



# INDUSTRIALISATION AT THE AGE OF DIGITAL REVOLUTION AND ENVIRONMENTAL DEGRADATION: A RHETORIC DISCUSSION ON THE ROLE OF CO-OPERATIVES

Happiness J. Nnko<sup>19</sup> and Faustine K. Bee<sup>20</sup>

---

## Abstract

*Co-operatives, through collective bargaining, are capable of waiving the barrier for marginalised populace to participate in industrial economy and their principles, values and purpose made them ideal organisations for an inclusive socio-economic development worldwide. Also, wide sectoral coverage and the flexible nature of co-operatives create a window of opportunities to address dynamic challenges associated with the digital era and environmental sustainability, which constantly shape the Industrialisation process. This paper, therefore, used primary and secondary data to rhetorically assess what roles co-operatives play in Industrialisation at the age of digital revolution and environmental changes. The study came up with experiences of industrial co-operative examples from Tanzania in areas of agri-processing, dairy-processing, tailoring and shoe making, among others, that relied on simple available technologies and raw materials. In addition, global trends in technology and environmental sustainability open up various opportunities for co-operatives. Consequently, non-traditional co-operatives are emerging and participating in various processes of Industrialisation and potentially will play an important role in Industrialisation under the fourth industrial revolution and current global environmental trends. However, for effective participation in Industrialisation, co-operatives will need an enabling environment; favourable governance, policy and regulatory frameworks; access to capital and technology, among others.*

---

## I. Introduction

Industrialisation is broadly defined as “a set of economic and social processes related to the discovery of more efficient ways for creation of value” that is categorised as a secondary sector (Simandam, 2009). The primary sector involves agriculture, hunting, fishing, and resource extraction whereas tertiary refers to services. Thus, Industrialisation involves the process of shifting the economy from the primary sector into sectors that exhibit higher levels of productivity and technological advancement. In this sense, Industrialisation does not mean establishment of a factory, rather it has to exhibit a qualitative economic and social change reflected in terms of its contribution to GDP, employment creation, and changes in the landscape of the area. Typically, industrial activities are characterised by high knowledge content and significant opportunities for technological advances. As a result, industrial development, more often than not, distributes the benefits of its development by accelerating growth in other sectors of the economy, thereby boosting the population’s overall welfare through improvement of living standards.

Historically, industrial revolution started in England (1763 – 1846); followed by the United States of America, USSR, Germany, and Japan, and later after WWII by the South East Asian countries (Simandam, 2009). Today, industrial revolution is categorized into four epochs – the first industrial revolution relied on water and steam power to mechanize production; the second used coal and electric power to create mass production; and the third used electronics and information technology to automate production. The world has entered the fourth industrial revolution (4IR), the “digital era” which is characterised by a fusion of technologies that lines up the physical, digital, and biological spheres (Koloszár and Németh, 2020). At this era, technology has advanced to the extent that machines are capable of performing the tasks that normally would require human intelligence (Schwettmann, 2015). For example, self-driving cars, bank automated customer services, travel online bookings

---

<sup>19</sup> University of Dodoma  
<sup>20</sup> University of Dodoma

and 3-D printing technology. Unmatched digital technology progression in 4IR is transforming the global traditional economy towards digital and no country is immune, nonetheless, the pace varies between countries (Schwettmann, 2015).

The digital economy is fundamentally changing Industrialisation (ILO, 2013:2016). It is affecting the patterns and geographical location of industries, employment and economic growth, and there are various opportunities and disruptions that come along with these developments. The emergence of technology-aided Industrialisation requires specialised skills; hence demand for a new approach to education and training, research and innovation, and review of public policies. The experience of East Asia where investment in Industrialisation moved from developed countries to less developed countries due to low labour cost may not be applicable to Africa during the digital economy as investment attraction is driven by availability of talents and skills (ILO, 2016). Automation and digitization in 4IR are improving productivity through increased efficiencies, which potentially benefit the environment by alleviating environmental resources deterioration and depletion. However, ongoing efforts of Industrialisation across Africa and other regions will consequently lead to increased resource extraction, environmental pollution and accelerated loss of biodiversity.

Over the past 50 years, 60% of the earth's ecosystem has been depleted and by 2050 natural-resource consumption will rise by three to six times due to human population increase (Brahmbhatt, et al., 2017). Climate change is augmenting the resource scarcity and this situation has impact on Industrialisation process; thus, high time to explore more climate technology aided Industrialisation alternatives (Terrapon-Pfaff et al., 2012; World Bank, 2015; Buseth, 2017; Brahmbhatt, et al., 2017; NEMC, 2017; Luken and Clarence-Smith, 2019). For instance, with the aid of advanced bioengineering technology in agriculture, varieties of drought-resistant crops that can feed intensive industries are being developed particularly for climate sensitive production zones such as Africa. Technological innovations in recycling help to reduce environmental pollution and resource depletion problems (World Bank, 2019). Considering the growing trend of declining natural resources, green growth is becoming a concern (Brahmbhatt, et al., 2017; Luken and Clarence-Smith, 2019). As such, the green economy, inclusive economy, and climate change mitigation are now central to many global sustainability discussions unlike before.

### **1.1 Industrialisation and African Countries Catch up Potentials**

African countries, have adopted various development strategies including Import Substitution Industrialisation Model (ISI -1960s-1970s), Rural Development Model (RDM - 1970-1980s), and Structural Adjustment Programmes (SAPs mid 1980s-1990s) (Nzau, 2010; Heidhues and Obare, 2011; Mendes et al., 2014). ISI was state dominated and aimed at minimising reliance on manufactured foreign imports. The model failed to facilitate industrial development partly due to lack of competition resulting from government control, and corruption (Nzau, 2010). RDM was adopted in order to mainstream informal rural agricultural industry into the countries' economy. Similar to the ISI model, government control dominated the RDM process and eventually the model failed to transform the industrial sector (Tafirenyika, 2016). Failure of RDM resulted in the de-Industrialisation period of the 1980s when most developing countries experienced economic crises. Subsequently, most developing countries adopted Structural Adjustment Programmes (SAP) with financial support from international financial institutions. SAP encouraged a reduction in the public sector and privatisation of publicly owned companies. Liberalisation of the economy exposed most developing countries into unfair competition and, thus, the SAP policy is considered the first reason for stagnation of Africa's Industrialisation. Hitherto, Africa is at the bottom of the global Industrialisation partly because it exports raw materials or semi-processed products (Zamfir, 2016). Lately, the Industrialisation agenda across Africa has been stronger than previous and the continent has potential to industrialise her economy.

Africa has the potential to industrialise faster because processes can now benefit from leapfrogging through replication of production methods, technologies, and institutions of developed countries. The same approach was used and worked for economies like Japan, the Asian tigers and China to accelerate their Industrialisation process. Besides, Africa has relatively weaker diminishing returns (in particular, to capital) which potentially give the continent an opportunity to invest in the industrial economy. Furthermore, in the past few decades, the developing world, particularly Asia, became the world factory due to low cost of production in terms of labour and raw materials. Recently, the cost of production in Asia has risen and is now similar to high-income countries (Brahmbhatt, et al., 2017). The increasing cost of production in Asian countries, coupled with domestic demand policies and advancement of technologies are opening a window of opportunities for African countries to attract industrial investors based on low production cost. In addition, the Chinese policy of "offshoring" a portion of low-end manufacturing to Africa (Omoruyi, 2016) is expected to boost the continent's manufacturing sector.

## **1.2 Tanzania and the Pursuit for Industrialisation**

Tanzania's drive to Industrialisation has gone through various stages since independence, from nascent and undiversified to state – led ISI, and subsequently to de-Industrialisation in the 1980s. Consequently, the government took various initiatives: first, the Sustainable Industrial Development Policy (SIDP) of 1996 – 2020 that focused on enhancing sustainable development of the industrial sector that will transform the economy, create employment, and enhance the contribution of the private sector. Secondly, Tanzania Development Vision TDV 2025 (1999 – 2025) which aimed at transforming Tanzania into a semi-industrialized country by 2025. The government adopted the Integrated Industrial Development Strategy 2025 (IIDS 2011 – 2025) to realise the TDV 2025 and currently, Industrialisation is on the top government development policy agenda.

Although these various development strategies recognized the role of the private sector in the Industrialisation processes, to which co-operatives belong, the role of the co-operative sector is not clearly defined. Co-operatives as member owned, controlled and democratically governed enterprises are ideal organisations for people centred industrial development agenda. Unfortunately, the Co-operative Development Policy 2002 and the subsequent Co-operative Reform and Modernization Programme (2005 – 2015) did not provide for co-operative Industrialisation strategy as part of the broader national Industrialisation strategy. However, co-operatives can utilise available natural resources and opportunities to enhance effective member participation in Industrialisation processes in both urban and rural areas.

## **1.3 Co-operatives and Industrialisation: General Perspectives**

Co-operatives are unique business, social, and democratic enterprises where people unite and pool resources together and make decisions jointly over their common economic, social, and cultural needs. As a modern form of enterprises, their history can be traced back to the founding of Rochdale Society of Equitable Pioneers in the United Kingdom in 1844 (Abell, 2004). Expansion of urban-capitalist society, which brought hardship and poverty to the masses was among the motivation behind their formation. Later co-operatives spread in European countries, the United States of America and Canada. In Africa, modern forms of co-operatives were introduced during the colonial period; partly as a drive to commercialise the economies through the support of cash crop production - that were needed by the colonial administration; but also, as a means to liberating the natives from colonial masters (Khumalo, 2014). It was for this reason those early co-operatives were associated with the production of cash crops – mainly cotton, coffee, and tobacco. Co-operatives were also used as a vehicle for political struggles in many countries. After independence, co-operatives were engaged by the independent government to undertake delivery of multifaceted development objectives including modernization of agriculture and the transformation of the rural sector.

The democratic and voluntary membership nature of these enterprises provide an institutional framework through which local communities collectively exert control over productive activities, which drive their livelihoods (ICA, 2020; Gibson, 2005; Wanyama et al., 2009). The co-operative framework provides a viable platform for marginalised and ordinary people to participate in the industrial economy through collective bargain gained through organisational access. This could be done by mobilisation of personal and saving deposits that are injected into the co-operative industries and collection and supply of industrial raw materials to feed the co-operatives and non-co-operative industries. Co-operatives exist in almost all sectors of the economy: the wide sectoral coverage provides a window of opportunities for co-operatives to participate in the industrial economy through a broad and dynamic Industrialisation process. The co-operatives potentially hold a bright future especially now that economic inequality has made it difficult for the poor population to participate in Industrialisation. Co-operatives are ideal organisations for redressing inequalities – as they promote economic and political democracy, establish co-operative business enterprises, increase peoples' control over resources and economies, manage environment friendlier, provide equal access to opportunities, can utilise emerging technological revolution friendlier, and promote peace and security. The early co-operatives were established among weavers, workers in cottage industries, who were aggrieved by moneylenders and mercantile economy during the early industrial revolution. Indeed, this is one of the arguments that co-operatives are still valid during this 4IR.

#### **I.4 The Context, Outline of the Paper and Methodology**

Co-operatives, in this paper, are defined as: “*people centred enterprises owned, controlled, and run by and for their members to realise their common economic, social, and cultural needs and aspirations*”. The paper attempts to steer rhetoric discussions on the role co-operatives can play in promoting Industrialisation in Tanzania at the age of digital revolution and environmental changes. First of all, the paper takes a stock of co-operatives present and participating in the Industrialisation process in the country. Based on these experiences, available raw material, and technology, the paper provides candid assessment on the roles and potentials that co-operative organisations played, and can continue to play in addressing development challenges including environmental degradation which impact human lives negatively. The paper is organised in four sections. Section one provides the introduction, background information, Industrialisation and Africa catching up, Tanzania and the pursuit for Industrialisation, co-operatives and Industrialisation and the context, methodology and an outline of the paper. Section two contains co-operatives Industrialisation in Tanzania with some examples. Section three presents the co-operative Industrialisation at the age of digital revolution and environmental degradation: a bright future. Section four contains concluding remarks and a way forward.

The paper is based on the data collected from the Tanzania Co-operative Development Commission (TCDC) in July - August in 2021 and Tanga Dairy Co-operative Union Limited. Also, secondary data from Tanzania Milk Processing Association (TAMPA), Government Ministries and institutions were used to supplement information from TCDC. Attempts were also made to discuss the subject matter with some experts on the topic presented here. SPSS and Excel computer programmes were the main software employed in data processing and thematic content analysis and descriptive statistics were the main analysis approaches employed.

## 2. Co-operatives Industrialisation in Tanzania with Some Examples

### 2.1 Co-operatives status in Tanzania

Co-operatives have a long history in Tanzania and as of 30 June, 2020, a total of 9,185 co-operatives distributed in 26 regions were registered by TCDC. Financial co-operatives – mainly SACCOS dominated the Dar-es-Salaam region, while agricultural marketing co-operatives dominated Tabora, Mtwara and Simiyu (Figure 1). This distribution is attributed to livelihood drivers where Tabora and Mtwara are largely driven by agricultural-related activities while business drives the Dar-es-salaam region.

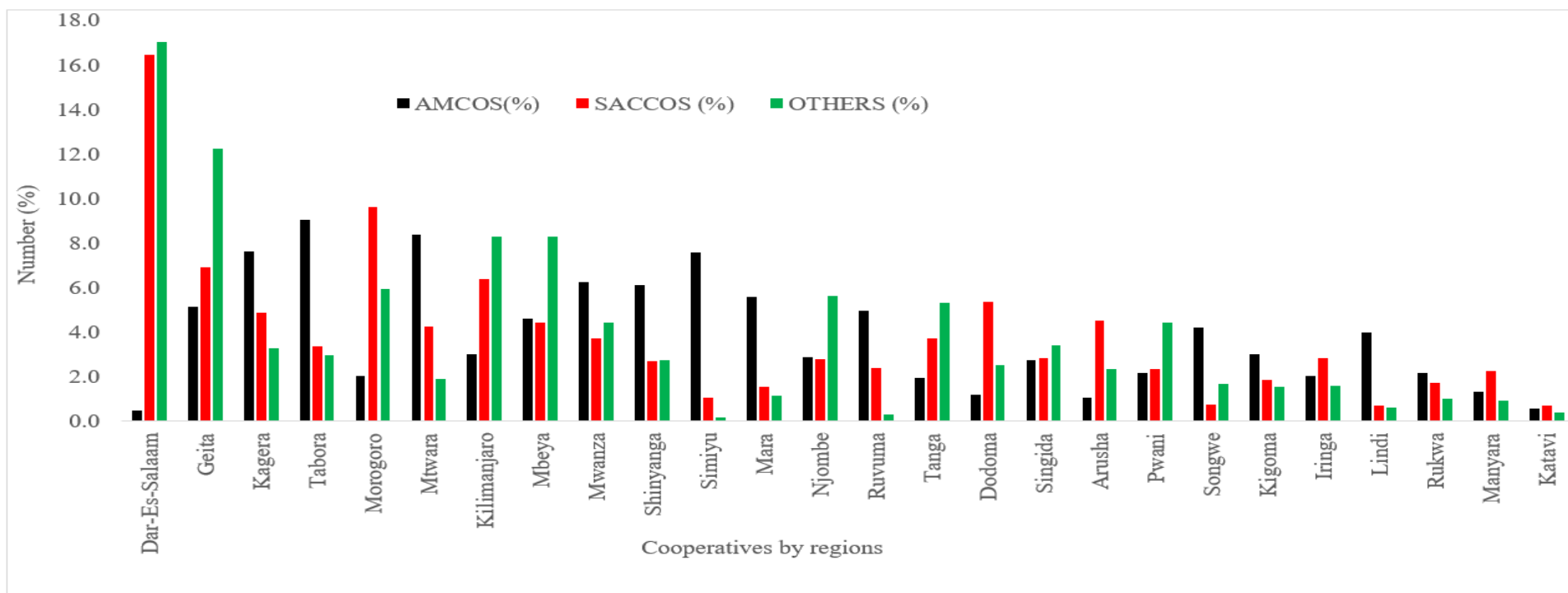
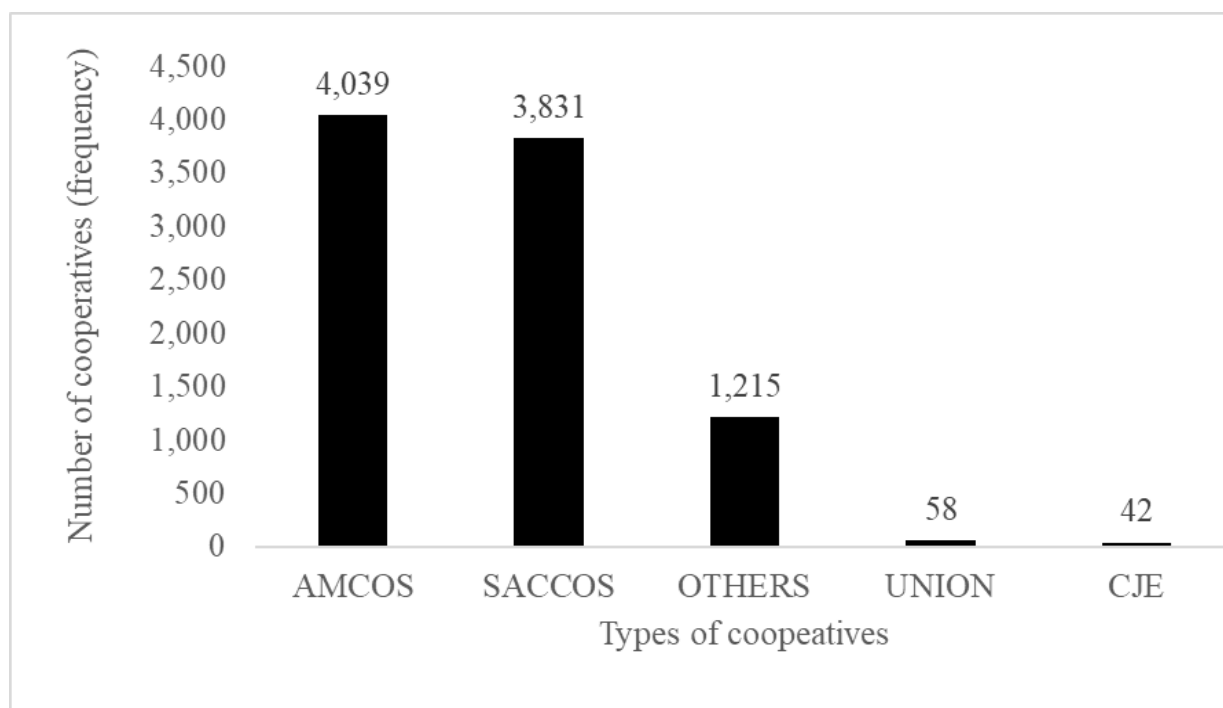


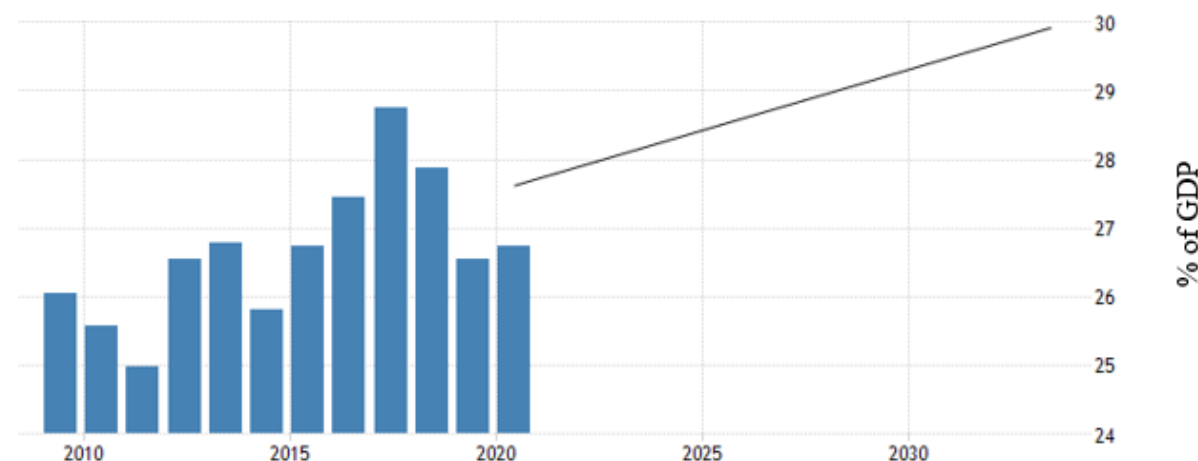
Figure 1: Types of co-operatives by regions in Tanzania

Overall, Agricultural Marketing Co-operative Societies (AMCOS) were the dominant type with approximately 44% of all registered co-operatives in the country, followed by SACCOS and Co-operative Joint Enterprises (CJE) were the least (Figure 2). The dominance of AMCOS is not a surprise because agriculture is the dominant sector that employs over 60% of the workforce (World Bank, 2021) and so has the potential to attract a large number of co-operatives. In addition, diverse climate and agro-ecological zones provide an opportunity for farmers to grow a variety of food and cash crops while livestock keeping is almost a traditional activity in the country.



**Figure 2: Types of co-operatives in the country as of 30 June, 2020**

Accordingly, in 2020 agro-processing industry in Tanzania contributed 26.74% of the GDP and predictions indicate potential for further growth (Figure, 3).



**Figure 3: The predicted performance of agro-processing sector, between 2010-2030**  
Source: World Bank (2020)

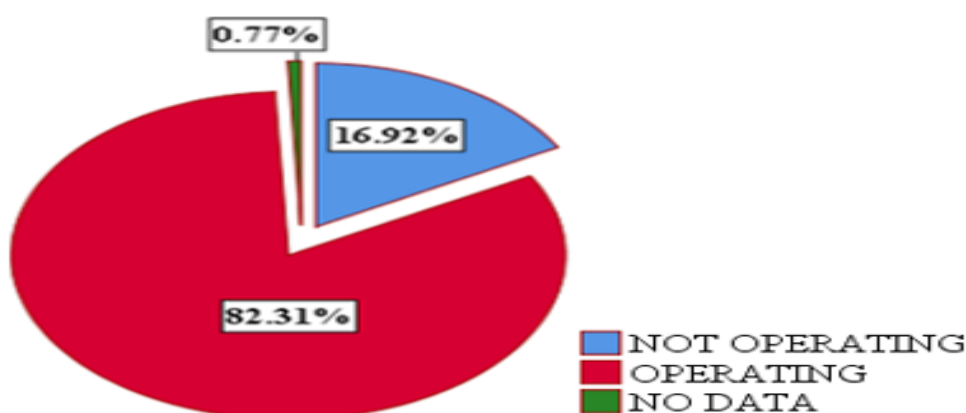
## 2.2 Industrial Co-operatives in Tanzania

Industrial co-operatives played a major role in the Industrialisation of countries such as France (Mélo, 2015). In Tanzania, the analysis of TCDC data revealed that only 1.5% of 9,185 co-operatives are industrial co-operatives; over 60% in Agro-processing followed by dairy and others (Table 1). These co-operatives provide a framework,

which enables members to either organise raw materials for industrial processing or mobilise capital and inject it into their associations' ventures. Over 80% of the recorded co-operatives' industries were operating and around 16% were not operating (Figure 4). This is probably due to inadequate human resources and access to capital and technology that reduce the ability of a co-operative to compete in a liberal market. In the past, the weakness of incompetent management, capital, technology, corruption have negatively affected co-operatives operations in Tanzania (Bibby, 2006). The low pace of Industrialisation through co-operatives, despite their potential, calls for the government to create an enabling environment for co-operatives to maximise their potentials.

**Table 1: Types of Co-operative industries in Tanzania**

	Responses	
	N	Percent
AGRO-PROCESSING ( <i>MAINLY CROPS</i> )	89	67.4%
DAIRY	23	17.4%
MANUFACTURING/HANDCRAFT	13	9.8%
SERVICE	4	3.0%
TAILORING	2	1.5%
SHOE-MAKING	1	0.8%
Total	132	100.0%



**Figure 4: Operational status of co-operative industries**

### 2.2.1 Agro-processing industrial co-operatives

Most of the recorded agro-processing co-operatives were in cotton ginning and coffee processing. The Kahama Co-operative Union (KACU), Chato Co-operative Union (CCU), Mbogwe Co-operative Union (MCU) in Geita, and Kagera Co-operative Unions (KCU) are good examples to single out. These co-operatives help to add value to members' crops and, hence, improve income. For example, KACU has improved members' income by engaging itself in cotton ginning. A joint venture between KCU, Karagwe District Co-operative Union (KDCU), Tanzania Federation of Co-operatives (TFC) and government, is operating TANICA instant coffee production that is doing well and the beverage is in local demand. The agro-processing activities reported in this paper concentrate in small-scale production units. Accessibility of adequate capital, technology and raw materials could potentially widen the window for co-operatives to process more crops and increase co-operatives market-share internally and externally.

### 2.2.2 Dairy-processing industrial co-operatives

There were several co-operatives participating in dairy value addition (Table 2). Farmers' associations or co-operatives play an important role in coordinating the dairy value chain from milk collection, processing and marketing. This avenue provides a window of opportunity for co-operatives to participate in the dairy industry by coordinating dairy farmers in order to increase the number of raw materials reaching existing plants. A good example is "Tanga Fresh" Limited – a joint venture by the Tanga Dairy Co-operative Union Limited (Table 2 and Box 1-Tanga Fresh Model).

**Table 2: Example of dairy processing co-operatives.**

S/N	Name Of Co-Operative	Name Of Plant/Industry	Line of Operation	Capacity	Location
1	Tanga Dairy Co-Operative Union Limited	Tanga Fresh Limited	Milk Collection, Cooling, Processing, Parking and Market	No Data	Tanga Region
2	Mshikamano Babati Dairy Coop Society	Mshikamano Babati Dairy	Milk Processing	No Data	Manyara, Babati Town Council
3	Nronga Women Dairy Coop.Ltd	Maziwa Hai	Milk Collection, Cooling, Parking and Market	4000 Litres	Hai (Bomang'ombe)
4	Marukeni Dairy Coop. Ltd	Marukeni	Milk Collection, Cooling, Processing	No Data	Masama Kati
5	Kyeeri	Kyeeri	Milk Collection, Cooling, Parking and Market	1,500 Litres	Machame Magharibi
6	Sawe	Sawe	Milk Collection, Cooling, Parking and Market	1500 Litres	Masama Mashariki
7	Ng'uni	Ng'uni	Milk Collection, Cooling, Parking and Market	1300 Litres	Hai (Masama Kati)
8	Foo	Foo	Milk Collection and Marketing	No Data	Hai (Machame Kaskazini)
9	Nkwarungo	Nkwandako	Milk Collection, Cooling, Parking and Market	1500 Litres	
10	Kalali	Kalali	Milk Collection, Cooling, Parking and Market	1300 Litres	
10	Mboreny	Mborenyi	Milk Collection, Cooling, Parking and Market	1300 Litres	
11	Nkuu	Nkuu Maziwa	Milk Collection and Marketing	No Data	

The Tanga Fresh Limited is one of the successful models which safeguard continued availability of raw materials from farmers while leading the dairy processing industry in Tanzania. As indicated in Table 3, the facility is serving about 8,000 farmers in the Tanga region.

**Table 3: Tanga Dairy Co-operative Union Limited primary co-ops membership**

S/N	District	No. of Primary Co-ops	Membership Target	Actual Members	
				Total	%
1	Tanga City	7	1,943	1,468	76%
2	Muheza	6	3,460	2,549	74%
3	Mkinga	7	1,899	1,465	77%
4	Pangani	2	1,182	1,132	96%
5	Korogwe	2	556	407	73%
6	Lushoto	4	1160	891	77%
<b>Total</b>		<b>28</b>	<b>10,200</b>	<b>7,912</b>	<b>78%</b>

**Box 1: Tanga Fresh Limited**

Tanga fresh limited is a coordinated dairy value chain of milk collection, processing and marketing combined with growth opportunities offered to small-holders' farmers through heifer availability and cattle credit. Until 2018, it was serving 6,500 farmers in Tanga region. The facility is owned by TDCU by 43.6% of the total shares. Other Investors are Dutch Oak Tree Foundation (DOB 53.8%) and a private investor Alnoor Husein 2.6%. Currently, this is one of best performing dairy process facility that has improved welfare of its members through improved dairy production, credit and income. The model is currently being adopted by other co-operatives including; Mara Dairies therefore, there is a room for growth and contribute more to Industrialisation.



At present, 70% of milk in the country comes from traditional cattle reared in rural areas and 30% comes from improved cattle primarily kept by smallholder producers (Ulicky, 2013; Mlozi et al 2015). Only a small fraction of milk produced in the country is processed leaving enormous growth potential for the dairy industry. Until June 2021, Tanzania Milk Processing Association (TAMPA) recorded 104 dairy industries with capacity of processing over 75 million litres of milk annually (Figure 5). Installed dairy processing plant capacity is larger than operating capacity. For example, until June, 2021, installed processing capacity was 715000 litres, but only 35% was processed (TAMPA, 2021). Processed dairy products have a high-value within the country, yet supply is limited. This is a window of opportunity for co-operatives to innovatively continue to participate in the dairy industry value chain process by coordinating the dairy value chain from milk collection, processing and marketing.

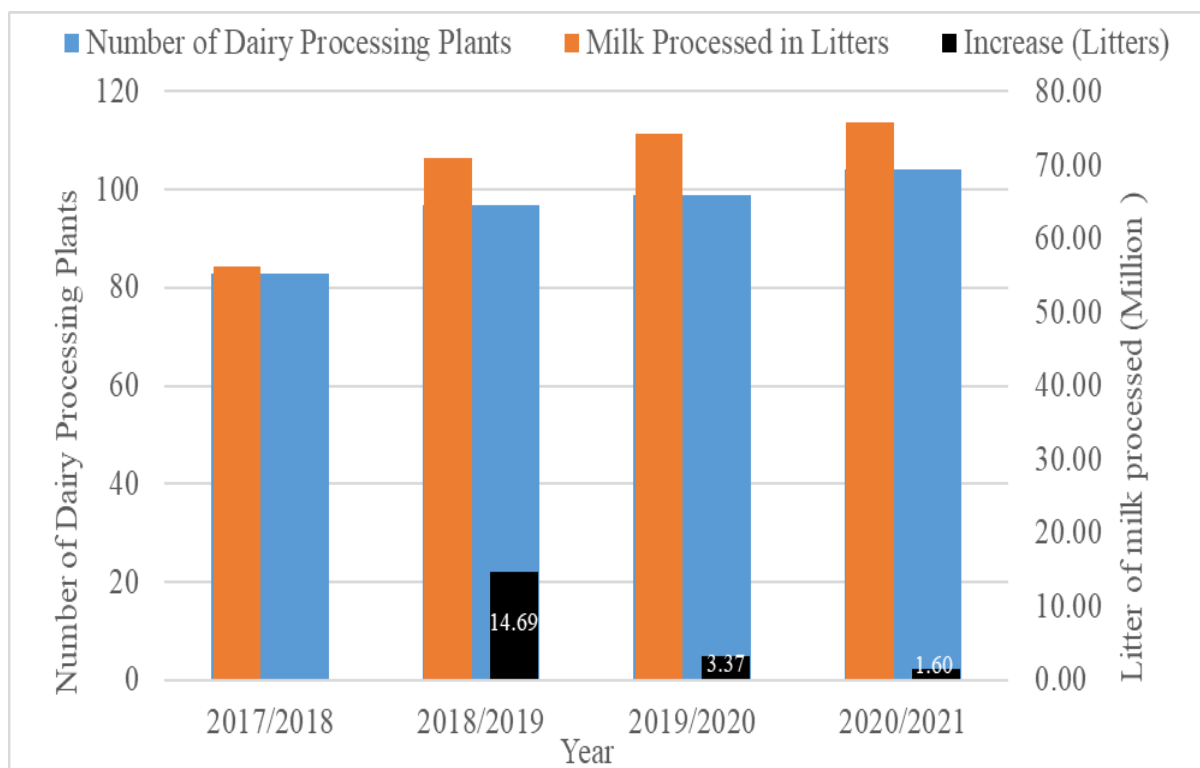


Figure 5: Dairy industries and their respective capacities in (2017-2021)

### 2.2.3 Co-operative enterprises in manufacturing

Reported co-operatives were focusing on diverse processes (Table 4) and concentrate on the creation of simple consumer products such as foods, furniture and allied wood products, and handcraft. Manufacturing sector is an important source of government revenue, employment and value addition. Therefore, there is a potential for raising the manufacturing sector by reviving dormant manufacturing industries and expanding the operating one if some of manufacturing challenges such as inadequate capital, governance and technology are addressed.

**Table 4: Co-operatives owned small-scale manufacturing**

S/N	Co-Operative Name	Industry Name	Area of Focus	Industry Location	Operational Status
1	Ushirika wa Wahunzi	-	Home Appliances and Grill	Tanga Urban	Opr
2	Ushirika wa Mafundi Seremala	-	Home And Office Furnitures	Korogwe Town Council	Opr
3	Wateco Ltd	Wateco	Carpentry	Sinde, Mbeya City	Opr
4	Uhunzi Coop Society	Uhunzi	Iron Smith	Sinde, Mbeya City	Opr
5	Shirecy (1984) Ltd	Sola Oil Mil	Soap Making	Shinyanga Municipal	Opr
6	Dasico Ltd	Dasico Sme Ind.	Carpentry	Ilala, Dar Es Salaam	Opr
7	Motico Ltd	Motico Ltd	Fabrication Of Spare Parts	Morogoro	Opr
8	Shirecy (1984) Ltd	Muhnze Oil Mil	Soap Making	Kishapu, Shinyanga	Not -Opr
9	Chammau	Chammau	Welding	Manyara, Babati Town Council	Not -Opr
10	Umoja Electrical Eng. Co-Operative Society Ltd	Umoja Electrical Eng	Fabrication Of Spare Parts and Leather Products	Babati Town Council	Not -Opr
11	Mlingotini Mwani Growers	Mlingotini Mwani Growers	Soap Making	Pwani	Not -Opr
12	Manza Technical Coop Society	Manza Technical Coop Society	carpentry	Korogwe Town Council	Not -Opr
13	Lushoto Wood Sawing and Carpentry Coop Society	Lushoto Wood Sawing and Carpentry Coop Society	Carpentry	Lushoto, Tanga	Not -Opr

OPR = Operating

#### 2.2.4 Co-operatives in leather industry: Shoe making co-operatives

Currently, there is only one co-operative in the leather sector found in TCDC data - “*Ushirika wa washona viatu – Lushoto Tanga*” focusing on shoe making. On the other hand, internal demand for shoes outweighs the supply, for instance, production capacity of leather shoes for local industries is approximately 1.2 million pairs per year but demand is almost 54 million shoes (URT-MLF, 2019). External demand particularly the United States of America, India, China, Brazil and South Africa is a growth avenue for the sector. At present, the sector is challenged by inadequate public investment, lack of trained personnel, poor quality of hides and skins, limited value addition, lack of quality and modern processing machines, inadequate availability of raw materials for local factories, high post-harvest losses and underutilization of the capacity of local factories. These challenges are an opportunity for co-operatives to participate in the Industrialisation process.

#### 2.2.5 Co-operatives in textile and apparel industry: Tailoring co-operatives

Despite the potential for growth of the textile and apparel industry, co-operatives have not been as active as in agri-processing. Based on the collected information, only two co-operatives; “*Ushirika wa mafundi nguo-Korogwe and Ushirika wa Mafundi cherehani-Tanga city*” have been registered with TCDC. According to the National Bureau of Statistics, knitted fabric production rose from 6.3m sq metres in 2011 to 20.3m sq metres in 2015. Also knitted garment production rose from 369,000 garments in 2011 to hit 5.5m in 2015. Co-operatives can expand in this industry given the availability of reliable fabric and assurance of a market for locally made garments. In general, co-operatives have managed to promote over 100 small-scale industries ranging from agro-processing to

manufacturing across the country. Based on the kind of co-operatives registered by the TCDC, co-operatives can participate in Industrialisation by raising capital to finance small-scale industries. Marginalised communities have a great difficulty in mobilising capital for any value addition process due to their inherent lack of access to finance and the fact that the Industrialisation process requires significant funding. Of all financing options available including a reluctant government loaning to the marginalised poor communities to have some sort of institutional mechanism and co-operatives appear to be the most reliable option as inherently are developed for the purpose of mobilising people with common interest to work together. Financial co-operatives can mobilise resources and make the same available to co-operatives, individuals, or associations of people who are working in value addition.

### **3.0 Industrialisation at Digital Age and Environmental Degradation: A Bright Future?**

The important question that this paper is addressing is “*what roles can co-operatives play under Industrialisation process dynamics where fairness and sustainable economic system is shaky*”. Economic inequality between poor and rich has made it difficult for the poor population to participate in Industrialisation despite the availability of raw materials for industrial manufacturing/value addition. The fact that the digital era favours the few who are adaptable while climate change is disproportionately affecting the poor compounds the situation for the poor to participate in the Industrialisation process. While the economic inequality gap is widening, profound digital revolution and environmental sustainability challenges constantly shape socio-economic position globally. This implies that development challenges need to be addressed differently through the deployment of ICT – 4D (ICT for Development). For instance, investing in non-traditional sectors, adopting more environmentally friendly technologies, among others.

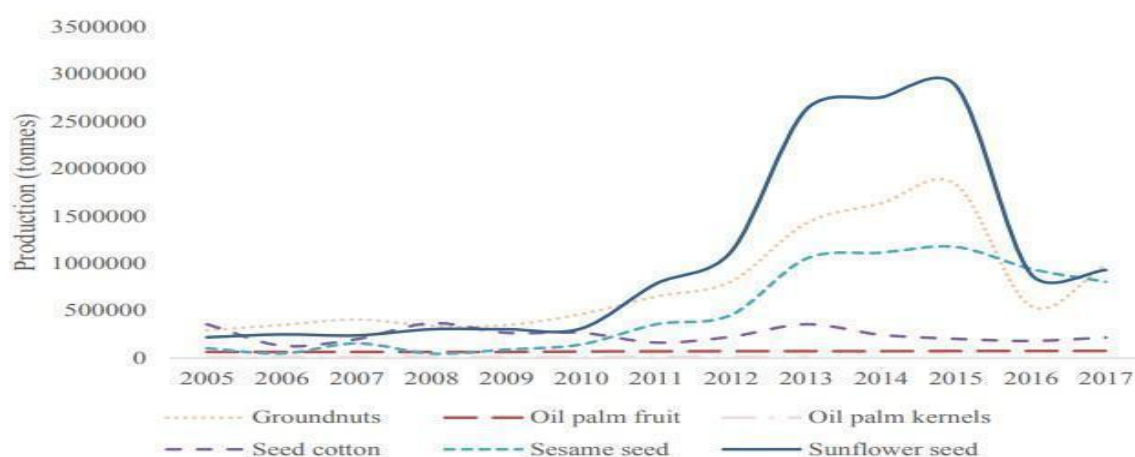
The values of co-operatives, among others, are equality, equity, self-help, democracy and solidarity economy where human needs are prioritised. Co-operatives as member owned, controlled and democratically governed enterprises, are ideal organisations for people centred Industrialisation processes. Nonetheless, for co-operatives to remain relevant in a constantly changing world, they must evolve and adapt to new trends by innovatively developing alternative means of resolving socio-economic problems (Borzaga and Spear, 2004). Co-operatives’ wide sectoral operation and establishment versatility, give them unique capability of taking part in ever changing socio-economic atmosphere and, thus, an opportunity to participate in the Industrialisation process. At present, there are numerous co-operatives that have expanded into new fields of activities to provide viable and sustainable responses to the ever-changing socio-economic atmosphere (EURICSE, 2016; Tchami, 2019). Based on the broad definition of Industrialisation, co-operatives in Tanzania have potential to participate in the Industrialisation process by taking advantage of available raw materials and technology and environmental challenges and opportunities. While Section 3.1 highlights the general potential co-operatives based on available raw materials, Section 3.2, 3.3 and Table 5 highlights potential co-operatives under the current 4IR and environmental sustainability global trends.

### **3.1 Available Raw Materials**

The government of Tanzania has recently raised demand for domestic processed food products to encourage local agro-processing and manufacturing which increase the opportunity for co-operatives. The following are key areas with potential for co-operatives to participate in Industrialisation by supporting value addition.

#### **3.1.1 Seed oil processing opportunity**

Common seeds oil produced in the country include sunflower, sesame, groundnuts and palm oils. The production has inconsistently increased (Figure 6), but processing is low as sufficient physical infrastructure is still a challenge. Thus, co-operatives have potential to support the seed oil processing through financing or by supplying oil-pressing equipment or participating in collection and supply of raw materials.



**Figure 6: Production of edible oilseed in Tanzania from 2005-2017**

Source: FAO (2017)

### 3.1.2 Cashewnuts processing opportunity

Cashewnuts production is around 120,000 tons per year (ITA, 2021). At present, only 10% of cashewnuts produced is processed in Tanzania, leaving the opportunity for investors such as co-operatives to support farmers by establishing small to medium-scale processing plants and coordinating farm inputs and markets for small farmers. Recent cultivation expansion to other regions increases the window of opportunity for further production increase.

### 3.1.3 Textile and clothing processing opportunity

At present, there are no fully integrated textile mills in Tanzania and only 20% of cotton produced in Tanzania is processed. The sector has great investment potential in establishing fully integrated textile mills as well as plants for cotton ginning, yarn fabric production (spinning, weaving and printing) and cut, make and trim (CMT) units. High availability of raw materials and lack of enough infrastructure along the cotton value addition leave great opportunities for stakeholders to participate in the cotton value addition such as establishment of clothing factories.

### 3.1.4 Vegetable and fruits value addition opportunity

Despite the large and diverse production of vegetables and fruits, only 4% of 2.75 million tons of fruits and vegetables are processed (Nkwabi *et al.*, 2019). There are huge potentials for co-operatives to participate in the Industrialisation process by directly supporting farmers to do commercial farming or by participation in collecting, and processing and marketing the processed fruits.

## 3. 2 Digital Transformation: Opportunities and Challenges

### 3. 2. 1 Automation and digitization increase income inequality

Hotspots of the digital economy are in a few countries and communities that are better adapted to the digital technologies mostly are from the developed world. Digitization has led to creation of enormous wealth in these few countries, companies and individuals. Augmentation of income inequality is widening the gap between poor and rich. Already the richest 8% of the world's population earn half of the world's total income (Zervoudi, 2020). Digital technological hub countries, companies and most educated skilled workforce will continue to benefit more from technological achievements because of their ability to adapt to automation. Unlike poor countries and low skilled workforce, skilled workforce and wealthy countries will be more favoured by the significant increase of their assets' value because of technological progress. Thus, the process has major challenges for policymakers across the world and at all levels of development.

### 3. 2. 2 Automation facilitate disruption of labour potential exploitation of workers

Technological advancement has made it easier for workers and firms to find each other for short-term work arrangements, which has led to a rise in the size of the independent workforce. This arrangement is referred to as gig economy which is "non-traditional work arrangement characterised with short-term work relationships with free agent workers who can take assignments from varying lengths". In this economy, workers become invisible because there is an agent between the independent workers who provide service to a client who requires that service. A good example is Uber which is an agency "digital company" standing between passengers and drivers. In this kind of work, labour protections and employer-provided social security benefits are rare. Gig workers don't have the right to form unions and bargain collectively. In this case, co-operatives have the opportunity to provide

a framework where gig workers can join and bargain collectively. Amazon online workers co-operatives are a good example of gig economy model co-operatives.

Generally, the changes resulting from innovation are impacting the government, people, and creating a new future. The system of public policy and decision-making must evolve with the evolution in technology – hence a challenge to government in terms of policy and regulatory framework under the emerging 4IR. This argument is also true for the national and international security concerns as the nature of global security threats is also going to change – cyber security may become common issues to address. The revolution in biotechnology and Artificial Intelligence as well as robotics – have an impact on human life and relationships. These will definitely re-define our moral and ethical values. Thus, human beings must act collectively to utilise the emerging technological revolution to shape the future for the common objectives and values. A comprehensive shared global view of how technology will affect lives and shape economic, social, cultural, and human relationships is required. This can only happen through co-operative action – where a member (man) is at the centre of business rather than profit.

### **3.3 Environmental Trends and Co-operative potentials**

Environmental trends, particularly climate change and resource depletion, are affecting the world and impacts vary in space and time across the globe. Poorest countries are more vulnerable to the impacts of climate change and already, there is an outcry of massive job and income losses in countries most affected by climate change. Nonetheless, environmental trends have created opportunities to generate green jobs in recycling and renewable energy across the world and already co-operative model enterprises in clean energy exist across the globe and are likely to expand further in the future (ILO, 2013). Apart from energy, co-operatives are also addressing climate change in sectors such as agriculture, transportation, retail and housing across the globe. In transportation, for example, in Vancouver Canada, there is MODO, a car-sharing co-operative that allows members to access cars only when they need to do so and it has helped MODO members to lower their carbon footprint and costs of owning a car (SSG, 2014). Also, there are co-operative enterprises that promote local prevention and adaptation practices so as to reduce the impacts of climate change. For example, alternative production practices and enterprise diversification can increase the resilience of rural communities when confronted with climatic hazards. However, at a local scale, co-operatives are not a ‘one-size-fits all’ solution, other means of improving locals’ adaptive capacity are equally important.

The combination of all the above trends; locally available raw material potentials, digitization and automation, climate change and dwindling of natural resources and growing global income inequality implies that there is a need to holistically re-organise the global economy towards sustainability where inclusiveness, equity and equality is key. Since co-operatives are built on the principles of collaboration and sharing rather than competition and profit maximisation, could they be a remedy for problems posed by trends described above and those that are likely to escalate in the future. According to ICA (2017), co-operatives due to their values and characteristics, could be among essential means of lessening some negative impacts posed by the current global trends while harnessing the positive impacts of these trends. Thus, potential co-operatives that may tap on this opportunity are summarised in Table 5.

**Table 5: Potentials for co-operatives under the 4IR and current global environmental trends**

Trends affecting Industrialisation process	Impact	Potential role of co-operatives	Potential co-operatives	Real world example
4IR and Digitization	Increase income inequality	Build inclusive economy/ Improve financial inclusion by solidarity economy/ provide capital	Co-operative banks and credit unions Digital money co-operatives???	Ranging from SACOSS to union banks.
	Increase production efficiency and competitiveness through automation and digitization	Reduce resource intensive use/consumption pattern by Joint use of efficient automated equipment	Shared service co-operatives; Shared service co-operatives for data processing, cloud computing and information management Self-help already exist Platform co-operatives Formation of Internet based collaborative platforms of teleworkers, translators, journalists etc.	DENIC and DATEV, Germany); co-operative groups of open-source programmes (Mozilla, Linux, Wikipedia etc.)  Housing co-operatives Shared home; Online holiday rental and 'home-sharing' platforms such as Airbnb and VRBO (Vacation Rentals By Owners) Coop Italy's 'Vivi Verde/ vivi Verde Co-operative
	Improve people's life Fight hunger through efficient and smart agriculture and bio-engineering technology	Produce organic and eco-friendly raw material for industries Lower ecological footprint through Smart agriculture through	Eco- Consumer/Producer co-operatives/associations Intensify their efforts to source more goods bearing sustainability certifications in the areas of: Ecological production; Organic farming; Recycling co-operatives	PEACE. -Thinana Recycling Co-operative in South Africa
	Lower environmental pollution. Fight environmental pollution through resource use efficiency technologies and recycling technology Disruption of labour law/ potential exploitation of workers especially in gig economy	Lower ecological footprint through industries material recycling  Regulate work by creating and offering work on the market within the frame of a co-operative formalisation.	Worker co-operatives Online workers co-operatives in the online trading industry	Amazon.co-operation

Environmental unsustainability (Resource depletion and climate change)

Scarcity of water, energy and raw material especially in resource-intensive industries and supply chains

Reduce carbon emissions through green industries and smart agriculture

Public service provision co-operatives  
Utility industry “Water, renewable energy,

Renewable energy co-operative, numerous in Europe. For example, European Federation of Renewable Energy Co-operatives (SSG, 2014) Jühnde Bioenergy Village in Germany Middelgrunden Wind Turbine Co-operative in in Denmark Co-operative Sahel Vert-Organic Valley, La Farge, Wisconsin, USA. Organic farmer co-operative developed a community-owned wind farm sufficient to power 1,800 homes while 32% of their diesel fleet fuel is biodiesel. The members of Organic Valley have eliminated the use of synthetic fertilisers from their operations.  
Water supply co-operatives; common in Finland, Denmark, Austria, Canada and USA, and in developing countries, for example in South America, such as Bolivia and Chile.  
In Kenya, there are several, Kiamumbi Farmers Multipurpose Co-operative Society (Kiamumbi Water Trust) and Ng’ati Farmers’ Co-operative etc. (Arvonen *et al.*, 2017: Koros and Nyanhaga, 2017), Organic Valley

Climate adaptation  
Organic farming

Heiveld Co-operative-  
Nieuwoudtville, South Africa. a  
producer of the finest organic  
rooibos tea is leading a significant  
climate change adaptation  
programme to identify strains of  
rooibos that are more resilient to  
changing climate conditions.

Recycling co-operatives,

Outpost Natural Foods Co-  
operative found in Milwaukee,  
Wisconsin. Composite the food  
leftovers and sell the compost to  
gardeners in their community—  
closing the loop on food waste and  
preventing it from ending up in the  
landfill.

---



## **4.0 Conclusions and Recommendations**

### **4.1 Conclusions**

The unmatched digital technology progression in 4IR is transforming the global traditional economy towards digital, which is fundamentally changing the dynamics of Industrialisation. Digitalization and automation in the 4IR come along with various opportunities and disruptions. In addition, ongoing global environmental decline and climate change disproportionately affect the poor and their effort to industrialise. Despite these challenges, the 4IR and environmental degradation opens up various opportunities to co-operatives. Since they focus on human welfare, equity and equality, co-operative enterprises are ideal organisations that put members at the centre of development, thus, ideal organisation for people centred on the Industrialisation process.

The quest for Industrialisation in Africa, Tanzania included, has been a central agenda since their independence with the aim of catching up with industrialised countries. Tanzania's drive to Industrialisation has gone through various stages since independence, with its own successes and failures. Currently, the Industrialisation agenda is on the top list of the country's development priorities. The focus of the Industrialisation agenda is on transforming Tanzania's economy into a semi-industrialized country by 2025 and, hence, transforming the economy by creating employment, and enhancing the contribution of the private sector to which co-operatives belong. Co-operatives can tap into advantages resulting from its wide sector coverage, available technology and environmental trends to enhance effective member participation in Industrialisation processes in both urban and rural areas. Despite the existing potential, TCDC data show that only 1.5% of co-operatives participate in small-scale industries ranging from agro-processing to manufacturing across the country. To increase and enhance effective participation in Industrialisation, co-operatives will need an enabling environment; favourable governance, policy for the management of technological advancement and regulatory frameworks for co-operatives to maximise their potential. In addition, access to capital, technology, training and education in co-operative entrepreneurship at the age of digitalization and environmental degradation would be necessary.

### **4.2 Policy recommendations**

#### **4.2.1 Enabling co-operative governance, policy and regulatory frameworks**

The development of co-operative enterprises requires the existence of an enabling environment including conducive policy and legal frameworks. For co-operatives to effectively participate in Industrialisation under the current global technological and environmental trends, their movement with assistance of researchers need to identify gaps in the current policy and legal framework and advise the government accordingly. The government has to create an enabling environment through an appropriate policy and regulatory framework for co-operative development. Such a framework has to define the roles of various actors appropriately without much intervention but create an incentive and appropriate support for the promotion and establishment of member centred co-operatives. In addition, the first Co-operative Development Policy was prepared in 1997 and revised in 2002. The first legislation was enacted in 1932 and, currently, the Co-operative Societies Act, 2013 is in operation. Thus, both the Co-operative Development Policy 2002 and legislation require fundamental reviews to accommodate the various socio- economic, technological revolution and political changes that have taken place. This will also require the development of a Co-operative Development Strategy as well as a programme of action.

#### **4.2.2 Appropriate public policy for the management of technological transformation**

The digital economy that is driven by technological transformation will bring with it fundamental changes in Industrialisation. The emergence of technology-aided Industrialisation will require specialised skills; hence demand for a new approach to education and training, research and innovation, and review of public policies. The digital economy will be characterised by automation of work and digitalization of services through robotics technologies, Artificial Intelligence, digital platforms, and greater connectivity. The situation implies that investment in Industrialisation during the digital economy will be influenced by availability of technological skills and talents, rather than capital and low labour costs. Thus, a favourable public policy on employment-led growth is required to guide adaptation to newer and disruptive elements of the digital economy. The strategy has to adopt a multi-dimensional approach to Industrialisation, trade, and integration in the regional and global value chains in which industrial development is matched with higher spending on education and development of skills and training for adapting to digital age technologies and improved productivity.

#### **4.2.3 Access to adequate capital and technology**

Co-operatives pool capital, thus, allowing them to achieve more than they could individually. The challenge they face is that they are not able to pool sufficient capital to invest in, for instance, manufacturing. Traditionally, co-operatives have been funded by withdrawable share capital provided by members and retained earnings (or

reserves comprising undistributed earnings). However, experiences have shown that there are various innovative options that co-operatives can deploy to raise additional capital. First is from among the members themselves by introducing additional classes of shares or debt instruments to attract more member investment. Co-operatives could also attract non-members to invest in co-operative business (the experience of KCBL). The other option is direct co-operative investment – one co-operative investing in another co-operative by owning shares, or forming a joint investment – the case of Tanga Fresh Limited – where Tanga Dairy Co-operative Union (TDCU) sells milk to Tanga Fresh Limited where it also co-owns shares with other private investors in the milk processing facility. Co-operative movement can establish Co-operative Central Finance facility (co-operative financial services in the form of SACCOS, co-operative bank, or a centralised funding vehicle) which can assist in raising additional capital required by co-operatives in investing in manufacturing. Co-operatives may also seek grant, trade credit, or any other form of external capital that will not jeopardise the co-operative democratic control by ensuring all or a majority of the voting rights in the co-operative enterprise remain in the hands of the members – the rightful owners.

The access to technology, particularly in co-operative Industrialisation, is another challenge. Although technology can easily be accessed from the market, its access by co-operative ventures is critical. The required machinery can be imported from other developed countries from manufacturers or in partnership with other co-operatives globally. The joint venture both from within and outside could help co-operatives to acquire the required machinery for the establishment of co-operative industries. However, where sophisticated technology is not easily accessible, co-operative societies can start with simple and easily available and affordable technologies to engage in agro-processing in rural and urban areas. On the other hand, co-operatives must embrace digital technology as it provides opportunities. Digital technologies apply to lots of areas in co-operatives from communication (internet), marketing design, branding and even making transactions. Since investment involved in digital transformation is substantial, co-operatives need to devise ways to access it including developing and acquisition of the right digital technology – through the Co-operative Federation, or promoting specialised service co-operatives such as ICT services to co-operatives. This will facilitate electronics commerce and expand services offered through the internet. In this way, co-operatives will be able to take on challenges associated with the digitization of the value chain or integration of technologies such as artificial intelligence, block chain, robotics, or the internet of things.

#### **4.2.4 Environmental sustainability and digital transformation**

Environmental sustainability is now becoming a major issue of concern to communities, government and development partners. The intervention requires a multi-prolonged approach, which includes a combination of regulatory, economic voluntary, community engagement, and information instruments, where a policy mix approach is adopted. The various initiatives implemented so far, have not addressed squarely issues of self-regulation and self-governance that involve co-operative organisations at communities' level.

Digital transformation is associated with unprecedented disruptions in society, industry, and organisations inspired by advances in digital technologies. The impact of these disruptions will be enormous on the environment and human health as well as the food chain. Thus, the environmental sustainability spectrum wherein digital technologies influence the ways and mechanism by which production, waste, pollution, and urbanism are managed and controlled is important. Digital technologies can offer enterprises unique opportunities to develop new business models that focus on environmental sustainability. The co-operative organisations provide appropriate social response to economic and social challenges posed by environmental destruction caused by human activities through Industrialisation, farming, and deforestation, among others. This could be an area for further research so as to provide new knowledge on how the digital transformation can improve environmental sustainability. Technologies can help in reducing pollution, manage waste better, and enhance further environment-friendly production techniques.

#### **4.2.5 Training and education in co-operative entrepreneurship and ICT**

Skills and talents are central to the employment ecosystem in the digital age. Thus, this requires a purposeful drive-in skills development in order to create a skilful workforce that will attract foreign investors. Investment in basic education, higher education, vocational and professional training is essential. Thus, review of curriculum at all levels in order to address the challenges of the digital era is necessary. Investment in human capital should ensure both access and quality of education in schools, colleges, and universities. Co-operative organisations, as unique business entities, call for education and training particularly in co-operative governance and management; entrepreneurship skills; information and communication technology, and STEM (science, technology, engineering, and mathematics) disciplines, to keep abreast with technological revolution of the fourth industrial revolution.

## References

- Abell, P. (2004): Co-operative Movement, Encyclopaedia Encarta 2004 Edition
- Arvonen, V., Kibocha, N.S., Katko, S.T., Pietilä, P. (2017). Features of Water Co-operatives: A Comparative Study of Finland and Kenya. *Public Works Management and Policy* 2017, Vol. 22(4) 356–377.
- Bibby, A. (2006). Tanzania's co-operatives look to the future. <http://www.andrewbibby.com/pdf/Tanzania.pdf> cited on 20 September 2021
- Buseth, T.J. (2017). The green economy in Tanzania: From global discourses to institutionalisation. *Geoforum* 86 (2017). DOI: 10.1016/j.geoforum.2017.08.015.
- Brahmbhatt, Milan, Haddaoui, Catlyne and Page, John, 2017. Green Industrialisation and Entrepreneurship in Africa, Contributing paper for African Economic Outlook 2017: Entrepreneurship and Industrialisation. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/misc/working-papers>.
- Borzaga, C. and Spear, R. (2004) Spear Trends and challenges for co-operatives and social enterprises in developed and transition countries. Edizioni3I, Trento – ITALY pp.
- EURICSE (2016). *World Co-operative Monitor. Exploring the co-operative economy. Report 2016*.
- FAO, (2017). FAOSTAT. <http://www.fao.org/faostat/en/#data/QC/metadata> accessed on 19 July 2021
- Gibson, R (2005): The Role of Co-operatives in Community Economic Development, RDI Working Paper # 2005-3
- Heidhues, G. and Obare, G. (2011). Lessons from Structural Adjustment Programmes and their Effects in Africa. *Quarterly Journal of International Agriculture* 50 (2011), No. 1: 55-64
- ICA –Africa (International Co-operative Alliance-Africa, A region of International Co-operative Alliance (2020). LEGAL FRAMEWORK ANALYSIS NATIONAL REPORT – Tanzania.
- ILO (2013). Providing clean energy and energy access through co-operatives / International Labour Office (ILO), Co-operatives Unit (ENT/ COOP), Green Jobs Programme. – Geneva.
- ILO (2016). *Technological changes and work in the future: Making technology work for all*. The Future of Work Centenary Initiative Issue Note Series No. 1.
- ITA –International Trade Administration, (2021). Tanzania Commercial guide - Agriculture and Agricultural Processing. <https://www.trade.gov/country-commercial-guides/tanzania-agriculture-and-agricultural-processing> accessed on 2 August 2021
- Kolozsár, L. and Németh, N. (2020). The Characteristics of the Fourth Industrial Revolution: Buzzword, Hype or a Radical Change? DOI: 10.17836/EC.2020.1.091
- Koros, K.J. and Nyanchaga, N.E. (2017). Accessing Sustainability of Water Supply Co-operatives as Sustainable Options for Rural Community-Managed Water Supply in Kenya. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, e-ISSN: 2278-1684, p-ISSN: Volume 14, Issue 4 Ver. III (Jul. – Aug. 2017), PP 45-51
- Luken, A.R. and Clarence-Smith, E. (2019). *Green Industrialisation in Sub-Saharan Africa: A GUIDE FOR POLICY MAKERS*. Published by UONGOZI Institute.
- Mélo A. (2015). “Fruitières comtoises” (Franche-Comté, France) From Village Associations to an Agro-Industrial District: a Mountain Story? *Journal of Alpine Research | Revue de géographie alpine* 103-1 | 2015
- Mendes, F.A., Bertella, A.M. and Teixeira, F.A.P.R. (2014). Industrialisation in Sub-Saharan Africa and import substitution policy. *Brazil. J. Polit. Econ.* 34 (1) Mar 2014 <https://doi.org/10.1590/S0101-31572014000100008>
- Mlozi, S.R.M, Mtambo, A. M.M and Olse, E.J. (2015). Mindset of urban and peri-urban dairy cattle keepers in Morogoro, Tanga and Temeke Districts, Tanzania. *Livestock Research for Rural Development* 27 (2) 2015.
- NEMC (National Environment Management Council), 2017. Environmental consideration for sustainable Industrialisation in Tanzania.
- Nkwabi, M.J, Mboya, B.L., Nkwabi, M.J. and Nkwabi, M.J. (2019). A review of the challenges affecting the agro-processing sector in Tanzania, *Asian Journal of Sustainable Business Research*, 1 (2): 68-77.
- Nzau, Mumo (2010) Africa's Industrialisation Debate: A critical Analysis”, In the *Journal of Language, Technology and Entrepreneurship in Africa*, Vol. 2 No. 1, 2010.
- Omoruyi, M.E.M, (2016). The Impact of China's Economic Activities in Africa on Economic Growth of African Countries. *Bangladesh Development Studies*. Volume XXXVIII, December 2014, No.4
- Simandam, D. (2009) Industrialisation, In R. Kitchin and N. Thrift (Eds.) *International Encyclopedia of Human Geography*, Oxford: Elsevier, Vol. 5, pp. 419 – 425. Shaffer, J. (1999): *Historical Dictionary of the Co-operative Movement*. London UK: The Scarecrow Press
- SSG - Sustainability Solutions Group (2014). A Co-operative Solution to Climate Change. [http://www.ssg.coop/wp-content/uploads/2015/03/141205\\_Co-ops-and-climate-change\\_v4.pdf](http://www.ssg.coop/wp-content/uploads/2015/03/141205_Co-ops-and-climate-change_v4.pdf), accessed on 2 March 2020.
- Schwettmann, J. (2015). Co-operatives and the future of work. <https://ccr.ica.coop/sites/ccr.ica.coop/files/attachments/Jurgen%20Co-operatives%20and%20the%20Future%20of%20Work%20New.pdf>, accessed on 2 February 2020.

- Tarifenyika, M. (2016). Why has Africa failed to industrialise? <https://www.un.org/africarenewal/magazine/august-2016/why-has-africa-failed-industrialize>, accessed on 5 August 2021.
- Terrapon-Pfaff, J.C.; Fishedick, M.; Monheim, H. (2012). Energy potentials and sustainability-the case of sisal residues in Tanzania. *Energy Sustain. Dev.* 2012, 16, 312–319.
- Tchami, G (2019). The future of work, current trends on co-operatives and the social and solidarity economy - The role of the ILO. Tokyo, September 2019.
- Ulicky, E., Magoma J., Usiri, H. and Edward, A. (2013). Improving smallholder livelihoods: Dairy production in Tanzania. Proceedings of The XXII International Grassland Congress (Revitalising Grassland to Sustain Our Communities) took place in Sydney, Australia from September 15 through September 19, 2013. <https://uknowledge.uky.edu/igc/22/3-1/4>, accessed on 5 August 2021.
- URT –MLF (2019). Budget speech by the Minister for Livestock and Fisheries, Hon Luhaga Joelson Mpina (MP). Presenting to the national assembly estimates of the Ministry of Agriculture Livestock and Fisheries revenue and expenditure for 2019/20. Dodoma, Tanzania.
- Wanyama, F. O., Develtere, P., and Pollet, I. (2009). Reinventing the Wheel? African Co-operatives in a Liberalized Economic Environment. *Annals of Public and Co-operative Economics*, 80(3), 361–392.
- World Bank, (2015). Tanzania: Solar and Wind Potential Could Help Meet Future Power Generation Goals. <https://www.worldbank.org/en/news/feature/2015/06/09/tanzania-solar-and-wind-potential-could-help-meet-future-power-generation-goals>, accessed 2 February 2021
- World Bank (2019). Tanzania: Country Environmental Analysis – Environmental Trends and Threats, and Pathways to Improved Sustainability. 2019. Washington, DC: World Bank.
- World Bank, (2020). Agriculture, forestry, and fishing, value added (% of GDP) – Tanzania. World Bank national accounts data, and OECD National Accounts data files. <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=TZ>
- World Bank 2021. Employment in agriculture (% of total employment - modelled ILO estimates) Tanzania. <https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=TZ>. Cited on October 2021
- Zamfir, I (2016). Africa's economic growth; Taking off or Slowing Down. European Parliamentary Research Service. [https://www.europarl.europa.eu/RegData/etudes/IDAN/2016/573891/EPRS\\_IDA%282016%29573891\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2016/573891/EPRS_IDA%282016%29573891_EN.pdf) accessed on 5 August 2021.
- Zervoudi, K. E. (2020). Fourth Industrial Revolution: Opportunities, Challenges, and Proposed Policies. DOI: 10.5772/intechopen.90412