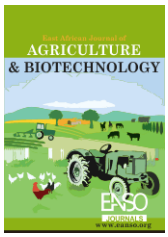


East African Journal of Agriculture and Biotechnology
eajab.eanso.org
Volume 7, Issue 2, 2024
p-ISSN: 2707-4293 | e-ISSN: 2707-4307
Title DOI: https://doi.org/10.37284/2707-4307

EAST AFRICAN NATURE & SCIENCE ORGANIZATION

Original Article

Reflections on Social Justice in the Promotion of Biotechnology Crops and Institutionalisation of Food Values among Smallholder Farmers in Central Uganda

Paulous Serugo[1], Assoc. Prof. Jimmy Spire Ssentongo, PhD[2] & Dr. John Byalebeka, PhD[2]*

[1] Kyambogo University, P. O. Box 1, Kyambogo-Kampala, Uganda.
[2] Uganda Martyrs University, P. O. Box 5498, Kampala, Uganda.
* Author for Correspondence Email: pserugo@kyu.ac.ug

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Date Published:

06 November 2024

Keywords:

Food Security, Institutionalisation of Values, Biotechnology Crops, Smallholder Farmers, Food Sovereignty, Traditional Knowledge, Social Justice.

ABSTRACT

The academic discourse of agricultural biotechnology carries a lot of information on how biotechnology crops are crucial in realizing food security once they are fully adopted by farmers. Biotechnology crops are seen as the solution to ameliorate the Malthusian catastrophe of population increase threatening food security. While studies on agricultural biotechnology are increasing, they mainly focus on how the new agriculture science produces crops with desirable traits in supporting food production interventions. Few studies have concerned themselves with the social justice implications among smallholder farmers, posed by institutionalised agricultural biotechnology knowledge with its sophistication. This paper addresses itself to the above lacuna. The data collection used an embedded mixed method design with focus group discussions, in-depth interviews, non-participant observation, and questionnaire survey methods. The paper shows that mechanisms that are used to promote biotechnology crops are highly institutionalized. The institutions not only develop the biotechnology crops but also engage in mechanisms that encourage smallholder farmers to adopt these crops. The major social justice concerns addressed by this study are plant diversity, equity and commercialization of biotechnology-generated seeds/crops, participation, and farming choices.

APA CITATION

Serugo, P., Ssentongo, J. S. & Byalebeka, J. (2024). Reflections on Social Justice in the Promotion of Biotechnology Crops and Institutionalisation of Food Values among Smallholder Farmers in Central Uganda. *East African Journal of Agriculture and Biotechnology*, *7*(2), 126-144. https://doi.org/10.37284/eajab.7.2.2380

CHICAGO CITATION

Serugo, Paulous, Jimmy Spire Ssentongo and John Byalebeka. 2024. "Reflections on Social Justice in the Promotion of Biotechnology Crops and Institutionalisation of Food Values among Smallholder Farmers in Central Uganda". *East African Journal of Agriculture and Biotechnology* 7 (2), 126-144. https://doi.org/10.37284/eajab.7.2.2380

HARVARD CITATION

Serugo, P., Ssentongo, J. S. & Byalebeka, J. (2024) "Reflections on Social Justice in the Promotion of Biotechnology Crops and Institutionalisation of Food Values among Smallholder Farmers in Central Uganda", *East African Journal of Agriculture and Biotechnology*, 7(2), pp. 126-144. doi: 10.37284/eajab.7.2.2380.

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

IEEE CITATION

P. Serugo, J. S. Ssentongo & J. Byalebeka "Reflections on Social Justice in the Promotion of Biotechnology Crops and Institutionalisation of Food Values among Smallholder Farmers in Central Uganda", *EAJAB*, vol. 7, no. 2, pp. 126-144, Nov. 2024.

MLA CITATION

Serugo, Paulous, Jimmy Spire Ssentongo & John Byalebeka. "Reflections on Social Justice in the Promotion of Biotechnology Crops and Institutionalisation of Food Values among Smallholder Farmers in Central Uganda". *East African Journal of Agriculture and Biotechnology*, Vol. 7, no. 2, Nov. 2024, pp. 126-144, doi:10.37284/eajab.7.2.2380

INTRODUCTION

The rapid population growth and significant shifts in food demands pose major challenges to achieving food security and ending hunger and poverty (Miladinov, 2023). Food and Agriculture Organisation (FAO) pointed out that around 815 million people in the world today do not have secure access to food and that, by 2050, the global food demands are projected to further grow by 60% (FAO, 2017). The fears of the FAO draw back on the observation by the World Food Summit Plan of Action (1996) on food security that the growing food security concerns, sustainable food consumption in urban areas, and production in rural areas have become urgent issues at the global level, as also emphasized in the Sustainable Development Goal 2 and 16 (FAO, 2017). These concerns of how to ensure food security are in agreement with the revelation that researchers estimate that agricultural productivity in Africa must increase by 50% to feed the 1.3 billion estimated population by 2030 (Mersha & Ayenew, 2018). World leaders, national and international institutions have always designed food security programs in the endeavour to overcome the Malthusian prediction on population and food production.

Malthus in the *Essay on the Principle of Populations* postulated that infinite human hopes for social happiness must be vein, for population will always tend to outrun the growth of production. The increase in population will take place if unchecked in a geometric progression while the means of subsistence will increase in only an arithmetic progression. Population will always expand to the limits of subsistence (Encyclopaedia Britannica viewed on 28/4/2022). The presumed mismatch between population increase and food production has continued to worry people observing that the world population continues to grow at a rate that is not consistent with global food production leading to a high prevalence of food insecurity and malnutrition among many countries particularly the developing ones in Africa, Asia and South America (Imathiu, 2021). The associated challenges of ensuring food security justify the many alternatives being proposed as solutions to food insecurity.

Ensuring food availability in developing countries has mainly been identified as being fulfilled by smallholder farmers. Smallholder farmers have been defined differently, with the majority of scholars referring to them as farmers cultivating on land of less than 2 ha although other scholars have considered land less than 5 ha (Kamara et al., 2019). In other instances, these farmers have been defined in line with the farming conditions they experience in terms of labor used; family labor (Kapari et al., 2023) and output produced, a form of agriculture, and other management practices they employ. What comes out of the definitions is that these are farmers who produce for household consumption and market, subsequently earning ongoing revenue from their farming, which forms a source of income for the family (Carelsen et al., 2021). Despite the importance of smallholder agriculture to global food production and poverty reduction, there has been a decline in the level of agricultural production in Sub Saharan African region (Dziba et al., cited in Mugiyo et al., 2021). To overcome the challenges related to reduced food production, the adoption of biotechnology crops is considered to possess envisaged potential to contribute towards crop productivity gains and crop improvement for smallholder farmers in developing countries (Beumer & Swart, 2017).

Biotechnology crops are scientifically conceptualised in terms of the transfer of genetic material containing a specific trait from one crop/organism to another in order to improve

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

productivity and resistance to various biotic and abiotic stresses (Das et al., 2023) however, for this paper, biotechnology crops is used to mean those crops that have undergone human manipulation to produce desired traits. Smallholder farmers in central Uganda to them these are improved crops that they call *ebireme ebirongoseemu*. The activities on crops improvement in Uganda are being undertaken by government agriculture research organisation, and multi-national corporations in the name of Monsanto, Novartis, Pioneer/Dupont, Aventis, Crop Science, Bayer Crop Science, BASF, Syngenta, and Dow (Donohoe, 2014), collaborating with local agro-traders (Seed and Plant Act, 2006) The proponents of improved crops present the expected good traits of these crops but importantly there is need for understanding how institutionalised food production affects the social justice concerns of farmers. This paper addresses the following research question; how does the promotion of biotechnology crops that institutionalise food values affect social justice concerns among smallholder farmers in central Uganda?

As biotechnology crops are being promoted by different stakeholders, little is known regarding how institutionalisation of values of food production raises concerns over social justice among smallholder farmers. The paper is not about arguments for or against biotechnology crops but situates the debate within the framework of social justice and argues that the promotion of biotechnology crops institutionalises food values, posing injustice concerns among smallholder farmers. Methodologically, the paper enlists succinct insights using the philosophical assumptions of post-positivism with a mixed method case study design that enabled using qualitative methods complemented by quantitative methods (Wasti, 2022). The methods of data collection included questionnaire survey, focus group discussion, non-participant observation and in-depth interview. Data collection ethical review approval was received from Uganda Christian University Institutional Review Board (UCUREC, 2024-764)

Biotechnology crops grown by Smallholder Farmers

The farmers in the four districts of Luwero, Mukono, Wakiso, and Masaka grow the following biotechnology crops. As explained earlier, to the farmers, biotechnology crops simply mean those crops that have undergone improvement through human manipulation. These include the following: mangoes, yellow sweet potatoes locally called *kipapaali*, bananas varieties including fhia, upland rice of New Rice for Africa (NERICA) variety, soya beans. Beans called *nabudama*, Namulonge Beans abbreviated as NABE 15,16,17,18, 19, 20, 21, 22, 23 developed in 2010, NAROBEAN 1, 2,3, 4C 5C developed in 2016, NAROBEAN 6, 7 developed in 2019. Some of the bean varieties have been fortified with zinc and ion especially the NARO Beans - NAROBEAN 1, 2, 3, 4C, 5C, 6, and 7. Clonal coffee, maize mainly the variety of bazooka, yellow maize (*Kasooli wa kipapaali*), DK, and longe 9H, Longe 10H and Longe11H developed in 2009. Other maize varieties grown include UH5354, UH5355, UH5051, UH 5052, UH5053 developed in 2012. In 2014, the varieties of WE2114, UH5401, WE2101, WE2103, WE2104 and WE2106 were developed. The Water Efficient Maize for Africa (WEMA) maize varieties currently in five African countries of Kenya, South Africa, Mozambique, Tanzania and Uganda have seen Monsanto and International Maize and Wheat Improvement Centre (CIMMYT) being involved in the project with Monsanto contributing its molecular genomics and biotechnology, and CIMMYT contributing its breeding program and adapted maize varieties (AATF, 2017). Tomatoes, oranges, Hass avocado, passion fruits, cassava varieties of Nacer I, NAROCAII, cabbages, onions, broccoli, gooseberries, strawberries, and green pepper.

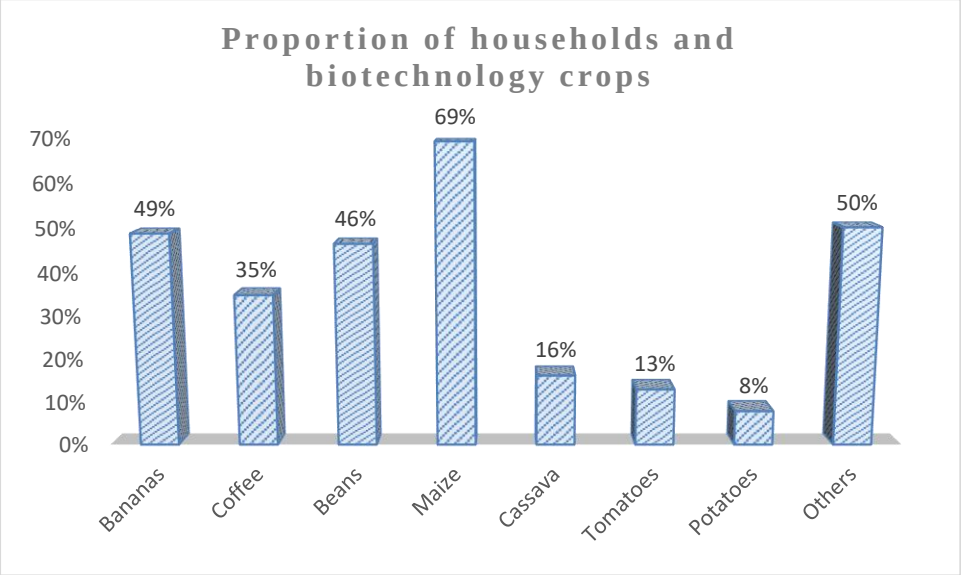
There is continuous research to develop more biotechnology-generated crops in Uganda which has witnessed other crop varieties. The effort to produce improved crops which have seen NARO produce bananas resistant against bacterial wilt, nematodes, and black Sigatoka, cassava against cassava Brown Streak Virus (CBSV), and

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Cassava Mosaic Virus (CMV), banana rich in Vitamin A and iron, Irish potatoes against bacterial blight, maize resistant against Maize Stalk Borer and drought tolerant and herbicide-resistant cotton against ball worms. In fact, National Agriculture Research Organisation (NARO) has produced and supplied to farmers cassava varieties of NASE 14, Naro Cas1 and Naro Cas 2. At the launch of new crop varieties by NARO, a project officer remarked, as a practicing scientist, I see no need why farmers should be denied crop varieties bred using modern biotechnology because this is a technology being used to develop varieties to address challenges of pests and diseases by our farmers (Daily Monitor, 2021). NARO has recently also released eight new improved crop varieties including; two bean varieties NAROBEAN 6 and two potato varieties (NAROPOT 5 and 6), two sweet potato varieties NAROSPOT 16 and 17, one provitamin A maize variety NAROMAIZE 63PVA and one pasture variety with high protein content NAROLABLAB1 (Nakirigya, 2024).

The names of these crops were given by the smallholder farmers though in some instances they could not differentiate the specific crop variety names and labelling. In such instances, the researcher got the specific information from the used packages of the varieties the farmers had bought. In addition, the scientist engaged from NARO organisations and private agricultural biotechnology companies also provided the technical names of the crops/seed varieties.

Figure: 1.1 Common biotechnology crops grown in central Uganda (field data)



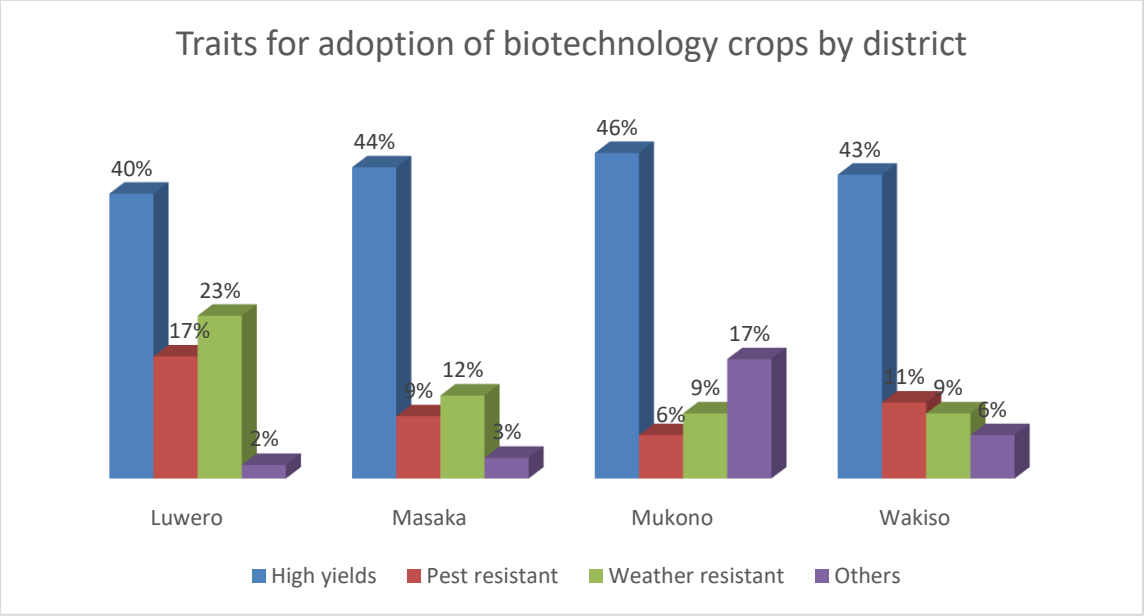
Results indicate that the majority of the households 69% were growing biotechnology maize, Bananas 49%, and Beans 46%. Only a small proportion of households 8% were growing potatoes, tomatoes 13%, and cassava 16%. 50% comprises of other crops that include carrots. Eggs plants, tomatoes, pass fruits, hass avocado, watermelon, cabbages, pumpkins, and oranges

Promised traits of biotechnology crops

Biotechnology crops adoption is being promoted in Uganda with various interventions. The crops provided by institutions are premised on the promised traits that manifest positive outcomes as shown below:

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Figure 1.2 Traits of biotechnology crops



The findings reveal that across districts, the majority of households were growing biotechnology crops because of the trait of high yields, Luwero, Masaka, Mukono, and Wakiso at 40%, 44%, 46%, and 43% respectively. Others had traits of quick maturity, big size, and good weight

The paper is structured into four sections where the first section presents the introduction, of the biotechnology crops grown in Uganda and their traits, and the second section provides the conceptualization of institutionalisation of food production values and the social justice context. Section three has the study findings focusing on mechanisms being used by stakeholders in Uganda to promote biotechnology crops. The mechanisms depict how food production values are being institutionalised. Section four highlights the social justice concerns among smallholder farmers namely related to plant diversity, equity, and participation.

Understanding Institutionalisation of food values

The institutionalisation of values as a development objective can be traced after the Second World War, specifically to the inaugural speech of the president of the US in 1949. President Harry Truman stated,

> *"... I believe that we should make available to peace loving people the benefits of our store of technical knowledge in order to help them realize their aspirations for a better life... [ ] what we envisage is a program of development based on the concept of democratic fair dealing...[ ] greater production is the key to a wider and more vigorous application of modern scientific and technological knowledge" (Escobar, 1995).*

In the speech, the president deliberated on how the underdeveloped areas of the world could be helped by the Western world to overcome the undesirable situation in which they found themselves. This was a precursor to the institutionalisation of values as the only mechanism that would deliver the underdeveloped areas from the misery and suffering that they were experiencing. In doing so, the use of modern science was highly prioritised to influence agricultural, production. For this, we are witnessing its rigorous application in agricultural biotechnology production.

Institutionalisation of food values, though not widely studied, has been categorendeavor systematic endeavor in which institutions take care of the needs of peoplthe e (Illich, 1970). Similarly, institutionalisation of values represents

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

a process through which new ideas and practices a,organizations, accepted, used by organisations and eventually become a part of the norm (Sutherlandthe, 2021). This implies that people start to see the values of food production as products to be provided by institutions like agriculture research institutions/ organizations, multi-national seed companies, and agro-traders. This is possible because institutionalisation often frames the propensity of community reliance on a particular institution as the primary service delivery (Dobler, 2011). The institutions and agencies have become the only dominant spaces for delivering food production inputs, technical knowledge, and management skills. The prevailing circumstances surrounding the institutionalisation of values of food production are a reality but for this paper, the focus is on looking how the institutionalisation of food production values by the introduction of biotechnology-generated crops affects the social justice of smallholder farmers.

Institutionalisation of values in food production manifests an involuntary transfer of responsibility in food production from the self to an institution. Such was evident in all four districts of the research area as farmers always inquired from the researcher and the agriculture extension officers who participated in the study about when subsequent training on modern farming would be organized for them. There is acceptance of change of obligation from the individual to the institutions in terms of acquisition of agriculture knowledge and skills. There arises a fundamental question; is it possible to take care of food production without depending on multi-national seed companies, Institutions, and agro traders? This paper focuses on institutionalisation of the value of food production in view of the introduction of biotechnology crops that smallholder farmers are being urged to adopt. It is realized that when people become dependent on institutional care, they become less and less capable of organizing their own requirements around their own experiences and resources. When farmers cannot organise and control processes of food production, it raises social justice concerns in food production.

Much as institutionalisation of values in development practice gained more emphasis especially after the second world war, and also in the current discourse of modernising agriculture, it is perceived to be a 'product of western epistemology extending as far back as Aristotle's starkly biological view of the human soul in De Anima' (Scheper & Lock, 1987). Needless to say, it is practiced through the transfer of agricultural technology that heavily relies on Western science (Pimbert, 2022). Using technology, seeds, and crops are being manipulated using scientific methods to produce traits that are deemed desirable.

The academic discourse of institutionalisation of values in food production is recent and has not been largely explored in the context of how institutionalising the growing of biotechnology crops raises concerns over the social justice of smallholder farmers. This paper draws on two objectives namely; to understand the process of institutionalisation of values of biotechnology-generated crops, and to analyse how institutionalisation of biotechnology-generated crops raises concerns over plant diversity, equity, and participation of smallholder farmers in food production.

Social Justice Context

Social justice has been variously conceptualised. The classical philosophic period understanding of justice provided ground for later scholars to conceptualise social justice. To philosophers who lived during this period, justice was mainly related to the moral aspects of living in a community. To Plato for example, justice meant speaking the truth and paying your debts (Kumar, 2018). Plato envisaged that when an individual is just, social institutions will also be justly arranged in as much as justice was looked at as the highest good-which is a virtue. Justice means exercising virtuous values in society. For Aristotle, justice consisted of what is lawful and fair, with equitable distribution of opportunities, resources, and rewards. Aristotle was thus postulating a form of

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

distributive justice related to sharing benefits and burdens. Later philosophers like Marx agitated for a form of justice that was against the unequal distribution of resources. No wonder the Marxist theory of justice recognises class struggle as a matter of social reality and tries to direct it toward a just society, in which classes are abolished through class struggle that is through a violent overthrow of the capitalist society (Kumar, 2018).

Marx postures a concept of justice that was concerned with the problem of inequitable distribution of consumption goods (Hancock, 1971:66). Philosophers in the modern period have developed the notion of social justice building on what earlier philosophers had postulated. Robert Nozick (1938-2002) presented a theory of Justice aimed at providing an understanding of social justice as he elucidated on justice in holding. To him justice is concerned with personal holding which are acquired through just original acquisition, or just transfer, can also be through rectification of injustice in the two senses (Salahuddin, 2018). This conceptualization meets the challenges of who determines just transfer given what is just transfer may be unjust to another party besides, with globalization and rampant market failure, rectifying injustice is an uphill task, especially for the voiceless/ powerless populations. Social justice in many instances is concerned more specifically with a just distribution of resources resulting from the economic, political, and cultural organisation of the community (Deranty, 2016). Subsequent scholars have addressed social justice as an issue of distribution especially of the benefits and burdens specifically urging the promotion of fairness, equality, equity, and rights across multiple aspects of society (Killen et al.,2021). Some argue that social justice reflects a concept of fairness in the assignment of fundamental rights and duties, economic opportunities, and social conditions (Miller, 1976, cited in Reisch, 1998). These scholars are putting forward the idea that social justice is about an ideal condition in which all members of a society have the same rights, protection, opportunities, obligations, and social benefits (Lai, 2023)

Other scholars frame the concept in terms of three components – legal justice, which is concerned with what people owe society; commutative justice, which addresses what people owe each other; and distributive justice, or what society owes the person (Reichert, 2003 &Van Soest, 1995). From a distributive perspective, social justice entails not only approaches to societal choices regarding the distribution of goods and resources but also consideration of the structuring of societal institutions to guarantee human rights and dignity and ensure opportunities for free and meaningful social participation. In this, social justice means the idea of creating a society or institutions that are based on the principles of equality, equity, and solidarity, that understand and value human rights, and that recognizes the dignity of every human being (Chaturvedi, 2015). This is the meaning of social justice that the paper uses in exploring institutionalisation of food production values that are being reflected in promoting the adoption of biotechnology crops for smallholder farmers in central Uganda. Social justice is employed as the analytic frame to analyse how interventions in agricultural biotechnology are institutionalising values of food production, constraining principles of plant diversity, equity and participation.

FINDINGS

Institutionalised mechanisms for adoption of biotechnology crops

The improved crops have been provided to the farmers through the government agriculture program of National Agriculture Advisory Services (NAADS). The staff of NAADS working together with the local leaders often give farmers improved coffee, mangoes, maize, oranges, cassava, sweet potato and beans. Farmers are given the quantity required for planting in their respective prepared gardens although sometimes the quantity is restricted to not more than 10 kilograms of seeds. On the other hand, some farmers who have the economic ability have been able to purchase improved passion fruits, tissue culture bananas, and mangoes from the National Agriculture Research Institute Kawanda in

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Wakiso district and from other private biotechnology laboratory operators.

Private and religious institutions and civil society organizations have played a complementary role to the government in influencing smallholder farmers to grow improved crops. During a focus group discussion in Katwe/Butego Sub County in Masaka district, smallholder farmers mentioned Vi, a Swedish development organisation and World Vision as some of the civil society organizations that at one time had projects of encouraging them to grow improved crops. Whereas Vi focused on avocados and bananas, World Vision had projects on jackfruits and mangoes. The media houses were also mentioned as being involved in the promotion of improved crops specifically Central Broad Casting Service (CBS) radio station through the project of Buganda Cultural and Development Foundation (BUCADEF) with a Radio program of *Emwanyi Terimba* has regularly encouraged the farmers to grow cloned coffee. The civil society organisations that were mentioned include Masaka Catholic Diocese through the development arm of Masaka Diocesan Development Organization (MADDO) was also named among the institutions that are playing a part in encouraging farmers to grow improved crops. MADDO has supplied farmers with cloned coffee, avocado, and heifers.

Bukedde Newspaper also runs a weekly newspaper pull-out called *Enkumbi Terimba* that the farmers who have the money and can read buy. A participant from Katwe/Butego Sub County in Masaka district in a focus group discussion appreciated *Bukedde* Newspaper by revealing that, "sometimes I read *Bukedde* Newspaper of every Monday where there is *enkumbi terimba* [the hoe does not lie]. Here you find information on the new improved crops/ seeds, market, how to grow the crops, reports on new crop diseases and what you can do when your crops are attacked, experiences of other farmers on the different crops, and how we can make money from farming. I find it important to me and I encourage those who can to always read it". In Kamira Sub County, Luwero district, NAADS, National Women Organization in Uganda (NAWOU), Uganda Association of Women Lawyers (FIDA), Save An Opportunity (SAO)-Uganda, and Voluntary Effort for Development Cooperation (VEDCO) are instrumental institutions in encouraging smallholder farmers to adopt the growing of improved crop/ seed varieties.

Besides giving free improved crops by government agencies as an incentive that influences the growing of these crops, the smallholder farmers also get influenced by admiring the garden output of fellow farmers. A participant from Nakisunga sub-county in Mukono district confers, "I saw a neighbour who had planted improved beans get a good harvest and I was influenced to start planting those beans". This shows the influence of social learning. The farmers also grow the improved crops depending on the use they want to realise from these crops. The same participant continued: "The green improved beans are good for *Katogo* (mixture of cooked cassava and beans) but not as a source for food. The improved ground nuts are good for sale in the market but not tasty when roasted". The high yields are playing a big role in making farmers plant improved crop/ seed varieties, the farmers have started to envisage the positive aspect of these crops. In a focus group discussion, a participant from Kamira sub-county, Luwero district affirmed that "many farmers (*abalimi*) are now planting improved crops (*ebirime ebirongoseemu*). Even bananas (*ebitooke*), farmers want to plant improved varieties. Some farmers are uprooting the indigenous banana because they put on small bunches and are planting *mpologooma* which has been improved". This shows the effect of improved varieties on the growing indigenous crops.

The government in responding to smallholder farmer challenges of associated with reduced yield and the desire to help farmers adopt improved crop varieties has established zonal agricultural centers in the country. After establishing a banana breeding center at the National Agricultural Research Laboratories (NARL)-Kawanda, 9 Zonal Agricultural

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Research and Development Institutes (ZARDI) across the different regions were set up. Mukono Zonal Agriculture Research and Development Institute is for the central region. Other zonal institutes include; AbiZARDI, BuZARDI, NgettaZARDI, MbaZARDI, NabuiZARDI, KaZARDI, RwebiZARDI. NARL also collaborates with private tissue culture laboratories to multiply and disseminate improved banana varieties. A plant breeder at NARL identified tissue culture laboratories that include; Agro-Genetic Technologies (AGT) in Buloba, Senai Bioscience Laboratories in Busega, Bio-Crops in Namalere, and Nsigo Tech Africa (U) Ltd in Busika. Nursery operators have also been incorporated in disseminating the improved banana varieties. The Nursery operators include Black Seeds in Nakaseke and Royal Plants and Nurseries in Kyenjojo. These private Laboratories and Nursery Operators are found in Wakiso, Kampala, Luwero, Nakaseke, and Kyenjojo districts.

Besides government institutions working on agricultural biotechnology in Uganda, there are 13 registered multinational companies, including African multinationals, of which six are involved in the production of crops, and seeds, and seven are involved in sales of hybrid vegetable seeds (Longley et al., 2021). Crops and seed management in Uganda today is under private companies such as Victoria Seeds, Nalweyiso Seed Company (NASECO), Farm Inputs Care Centre (FICA) Seeds, East African Seed Company Ltd, Syngenta, Monsanto, Bayer, and Pioneer Corteva and Panner. The multinational corporations are having their improved seed/ crop varieties sold to farmers through local agro traders. As discussed above, these companies supplement the work of government institutions in working on crop improvement using biotechnology processes and adoption mechanisms. The institutions working with local government administrative units sometimes give out free crops and seeds during planting seasons. The crops and seeds are given to the farmers as a participant in Katwe/Butego, Masaka district informed: “we are given free seeds and crops according to the quantity required by the farmer but not exceeding 15 kilograms”. The free crops are an incentive for farmers to plant them but they are required to start the purchase of crops in subsequent planting seasons. The giving of free crops to farmers has made them always expect the government to give them free crops to plant every season.

Training on how to plant improved crop/seed varieties is being undertaken by several agencies. Annual agriculture shows have been organized for example in Masaka district, Buganda kingdom organizes annual agricultural shows as a participant from Katwe/Butego sub-county, Masaka district informed the group discussion that, “sometimes Buganda kingdom organizes agriculture shows here in Masaka. Entry at the main gate is always free but while inside when you want to attend a specific farming training you have to pay for example 2,000/= or 5,000/=”. To improve farm output, smallholder farmers are at times given fertilizers to use in the gardens. The government has been giving fertilisers to farmers at subsidised prices. The first time to request government-sponsored fertilisers the farmers are provided with fertilisers at a subsidised fee of 14 8,500/=. The fertilisers are subsidised as a way to encourage the farmers to use them to realise better yields. For the subsequent requests for government-sponsored fertilisers after the first harvest, farmers are required to pay 220,000/=. The cost of government fertilisers increases on subsequent requests for them based on the assumption that from the sale of crops from the first planting and application of the fertilisers, you get money from the sale of the crops. Farmers are provided with fertilisers without adequate knowledge of their application.

Farmer exchange visits for knowledge exchange have been sponsored by financial institutions. Micro-Finance Support Centre and Masaka Micro-finance and Development Cooperative Trust Limited (MAMIDCOT) were singled out as the financial institutions that are playing a big role in helping farmers acquire knowledge in growing improved crops through farmer exchanges. These financial institutions mobilise the farmers through

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

radio announcements and placing notices along roads. For local contribution to the sponsored farmer exchange visits, the farmers are requested to pay for the transport costs.

Capacity building and extending financial assistance to smallholder farmers to grow particular crops is an incentive that plays a role in influencing the growing of biotechnology crops. The coffee farmers in Masaka fervently talk of the support Ibero, a coffee processing company used to give them. Ibero used to organize capacity-building training every Tuesday of the month. The training focused on coffee management from planting to harvest. The company also used to buy the coffee of the farmers who used to participate in the activities they used to organise. At the same time, the company used to give short agriculture loans to coffee farmers. The company used to move from village to village, home to home not only to encourage farmers to grow coffee but also to monitor and assess the process of the coffee gardens in terms of how the farmers were applying the knowledge from the provided training. The involvement of Ibero in the chain production of coffee accompanied by the financial credit they used to provide became motivating factors that encouraged farmers to grow improved coffee.

Agricultural extension services are continuously being provided with every sub-county having an extension officer attached to it. In Kamira Sub County, Luwero district, the roles of agriculture extension services were applauded. A participant shared, "we normally get training organised by the agriculture extension officer *(omulimisa*). These training give new skills to manage the crops we plant these days". To appreciate the contribution of extension services to farming, a participant in Busukuma division, Wakiso district said: "These days we need regular visits and training by the agriculture extension service officers. The crops we grow are new and we need new knowledge and skills to manage them well". This shows the extent to which farmers yearn for technical institutional knowledge to guide them in undertaking their farming activities.

The institutional support towards growing improved crops has been channeled through government research institutions with the main objective of addressing farmers' challenges related to low yields, pests, and diseases. Government institutional support to alleviate the challenges the farmers face was confirmed by a banana breeder at the National Agriculture Research laboratory-Kawanda. The banana breeder noted that " … to address the challenges that were affecting banana farming, National Agricultural Research Organisation (NARO) established the Banana Research Program to generate and promote technologies for improved banana productivity and utilization. The short plantation life cycle and low yields were mainly the result of pests and diseases, declining soil fertility, climate change, and socio-economic problems".

Farmers also noted that there are certain periods of the year in which certain institutions organise crop tours for farmers. In these tours, farmers are informed of the benefits and processes of growing and managing biotechnology crops. In Busukuma division in Wakiso district, it was categorically stated by a farmer that: "Namulonge Agricultural Institute organises open days on which interested farmers especially from around the institute are allowed into the institute compound. We meet with staff, who teach us about new varieties, and how to manage them, they seek our views on varieties they want to distribute to farmers, we make garden tours within the institute and one identifies which crops he may want to produce. At the end of the exercise, arrangements are made to deliver the chosen crops to your home"

In fact, the efforts of Namulonge Agriculture Institute in encouraging farmers to adopt improved crop varieties have seen farmers form an association called Namulonge Horticulture Farmers Association. In the association, a participant shared: "We provide free improved seeds to members, help in selling produce, when the association gets funds at times from the Private Sector Foundation of Uganda, we give members free spray pumps, pesticides, fertilizers, and training"

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Smallholder farmers have been encouraged to adopt biotechnology crops by various actors. These efforts are embraced by the farmers, making them grow these crops with the hope to realise the promises attached to them. The promises are namely; improved quantity; attracted market, weather resistance, quick maturity, and their ability to become a source of income for small-scale farmers' households.

DISCUSSION OF FINDINGS

Institutionalisation of values regulates food production by inventing stringent processes that are beyond the apprehension of smallholder farmers. The food production discourse cements the phenomenon that is controlled by powerful institutions that are always struggling to exert their hegemony. The monopoly of the institutions poses a limiting factor in terms of the variety of crops the farmers can plant. These agencies propagate only crops of their interest. This affects social justice in terms of controlling plant diversity, equity and commercialisation of farming knowledge, and participation in view of farming choices.

Plant Diversity

Plant diversity is fundamental in food production sustainability for farmers but it is affected by institutionalisation of food values in many ways. Vandana Shiva has an insightful article; *'High Breed Seed a Menace'* in which she highlights the danger of institutionalisation of food value processes to peasant cultivators by multi-national companies in the name of agriculture modernisation. Traditionally peasant cultivators have conserved (Chichongue et al., 2019) and enhanced the genetic diversity of plants as a sign of environmental stewardship (Mulimbi et al., 2023). They were custodians of plant genetic health, treating seeds. Seeds were treated as sacred, the source and origin of life, as the critical element in the chain of 'being'. The peasant has always reproduced their seeds on their peasant holdings; selecting and storing the best, replanting them, (Uganda National Seed Policy, 2019), and allowing nature to take its course. With the modernisation of agriculture in Uganda for example, peasant cultivators are being discouraged from developing their seeds and they are being made to depend on foreign-developed (certified) seeds that they have to purchase every planting season; pay for seeds, chemicals fertilisers, and for farming knowledge. Improved crop varieties affect the capacity for preservation, promotion, and conservation of indigenous plant genetic resources which are under threat of genetic modifications and diverse forces (Seed Policy, 2019). For example, any farmer who needs high-quality seed must obtain it from registered and certified seed companies and not farm-saved seed from the previous crop harvest, neighbours, and local market (National Seed Strategy Plan-NSSP, 2014/15-2019/20). Regularisation of seeds access is one way of institutionalising food system processes. Interventions are being implemented to enable smallholder farmers to adopt improved crop/ seed varieties aiming at making these farmers lose control of the farming system. In these efforts in Uganda, the framework for Integrated Seed Sector Development (ISSD) was applied through the ISSD Uganda program. ISSD was a two-phase program of four years each (2012-2016 and 2017-2021), funded by the Embassy of the Kingdom of the Netherlands in Uganda. It aimed at empowering smallholder farmers to access affordable quality seed of superior crop varieties (Mastenbroek et al., 2021).

The superior crop varieties being introduced are only those of the interest of the institutions producing them which threatens those varieties which are neglected and are of no interest to the institutions developing these varieties. The genetic diversity that has been a preserve of the smallholder farmers is being taken over by institutions in a way that diversity from local peasants to transnational corporations and changes biological systems from complete systems reproducing themselves into raw materials. It therefore changes the role of agricultural producers and the role of ecological processes. The new biotechnologies follow the line of the path of hybridisation in changing the location of power associated with the seed (Shiva, 1991). Losing control over genetic diversity

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

comes with the loss of power over seed control by the smallholder farmers in a way that modified crops can mean loss of farmers' autonomy and greater dependency on the transnational corporations both technologically and economically (Monitor, Tuesday, November 30, 2010). This poses a threat to Indigenous seed sustainability and failure to recognize diversity as a social justice value that smallholder farmers have been enjoying before the introduction of biotechnology crops,

What has happened is that the peasants have lost their former role and potency to control and manage seeds and food production (Kropiwnicka, 2005). Farmers, who knew how to deal with their seeds and plants, have been rendered foreign to them. When farmers depend on institutions for seeds/ crops it negates the ideal objective of seed regeneration in that, institutionalisation creates a framework in which the whole is rendered partial, the partial is rendered whole for which the commoditised seed does not reproduce itself yet by definition seed is a regenerative resource, and it needs help from inputs to produce, as the seed and chemical companies emerge, the dependence on inputs increases (Shiva, 1991). The role of preserving Germplasm that farmers have enjoyed for millennia has been crucial in ensuring food security for smallholder farmers. Food production knowledge and sustainability mechanisms are being destroyed. In essence, even the coping mechanisms to guard against food insecurity have been systematically destroyed.

Institutionalisation of values perceives smallholder farmers as tools used to promote and protect the interests of the institutions; the intrinsic value of the farmers as people who ought to live in dignity and be able to define their identity and destiny is seriously being destroyed. It is important to move away from the focus on production and on satisfying the physiological needs of the individual as if these were merely technical problems that the processes of technology could adequately address (De Shutter, 2019). Farmers have become susceptible to structural and systematic monopolies of the institutions often based on manipulation of the fundamental knowledge base. Significantly, stakeholders are worried about the consequences of corporate consolidation for the diversity of available seeds and their adaptability to the variety of farmers (Bonny, 2017). The resultant effect is an arbitrary inequality created in the status of Germplasm presenting an arbitrary separation between production and conservation. The power influence in institutionalisation of food values threatens plant diversity and possibility of control food production by smallholder farmers.

Equity and the commercialisation of agricultural biotechnology knowledge

Fair access, ownership, use, and control of resources, assets, and opportunities are important aspects in the adoption of improved crop varieties in view of how they demonstrate the realisation of equity in farming processes. The farmers are treated as equal in terms of access to the crops in the form of selling to them at the same price, costs of inputs including fertilisers, pesticide, farm equipment, and marketability, and charges for attending farming capacity building trainings. This experience manifests neglect of the fact that farmers are differentiated, manifesting differences in access, benefits, obligations, and opportunities (FAO, 2024 viewed on 24/5/2024). The farmers experience structural and institutional challenges reflected in the historical, cultural, and social disadvantage all of which affect equitable outcomes in growing improved crop varieties. Often, using equity as a lens to interrogate the adoption of biotechnology crops among smallholder farmers is neglected and instead assumes neutrality and generalisation that all farmers access and benefit equally in growing these crops once the farming process becomes institutionalised which is not the case.

The technical and capability requirements for growing biotechnology crops create a divide between capable and incapable smallholder farmers in light of adoption. This brings about the segmentation and binary categorization of farmers. The capability requirements are also related to risk management as experience has suggested that such uptake tends to be socially

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

differentiated with those less risk-averse farmers adopting first. The less risk-averse farmers tend to be better off in society, and they are also the ones likely to be able to afford a premium. In other words, there are potential socio-economic problems surrounding a widening of the gap between those who can afford the technology and those who cannot (Morse, 2007).

The process of adoption of biotechnology crops provided a segmented outcome between the rich smallholder farmers and the poor smallholder farmers although in many cases, the protagonists agitating for biotechnology crops adoption assume that smallholder farmers are homogeneous and are poor subsistence farmers (Fan & Rue, 2020). Notably, these farmers are typically poverty-ridden (Batista &Vicente, 2020). Poverty in the context of biotechnology adoption is used to mean a lack of money (Despard et al., 2020). Meaningful understanding of smallholder farmer experiences requires the recognition that farmers vary in their demands, understanding, experience, and preferences (Ayisi et al., 2022). Whereas there are rich and poor smallholder farmers, the richer farmers hold an advantage in the process of adoption because they can easily afford the initial cost involved in using biotechnology crops, leaving behind the poorest ones who may not even have the money to buy starters or inputs like seeds. In the end, the gap between these two groups puts the developmental value of biotechnology crops in peril (Torres et al., 2013). Economic inequalities are emerging among farmers whereby those with money are able to effectively adopt and benefit from their involvement in growing improved crop varieties while those without money are left out from sharing the benefits associated with growing these crops.

Food production knowledge is commoditised to the extent that farmers no longer freely access it. It has to be acquired at a monetary cost. Modernisation of food production spearheaded by scientific innovations in biotechnology has made farmers dependent on institutions for crop management. No wonder, Gabbard (1994) argues that the idolatry of science has pushed humanity beyond the point at which people are capable of exercising control over their tools (reason). Having crossed this threshold, the value of knowledge has been institutionalised, taking on the material form of a packaged commodity to be consumed after purchase. The monetary requirement to access technical farming knowledge is evident in Uganda. The New Vision Group annually organizes an agriculture Expo to which farmers are required to pay a fee for entry and pay an extra fee if they want to attend farming training within the expo.

The monetised access to scientific knowledge in farming contravenes the traditional farming approaches of knowledge exchange and transfer yet it has reshaped the farming system ownership and geographies of the food centers (Clapp et al., 2022). The farmer usually receives little formal education. They acquire knowledge by customary practice, trial and error, and experience. They learn what they know from the social and cultural group they live with. Farmer knowledge constitutes a local, traditional knowledge system (Islam, 2010).

The institutionalisation of values in food production has consequently changed the spectrum regarding food production. Food production knowledge is no longer a free good that is shared by all community members. The farmers with money can acquire it, access it, and use it to meet their goals and interests. Thus, the spirit of competition is slowly being enshrined into farming systems. The competitive practice in farming is for example reflected in the Annual Best Farmer Competition organized by The Vision Group, Koudjis, KLM Airlines, DFCU Bank, and the Kingdom of the Netherlands for which the best farmers in Uganda are taken to visit the Dutch farmers and other agricultural institutions in the Netherlands.

These competitions organised among others by such institutions have the objective of commercialising agriculture as the Netherlands Ambassador to Uganda noted in 2018 during the Best Farmer Competition Award. The Ambassador remarked, “The Best Farmers

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Competition is making a significant contribution towards Uganda's vision of transforming subsistence farming to commercial agriculture" (New Vision, 2018). Additionally, given that these competitions target farmers who are growing improved varieties, they are insidiously re-enforcing the assertion that improved agricultural technology adoption, such as using improved seed varieties, could inspire the changeover from the pleasantly low productivity, peasant and subsistence farming to commercial farming (Awotide et al., 2016). In essence, the competitions reinforce the institutional exclusion of smallholder farmers from participation in agricultural support provided by Western institutions. These institutions set the requirements for entry into the competitions. Many times, smallholder farmers do not meet the requirements of the competition hence being excluded from such farming processes.

Participation and farming choices

The lack of money for smallholder farmers to participate in knowledge acquisition narrows the possibilities for farmers to make genuine choices in farming to get involved in growing improved crop varieties. The precarious situation of the farmers has been worsened when messianic prophesy that these crops will help reduce global hunger and deliver the world to the food secure world as a promising technology that can make a vital contribution to global food, feed, and fibre security (Ozor, 2008) has not yet been trusted by some sections of the farmers. The crops use scientific and highly sophisticated knowledge, which contradicts the episteme indigenous knowledge of smallholder farmers. Other biotechnology processes and procedures notwithstanding, lead to the perpetual enslavement of the farmers by corporations who patent the food chain mechanisms (Kumar, 2017). It is noted that the corporate visions for the future essentially conform with-rather than transform the dominant agri-food regime because they are primarily based on principles of uniformity, centralization, privatization, the concentration of power, control, and coercion (Pimbert, 2022). These corporations, institutions, and agro-traders control and force/coerce farmers to access the knowledge, seeds, manure/fertilisers, and pesticides from them

Institutionalisation of biotechnology-generated crop knowledge augments a consumption myth, a myth of unending consumption. This myth is grounded in the belief that process inevitably produces something of value, and therefore production necessarily produces demand (Illich, 1970). The existence of biotechnology research institutions and laboratories produces a demand for biotechnology knowledge on crops produced by these institutions (Lee, 2018). The specialized nature of these institutions and laboratories discredits more specifically the indigenous farming knowledge because the institutionalisation of food values through the transfer of agricultural technology heavily relies on Western science (Pimbert, 2022). All the non-professional activities on crop production are rendered suspect as these institutions and their agents emphasize that valuable agriculture production is realised after attending agriculture training and that skills acquired after training increase the amount of output, output value can be measured and documented by weight and income from these crops.

The processes, mechanisms, and structures guiding food production today present constructed knowledge that is prejudiced in favour of the literate and the rich who have the means to access the knowledge through the institutions. Smallholder farmers are steadily going to be phased out of crop production given 200,000 farmers disappeared between 1966 and 1995 alone as the decline in agriculture commodity prices coupled with the increase in price for production inputs led to rising bankruptcy and poverty within rural farming communities worldwide (Pimbert, 2009). In many instances, participation in the commercialisation process has been a difficult task for smallholder farmers because of inappropriate policies, insufficient access to technology, institutional obstacles, weak infrastructure, and unfortunate links to markets (Chapoto et al., 2013; Sharma et al., 2022). This raises critical decisions regarding

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

smallholder farmers affected by the institutionalisation of biotechnology-generated crop knowledge. These decisions are about credit access, crop selection, tillage methods, pest control, harvest, post-harvest processing, and marketing (Chana et al., 2022 & Berhe et al., 2022). These decisions place the farmers in a dilemma in that institutional support and requirements for farming in biotechnology crops are sometimes not timely, inadequate, and inaccessible for these farmers.

CONCLUSION

The mechanisms used by government and private agencies to promote biotechnology crops institutionalise values of food production. The process raises concerns over social justice for smallholder farmers. The main reason for addressing the social justice concerns of the farmers is that the institutionalisation of food production values affectsaffects plant diversity, equity, participation, and farming choices. The stakeholders of agricultural biotechnology have not only dominated control over seeds/crop production but also the technical knowledge needed to grow them. Smallholder farmers are being rendered increasingly incapable of organising their own food production needs and live around their own experiences and resources within their communities.

The salient hegemony is disrupting smallholder farming when it anchors food production on the values of commoditisation and monetisation of food production that constrain smallholder farming. The agency of the farmers to determine what kind of seeds/ crops to grow is also threatened. The power to own, utilise, and control food production systems is slowly slipping away from the smallholder farmers' domain to an institutionalised setting. It is essential to challenge the dominance of institutionalising food production values in promoting biotechnology-generated crops that dictate food production processes. Fostering dialogue that incorporates the voices of the farmers is needed such that food production is not merely a response to fears of feeding the increasing population but becomes a process that addresses the social justice concerns of the farmers. This is what will ensure meaningful food security and equity are accessible to all.

Implications and limitations of the study

The findings produce evidence-based information from smallholder farmers important for developing relevant biotechnology and crop interventions that secure and enhance the social justice concerns of the farmers without compromising the mechanisms that ensure adequate food production. The policymakers can use the findings to address the desire to ensure plant diversity and farmers' inclusivity concerns at all levels of food production. Furthermore, broadening the farming choices in growing biotechnology crops by smallholder farmers to disentangle the framers from institutionalised processes that are often associated with these crops. The study encountered some limitations mainly because budget constraints only enabled collecting data from four districts in central Uganda out of the 23 districts. In addition, private biotechnology laboratory owners were not comfortable sharing information on the different crop improvement interventions they undertake. It required assuring them that the information was purely for academic purposes and not to be used by competitors.

Recommendations

The financial capabilities required for the effective growing of biotechnology crops that pose challenges to farmers require creating an enabling environment to access friendly financial services to smallholder farmers in their villages. Such accessible services will help to narrow the gap between capable rich farmers and incapable poor farmers who are unable to participate in growing biotechnology crops. Further study is needed to cover all regions in Uganda given that some regions have different crops. This will help to establish how the different crop systems in Uganda are affected by promoting biotechnology crops.

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Declaration

Author Contribution

1. P.S: Conceptualisation, data collection, and writing the manuscript

2. JSS: Review and editing the work

3. JB: Review and editing the work

Funding

The study was funded by the Kyambogo University Staff Development Program.

Acknowledgement

Sincere appreciation goes to Kyambogo University for funding my studies. I acknowledge the support by Uganda Martyrs University-Nkozi for the academic training they have provided me. I am grateful to my research supervisors who have guided the writing of this article. The enormous contribution of the smallholder farmers who sacrificed their time to share their knowledge and experiences are greatly appreciated.

Conflict of Interest: There is no conflict of interest

REFERENCES

Awotide, B. A., Karimov, A. A., & Diagne, A. (2016). Agricultural technology adoption, commercialization and smallholder rice farmers' welfare in rural Nigeria. *Agricultural and Food Economics*, 4(1), 1–24. https://doi.org/10.1186/s40100-016-0047-8

Ayisi, D.N., Kozári, J, Krisztina T. (2022). Do smallholder farmers belong to the same adopter category?. An assessment of smallholder farmers innovation adopter categories in Ghana. Heliyon. Aug 28;8(8):e10421. doi: 10.1016/j.heliyon.2022.e10421. PMID: 36090232; PMCID: PMC9449744.

Batista, C. (2020). Improving access to savings through mobile money: Experimental evidence from African smallholder farmers, *World Development*, Volume 129, pages104905, https://doi.org/10.1016/j.worlddev.2020.104905.

Berhe, M, Subramanyam, B., Chichaybelu, M., Demissie, G., Abay, F., & Harvey, J. (2022) Post-Harvest Insect Pests and Their Management Practices for Major Food and Export Crops in East Africa: An Ethiopian Case Study. Insects. 13(11):1068. doi:10.3390/insects13111068. PMID: 36421971

Beumer, K., & Swart, J. A. (2017). Understanding Agricultural Biotechnology Innovation in the Context of Development. *The Politics and Situatedness of Emerging Technologies* (Vol. 8, pp. 91-110). IOS Press.

Bonny, S. (2017). "Corporate Concentration and Technological Change in the Global Seed Industry" *Sustainability* 9, no. 9: 1632. https://doi.org/10.3390/su9091632

Carelsen, C., Ncube, B.,& Fanadzo, M.(2021) Classification and characterisation of smallholder farmers in South Africa: a brief review, S. Afr. J. Agric. Ext, Vol. 49 No. 2, 2021: 97- 106,http://dx.doi.org/10.17159/2413-3221/2021/v49n2a12821

Chapoto, A., Haggblade, S., Hichaambwa, M., Kabwe, S., Longabaugh, S., Sitko, N., &Tschirley, D.(2013). "Institutional Models for Accelerating Agricultural Commercialization: Evidence from Maize, Cotton and Horticulture," Food Security Collaborative Policy Briefs 154940, DOI: 10.22004/ag.econ.154940

Clapp, J., Moseley, W. G., Burlingame, B., & Termine, P. (2022).Viewpoint: The case for a six-dimensional food security framework, Food Policy, Volume 106, 102164, https://doi.org/10.1016/j.foodpol.2021.102164.

Das, S., Ray., M.K, Panday, D & Mishra PK (2023) Role of biotechnology in creating sustainable agriculture. PLOS Sustain Transform 2(7): e0000069. https://doi.org/10.1371/journal.pstr.0000069

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Deranty, J-P. (2016). Social Justice. In International Encyclopedia of Political Communication, G. Mazzoleni, K. Barnhurs, K. Ikeda, R. Maia, H. Wessler eds., Wiley, 2015, 1483-1489 10.1002/9781118541555.wbiepc060.

Dobler, Constanze (2011): The Impact of Formal and Informal Institutions on Economic Growth: A Case Study on the MENA Region, Hohenheimer volkswirtschaftliche Schriften, No. 65, ISBN 978-3-653-00883-8, Peter Lang International Academic Publishers, Frankfurt a. M.

Donohoe, M. (2014). Hard to swallow: Genetically-modified crops and corporate agribusiness' takeover of the food system.

Escobar, A. (1991), *Anthropology and the Developmental Encounter: The making and marketing of Development Anthropology*, Princeton University Press, New Jersey

Fan, S., & Rue, C. (2020). The Role of Smallholder Farms in a Changing World. In: Gomez y Paloma, S., Riesgo, L., Louhichi, K. (eds) The Role of Smallholder Farms in Food and Nutrition Security. Springer, Cham. https://doi.org/10.1007/978-3-030-42148-9_2

FAO. (2017), *The State of food security and nutrition in the world: Building Resilience for Peace and Food Security,* Rome www.ngopulse.org/article/small-scale-agriculture, 24/4/2012.

Gabbard, D., & Illich, I. (1994). Postmodernism, and the Eco-crisis: Reintroducing A "Wild" Discourse, Educational Theory, Volume 44, Number 2, pages 173-187.

Hancock, R. (1971), Marx's Theory of Justice, Social Theory and Practice, Volume 1, Issue 3, pages 65- 71, https://doi.org/10.5840/soctheorpract1971134

Imathiu, S. (2021).Neglected and Underutilized Cultivated Crops with Respect to Indigenous African Leafy Vegetables for Food and Nutrition Security. *Journal of Food Security*, *9*(3), 115-125

Kamara, A., Conteh, A., Rhodes, E. R., & Cooke, R. A. (2019). The relevance of smallholder farming to African agricultural growth and development. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(1), 14043- 14065. https://doi.org/10.18697/AJFAND.84.BLFB1010

Kapari, M., Ginindza, H., Nhamo, L., & Mpandeli, S. (2023). Contribution of smallholder farmers to food security and opportunities for resilient farming systems. *Front. Sustain. Food Syst*. 7:1149854. doi: 10.3389/fsufs.2023.1149854

Killen, M., Yee, KM, & Ruck, MD. (2021). Social and Racial Justice as Fundamental Goals for the Field of Human Development. Hum Dev. Dec;65(5-6):257-269. Kropiwnicka Magdalena, Biotechnology and food security in developing countries Journal on Science and World Affairs, Vol. 1, No. 1, 2005 45-60,doi: 10.1159/000519698.

Kumar, A. (2018). Social Justice Through Philosophical Traditions: Outlining the Conceptualisation (September 30, 2018). International Journal of Research and Analytical Reviews, Volume 5, Issue, 3, pp. 212-216, Available at SSRN: https://ssrn.com/abstract=4295853

Lai, D. W. L. (2023). Social justice as well-being: a radical rethinking of social work and social policy. *China Journal of Social Work*, *16*(3), 273– 289. https://doi.org/10.1080/17525098.2023.2285049

Longley, C, S., Ferris., A. Connor, M., Maina, J., Rubyogo, C.,& Templer, N. (2021). Uganda seed sector profile. A Feed the Future Global Supporting Seed Systems for Development activity (S34D)

Mastenbroek, A., Otim, G.,& Ntare, B.R. (2021). Institutionalizing Quality Declared Seed in

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

Uganda. Agronomy, 11, 1475. https://doi.org/10.3390/agronomy11081475

Miladinov, G. (2023). Impacts of population growth and economic development on food security in low-income and middle-income countries. *Front. Hum. Dyn.* 5:1121662. doi: 10.3389/fhumd.2023.1121662

Morse, S., Bennett, R.,& Yousouf, I. (2007). Inequality and GM Crops: A Case-Study of Bt Cotton in India, *AgBioForum*, 10(1): 44-50

Mugiyo, H., Chimonyo, VGP., Sibanda, M., Kunz, R., Nhamo, L., Masemola, C., Dalin, C., Modi, AT., & Mabhaudhi, T. (2021). Multi-criteria suitability analysis for neglected and underutilised crop species in South Africa. PLoS One, 19;16(1) doi: 10.1371/journal.pone.0244734.

Mulimbi, W., Kristofor, R., Brye, L., Nalley, D., Birindwa, R. (2023). Conservation agriculture assists smallholder farmers and their agroecosystem in the Democratic Republic of the Congo, Agriculture, Ecosystems & Environment, Volume 355,108597, https://doi.org/10.1016/j.agee.2023.108597

Nakirigya, S. (2024, January 06). NARO Introduces eight crop varieties in three years. The Daily Monitor

National Seed Strategy Plan. (2019), Factors influencing the adoption of conservation agriculture practices among smallholder farmers in Mozambique, International Journal of agriculture Extension, Vol.7 No.3, DOI: 10.33687/ijae.007.03.3049

Ozor, N. (2008). Challenges and impacts of agricultural biotechnology on developing societies. African Journal of Biotechnology, Vol 7 Num 4. pp. 322-330

Pimbert, M. (2022). Transforming food and agriculture: Competing visions and major controversies, Dans Mondes en développement Volume 199-200, Issue 3, pp 361 - 384, DOI 10.3917/med.199.0365

Salahuddin, A. (2018). Robert Nozick's Entitlement Theory of Justice, Libertarian Rights Scheper-Hughes N., M. Lock, 1987, "The Mindful Bbody: a Prolegomenon to Future Work in Medical Anthropology" in Medical Anthropology Quarterly 1(1):6-41. Seed and Plant Act. (2006) https://faolex.fao.org/docs/pdf/uga140397.pdf

Sharma, S., Kant, S., Mishra, R., & Azhgaliyeva, D. (2022). Market Access and Firm Performance: Evidence Based on GIS Analysis of Road Network and Manufacturing Plant- level Data from India. ADBI Working Paper 1351. Tokyo: Asian Development Bank Institute. https://doi.org/10.56506/PHTN2138.

Shiva, V. (2014). Biotechnology Development and Conservation of Biodiversity, Economic and Political Vol. 26, pp. 2740-274

Shiva, V., & Berry, W. (2014). The Seed and the Earth. In *The Vandana Shiva Reader* (pp. 159–178). University Press of Kentucky. https://doi.org/10.2307/j.ctt12880j6.12

Sutherland, L. A., Burton, R. J. F., Adamsone-Fiskovica, A., Hardy, C., Elzen, B., Debruyne, L., & Flanigan, S. (2021). Inclusivity of on-farm demonstration: gender, age, and geographical location. *The Journal of Agricultural Education and Extension*, *27*(5), 591– 613. https://doi.org/10.1080/1389224X.2020.1828115

Torres, C.S., Romel, A., Daya, M., Teresita, B., Juvy, N., & Gopela, N.(2013). Adoption and Uptake Pathways of GM/Biotech Crops by Small-Scale, Resource-Poor Filipino Farmers. College of Development Communication, International Service for the Acquisition of Agri-biotech Applications (ISAAA) SEAsiaCenter, and SEAMEO Southeast Asian Regional Center for Graduate Study and Research in Agriculture

Article DOI : https://doi.org/10.37284/eajab.7.2.2380

(SEARCA): Los Baños, Laguna, Philippines. Volume 157, 2022, 102851, https://doi.org/10.1016/j.jdeveco.2022.102851

Wasti, SP., Simkhada, P., Teijlingen, ER., Sathian, B., & Banerjee, I. (2022). The Growing Importance of Mixed-Methods Research in Health. Nepal J Epidemiol. pp1175-1178. doi: 10.3126/nje.v12i1.43633

