience today [11,43,55,58,62–66]. Similar markets to those described in this report can also be found in Asia [67,68]. In Zimbabwe, even with the previously high level of formalization and corporate control of the economy, there is evidence of similar markets, perhaps SFSs, emerging post the fast track land reform in the country [53,69,70].

Unfortunately, more attention and finance currently goes into research on corporate systems and non-government organization and state ‘development’ projects. Too little goes into looking at what exists without these interventions. More research is needed to understand the food system in other contexts, especially in Africa and Asia, where small farmers and traders remain dominant in production and distribution. In carrying out such research, those involved would do well to consider some of the theoretical steps and their methodological implications that Hebinck et al. elaborated in “Rural Development and Construction of New Nested Markets” [21]. These can be summarized as: (1) look at markets beyond the neo-classical frame of references to be open to explore the extent to which markets are places of social interaction and exchange and “embedded in historical and cultural repertoires” (p. 3); (2) put aside “a priori normative framing. The market is neither intrinsically good... nor intrinsically ‘evil’” (p. 4); (3) markets can be places of social struggle; (4) go beyond the “conventionalization thesis” and the related normative assumptions about a particular modernization trajectory of ‘development’ and change; and (5) go beyond the narrow exploration of alternative food systems that is often overly focused on the local and the ‘short food circuits’ and other assumptions about ‘alternatives’ to take a wider view of food circuits that are not corporate and global, nor necessarily local and short.

In addition to these considerations, we suggest that the approach of starting with a cross-section of eaters of food is a useful entry point to studying food systems, as it creates the opportunity to focus the research on the most important foods for the majority of people and it does not presuppose the sources of food or the actors involved. Such research will only touch on specific interventions in the food system to the extent those are valuable to the supply of food. When we see where food actually comes from, we may find elements of the food system and actors about which there has been little awareness. This is of course the opposite starting point from many food/value-chain and food system studies that start with particular producers or crops and even specific projects.

Recognizing that the SFS runs on many elements of CPR management gives us new areas of research to explore and a body of work to draw on for ideas when seeking appropriate policy and programmatic interventions to enable the SFS. Links can also be made with the emerging work on “nested markets” that could benefit from the wider concept of SFSs. More empirical work to test the well-established theories of CPR in the context of markets and food systems could be of value to reinforce or question some of the ideas in this article.

## 6. Conclusions

Of particular interest is how a multitude of small-scale and interdependent actors produce the food and get it to urban eaters at a city feeding scale without large vertically- or horizontally-integrated corporate structures. From small farmers through to urban retailers and in markets in-between, there is a high-level of diverse forms of collaboration between actors, many of whom are also competitors. The way this food system works is not well explained by existing theories applied to markets and food systems, either from the neo-classical economics perspective or from the rural development and alternative food studies disciplines.

Based on empirical research in Tanzania that has looked at how the large city of Dar es Salaam is fed, we put forward here the concept of a “symbiotic food system” (SFS). This draws and builds on the understanding of the importance of social embeddedness, work on “common pool resources” management and the emerging thinking on “nested markets” to provide a more satisfactory explanation of how and why the SFS is functioning in this context.

The functioning of the SFS is socially and institutionally embedded, but it is also subject to market forces of pricing and competitiveness. The symbiotic nature of the relations, including reciprocity and interdependence, supported by well-established and common internal and social norms, explains how this works. There are strong elements of “common pool resources” management, which we argue exist within the SFS and show both the logic of the established social and internal norms and that the phenomena of such arrangements are not unique to this context. The SFS also shares some characteristics with “nested markets”, but not others, and it has important additional characteristics. The concept of the SFS takes us beyond theorizing markets by providing a way of understanding the food system as a whole.

The value of this article is in showing that SFSs exist, with their own ordering principles, and have value in many contexts for the actors within them, for meeting food needs and doing so sustainably. Not least, this is a food system that does deliver at scale and can therefore play a significant role in feeding the, increasingly urbanized, projected nine billion people by 2050. In addition, the way the SFS produces and delivers food creates a large number of economic opportunities in a highly equitable way. Approaches that favor large and capital intensive enterprises, whether in production, processing or retailing, are likely to have a negative impact on SFSs and those who depend on them, including farmers and eaters. The recognition of the SFS system opens up new research agendas and has important implications for policy development. We need an informed development of policies that will value and enable the symbiotic relations at the heart of such food systems.

**Acknowledgments:** We would like to thank the social actors in this “symbiotic food system” from whom we have learnt a great deal. Thank you to Sergio Schneider for the encouragement and sharing of ideas. The extensive and, in some cases, critical comments from the two anonymous reviewers are much appreciated, as they helped improve this article and point to more issues to address in future work.

**Author Contributions:** Marc C. A. Wegerif carried out the field research, took the pictures used in this article, did the analysis of data, developed the ideas and drafted the article. Paul Hebinck was part of the analysis of the data and the development of the ideas and directly contributed to writing and refining the article.

**Conflicts of Interest:** The authors declare no conflict of interest.

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