From Breadbasket to Innovation Basket

September 2018

Accelerated agriculture growth is a pragmatic approach for Zimbabweans to achieve the vision to be an upper middle-income economy by 2030. Agriculture enables an inclusive sustainable growth and the base for an affordable food system. Innovation is integral to any contemporary social-economic national development plan. As such, agriculture innovation is a future-proof and globally competitive development pillar than agriculture on its own. This article articulates how Zimbabwe can achieve vision 2030 by transitioning from a breadbasket legacy to innovation basket of Africa status.

Zimbabwe was the breadbasket of Africa in the 1990s when agriculture contributed 9-15% of Gross Domestic Product, 20-33% export revenue and livelihoods to 70% of Zimbabweans. This achievement is rooted in Zimbabwe's economic history. When colonialists arrived in the 1890s, Zimbabwean agriculture was thriving with prospects beyond their imaginations. As a result, they switched to agriculture instead of the original British South Africa Company (BSAC) mining objective. During the liberation struggle, agriculture carried the day. From 1980 to 1998, agricultural contribution to GDP averaged 17% and in 2017 it was 10%. About 65% of Zimbabweans live in rural areas, making the county's economy inherently coupled with agriculture. At a continental level, Agriculture contributes 30% of Africa's GDP and employs more than 60% of workers.

Although the food market demand is guaranteed in perpetuity, the production economics are changing rapidly. Therefore for agriculture based economic development model for Zimbabwe to be sustainable, it must be more than just restoring the breadbasket status. The world is currently experiencing the 4th industrial revolution, which is characterised by digital innovation, it is imperative to superimpose agriculture to this global economic tide. We therefore propose an agriculture driven innovation model which dovetails and compliments the national blueprints such as the Transitional Stabilization Program, agriculture and industrialisation policy.

By 2050, the World population will reach 9.1 billion, Africa 2 Billion and Zimbabwe 20.6Million which will exponentially increase food demand. According to United Nations, global food production must increase by 70% else we run out of food by 2050. For Africa, the food shortage bad. From 1980 to 2007, the net food import grew by 3,4% per year. In 2007, Africa spend $30-$50 billion to import food and if Agriculture output doesn't increase, imports could be $150billion per year by 2030.

Food security defines a situation where people have physical, social and economic access to sufficient food for a healthy and active life. The global food security index (GFSI) is measured using affordability, availability, and quality and safety, and covers 109 countries which includes 28 Sub-Saharan Africa (SAA) countries. In 2017, nine of the ten lowest-ranked GFSI countries are from the SSA. The Zimbabwe food import was xxx in 2017 alone.

For Zimbabwe's agriculture production to meet domestic demand and competitively supply the huge export market, the classic scaling up of infrastructure and inputs investment is not sufficient. Disruptive and leapfrogging innovation must be added to the production systems. The result is a transition from breadbasket legacy to innovation basket which enables catching up and overtaking using a quicker growth curve.

The breadbasket to innovation basked should be elevated to a national agenda with government policy objectives, legal and regulatory frameworks. The first step is to develop and align a national innovation policy which builds on an agrarian foundation. The second step is to diffuse the innovation culture and competence achieved into all economic sectors. Generally two approaches are used simultaneously. A Top-down innovation approach creates a government driven enabling environment for large-scale investment into infrastructure, research and technology deployment which triggers spill-over effects. A bottom-up innovation is enables successful adapting technology to local needs and challenges.

The first area to apply the breadbasket to innovation basket policy is in agriculture productivity improvement which is a global problem. Since the 1990s, Global food demand grew by 70% while productivity dropped by 50%. Looking at maize and tobacco which are Zimbabwe's staple food and the cash crops respectively the following observations are apparent. Zimbabwe's 2016 maize productivity was 0,9 tons per ha, compared to Brazil 9 tons per ha, USA 11 tons per ha and a 2013-16 global average of 9 tons per ha. Tobacco productivity was 1951kg per ha in 1980, 1842kg per ha in 2010, and 1705kg per ha in 2017. The 2010 to 2017 production growth from 122Million kg to 188 Million kg was due to increase in harvest area from 67 054ha to 110 816ha and active tobacco growers from 54 069 to 97 066.

The maize productivity is ten times below global averages while the tobacco productivity is not improving. The productivity problems causes are multi-faceted therefore addressing them to make Zimbabwe a global player requires an innovation basket status else the time and cost become exorbitant.

Zimbabwean farmers face thinning profit margins because input costs are increasing, commodity product prices are dropping and market deregulation increase competition. Most farms are undercapitalised resulting in low productivity and land underutilization. Africa agriculture sector receives less than 5% formal financial institutions lending due to small landholding farms risks, uncertain property rights, and inadequate policy and regulatory frameworks. African governments spent 5% while Asian governments spent 10-15% of their total budget on agriculture each year. However governments provide support in credit systems, subsidising seeds, fertiliser, power and water. They make policy interventions in markets for stable and fair prices.

Command Agriculture is timely intervention to alleviate agriculture funding requirements. Other sources of funding are government national budget, Presidential Inputs scheme, donor and private sector funding. Without innovation, the finding is simply swallowed by production processes inefficiencies which dilutes the results. In addition, without innovation, the country will struggle to attract quality investors into the agriculture sector. The total funding required to transition from breadbasket to innovation basket has not been ascertained in this article.

Zimbabwe should make policy interventions to translate the mobile money services success into a Fintech industry that delivers innovative agriculture solutions. For instance, 500,000 farmers in Tanzania benefit from a financial solution that enables buying inputs on credit, selling produce and buying insurance using the mobile phone. The Kenyan One-Acre Fund enables funding, procurement, timely and convenient distribution of inputs. Farmers use M-Pesa to pay as little as they want at any time which matches repayments to cash flow and household finances. Small-holder farmers require flexible financial products to mitigate their lumpy and seasonal income. The One-Acre Fund improved productivity and increased income per acre by 50%.

The easier route to achieve agriculture growth has been expanding the land under cultivation. Unfortunately, this approach now comes at an environmental cost in terms of deforestation and greenhouse emissions that threaten the very objective of food production that we trying to achieve. The breadbasket to innovation basket strategy entails accelerating information-intensive, knowledge based and precision agriculture techniques. For instance, satellite positioning systems, data collection sensors, geo-information systems and rate application are used to deliver information on seeds types, seed dropping time, size of crop land, water, nutrients, climate, plant growth, harvesting time and yields to farmers and policy makers.

In the past 20 years agricultural R&D investment increased by 20% in Sub-Saharan Africa compared to China and India which trebled. Relatively small African countries like Zimbabwe, require regional collaboration to create sustainable R&D economies of scale benefits. International technology and best practice transfer is diluted, due to the unique African agro-ecological environment. This means Zimbabwe require R&D to localise global technologies and practices. Zimbabwe has institutions like Chibero Agricultural College, Esigodini Agricultural College, Gwebi Agricultural College, Kushinga Phikelela National Farmer Training Centre, Mazowe Veterinary College, Mlezu Agricultural College, and Rio Tino Agricultural College. In addition, there are research centres such as SIRDC and in 2018, the government announced that all the 10 state universities will have innovation hubs. All these assets can be directed towards the transformation from breadbasket legacy to innovation basket. These institutions and hubs should be kitted with appropriate digital

technologies so that produced knowledge and Information is collected and disseminated cost effectively and easily to farmers.

Zimbabwe has 97% mobile communications penetration rate. The key is to ensure that farms have high quality and affordable connectivity to enable complete digital integration with the rest of the world. The agriculture extension officers' model which was successful in the 1980s and 1990s can be recreated using digital platforms. About 1.2 million farmers in Ethiopia, Ghana, Malawi, and Niger use Digital Green, a low cost video based platform that offers best farming practices lessons similar to agriculture extension.

Zimbabwean farmers face high transport costs. Studies show that access to all-weather roads reduces poverty by 6.9 percentage points. Zimbabwe can invest into drone technology to alleviate transport infrastructure challenges. Drones are also used for precision crop spraying, aerial photography, for soil and water survey.

Innovations to mitigate water scarcity are improved irrigation techniques, software designed to improve water reservoir retention, multiple cropping and the use of seed varieties that produce drought-tolerant crop. Water-saving sensors that use wireless and smart water management systems can be used. Zenvus, a Nigerian precision farming system measures soil temperature, nutrients, and vegetative health to help farmers apply the right fertilizer and optimally irrigate their farms. SunCulture provides drip irrigation systems that use solar energy to pump water from any source making irrigation affordable.

The Zimbabwe economic situation today is similar to the 1960s Asian countries. These countries wanted to industrialise, but slow agricultural growth and under-capacitated peasant farmers cause food shortages. The countries used rapid agricultural growth, code named green revolution, as a first milestone before industrialisation. The green revolution transformed Asia and pulled the region back from famine to food surpluses within 25 years. It created jobs in agriculture sector industries, reduced food prices, and poverty and created demand that grew other sector industries. However, Zimbabwe's agriculture has small land holdings and a unique African agro-ecology such that transformational changes require innovation beyond the Asian green revolution characterised by relatively simple intensive application of high-yield seeds, fertilizer, pesticides, and irrigation.

Innovation basket enables digital agripreneurs to start agro-companies that have a better understanding of their rural context, giving them an advantage over large multinationals. Innovation basket capacity overcomes challenges like fragmented markets, lack of scale and cultural barriers. It improves collaborative links in the agriculture supply chain, from farmers, to agribusinesses, to consumers are essential. Innovation will allow Zimbabwe to access global markets and therefore monetize digital platforms offered by the internet and economies of scale from the global shared economy. Botswana's

Livestock Identification Trace-back System tags cattle with radio frequency identification devices. Information is transmitted to a central database which enables EU certification for the country's beef exports, and is a key repository of information for livestock farmers, as well as for state veterinary services and health authorities.

But most farmers are still use traditional processes, tools like hoes, cutlasses and the ox is the source of power for operations for the past couple of centuries. In some communities, farmers plant according to the phases of the moon. However, Zimbabwe has a well-developed education system, with one in eleven adults holding a tertiary degree and the highest literacy rate in Africa. Such world-class assets should be utilised to develop mass produced low cost farm mechanisation equipment. The country has been producing engineers and scientists who have not gone past the ox-drawn plough for several generations.

For instance, Zimbabwe is the largest grower of tobacco in Africa, and the 4th in the world trailing behind China, Brazil and India. In 2017, Zimbabwe produced 188.9 million kilogrammes and Malawi 136 million kg, Zambia 114 million kg and Mozambique 106 million kg. China produced 3,150 million kg, Brazil, 851 million kg. To scale up both volume and productivity on this cash crop requires innovation in mechanisation to lower the required investment.

In 2017, tobacco average export price was US$4,96 per kg, but the average price paid to farmers by merchants at auction floors was US$2,96 per kg. In fact, in 2017 Chinese merchants exported the same tobacco at US$7,88 per kg which is 2,7 times more than local farmers. Zimbabwe should beneficiate the tobacco rather than exporting it and then importing processed cigarettes. Innovation will help Zimbabwe to directly access global markets and to reduce dependence on commodity exports which are vulnerable to price erosion.

Digital technologies overcome information problems that hinder market access for many small-scale farmers and provide novel ways for agricultural supply chain management. Ghana-based AgroCenta deploy mobile and web technologies that bring farming advice, weather forecasts, market information to farmers, who are generally off-line due to barriers in connectivity, literacy, or language. The positive impact of digital dividends in agriculture don't quickly scale up to the extent expected because technology cannot address the barriers faced by farmers in the poorer countries. However, when combined with a government agriculture policy, the results can be amazing. In Rwanda, agricultural growth has been a main driver of poverty reduction. Rwanda focused agricultural production on staple crops to replace imports and enhance food security. According to the World Bank, 45 percent of poverty reduction in Rwanda over that period can be attributed directly to agriculture. The GDP per capita income rose by 62% and the poverty rate came down from 57% to 45%.

About 75% of the world's food is generated from only 12 plants and 5 animal species, making the global food system vulnerable to shock or responsive to innovation. Agriculture can grow to contribute up to 30% GDP build the foundation of multi-sectorial national innovation policy which will spur Zimbabwe to Vision 2030. rubiem Innovations believes that agriculture as a science sustains agriculture as a business. The time is here and now for Zimbabwe to evolve the breadbasket legacy to Innovation basket of Africa.

Dr Dennis Magaya Founder and CEO rubiem Innovations
www.rubiem.com
Dennis@rubiem.com, +263 71 777 0666 , Twitter @Dennis_Magaya , @Innovatihub