Sustainability Leadership: Pursuing a Circular Economy in Urban Agriculture

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Abstract: Africa faces a rapidly growing food security dilemma unless the required policy and strategy imperatives are addressed by the continent's governments. Whilst growth in the agriculture industry offers some hope for poverty reduction and food security, big-scale agricultural development and transformation remains complex; communities remain impoverished and subjected to associated food insecurity. Additional insecurity is caused by increasingly fluctuating and unpredictable climatological factors. Since urbanisation trends will not abate, public sector leaders in Africa may be well-advised to step up to the sustainability challenge and respond timeously and adequately to food security challenges. It is postulated that informal urban agriculture may alleviate food security concerns for urbanised communities by empowering them to become involved in the "farm-to-fork" process. This means that communities should tie closer to the whole production chain by becoming producers and consumers of food in their own (urban) localities. Urban agriculture is a term that the researcher uses to refer to the different types of farming practices that are applied to conduct agriculture in urban settings. However, by extension the postulate dictates that food security may only be advanced if an appropriate policy is prevalent; A careful policy and technology mix may revolutionise sustainable urban agriculture practices to alleviate the poverty and food insecurity disposition among the needy. Furthermore, a circular economy, cognisant of the environmental and sustainability issues of an urban agriculture economic system is imperative. A research series is underway that focuses on creating awareness among scholars and practitioners of public administration on the matter of sustainability leadership particular to urban agriculture. The objective is to encourage a new type of leadership that advances sustainable urban agriculture in practical ways. The research involves secondary as well as primary data collection. However, this paper in particular serves to engage the notion of urban farming amidst a circular economy. The paper is informed by current thinking and initiatives prevalent across the world and it seeks to present initial thematic extrapolations in context. An attempt is made to invoke critical reflective thought on the issue at hand, intent on informing future praxis development.

Keywords: Circular economy, Food security, Poverty reduction, Sustainability leadership, urban agriculture

1. Introduction

Urban Agriculture isn't a new phenomenon. Growing plants and keeping livestock in urban environs have been *communi praxi* for time immemorial. Whether legend or truth, the anecdotal tales of the hanging gardens of Babylon have always enthralled readers with descriptions of fruit trees, shrubs and vines growing vertically and on rooftops in the Babylonian cityscape. It is said to have been located in the current Iraq and is regarded as one of the 'seven wonders of the ancient world'. Legend has it that the gardens were established by King Nebuchadnezzar II and maintained by subsequent rulers. Such a phenomenon has fascinated scientists through the ages. What makes the Babylonian hanging gardens as a notion (or a concept) significant is the thought that food may be grown extensively in an urban environment, even vertically. Of significance for this paper, is that these gardens would have formed part of the regent's policy regime, administered by the ancient City.

Urban agriculture is seen as an alleviator of poverty and a contributor to food security in urban communities. This paper expounds on urban agriculture in a circular economy and refers to the ideal administrative environment that may be necessary to promote sustainable urban farming practices. It proposes how local government may lead and facilitate ideal policy frameworks, with a view to attaining greater measures of food security and poverty reduction in this context. The methodology employed in this article consists of mainly a desktop scrutiny of urban agriculture and circular economic policy. It presents extrapolations of existing and experiential knowledge on the issue under discussion. The author projects urban agriculture within a circular

economy context, and subsequently postulates on the relative benefits thereof for local communities.

2. Clarifying Relevant Concepts

Following are concise notes on a number of pertinent key words, which may apply to this paper.

2.1 Sustainability Leadership

The concept has been attributed to many definitions. For the purposes of this paper, the definition by Visser & Courtice, in an article entitled *Sustainability Leadership: Linking Theory and Practice* (2011), sustainability leadership warrants differentiation as a separate concept but shouldn't be viewed as a different school of leadership. Rather, it should be viewed as a particular "blend of leadership characteristics" applied within a particular context. As such, the following definition may be valuable (Visser & Courtice, 2011): "A sustainability leader is someone who inspires and supports action towards a better world." The authors furthermore state that sustainability leaders are: "individuals who are compelled to make a difference by deepening their awareness of themselves in relation to the world around them. In doing so, they adopt new ways of seeing, thinking and interacting that result in innovative, sustainable solutions." It may therefore be noted that a sustainability leader exudes leadership within the context of the world environment, and matters that relate to sustainability.

2.2 Urban Agriculture

"Urban agriculture can briefly be defined as the growing of plants and the raising of animals within and around cities" (RUAF, 2017). This type of urban activity, in its truest sense forms an integral part of a city or urban environment's economy and ecosystem. Typically, urban residents run these enterprises. Often, natural urban resources such as organic waste and waste water sustain and irrigate the vegetation and feed the animals. On the consumer and beneficiation side, local communities, traders and tourists acquire the produce; business as well as employment opportunities may result.

2.3 Circular Economy

The term circular economy suggests an economy that is generally focused towards the following (3-R Approach):

- Reducing – minimising – the use of raw materials;
- Reusing – maximising – the use of existing products and components; and
- Recycling – *high quality reuse* of raw materials.

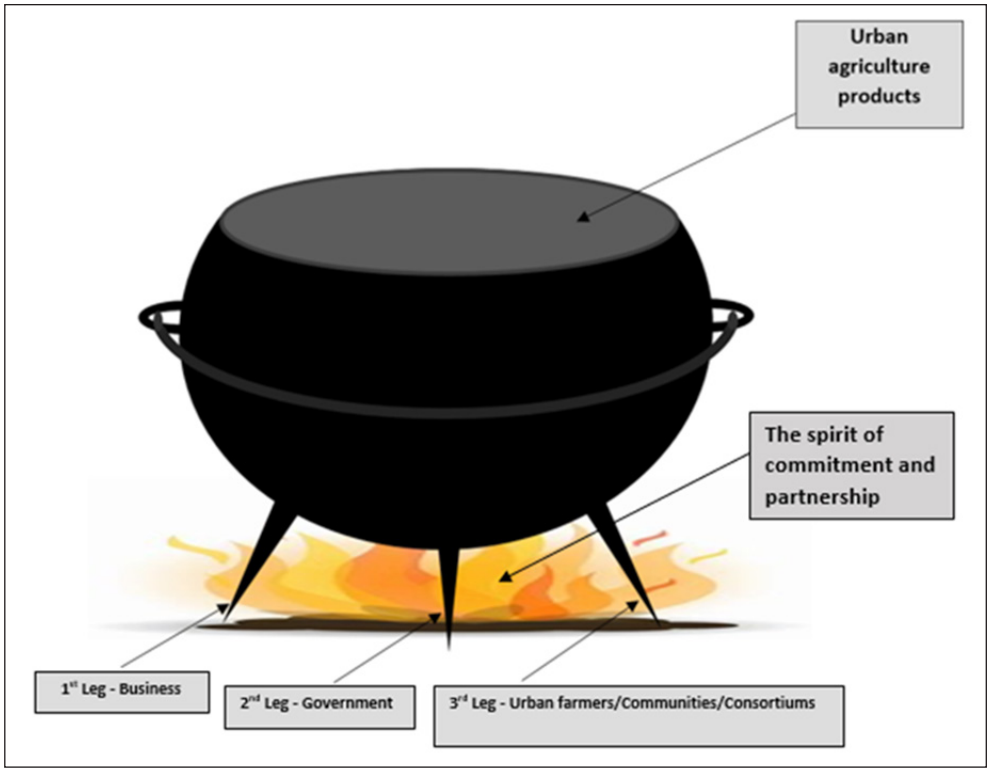
However, different definitions of the circular economy are used to explain the concept. This may be attributed to the fact that a divergent group of researchers and professionals use the concept and the usage thereof, is dependent on the particular angle of incidence that may be applied by the particular person. In addition, the diversity of definitions also makes it more difficult to introduce models with which circularity may be measured effectively and accurately (Kenniskaarten, [Sa]). For the purposes of this paper, a working definition of circular economy may be stated as: "*The Circular Economy means taking an eco-design approach to developing solutions, it means working on the modularity*, *repairability and recyclability of products and services offered, as well as on consumption models based on sharing and product as a service.*" (Enel X, [Sa]). Expounding on the above definition, it may be further stated that the circular economy is an economic model which observes five mainstays (pillars) (further elaboration on each of the below aspects to follow *Infra*) (Enel X, [Sa]):

- Sustainability of resources.
- Product as a service.
- Sharing platforms.
- Life cycle extension.
- Recovery and recycling.

3. Perspectives on Urban Agriculture

For urban agriculture practice to be impactful enough to address existing food security, and a rapidly growing urban migration of (poor) people, all stakeholders should understand what it entails. For the purposes of illustration, the metaphor of the African Three-legged Pot may be used. The pot contains the 'food' (product yield) of urban agriculture activities. The energy for cooking and producing the 'food' is acquired through the spirit of commitment and partnership resulting from interaction and a

Figure 1: African Three-Legged Pot of Development



Source: Author

symbiotic collaboration among the different stakeholders. The pot is supported by equal-length legs, which indicate equal but different responsibilities, allocated to the three main stakeholders (business, government and the practitioners thereof) to ensure that food security and poverty reduction are realised.

3.1 Urban Agriculture Practices and Technology

Across the world, different forms of urban agriculture are practiced (Spacey, 2017; Freerson, 2019). These types range from conventional "backyard" vegetable patches, pot farming to comprehensive community gardens. With the aid of technology, indoor farming, vertical vegetable farming and rooftop urban farming types are practiced as well. It is also not uncommon to find beekeeping, even small livestock (chickens and goats) being kept in the centre of Paris in France. In fact, since the 17th century until after the World War II, Paris was to a great extent self-sufficient as far as providing food – vegetables and livestock – to its citizens. This form of agriculture is practiced by *maraîchers* (market farmers). Even at that time, the *maraîchers* pioneered intensive urban farming techniques, which was, for the period, high-end technology. In Holland the latest technology is used for a 'floating' dairy farm provides milk to city dwellers in Rotterdam. The floating farm uses energy-neutral techniques to grow fodder for the cows. This means that the cows' manure and urine are utilised as fertiliser or biogas for energy generation. Other examples of such technology include different forms of Hydroculture (growing food in water solutions as opposed to soil – often indoors) or Aquaponics. Aquaponics refers to a specialised system where a symbiotic relationship between animals (fish) and plants are established. The system allows for circulation between the by-products of aquatic life – nitrates and minerals, being harvested to function as nutrients for plant growth. Depending on the technique applied, no soil is used for the plants, rather a water reticulation system between the fish and the plants (vegetables). The yielded products are fish and vegetables.

Afore a discussion ensues relating to the issues relevant to this article, urban agriculture and urban farming terminology should be noted to reflect the following conceptual modalities (*in practice, urban farming/agriculture are often used interchangeably*) (Difference Between.Com, 2011).

Table 1: Perspectives on the Difference between Agriculture and Farming

- The meaning of agriculture is field cultivation - farming and husbandry are two major divisions of agriculture;
- Agriculture covers a vast area including production, research and development, and farming is the process of implementing agricultural activities;
- Research as part of the agriculture, covers genetic engineering, plant breeding, and plant protection;
- Modern agriculture considers the sustainability of farming and associated safety measures;
- Different types of farming exist – including collective farming, factory farming, intensive farming, protected culture farming, and organic farming; and
- The concepts, farming techniques and agriculture techniques are often used interchangeably.

Source: Difference Between.Com (2011)

Technically, agriculture and farming mean different things. So, for policy makers, it may be necessary to properly distinct between the two concepts. From a policy design perspective, specification and exactitude may secure policy accuracy.

Furthermore, a particular set of dimensions associated with Urban Agriculture, should be considered:

First, the types of actors that are involved is valuable. Urban agriculture is often punted as a method for addressing food scarcity and poverty. However, it should be noted that in many cities and towns, middle income, employed people also engage in urban farming activities. These farmers may carry out these activities to augment their income, to produce food for domestic use, or as hobbyists.

Secondly, types of location play a significant role as far as the extent and type of urban farming that may be practiced. Differentiation is made between intra-urban and peri-urban farming activities. Here distinction is made between on the plot (such as a residential stand – e.g. back yard) or on land away from the residence (off-plot), public or private land (community land, conservation areas, along roadsides, streams and railway lines, school yards, hospitals or churches).

Thirdly, the types of products grown or kept: These may include for instance vegetables, fruits, root crops or grains and animals (e.g. poultry, rabbits, goats, sheep, cattle, pigs, fish). In addition, non-food products may also be cultivated, for instance medicinal herbs and ornamental plants.

Fourthly, the types of economic activity should bear consideration. Urban agriculture includes not only the farming part of the endeavour but may by extension include processing, packaging, shipping, and input requisites, such as composting, animal feed and chemical-nutritional additives to improve production efficacy.

A *fifth* dimension would reflect on the product destination and the degree of market orientation. For the most part, urban agriculture yield is self-consumption. In addition, surpluses are available for trading. Sales are made to consumers directly, to supermarkets or to intermediaries, depending on the type of produce and the type of the market in which the product is presented. In some cases, produce is farmed, processed (i.e. slaughtered, prepared, packaged, cured or cooked) and sold by an individual or a household or a consortium. In this case the degree of market orientation, which happens in/at a single locale, or in a particular urban area plays an important role as far as food security, employment and the general local economy are concerned.

The *sixth* dimension – scales of production and apposite technology used, may impact significantly on the measure of efficacy of the urban agriculture of an area. Various types, scales and methodologies may be employed for urban agriculture endeavours. These may range from individual or family farming undertakings to group or cooperative (e.g. community) farming to commercial enterprises. Classification of these may include micro- and small farms to medium sized or large scale categories. It should be noted that depending on the type of produce and the technology used, the physical size/outlay of the enterprise is relative. In the case of hydroponic-type farming, it may be that a relatively significant yield in terms of volume may be derived from a limited m^2 of space. Generally, the technological level of the majority of urban agriculture enterprises in

developing countries remains fairly low. With the aid of the scientific community and with the assistance of governments and business, the tendency is emerging to seek more sophisticated technology-supported methodologies. Simultaneously, an emphasis is concomitantly placed on intensifying farming practices to improve efficiency.

3.2 Key Elements of Urban Agriculture

Different literature sources, (Hendrickson & Porth, 2012; Quon, 1999; The World Bank, 2013; Toona, 2016) point towards a number of key elements which successful Urban Agriculture should reflect. The following 6 elements may *inter alia* be viewed as contributory factors towards increasing the prospect of applying this strategy to improve food security and to alleviate poverty. See Table 2 on the following page.

4. A New Policy Regime

For the purposes of this paper, it should be noted that policies to promote food security and poverty alleviation measures in often highly regulated and complex urban settings, may require a radical departure from conventional *status quos*. Facilitative policy emanating from sustainability leaders in government is a key requirement. When Urban Agriculture is considered as a policy, three essential perspectives form the 'driving force' that may direct the process: being the *social perspective*, the *economic perspective* and the *ecological perspective* (Condrea & Bostan, 2008). Similarly, RUAF (2017) also emphasise the three above mentioned policy perspectives which may find application to Urban Agriculture. RUAF (2017) continues to emphasise that these perspectives ensure that Urban Agriculture becomes robust, comprehensive, widely accepted and ultimately a sustainable policy. The policy perspectives are not mutually exclusive and should in practice be based on a specific (tailored) mix of the three perspectives. In other words, it should be assumed that different emphasis is allocated to a certain perspective(s) in certain locations, with particular categories of the population and additional considerations relating to other parts of the area and other stakeholders/ beneficiaries. As a result, policy designers (from a policy analysis point of view) should embed the policy within the context of the cross-cutting and multi-dimensional nature of Urban Agriculture and be cognisant that policy design processes should involve interests on multiple fronts:

- **Multi-sectoral** – Business/government/ community (stakeholders).
- **Multi-spherical** – National government/ provincial government/local government (metro/district/local municipalities).
- **Multi-functional** – agriculture/health/waste issues.
- **Functional management** – energy/water/ environment/community development or nature conservation etc.

Notably, the policy arena within which Urban Agriculture is to be nestled is complex and calls on direction form adequately capacitated individuals to provide the necessary sustainability leadership and foresight.

5. Integrated Development Planning and Local Economic Development Policy

Integrated development planning is a form of strategic planning that is a mandatory part of South African local government practice (ETU, [Sa]; Sebei, 2013). The regulatory framework of the South African local government system requires all municipal entities to engage in integrated development planning and implementation. The product of an integrated development planning process is an Integrated Development Plan (IDP), consisting of a local economic development and social development references, which serve to inform and direct strategies and budgets and general resources allocation of each municipality, towards service delivery. If these strategies are effective, the entity's development trajectory is increased.

Municipalities engage in term-of-tenure as well as annual integrated development planning and review exercises, respectively. After every local government election, a municipal council is required to develop a comprehensive IDP to guide the development of long term strategies for the municipality for the duration of the term of its tenure. In between, all municipalities are required to review these IDPs and adjust, where necessary. Of course, the annual reviews are also required to ensure that alignment occurs between the IDP and the budget.

Table 2: Key Elements of Successful Urban Agriculture

No 1: Facilitative policy (Regulatory framework) – National, provincial and especially local government spheres

• Formal acceptance of Urban Agriculture as an urban land use and policy instrument to promote food security and poverty reduction;
• Integration into development and land use (NDP, PG&DPs, IDPs and Spatial Development Plans);
• Policy forms the foundation for an effective regulatory framework to direct the development of Urban Agriculture;
• Existing policies and by-laws that may impact or hamper Urban Agriculture to be reviewed:
  • Identify and remove unsubstantiated legal restrictions; and
  • Integrate more adequate measures to effectively stimulate and regulate the sustainable urban farming/agriculture in practical terms.

No 2: Supportive infrastructure and strategy

• Create an 'institutional home' for Urban Agriculture in municipalities e.g. part of local economic department – a dedicated lead agency that is adequately resourced - physical, knowledge and administrative infrastructure; and
• Establish inter-spherical and inter-departmental working groups to coordinate Urban Agriculture modalities (programme/project management modalities):
  • Communication management planning/plans
  • Financial/funding/cost management planning/plans
  • Integration management planning/plans
  • Procurement management planning/plans
  • Resource management planning/plans
  • Risk management planning/plans
  • Stakeholder management planning/plans
  • Technology/knowledge management planning/plans.

No 3: Pro-Urban Agriculture land use arrangements
• Establishing an inventory of the available vacant open (government owned) land within the city; • Improve the suitability of available tracts of land/infrastructure – appropriation of Brownfields; • Integrating individual or community gardens in new public housing projects and township upgrading schemes – 'greening initiatives'; • Integration of Urban Agriculture in urban land use planning and zoning processes; • Promotion of multifunctional land use – e.g. symbiosis between urban farming and tourism; • Providing assistance to relocate urban producers that are poorly placed – translocation to suitable spaces; • Stimulating landowners to avail vacant land through longer term leases for agriculture; and • Temporal lease of vacant extraordinary municipal land, e.g. servitudes, buffer zones, flood zones, land underneath power lines, land earmarked for future development (extended future development).
No 4: Capacity building
Educating and training Urban Agriculture participants and stakeholders (public officials, urban farmers, unemployed adults, youth, women, entrepreneurs & pensioners) through: • Technical capacity building to promote more sophisticated farming practices; • Business skills enhancement, e.g. Financial management, Marketing, Project management, Human resource management knowledge; • Comprehend public affairs matters e.g. policy and governance; • Sustainability leadership; • Environmental sciences; • Disaster management; and • Citizenship & life sciences.
No 5: Public/stakeholder participation

• Stimulating the dialogue and co-operation among the direct and indirect stakeholders in Urban Agriculture;
• Establish a multi-actor platform and working group(s) on Urban Agriculture - joint analysis of:
  • Problems/challenges
  • Possible alternative solutions
  • Choice of best solution; and
• Coordinates the process of interactive and mutual formulation of policy and the planning and implementation of strategies by the various actors.

No 6: Partnerships – Business, government & beneficiaries

• Partnerships should be mutually beneficial, e.g. financially, socially, environmentally;
• Partnerships should involve constant formal and informal liaison (communication) – e.g. *Multi-stakeholder Forum on Urban Agriculture (assisted by multi-disciplinary working groups)*;
• Partnerships may be multi-faceted, multi-spherical, vertical/horizontal and multi-sectoral;
• Partnerships are unique to the locus and focus of a particular programme/project; and
• Partnerships should be closely designed and managed in terms of the existing *policy and regulatory framework* that govern:
  • Service delivery agreements;
  • Farming/agriculture;
  • Sustainable development and environmental management; and
  • Growth and development strategies/plans.

Source: Author

Figure 2: Sustainable Development Goals

Source: United Nations, 2015

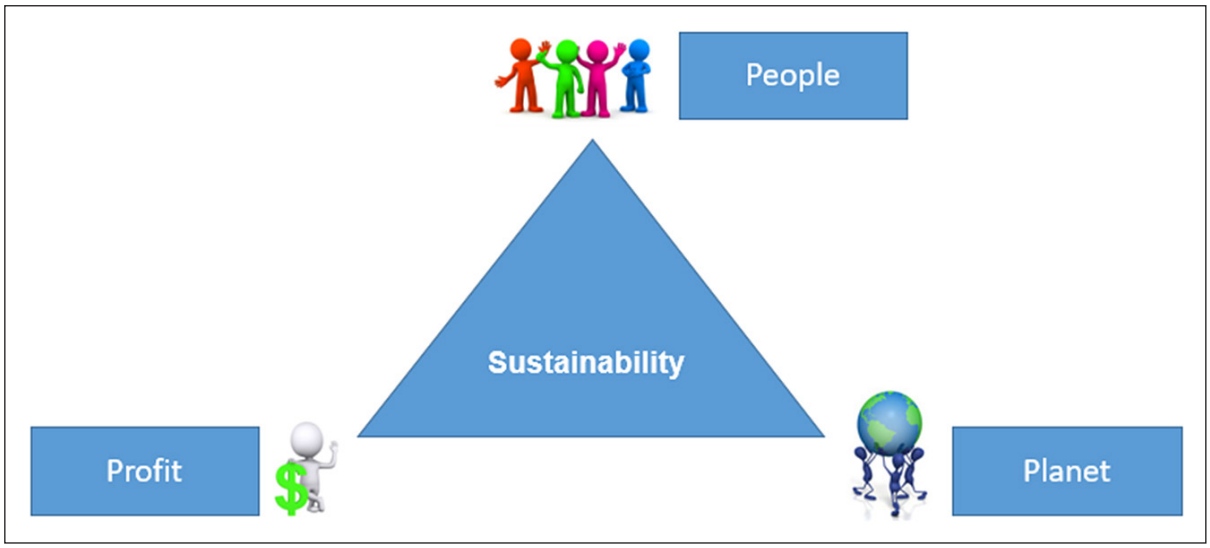
The main components of the general policy regime and local government regulatory framework, which relate to (and informs) integrated development planning and the IDP are as follows:

- Constitution of the Republic of South Africa, 1996;
- White Paper on Local Government, 1998;
- Municipal Systems Act, no. 32 of 2000;
- Municipal Systems Amendment Act, no. 7 of 2011;
- Spatial and Land Use Management Act, no. 16 of 2013;
- Sustainable Development Goals (United Nations, 2015). See Figure 2;
- The National Development Plan (NDP) (National Development Plan, 2011); and
- Relevant provincial development plans (ECSECC, 2014).

As a matter of course, IDPs contain elements that directly and indirectly relate to socio-economic and related development issues. A narrow definition of what an IDP is, as presented by the Education and Training Unit (ETU) for Democracy and Development, may be quoted as: "An Integrated Development Plan is a super plan for an area that gives an overall framework for development. It aims to co-ordinate the work of local and other spheres of government in a coherent plan to improve the quality of life for all the people living in an area. It should take into account the existing conditions and problems and resources available for development. The plan should look at economic and social development for the area as a whole. It must set a framework for how land should be used, what infrastructure and services are needed and how the environment should be protected." (ETU, [Sa]). IDPs may therefore include references to:

- Urban Agriculture policy(cies) and formal acceptance of urban agriculture as an urban land use;
- Measures to formalise and enhance access for urban farmers to vacant open urban spaces and the security of agricultural land use; and
- Envisioning to increase the productivity and economic viability, of urban agriculture by improving access of urban farmers to training, technical advice, and credit and supporting the establishment and strengthening of urban farmer organisations.

Figure 3: Triple Bottom Line (TBL)



Source: Author

6. Sustainability Leadership

Sustainability leadership therefore, may be described as the practical execution of the Triple Bottom Line concept: "Mindful actions and behaviours embracing a global world-view to recognize the connection between the planet and humanity; thereby, through personal and organizational choices, effects positive environmental and social change" (Way, 2012). Practically, the triple bottom-line considers the following issues, being environmental concerns (actions should not be harmful to the environment), social concerns (it should be beneficial to society, promotive of human development and wellbeing) as well as economic concerns (strategies should make economic sense).

The triple bottom-line may be illustrated as shown in Figure 3.

According to Way (2012), Sustainability Leadership principles (actions and attitude) include:

- **Understanding the interconnections of systems** – recognize how each group of related factors (people, objects, processes, etc.) are connected and impact on each other;
- **Think globally and toward the future** – consider what current and future impacts you are making with each decision on the broad environment;
- **Protect nature and people** – distinguish how actions affect the environment;
- **Transform business as usual** – change standard operating procedures that may have the potential to harm the environment; and
- **Lead by example** – become personally responsible for any negative environmental impacts of one's actions.

It may be concluded that to achieve sustainability leadership, actors within systems should display informed and appropriate leadership, first and foremost, and thereafter, as a natural consequence, sustainability leadership may follow.

7. Urban Agriculture in a Local Circular Economy

Unsustainable resource use and usage, global population growth and concomitant environmental scourges lent experts to conclude that the current linear economic model is no longer sustainable. As an alternative, a circular economy may pose an alternative for exchange and production of goods to separate economic growth from material dependency. A circular economy is positioned as opposite to the conventional linear economy, which is biased towards single-use resource application where after products are rendered valueless and typically discarded. With circularity, the goal is to increase resource efficiency through strategies to reduce the negative environmental impact at all stages of the product (goods and services) life cycle.

This would include measures to decrease resource waste, while allowing people to continue to satisfy their needs whilst attending to the welfare of the planet. According to the European Commission, a circular economy *sustains* the value of products, materials and resources that form part of the product value chain system for as long as possible. This occurs by redepositing products as return entrants to the product cycle, after their productive use-in-format, thus minimizing the generation of unnecessary waste and exploitation of raw and unprocessed materials and resources. In this regard, innovation and technology should be applied to strive towards a point where the economic system doesn't produce waste; *consequently, waste will be designed out of the product life cycles as far as possible while minimizing negative impacts of production of goods and services.*

For instance, the global consultancy firm McKinsey estimates that a transition to a circular economy across the European Community authority area, may lead to a reduction of pollution of 48% by 2030 if diligently implemented, and 85% by 2050, compared with 2012 levels. These estimates relate specifically to the mobility, food, and built environment sectors in European cities (United Nations Environmental Programme, [Sa]).

The dilemma with introducing a new economic model on this scale requires much effort from government and private sector as well as among other stakeholders, for this purpose. This requires a concerted effort by all. The quoted African pot of development (*Supra*) inadvertently comes to mind.

7.1 Sustainability Leadership and the 6 Key Elements

Changes in economic patterns require immense and complicated policy processes – design, implementation and continuous analysis. It is postulated that sustainability leaders may act as *influencers* to ensure that a proper mix of *the 6 Key Elements* are considered whenever Urban Agriculture policy is *planned*, *practiced*, *monitored* and *evaluated* – all within the precepts of a circular economy. Furthermore, in the wake of the urgent international drive to increase sustainable development in accordance with the Sustainable Development Goals and related local development plans (referred to *Supra*), South African local government entities should consider re-framing their own local economic modelling towards adopting a circular local economic model, which will be adherent towards the principles of Triple Bottom-line so as to resemble the 3-R Approach associated with circularity in the greater economic value chain. The urgency for the above is also exacerbated by the country's domestic socio-economic disposition as it currently represents a "perfect storm" on the economic front.

7.2 Urban Agriculture and the Circular Economy – The Current Reality

Upon considering the principles and mainstays of a circular economy, and international literature, the question may be posed as to how a circular economy for Urban Agriculture may potentially achieve success?

To attempt to answer the question, a report generated by the Ellen McArthur Foundation entitled Cities and Circular Economies for Food (2019) claims that urban and peri-urban farming has a role to perform in building a resilient food system. The concern however, is that the potential of urban farmers to satisfy the ever-growing urban food demand in some areas is limited at this point. Mention is made that technology and innovation and lacking sustainability leadership remains inhibiting factors in this scenario. These aspects may contribute towards closing the circularity gap which is currently prohibitive for this quest.

In particular, the following three challenges remain (Cities and Circular Economies for Food, 2019): *Firstly*, competition for land requires that demands for housing and other business initiatives may create supply-and-demand dynamics. In addition, technical feasibility and zoning modalities pose hurdles as well. An example is the urban agriculture programme in the Western Cape, on the outskirts of Cape Town, where the Philippi Horticultural Area (PHA) may to be developed as a mixed-use development (Oakland City), with the support of the City of Cape Town and the Western Cape Government and a local developer (Knight, 2019).

Secondly, non-suitability of certain food types makes it impossible to cultivate under certain conditions, either indoors or outdoors within urban settings. In this regard, it should be realised that not all farming activities may be equally feasible in urban settings. Until technology provides solutions, such realities may prevail.

Thirdly, challenges towards becoming truly circular in urban agriculture practice abound. Hydroponics, aeroponics and aquaponics for example, require some measure of chemical additions, which are contrary to the precepts of true circularity; high-technology soil-less methods still require synthetic liquid fertilisers to provide vegetation with the necessary nutrients. These dilemmas may be overcome once technology provides solutions by circumventing the need for synthetic pesticides and growth stimulants (ideally nutrients sourced from for instance food by-products would be preferable). Also, dependable and large scale renewable energy and sustainable loop water provision are important requirements.

8. Conclusion

It may be postulated that an opportune moment has arrived to re-think South Africa's economic architecture, not to mention the need to accelerate this in the aftermath of the effects of the COVID-19 reality. A socio-economic rebuilt is imminent but this may be conditional to the existence of a will to pursue this cause and journey; ultimately, sustainability leadership acumen is vital on all levels and in all sectors to plan for and overcome the prevailing challenges and implement circularity in the urban agriculture economic arena.

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