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Brain Re-Engineering Concept and Reimagination: Strategy for Rebranding Agriculture and Youth Engagement in Promoting Food Production

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Abstract. This paper explores the critical role that youths play in reshaping and advancing the agriculture sector, especially in the age of the fourth industrial revolution (4IR). The core of this discourse is the "Brain Re-Engineering and Reimagination" which seeks to foster youth engagement and agricultural entrepreneurship. This concept recognizes the need to shift from traditional perceptions of agriculture to a more dynamic, technology-driven innovative approach. It emphasizes harnessing the potential of the youth by redirecting their energy and innovative capabilities towards modernized agricultural practices. Through this, it aims to foster a generation of agripreneurs equipped to transform the agriculture sector.

Keywords: Brain Re-Engineering (BRECR), Youth Engagement, Agripreneurship, Sustainable Development, Fourth Industrial Revolution (4IR), Innovative Agricultural Practices

Introduction

Throughout the progress of technology and science, agriculture has consistently remained a significant beneficiary (Climate Change Committee, 2023). Conversely, the quality of food encompasses all the characteristics and features of a food product that meet the customer's standards and expectations (Agbugba *et al.*, 2023). At its core, agriculture can be defined as the fundamental process of transforming various inputs into food. The remarkable advancements and achievements witnessed in the agriculture sector serve as evidence of the significant progress and breakthroughs taking place in our contemporary world during this era of the industrial revolution (IR). The interdependency of the industrial and agrarian revolutions has consistently been evident, explaining why economies with stagnant agricultural sectors often struggle to experience industrial growth and development (Plecher, 2020). Throughout history, transformative changes have played a favourable role, and the industrial revolution stands out as a monumental global transformation. Undoubtedly, it has made a lasting impact on the socio-economic and developmental advancements of our modern world. The Industrial Revolution (IR) represents a significant period in history where the use of machines in factories superseded manual labour. Over the course of the past two centuries, the IR has brought about profound transformations, rivalling the impact of the Neolithic Revolution. Occurring approximately 12,000 years ago, the Neolithic Revolution marked a transition from a nomadic lifestyle dependent on hunting and gathering to one characterized by settled agricultural practices and the use of polished stone tools. This shift enabled the development of permanent settlements and played a crucial role in supporting larger populations.

Brain Re-Engineering: A Conceptual Reimagination

The concept of BRECR focuses on addressing the perception problem and offers a viable strategy to revive struggling economies through the agricultural or agribusiness sector. This is particularly important in the current age of heightened environmental concerns and climate change issues, where sustainable farming is a crucial topic (Ngigi & Muange, 2022). As the global population continues to grow, the scarcity of land and water poses a significant threat to human existence (Apeh *et al.,* 2023). While politicians may hesitate, agriculture technology start-ups are actively taking steps to tackle these challenges.

It is essential to recognize that advancements in machinery have revolutionized the scale, speed, and productivity of farming equipment (Onomu *et al.,* 2020). This, in turn, enables more efficient cultivation of various inputs and variables on productive lands. Improvements in seeds, fertilizers, and irrigation systems have greatly contributed to helping farmers increase their yields in crops, livestock, agroforestry, and fisheries.

Pillars to Brain Re-Engineering Concept and Reimagination (BRECR): Focus on Food Production

The foundation of the BRECR relies on creating awareness and providing education to young individuals and youths (Republic of Zambia, 2015). This is a paradigm shift that entails building of ideas and knowledge levels of youths in order to volunteer their willingness to change the negative or wrong ideologies and mindset creativity to appropriate a correct or right perceptive and engaging in agriculture or agro related ventures entrepreneurially to employ technology solutions to drive a sustainable change (Yami *et al.,* 2019). The institutions that can actualise this are institutions or platforms such as educational institutions (formalised and non-formalised), and the social media (Mdoda *et al.,* 2023). As indicated in Figure 1, the Brain Re-engineering Pillars are summarised. More specifically, Table 1 presents a comparative analysis of the Brain Re-engineering Pillars and Sustainable Agriculture.

- *Altering Perceptions:* This involves identifying the wrong ideologies and mindset about agriculture and willingness to drop them. This thought process must be frank, sincere and intentionally approached in interchanging the wrong mindset or way they perceive agriculture.
- *Ideation and Entrepreneurship:* This can be addressed on a dual basis and entails formation of new ideas or concepts, as well as building or developing their entrepreneurship capacity. Having or showing initiative and resourcefulness is intended to be accompanied by expressing some good degree in being innovative which is all about being original, creative and introducing some new business ideas.
- *Technology Integration:* Following ideation and enterprising, the next step involves the application of scientific knowledge to practical aspects of human life, encompassing the manipulation and transformation of the human environment. Furthermore, training in various technological solutions is an integral part of this process. Modern agriculture extensively utilizes advanced technologies, including robots, temperature and moisture sensors, aerial imagery, and GPS technology. These sophisticated tools, combined with precision agriculture and robotic systems, enhance profitability, efficiency, safety, and environmental sustainability within agricultural businesses.

Figure 1: Pillars of Brain Re-Engineering
Source: Author's Concept

- *Sustainability:* This revolves around being intentional, constant and productive in an agro enterprise or agro business over time. Every activity and practise between production, manufacturing, processing or value-addition, marketing, or distribution from time to time and from season to season must factor in training and education; research and innovation; cross-sector collaboration; regenerative practices and nature-based solution; and also, transparency and traceability. production and marketing of food and agro products and services until it gets to the hands of the end users. This pillar can be operational and can be sustained in developing and developed countries provided it factors in the cost and returns analysis, as well as policy formulation strategies that can best shape the world's largest industries.
- *Social Equity in Public Policy:* This conceptualises the description from an expression of impartiality, fairness, and justice for all people especially agripreneurs in social policy. Social equity considers systemic inequalities to ensure everyone in a community has access to the same opportunities and outcomes. The key component of social equity in public policy revolves around **s**ocial equity, impartiality, justice, inclusivity, public policy (both fiscal and monetary policies), community, government. This whole idea fosters equal privileges for key players, as well as practitioners in supply and value chains of food and agricultural systems such as equal rights to resources and government assistance such as subsidies, funding and agtech solutions. We must understand that social equity is about "whether citizens of different social groups are treated equitably or fairly and whether they receive the same treatment.

Bridging the Gap to Sustainability: Fourth Industrial Revolution (4IR) and Agriculture's Role in Ensuring Food Production

The fourth industrial revolution (4IR) is characterized by the convergence of the physical, digital, and biological worlds, resulting in a fusion of agricultural innovation systems (AIS) advancements (Ndungu & Signe, 2020). AIS encompasses the knowledge, technology, infrastructure, and cultural aspects that people have developed and are experimenting with sustainability in agriculture. Examples of AIS include farmland surveillance drones, blockchain technology, artificial intelligence, Internet of Things (IoTs), automation, CRISPR and genetic editing (biotechnology and nanotechnology).

Precision agriculture (PA) is an agricultural management approach that harnesses information technology to deliver precise and targeted care to crops and soil, optimizing their health and productivity. The key objectives of PA are to increase profitability, promote sustainability, and protect the environment. Through the integration of advanced technological

solutions like chemicals and larger tractors, farmers can effectively manage larger land areas with reduced labour. Government policies often encourage farmers to expand their operations, capitalizing on the benefits of economies of scale (Isukul *et al.*, 2019).

Among the latest and highly productive technology options in agriculture, drones play a crucial role. These unmanned aerial vehicles are employed for various purposes, including crop monitoring and the application of fertilizers and pesticides. This technological advancement is revolutionizing the agriculture sector by reducing labour requirements and enhancing efficiency.

Table 1 presents a sustainable approach to comparing the brain re-engineering pillars.

Table 1: Comparative Analysis of the Brain Re-engineering Pillars: Towards Sustainable Agriculture

S/N	Aspect	Pillar 1: Altering Perceptions	Pillar 2: Ideation and Entrepreneurship	Pillar 3: Technological Integration	Pillar 4: Sustainability	Pillar 5: Social Equity in Public Policy
1.	**Definition**	Changing entrenched mindsets about agriculture to foster a new, enlightened understanding.	Encouraging the development of innovative ideas and fostering entrepreneurial capabilities in the agriculture sector.	Utilizing modern technologies to enhance various aspects of agricultural operations.	Developing strategies to ensure the long-term viability and environmental sustainability of agro-enterprises.	Enhancing impartiality, fairness and justice for agripreneurs and agro-allied firms in social policy taking into account systemic inequalities to ensure equal access for everyone.
2.	**Key Components**	Awareness creation, Education initiatives, Media campaigns	Innovation workshops, Entrepreneurship training, Resource management programs	Technical training, Integration of modern tools, Research and development	Continuous education, Research and innovation, Regenerative practices, Policy formulation	Social equity, Impartiality, justice, inclusivity, Public policy (fiscal and monetary policies), Community, Government
3.	**Focus Area**	Perception and Mindset	Ideas and Business Development	Technology Application and Utilization	Long-term Business Viability and Environmental Conservation	Impartiality, Fairness, Justice and Inclusivity for all people in Social Policy
4.	**Beneficiaries**	Young individuals, General public	Aspiring entrepreneurs, Young individuals	Farmers, Agribusiness entrepreneurs	Society at large, Environment	Entrepreneurs in food and agricultural systems, Key Players in Agricultural Supply and Value Chains
5.	**Expected Outcomes**	Improved perception of agriculture, Increased interest in agro-related ventures	Rise in innovative agro-startups, Boost in agricultural entrepreneurship	Enhanced productivity and efficiency in agriculture, Technological advancements in farming practices	Sustainable agribusinesses, Environmental conservation, Economic growth	Equal privileges for key players in supply and value chains of food and agricultural systems
6.	**Challenges**	Overcoming deeply entrenched misconceptions, Effective communication of new perspectives	Access to capital for startups, Nurturing a culture of innovation	High initial costs of technology, Skills and knowledge gap in technology utilization	Implementing sustainable practices at scale, Policy constraints and bureaucratic hurdles	Lack of infrastructure base, access to technology, affordable housing, criminal justice and access to education.

S/N	Aspect	Pillar 1: Altering Perceptions	Pillar 2: Ideation and Entrepreneurship	Pillar 3: Technological Integration	Pillar 4: Sustainability	Pillar 5: Social Equity in Public Policy
7.	**Tools & Platforms Involved**	Educational institutions, Social media platforms	Business incubators, Innovation hubs	Research institutions, Technological platforms	Governmental bodies, Community organisations	Enterprises, Business incubators, Farmers, Families, Community organisations

Source: Author's Concept

Addressing the Perception Problem: Enhancing Youth Engagement in Agriculture for Sustainable Food Systems

The projected 70% increase in global food demand by 2050, driven by rapid population growth, poses a daunting challenge, particularly considering that 9.9% of the global population still suffers from hunger, according to a recent UN study (FAO, 2009). To tackle this issue amidst unpredictable environmental changes, innovation in agricultural technology is crucial. However, an outdated and negative perception of farming and agribusiness among African youths hampers their active involvement. Rectifying this perception problem is essential, highlighting the need for brain re-engineering and reimagination to promote agriculture as a prospective strategy for enhancing youth engagement and building their entrepreneurial capacity.

Previous studies by high-level panels of experts (HLPE) emphasize the significance of youth in driving transformation. They highlight the following key points:

i. Youth are at the forefront of building future food systems, but they also face substantial risks from climate change, social and economic disparities, and political marginalization.

ii. While food systems offer diverse opportunities for youth engagement and employment worldwide, these jobs often lack decent work conditions, meaningful livelihoods, and adequate support.

iii. Policies and initiatives aiming to protect and strengthen youth engagement in food systems should be grounded in principles of rights, equity, agency, and recognition. Redistributing resources, knowledge, and prospects for youth innovation and involvement in the development of context-specific employment and labour policies can generate jobs for youth and facilitate transitions toward sustainable food systems.

In conclusion, addressing the perception problem surrounding agriculture is crucial for effectively engaging youth in agriculture and establishing sustainable food systems. We can unlock their potential to drive transformative change in the agricultural sector by promoting positive perceptions, empowering youth, and implementing supportive policies.

Agricultural Production in the Fourth Industrial Revolution (4IR): Exploring the Brain Re-Engineering Concept

Traditionally, agricultural production has been attributed to physical factors such as soil quality, water availability, and climate. However, the current need is to drive economic transformation by embracing the new dimensions of technology. The concept of brain re-engineering seizes this opportunity, leveraging the advancements of the fourth industrial revolution (4IR) and technologies such as Artificial Intelligence (AI), Blockchain, Internet of Things (IoTs), Agricultural Drones, and other innovative solutions operating in the realm of cyberspace.

Throughout history, technological innovations have significantly influenced the agriculture sector. In the era of 4IR, we witness an array of cutting-edge solutions that revolutionize farming practices (Karunathilake *et al.*, 2023). Examples include Bee Vectoring technologies, precision agriculture, indoor vertical farming, livestock farming technologies,

laser scarecrows, farm automation, real-time kinematic (RTK) technology, mini-chromosome technology, farm management software, and water management technologies. From the invention of the plough to GPS-driven precision farming equipment, humans have constantly developed new approaches to enhance farming efficiency and productivity.

Empowering Minds and Transforming Agriculture: Youth-Focused

The concept of brain re-engineering and reimagination not only holds potential for empowering youths but also for empowering women. In communities where traditional values hinder women's empowerment, re-engineering their mindset, ideologies, and perceptions can create opportunities for them. Women play a significant role in agricultural production and household food security (Ezihe *et al.*, 2014).

Despite the crucial role that the evolving agriculture sector offers to the youth, younger generations are hesitant to pursue careers in agriculture due to misconceptions and limited awareness of opportunities. Insufficient connections between the agriculture sector and the amplification of the fourth industrial revolution have driven youths to seek non-agricultural career paths.

The youth are the future of society and can contribute their ideas and energy to solve social issues and make a positive impact. They have the potential to advance technology, education, politics, and peace, while also preserving cultural values and contributing to national development.

Youth involvement in agriculture is crucial for higher crop productivity, reduced water and chemical usage, and the preservation of natural ecosystems. Their role can contribute to stabilizing food prices and minimizing the environmental impact of agricultural practices (Egwue *et al.*, 2020).

The critical role of youth in building the future of food systems in both developed and developing nations cannot be overstated. Despite facing significant risks from climate change, social and economic inequities, and political marginalization, youth continue to drive innovation in agriculture.

Through the utilization of automated harvesters, drones, autonomous tractors, and advanced implements for seeding and weeding, young farmers are transforming traditional farming practices. Technology has enabled them to automate repetitive tasks, freeing up time to concentrate on more essential aspects of food production (Oteh *et al.*, 2021)**.**

Brain Re-Engineering and Reimagination (BRECR): Empowering the Younger Generation

Engaging young individuals in farming is contingent upon the productivity and profitability of the sector, both now and in the future (Allen *et al.*, 2016). This necessitates agricultural policies and programs that facilitate youth adoption of innovative technologies and access to productive resources such as land, credit, and markets. Creating these opportunities is crucial in attracting young people and fostering their interest in pursuing viable and attractive careers in agriculture.

It is important to note that the term "youngsters" typically refers to individuals aged between 15 and 24 years, constituting approximately 35 to 40 percent of the population (African Development Bank, 2017). The term "youth" is more multifaceted, encompassing both young individuals and the phase of life characterized by youthfulness. Encouraging governments of developed and developing nations to attract youths to the agriculture sector will contribute to tackling unemployment issues, creating job opportunities within the supply chains and value chains, and fostering economic growth and development (Agbugba & Isukul, 2020).

To make agriculture appealing to youths, it is necessary to showcase the benefits of agriculture as a business and challenge their preconceived notions that agriculture is synonymous with laborious field work using outdated tools. Leveraging social media platforms can help rebrand agriculture, highlighting the advancements of the fourth industrial revolution, including Artificial Intelligence, Blockchain, Internet of Things (IoT), augmented reality, metaverse, and other technological solutions. Over the years, agriculture has suffered from insufficient support, leading many young individuals to perceive it as unattractive.

Recognizing that there are diverse paths to economic engagement for youths in agriculture, it is important to emphasize that not all involvement requires physical labour (Mulema *et al.*, 2021). Young people should be encouraged to participate in activities supporting agricultural production, capacity building, goods and services, logistics, and value addition as service providers and entrepreneurs within the agriculture and agribusiness domains. I firmly believe that youths can play a pivotal role in driving impactful changes in the agriculture sector through various avenues.

i. Repackaging Agriculture for the Youth: Recognizing the image-conscious nature of today's youngsters, it is essential to rebrand and reframe farming activities and agricultural operations. Stereotypes associated with agriculture, such as low wages and mundane manual labour, can deter young individuals. By incorporating new ideologies and innovative agricultural practices, utilizing compelling images in editorials, and showcasing successful role models in the field, we can potentially influence and attract the youth (Plecher, 2020).
ii. Harnessing the Power of Technology in Agriculture: Embracing technology solutions in the era of the fourth industrial revolution (4IR) can drive impactful and scalable changes and tackle food wastes and losses by creating a formidable circular economy for a rechanneling into use (Bellu, 2016). Digital tools for weather information, crop production, and market access empower farmers to make informed decisions and enhance productivity.
iii. Promoting Agribusiness as a Viable Career Option: Presenting farming as a business opportunity can attract young individuals to engage in agribusiness. The agricultural sector not only plays a pivotal role in job creation and food security but also contributes to economic and social development outcomes. With a less saturated market compared to the formal economy, agribusiness offers promising prospects for young entrepreneurs, particularly in the context of post-pandemic job losses.
iv. Addressing Productivity and Efficiency Gaps: To enhance young people's participation in value chains, it is crucial to tackle key bottlenecks such as limited access to production information, financial resources, and market intelligence. Addressing these issues with a focus on youth needs will be a priority.
v. Fostering Value Addition in Food Supply Chains: Encouraging value addition in the agricultural sector can enhance entrepreneurial capacity and introduce emerging agribusiness models, including circular economy principles and opportunities for value addition through the adoption of productive use of energy technologies.
vi. Subsidized Access to Farm Implements: Government support in providing farm machinery like ploughs, ridgers, tractors, and cultivators at affordable rates can incentivize and facilitate youth participation in agriculture.

Unlocking Transformation: Empowering Youth and Technology in Agriculture Entrepreneurship

Entrepreneurship has proven to be a key strategy for economic progress and employment generation in both developed and developing economies (Kritikos, 2014). The concept of

innovation, creativity, and risk-taking has fuelled the generation of new businesses and ventures, driving growth and prosperity.

In the agriculture and agribusiness sector, technological advancements are revolutionizing traditional practices and empowering farmers to maximize resources and increase productivity. Automation, robotics, drones, and precision agriculture are reshaping farming operations, enabling more efficient monitoring and decision-making processes (YourStory, 2023).

By embracing entrepreneurship and leveraging technology, agricultural entrepreneurs can access funding and modern solutions, leading to higher productivity and improved efficiency. Information systems tailored for agribusiness provide valuable insights directly from the field, optimizing production flow and reducing costs (FAO, 2017).

The breakdown of agricultural processes into microservices enhances overall production efficiency, facilitating the adoption of better technologies and practices (Li *et al.*, 2023). With the integration of entrepreneurship, youth engagement, and technology, agriculture is poised for a transformative journey towards a sustainable and prosperous future.

Opportunity for Schools, Colleges, and Tertiary Institutions

Addressing the outdated perception and mindset of African youth towards farming and agribusiness is crucial for their active participation in the sector.

This unique approach aims to leverage the power of the mind, talent, and technology to drive sustainability and change the misconceptions surrounding agriculture. The concept is built upon four pillars: Perception Change, Ideation and Entrepreneurship, Technology Integration, Sustainability and Social Equity in Public Policy. By embracing these pillars, we can provide a robust framework for youth engagement in agriculture, aligning with the United Nations' 17 Sustainable Development Goals.

In the document, it is emphasized that agriculture is not merely traditional or peripheral, but a primary sector that forms the foundation for all other sectors to thrive. Recognizing this, the BRECR offer an innovative pathway to navigate the current challenging economic times faced by both developed and developing nations (Agbugba, 2023). The essential need for food, the functioning of industries dependent on the agriculture sector, international trade, and the generation of foreign exchange are all interconnected with agriculture.

It is believed that this concept can benefit educational programmes in setting an exemplary precedence for developed and developing countries, whether they have existing agriculture-related programmes. Together, we can inspire a new generation of agriculture entrepreneurs, drive sustainable practices, thereby contributing to the global economy.

Conclusion

The BRECR serves as a powerful strategy to foster youth engagement, particularly in the agriculture sector, by enhancing their entrepreneurial capacity. Entrepreneurship in agriculture offers a transformative opportunity to generate income, create jobs, and establish multiple sources of livelihood.

Youth agripreneurship not only generates decent work opportunities but also strengthens communities and drives inclusive economic growth. However, for many young individuals, entrepreneurship remains elusive. It is essential to bridge this gap and provide avenues for youth to embark on entrepreneurial journeys in agriculture.

One of the significant advantages of starting entrepreneurship at a young age is the opportunity to acquire valuable skills. Skills such as teamwork, networking, problem-solving, critical thinking, innovation, and self-discipline, cultivated through entrepreneurship, have far-reaching benefits. These skills contribute to improved performance in academics and become invaluable assets throughout life.

Entrepreneurs in the agriculture industry play a vital role in market economies as catalysts for economic growth. Through the creation of new products and services, they increase employment opportunities, which in turn accelerates overall economic development. By nurturing and supporting young agripreneurs, we can ignite innovation, drive economic progress, and shape the future of the country.

The brain re-engineering concept and reimagination offer a pathway to unlock the full potential of youth in agriculture, empowering them to become successful agripreneurs. By equipping them with the necessary skills, resources, and support, we can cultivate a thriving ecosystem that fosters entrepreneurial success and contributes to the prosperity of individuals, communities, and the whole nation.

Recommendations

i. Developing Tailored Educational Programs

It is imperative for educational institutions to devise curricula that resonate with the modern shifts in the agricultural sector. These programs should integrate practical knowledge of technological advancements and entrepreneurial skills essential for modern agriculture. It will help in fostering a generation that perceives agriculture as a vibrant and lucrative field.

ii. Creating Platforms for Youth Engagement

Establish platforms where young individuals can engage with experienced professionals in the agriculture sector. Such platforms can facilitate mentorship programs, knowledge exchange, and networking opportunities, helping the youth to gain insights and guidance from industry experts.

iii. Promoting Research and Innovation

Encourage research initiatives that focus on the development of sustainable and technologically advanced agricultural practices. Supporting innovation hubs where young entrepreneurs can experiment with new ideas will propel the sector forward.

iv. Facilitating Access to Financial Resources

Develop financial schemes and partnerships with financial institutions to aid young entrepreneurs in accessing the capital necessary to start and grow their ventures. These financial instruments could include grants, low-interest loans, or investment opportunities that are particularly aimed at fostering youth engagement in agribusiness.

v. Implementing Policy Reforms

Collaborate with government agencies to foster policy reforms that support youth entrepreneurship in agriculture. These reforms might encompass tax incentives, subsidies for technology adoption, and facilitating easier access to farmlands and resources.

vi. Encouraging Community Involvement

Initiate community programs that allow youth to work closely with local communities, understanding their needs and integrating community wisdom with modern technology for a sustainable agricultural sector.

vii. Fostering Global Collaborations

Promote collaborations with international institutions and organizations to facilitate knowledge exchange and global partnerships. This would allow the youth to gain a broader perspective and access to a wider network, fostering global advancements in the sector.

By implementing these recommendations, we can pave a path that not only reshapes the perception of the agricultural sector but also fosters a thriving community of young, tech-savvy, and entrepreneurial individuals ready to take agriculture into a prosperous future.

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