



Chuka University

info@chuka.ac.ke | 020 231 0512 / 020 231 0518

THE ROLE OF RESEARCH AND FARMER ENTREPRENEURSHIP IN SUSTAINABLE FOOD SECURITY AND DEVELOPMENT

¹*Gathungu, G. K.*

¹*Department of Plant Science, Chuka University, P. O Box 109-60400, Chuka*

Corresponding author email; gkgathungu@yahoo.com:

ggathungu@chuka.ac.ke

How to cite:

Gathungu, G. K. (2021). The role of research and farmer entrepreneurship in sustainable food security and development. In: Isutsa, D. K. (Ed.) *Proceedings of the 7th International Research Conference held in Chuka University from 3rd to 4th December 2020, Chuka, Kenya*, p.98-111

ABSTRACT

The global challenges (climate change, soil and biodiversity degradation) are affecting sustainability of food and agriculture systems, and livelihoods of millions of farmers by threatening achievement of the right to adequate food worldwide. Today, hunger remains an everyday challenge for humankind and about 815 million people are still chronically undernourished. Sustainable Development Goal (SDG) 2 aims to end hunger and ensure access to sufficient, safe and nutritious food by all people all year round. Achieving zero hunger by 2030 will require applications of new and existing STI across the food system through an enhanced research and farmer entrepreneurship culture. A number of technological innovations can play a role in addressing concerns related to the four dimensions of food security (availability, access, and nutrition, stability) to increase the amount of food produced. Research and farmer entrepreneurship will provide long lasting solutions for Kenya's food security through provision of quality seed for farmers, improving yields, creation of new value chains, markets and products of crops and livestock produced. Responsible research and innovation (RR&I) helps to distinguish societal obstacles which may hinder innovation implementation, as well as the values that innovation allows to help to bring about in farming. Breakthroughs are needed in research and innovation (R&I) that foster changes in the entire food system, targeting not only the food production chain, but also attainment of Sustainable Development Goals (SDGs). There is need to develop innovations that enhance nutrition for sustainable and healthy diets, climate-smart and environmentally sustainable food systems, circularity (recycling) and resource use efficiency of food systems, and empowerment of communities. Farmers are the main actors in the achievement of food self-sufficiency through entrepreneurship that is driven by their internal potential. Entrepreneurial farmers have creative and independent thinking, innovative behavior and are willing to take risks for agribusiness development by gathering resources and trying new ideas. Farmer entrepreneurship improves farm performance followed by increasing agricultural production towards national food self-sufficiency.

Key words: Farmer, Research, Entrepreneurship, Innovations, Production, Food Sufficiency

INTRODUCTION

The World is facing many challenges that are affecting the sustainability of food and agriculture systems, and thus the livelihoods of millions of family farmers worldwide. These challenges include natural resource depletion and environmental degradation through desertification, drought, land degradation, water scarcity and loss of biodiversity. These global challenges pose serious threats to achieving the right to adequate food to an ever increasing world population; and in this time of climate change. There is need to increase Research and farmer entrepreneurship on many crops and livestock to make their products more nutritious, productive and resilient in the face of climate change to improve on food security and farm incomes. This requires government organizations, universities, and Private Sector to together develop targeted interventions/ innovations to scale down the limitations to increased productivity. Innovations form the central driving force which will transform food systems, lift family farmers out of poverty and help the world to achieve food security and sustainable agriculture and the SDGs.

Research and farmer entrepreneurship will provide long lasting solutions for Kenya's food security through provision of quality seed for farmers, improving yields, creation of new value chains, markets and production of varied products of crops and livestock. Agricultural innovation is the process whereby individuals or organizations bring new or

existing products, processes or ways of organization into use in a specific context in order to increase effectiveness, competitiveness, resilience to shocks or environmental sustainability. This thereby contribute to food security and nutrition, economic development or sustainable natural resource management. Farmers' innovation depend on the broader structure and dynamics of the agricultural innovation system they are embedded in (Kaneene et al., 2015; Yoshida, 2017).

STATEMENT OF THE PROBLEM

The changing climate, a growing population and urbanization, and reduction in arable land per household devoted to food production, changing consumption patterns, conflicts and land use changes are main problems facing the world food security. Achieving zero hunger by 2030 will require applications of new and existing STI across the food

system through an enhanced research and farmer entrepreneurship culture. A number of technological innovations can play a role in addressing concerns related to food security to increase the amount of food produced (postharvest management, high-nutrient staple crops, precision agriculture, index-based insurance and early warning systems)

RESEARCH AND FARMER ENTREPRENEURSHIP

Beyond food production agriculture affects environment and land management, economic development, employment opportunities, social stability, and maintenance of cultural tradition and identity. To solve the grand challenges related to food production and consumption, breakthroughs are needed in research and innovation (R&I) that foster changes in the entire food system, targeting not only the food production chain, but also the social, political, economic and environmental aspects related to it. There is need for Responsible research and innovation (RRI) that include a variety of stakeholders to study on the value of an innovation to human and animal lives and the environment, during the research and innovation process. Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (allow a proper embedding of scientific and technological advances in society) [Von Schomberg, 2013].

Responsible research and innovation (RRI) helps to distinguish societal obstacles which may hinder innovation implementation, as well as the values that innovation allows to help to bring about-valued and used broadly in society (impact). Innovation in agriculture cuts across all dimensions of the production cycle along the entire value chain – from production to the management of inputs and resources, to organization and market access. Innovation is not just about technology, which may simply remain on the shelf but about social, economic, institutional/organizational and policy processes- impact on society. Through RRI, the intended and unintended impacts and consequences of research and innovation should be assessed and researchers and innovators should reflect upon their research process, activities, and underlying assumptions (Schuijff and Dijkstra, 2020).

Breakthroughs are needed in research and innovation (R&I) that foster changes in the entire food system, targeting not only the food production chain, but also attainment of Sustainable Development Goals (SDGs). The breakthroughs should focus on the priorities to overcome environmental, societal and health challenges that are related to food. These includes developing innovations to enhance Nutrition for sustainable and healthy diets, Climate-smart and environmentally sustainable food systems, Circularity (recycling) and resource use efficiency of food systems, and empowerment of communities. Integration of RRI practices within regional innovation policies and practices as well as the adoption of RRI practices in research and innovation activities make a significant contribution towards sustainable regional development (Thapa et al., 2019).

FARMER ENTREPRENEURSHIP AS A NEW APPROACH TO SUPPORT AGRICULTURE DEVELOPMENT

Many efforts to reach sustainable food just focus on cultivation aspect. Strategy approach that involve farmer internal potential, called entrepreneurship has not been used as a supporting policy (Farmer Entrepreneurship). Farmers are the main actors to achieve food self-sufficiency and they can be motivated, driven, directed even facilitated to implement developed technology packages. This approach takes farmers to have either internal potential, independent attitude, vibrant and dare to try, great desire for achievement, proactiveness, creative, Risk- taking (entrepreneurial spirit). Building farmers' entrepreneurial capacity accelerate and scale agricultural innovation processes and may reduce the persisting innovation gap among different farmers (Iza and Dentoni, 2020). Entrepreneurial farmers have creative thinking and innovative behavior and willing to take risks for agribusiness development (new alternative approach in improving farming performance).

They are able to transform opportunities into new ideas, are independent thinker, consider failure as study materials (part of life). Entrepreneurial farmer is an important factor in determining the success of market-oriented agribusinesses. The application and practice of entrepreneurship in agriculture will generate a wide range of benefits such as increased productivity, development of new agribusiness ventures that will lead to Job creations, innovations in products and service delivery, and increases in wealth (Birwa et al., 2014). Agriprenurship can contribute to social and economic development in the areas of reduction in poverty index, good nutrition and food security in the economy (Uche and Familusi, 2018).

Entrepreneurs make efforts with a creative and innovative way of developing ideas, and gathering resources to find opportunities and the improvement of living. The entrepreneurial potential can be seen from: (1) innovative

capability, (2) Tolerance for ambiguity, (3) The desire to excel, (4) Ability of realistic planning, (5) goal-oriented leadership, (6) objectivity, (7) personal responsibility, (8) Adaptability (Flexibility), (9) Ability as organizer and administrator, and (10) a high commitment rate (survival). Farm entrepreneurship improve performance followed by increasing agricultural production towards national food self-sufficiency. Some necessary skills the agripreneur must be equipped with to be competitive and successful are as indicated in Table 1 (Tripathi and Agarwal, 2015).

Table 15: Skills for the agripreneur

Category	Underlying skills
Professional skills	a. Plant and animal production skills b. Technical skills
Management skills	a. Financial management Skills b. Human resource management skills c. Customer management skills d. General planning skills
Opportunity skills	a. Recognizing the business opportunities b. Market and customer orientation c. Awareness of threats d. Innovation skills e. Risk management skills
Strategic skills	a. Skills to receive and make use of feedback b. Reflection skills c. Monitoring and evaluation skills d. Conceptual skills e. Goal setting skills f. Strategic decision making skills g. Strategic planning skills h. Goal setting skills
Cooperation and networking skills	a. Skill relating to cooperating with other farmers and companies.

According to Adeyemi (2017) some of the socio-economic and technological roles of agropreneurs in sustainable food security and rural livelihood include:

- Transformation of traditional indigenous agriculture industry into a modern enterprise.
- Stabilization of rural communities through creation of strategic rural–urban economic turnaround opportunities and sustainable jobs or employment creation.
- Marshalling the financial resources or mobilizing savings necessary for agricultural value chain development
- Reduction of food import bill and saving of foreign exchange needed for development
- Bearing the ultimate risk of uncertainty associated with agricultural industry
- Provision of avenue for the dispersal and diversification of economic activities
- Utilization of local raw materials and human resources
- Wealth creation in the society through improved productivity and accruable income to participating actors in the food and agricultural value chain
- Stemming the tide of out-migration (rural-urban drift), a pressing issue in rural Nigeria the agricultural base of the country, through creation of jobs and wealth.
- Stimulation and adaptation of indigenous technology to modern agricultural system
- Adaptation of imported technology to local environment
- Development and adoption of appropriate technology to maximize output and sustain production system

RESEARCH IN AGRICULTURE DEVELOPMENT

Investment in agricultural research and extension is critical and essential for sustainable economic growth (GOK, 2019). Research helps improve, agricultural productivity, food security and nutrition, and raising incomes of men and women smallholder farmers. Research promotes sustainable use of agricultural inputs and water , Reduce losses through post-harvest technologies, Improve use and control over resources, Support youth agri-business entrepreneurs and Diversify diets and reduce micronutrient deficiencies Research supports scientists and farmers to test innovations that increase yields while being environmentally and economically sustainable which enhances

efficiency of farming systems, adoption of climate-resilient agricultural practices, and sustainable use of inputs. Big data and the Internet of things can be harnessed for a number of agricultural applications, including farmer decision support, precision farming and insurance (United Nations, 2017). Data relating to meteorology and the Internet of things are increasingly valuable as agricultural inputs, and through research a number of new initiatives focus on sharing data to support agricultural productivity. Convergence of emerging technologies, such as synthetic biology, artificial intelligence, genetic/tissue engineering, three-dimensional printing, drones and robotics, through research may have profound impacts on the future of food production and food security.

COMPETENCES REQUIRED BY THE NEXT GENERATION RESEARCHERS

According to Feldmann-Jensen et al. (2017), European Union (2017), and Jones (2017) the next generation of researchers should;

- Abide by Professional Ethics - Professional ethics delineate expected and appropriate conduct, principles, and moral and ethical values that guide practice in the midst of both known and uncertain environments.
- Have communication' competency that covers both the nature of the communication (e.g. multi- perspective, inter-cultural) and the specific means (e.g. openness to dialogue, ability to open dialogue).
- Be ready for collaboration which enable multi-stakeholder processes, covering "what" (learning from others, empathy, empathic leadership, etc.) and "with whom" (multiple stakeholders, involving unusual suspects, inter and transdisciplinary, etc.).
- Have creativity- a key competence that is needed to devise innovative new ways of addressing problems.
- Empower for transformation and act as change agents' which requires bringing together several competences and characteristics such as resilience and adaptability, participatory ability, self-regulation and other self-oriented competences.
- Have critical thinking. This helps the professionals identify, analyze and evaluate situations, ideas and information in order to formulate responses to problems. The emergency management professional employs critical thinking to identify and reduce disaster risk in the communities they serve.
- Embrace systems thinking in order to tackle complexity and analyze and devise solutions to wicked problems.
- Have the concept of 'transdisciplinarity and Interdisciplinary' that facilitates addressing complex challenges and facilitating a systemic way of addressing a problem.
- Have International Networking to expand the Open Science community
- Have reflexivity and awareness' which is another self-oriented competence where one reflect his/her own role in the community and society as well as the norms and values that motive this/her actions, and evaluates those actions.
- Adopt continual learning which is about building adaptive capacity through an iterative exchange of new information in relationship to prior understanding. The continual learning process allows ongoing improvement, which is critical to achieving system stability, resilience, and thriving opportunities in the midst of an uncertain and complex future.
- Employs Theory of Change as a tool to align researchers and practitioners in a common, and agreed upon, plan for action. Theory of Change works to do this by making explicit the assumptions, actions, and reactions expected in any program, initiative, and/or research endeavor.
- Understand variation is a key to customizing for different developmental needs, experiences, and settings. Research for the next generation moves beyond averages to represent and act on variation.
- Finally, know 'responsibility' is the core concept of RRI in terms of both a sense of individual and shared responsibility among diverse actors towards making trade-offs to advance towards R&I that address grand challenges- Embrace outcomes

CONCLUSIONS AND PROSPECTS

There is need for government towards achieving the Big Four Agenda to prioritize research directions to develop innovations that enable orphan crops increase their productivity under limiting conditions to bridge the gap on food security and nutrition. There is an urgent need to increase investment in high-quality research that is directed to the needs of smallholder farmers for increased food security. Talent-building efforts may include targeted training (Problem solving and linked to industry)

REFERENCES

Adeyemi, O.O. 2017. Agropreneur Development: A Framework for Sustainable Food Security and Rural Livelihood. IIARD International Journal of Economics and Business Management, Vol. 3 No. 3: 53-62.

- Birwa, S. L., Kushwaha, S., Lark, K and L. K. Mena. 2014. Agripreneurship Development as a Tool to Upliftment of Agriculture. *International Journal of Scientific and Research Publications*, 4(3).
- European Commission. 2017. Providing researchers with the skills and competencies they need to practise Open Science. Directorate-General for Research and Innovation Directorate B – Open Innovation and Open Science Unit B2 - Open Science and ERA policy. Written by the Working Group on Education and Skills under Open Science July – 2017. Brussels, Belgium. 39p.
- Feldmann-Jensen, S., Jensen, S., and S.M. Smith. 2017. *The Next Generation Core Competencies for Emergency Management Professionals: Handbook of Behavioral Anchors and Key Actions for Measurement*, August 2017, 97p.
- GOK. 2019. *Agricultural Sector Transformation and Growth Strategy. Towards Sustainable agricultural Transformation and Food Security in Kenya, 2019-2029*.
- Iza, C.L.B and D. Dentoni. 2020. How entrepreneurial orientation drives farmers' innovation differential in Ugandan coffee multi-stakeholder platforms. *Journal of Agribusiness in Developing and Emerging Economies* Vol. 10 No. 5: 629-650
- Jones, S., Farrington, C.A., Jagers, R., Brackett, M., and J. Kahn. 2017. *A Research Agenda for the Next Generation*. National Commission on Social, Emotional, and Academic Development. 41p.
- Kaneene, J.B., Haggblade, S. and D.L. Tschirley. 2015. Special issue introduction: sub-Saharan Africa's agri-food system in transition", *Journal of Agribusiness in Developing and Emerging Economies*, Vol. 5 No. 2: 94-101.
- Schuijff, M. and A. M. Dijkstra. 2019. *Practices of Responsible Research and Innovation: A Review*. Science and Engineering Ethics. Springer Nature. <https://doi.org/10.1007/s11948-019-00167-3>
- Thapa, R.K., Iakovleva, T., and L. Foss. 2019. Responsible research and innovation: a systematic review of the literature and its applications to regional studies. *European Planning Studies*, Vol. 27, No. 12: 2470-2490. <https://doi.org/10.1080/09654313.2019.1625871>
- Tripathi, R and S. Agawam. 2015. Rural development through Agripreneurship: A study of farmers in Uttar Pradesh. *Global journal of advanced research*, 2(2).
- Uche, C. and L. C. Familusi. 2018. The Adoption of Agripreneurship as a Mitigating Measure to Unemployment in Nigeria: A Topical Review. *Global Journal of Management and Business Research (G) Interdisciplinary*, Volume 18 Issue 2 Version 1.0: 25-31
- United Nations (Economic and Social Council). 2017. The role of science, technology and innovation in ensuring food security by 2030. Commission on Science and Technology for Development, Twentieth session, Geneva, 8–12 May 2017, Item 3 (b) of the provisional agenda, E/CN.16/2017/3. 22pp.
- Von Schomberg, R. 2013. A vision of responsible research and innovation. In R. Owen, J. Bessant, & M. Heintz (Eds.), *Responsible innovation. Managing the responsible emergence of science and innovation in society* (pp. 51–74). London: Wiley.
- Yoshida, N. 2017. Local institutions and global value chains: development and challenges of shrimp aquaculture export industry in Vietnam", *Journal of Agribusiness in Developing and Emerging Economies*, Vol. 7 No. 3:318-338.
