

Participatory Technology Design for Urban Agriculture in South Africa

Angus Donald Campbell

University of Johannesburg, Senior Lecturer Industrial Design, Johannesburg, South Africa

acampbell@uj.ac.za

Abstract. As the population of South African cities rapidly increases, evidence of food insecurity of urban populations is also on the increase. Urban agriculture provides an opportunity to improve urban food security whilst reducing poverty, inequality and unemployment. This position paper identifies three problem areas in the current urban agricultural system in Johannesburg. It proposes methods, whilst exploring examples, that can better encourage participation, increasing skills and knowledge, and improve networking through considered design intervention between stakeholders in Johannesburg's food system through the use of appropriate technology.

Keywords: Urban Agriculture, Community Participation, Appropriate Technology, Participatory Technology Development, Industrial Design, South Africa

1 Introduction

The mass monoculture production and distribution of food, spurred on by the green revolution, has created a food system far removed from citizen 'average'. Highly processed foods blur the source of much of their content and the notion of seasonal or local food has almost become redundant [1]. This obfuscation of the food system has brought with it environmental degradation, introduced toxins into the food system and due to the commodification of food, affects international food prices and hence consumers pockets at the hint of a large drought. This highly technological, complex and hidden food system ultimately affects the poor and the marginalised most.

The latest South African census data indicates both an increase in South African urban population and levels of unemployment [2]. Both these indicators can have a detrimental impact on food security; namely the availability of and the ability to purchase healthy, culturally appropriate food [3]. There have been three national surveys of food security in South Africa undertaken between 1999 and 2008 [4], a comparison of these studies reveals a decrease in the level of food insecurity, however the statistics are still harrowing: almost 25% of South Africans are food insecure and the majority of children do not receive sufficient nutrient requirements [4].

There is a perception that food security is a rural problem based on the availability of food, hence by producing a sufficient quantity of food the problem should be eliminated [5]. This ‘grow more’ approach, as explained by The African Food Security Urban Network (AFSUN), does not aid the plight of the urban poor and highlights the complexity of finding solutions beyond “rural development” and “green revolutions” [5]. Leonie Joubert’s recent publication *The Hungry Season* [6] together with a multitude of articles in the press [7] [8] [9] [10] are popularising the problems that South African cities and their citizens face with access to readily available, nutritious, culturally appropriate food. Statistics indicated that in the deprived wards of Johannesburg, up to 60% of households are mildly to severely food insecure [11], add to this the prediction that by 2050 60% of Africa’s population will be urbanised [12] and the importance of a suitable and sustainable food supply in urban areas becomes clear.

The Food and Agricultural Organisation (FAO) of the United Nations promotes urban agriculture as being highly relevant to alleviating food insecurity in cities [13]. At the level of both the South African government [14] and city municipalities [15] [16] [17], policy and projects are in place to attempt to improve food security through urban agricultural initiatives even in the face of the reduction of available land for housing. Urban agriculture has been the focus of a few South African studies [18] [19] and research institutions¹¹: evidence shows a direct link between access to healthier food and opportunities for additional income through urban agriculture. With almost 20% of South Africans using agriculture to supplement household food supplies [5], urban agriculture provides an opportunity in cities to impact on the three core problems in South African society: poverty, inequality and unemployment. There are however cultural, political and organisational issues that need attention in order for urban agriculture to improve food resilience in South African cities. This position paper will unpack some of these problems evidenced through my involvement in research projects in the Johannesburg region. I propose that better opportunities for participatory engagement between all the stakeholders in city food systems needs considered design intervention specifically with a focus on appropriate technology. Technology designed with and for local farmers provides a viable avenue to increase food production; and by encouraging local food production, using local skills, a much more resilient local food system can be designed [20].

2 Issues Facing Urban Agriculture in South Africa

One of the organisational issues facing urban agriculture in South Africa is the fact that it does not sit comfortably in any one government department: part Social Development; part Health; part Agriculture, Forestry and Fisheries (AFF); it also has

¹¹ Most notably: Siyakhana, www.siyakhana.org ; African Food Security Urban Network (AFSUN) www.afsun.org ; Food & Trees for Africa, www.trees.co.za ; Abalimi Bezekhaya, www.abalimi.org ; South African Food Lab, www.southernafricafoodlab.org ; Oranjezicht City Farm, www.ozcf.co.za ; Organic Farms Group, www.organicfarmsgroup.com

impact on Water Affairs; Human Settlements; Labour; Rural Development and Land Reform; Higher Education and Training; and Economic Development. In Johannesburg the Department of Health and Social Development manage projects with a focus on nutrition [21] [22] [16]; the Department of Economic Development has a project focused on organic farming [23]; and the Mayoral Committee on Food Resilience, as part of the City of Johannesburg, sitting under the project banner A City Where None Go Hungry [15], is now attempting to manage a range of co-operatives that to varying degrees are located in City Parks, the Department of Health and Social Development and AFF. This all leads to a fragmentation of focus and serious confusion for urban farmers on the ground trying to negotiate the quagmire of departmental authority.

In my work with grassroots urban farming organisations Rainbow Nation Farmers [24]; Noodgesig Farmers; Balimi Food Security Company [25]; Siyazenzela Phiri Organic and Natural Food Market [26]; and the Soweto Farmers Forum, one of the biggest difficulties for these organisations is finding community members willing to work on their farms. If money is not directly offered for services, and their reward is based on the successful outcomes of a seasonal crop, compensation seems too far removed and unpredictable for the majority of workers. Issues of ownership in terms of land tenure and inputs are also a problem for commitment; this becomes particularly difficult when farming takes place on government land without a lease (Noodgesig Farmers) or on land owned by schools and hence not zoned for agriculture (Siyazenzela). Additionally there seems to be a social stigma attached to farming, this stigma may stem from childhood “gardening punishment” handed out by school teachers to try maintain discipline in classrooms; and/or the consideration of gardening as a “desperate” means to access food as a last resort; and/or the governments previous disregard for subsistence agriculture as relevant to economic participation¹². Add to this the theft of electricity circuit breakers by the *Izinyoka-Nyoka* or illegal electricity connectors, leaving the farmers without pumps for borehole water, and the theft of fences by opportunistic recyclers, leaving their produce unprotected from hungry passers-by; the unpredictability of rewards for effort becomes all the more clear.

In addition to the issues listed above, urban farming is especially difficult with limited farming skills. Umezuruke Opara, the chair of research into post-harvest technologies at Stellenbosch University says that, “often these [small-scale] farmers lack access to the latest scientific knowledge about how to increase crop yield with existing resources, when to harvest to achieve good post-harvest quality, how to package and store their produce to extend storage life, and meeting market standards and consumer demand.” [27]. Access to market for producers who are succeeding to produce is also a problem. The seasonality and unpredictability of crop production makes meeting sales agreements difficult, not to mention issues with maintaining quality control.

¹² The 2013 South African National Development Plan does however now very clearly support smallholder agriculture, as does the Johannesburg Mayoral Project A City Where None Go Hungry.

From the issues listed above, three problem areas can be clearly identified, namely encouraging participation, increasing skills and knowledge, and improving networking. I propose all three of these can be targeted through the use of appropriate participatory technology.

3 Participatory Technology

Surmounting the stigma of farming in urban areas is something that can only be addressed through a process of collaborative effort and slow change with tangible evidence of success. The power of participation in farming in Africa is not new; Paul Harrison's dated but seminal book *The Greening of Africa* discusses how the traditional African village facilitated participation prior to colonization [28]. In the complex environment of contemporary city centres such as a melting pot like Johannesburg, communities are a complex mix of migrants, ethnicities, tribes, and political leanings, and the concept of a "traditional" African village far removed from reality. Individuals are far more self-serving and distrusting than in familial clans, but even in such an emulsion, the power of grassroots communal action to increase political voice and participation in civil society should not be underestimated. Many case studies of successful communal farming action are documented under various participatory ground roots initiatives such as Farmer First [29], Participatory Technology Development [30], Participatory Research and Peoples Science [31]. The most powerful testimony to this is Roland Bunch's exploration of People-centred Agricultural Improvement [32]. Bunch is highly critical of paternalism created by give-aways highlighting the basic human nature that no-one really cares for anything they don't have an invested interest in. He proposes that enthusiasm is the driving force behind any developmental project and that the source of enthusiasm is through early recognisable success. The chances of success in an agricultural endeavour can be greatly increased through the use of suitable technologies and by increasing productivity; the viability of such a pursuit can visibly encourage participation and long-term sustainability.

Technology development for agricultural growth has often been seen as the transfer of technology and knowledge from either developed countries, institutions and practitioners to developing countries, institutions and practitioners. However, by simply transferring technology, little empowerment takes place for the recipients, and this creates a system of innovation that serves the current food system and the powers that control it. It also invokes a spectre of dependency, and this could cement developing country farmers as dependant on others who supposedly know 'better' what their development challenges are. For farmers and consumers in poor areas and newly emerging farmers, such as in the urban context, such technology is often inappropriate and does not help achieving outcomes that benefit both people and the environment. Participatory Technology Development [33] is aimed to build the capacity of farmers to conduct their own experiments, develop their own technology and make informed decisions on, demands of, and interventions into, the food system in order to realise their own interests. This does not take place in a vacuum and it is

important to acknowledge the social infrastructure necessary for innovation to take place. A designed social infrastructure can contribute to technology and other innovation by placing multiple stakeholders alongside each other in dialogue that would be able to make effective changes to the system. A multi-stakeholder intervention could innovate by the strategic incorporation of diverse stakeholders in the food system, from state agencies right down to communities themselves, and through such an intervention implement changes.

The Mayoral Committee on Food Resilience is valiantly attempting to organise urban agriculture in Johannesburg in a designed, top-down manner. Nabeel Hamdi describes the complexity of such an undertaking in terms of the unequal powers, unsymmetrical balance, weak links and fragmentation of the relationships between the state, the market and the community [34]. He goes on to expand this complexity into the relationship on a local, national and global level. This complexity withstanding, multi-stakeholder coalitions have also been shown to be very effective in helping to bring about change in agricultural and food systems [35] [36]. The TransForum project, undertaken in the Netherlands from 2004-2010, successfully used a Connected Value Development approach aimed at transforming perceived trade-offs into complements, by connecting the values held by the different stakeholders [35]. This approach is currently being implemented as part of a globally linked project that will share knowledge, innovations and expertise called the MetroAg Innoversity [37]. I am one of the Johannesburg representatives in this project, and although at the beginning stages of such an undertaking, we are already making significant steps to link farmers, knowledge based institutions, civil society groups and the government in Johannesburg.

Designers are well suited through their training in problem solving to be able to explore the global perspective of the various networks and stakeholders involved in food systems and providing designed opportunities for collaboration and path crossing. Such a systems design approach to collaboration can be enhanced through participatory approaches; many of these methods can be classified under the umbrella of social impact design [38]. Appropriate users, in this case urban farmers, undertake problem identification and problem solving while the role of the scientist/researcher/designer is more of a consultant to collaborate with, rather than to direct [31]. The design of the Seboko hail tunnel for the Rainbow Nation farmers by Kyle Brand as part of his Industrial Design Honours mini-dissertation at the University of Johannesburg is an example of the result of such a process [24]. Through a process of user group interviews, hail was identified as a major issue for the farmers due to the impact it had on their crop success. Brand was able to co-design a low-cost covering system with the farmers that allowed for local production, assembly and resulted in a product sufficiently flexible for their needs. The cover used invasive plant shoots (Black Wattle) as its major structural component whilst incorporating laser-cut joining mechanisms as the connectors. Standard hail protection covering was then attached to the armature through a mechanism integrated in the laser cut connector plates. The solution answered the farmers' needs with a low-cost product whilst maintaining a balance between high and low-tech componentry for manufacture and job creation.

From the other end of the technological scale, and notably with 650 million mobile

phone subscribers in Africa, Information Communication Technologies (ICT) are also facilitating change in African agriculture through the use of mobile apps [39]. *SokoniSMS64* uses sms's to provide farmers with market prices before the farmers travel long distances to market; *Kilimo Salama* ("safe agriculture" in Swahili) in Kenya provides "pay as you plant" micro-insurance to farmers; *iCow* from M-Farm helps farmers keep track of each of their cows through an online calendar; *Tigo Kilimo* in Tanzania gives farmers instant weather information and provide farmers with appropriate farming tips; and *CocoaLink* in Ghana provides farmers with information on farm safety, child labour, health, crop disease prevention, crop marketing and improvements in farming practices [39]. From another developing context, in India, a mobile app called *Nano Ganesh* "seeks to transform the way farmers manage their water systems by giving them the freedom to turn pumps on and off, from any location, with their mobile phone" [40]. These technologies developed on the back of the ubiquity of mobile phones in Africa and India, in some cases provide farm management tools for farmers, but in many cases enable knowledge transfer between 'experts' and farmers. These knowledge transfer applications would become all the more powerful through the integration of bottom-up knowledge transfer through wiki type applications. Paul Richards in his book *Indigenous Agricultural Revolution* was quick to note that many of the most successful innovations in crop production in Africa had local roots, highlighting that "there should be less of an emphasis on 'teaching' farmers how to farm and supplying 'improved' inputs, and more emphasis on how to foster and support local adaptation and inventiveness." [31].

4 Conclusion

The University of Johannesburg's involvement in the MetroAg Innoversity has prompted us to undertake semester-based design lab projects in collaboration with the Departments of Industrial Design, Anthropology and Development Studies and the Soweto Farmers Forum in 2014. These projects will be site specific, moving annually from one farmer to the next. They aim to document current issues faced by the farmers on each site and then, together with the farmers, explore design solutions. These will then be prototyped, field tested and evaluated in relation to their initial aims. The objective is that when the team move to the next site, the farmers are left with enough skills for them to continue experimenting and hence empowering their own emancipation whilst still remaining connected to the broader food system through the Soweto Farmers Forum. The impact that urban agriculture could have on reducing poverty, inequality and unemployment is clear. The problems identified in this paper of the complexity of encouraging participation, increasing skills and knowledge and improving networking for urban farmers are what this future design intervention aims to impact on through participatory technology development. Ultimately the resilience of the Johannesburg food system will be improved through incremental changes in current urban agricultural practice.

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