



Extended Abstract for the 15th IFSA conference

Smallholder farming agricultural transformation: implications for environmental sustainability, household dietary diversity and food (in)security

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Abstract

This study explores how agricultural sector transformation aimed at increasing productivity and improving farmers' livelihoods and realised through the commercialisation of smallholder agricultural production systems has impacted environmental sustainability, household dietary diversity and food (in)security in the seven counties in the Mau-Cherangany complex in Kenya. Farmers were selected through convenience and purposive sampling by a team of Prosperity Co-learning Laboratory (PROCOL-Africa) network citizen scientists. Data was collected through key informant interviews conducted with 85 farmers. Additionally, data was collected through participatory photography and mapping exercises involving 45 farmers.

Cash crops such as avocado, maize, tea and coffee are increasingly being produced in Kenya. The agricultural commercialisation that has driven this land use change has accelerated biodiversity loss. The use of herbicides to control weeds has led to the loss of native flora and fauna. It has also reduced access to nutritious indigenous vegetables, leading to a reliance on the consumption of purchased foods from the market, and negatively impacted household food security. Holistic approaches to realising food system transformation are required to ensure that the commercialisation of smallholder agricultural production systems is not pursued at the expense of environmental sustainability, socioeconomic inclusion, and rural households' food and nutritional security.

Keywords: Citizen science, food system transformation, food justice, food democracy

Introduction

The global agri-food system is a major driver of climate change; environmental degradation and biodiversity loss; public health problems; and broader societal challenges undermining the realisation of the Sustainable Development Goals (SDGs) (Eliasson et al., 2022). Recognition of the linkages between the global food system and complex wicked problems and societal challenges have led to efforts in the Global North and South to transform food systems and achieve improved nutrition, health, environmental and climate change resilience outcomes (Davis et al., 2022). Food systems also necessitate a transformation to ensure their resilience against climatic and other shorter-term shocks, as evidenced by the recent COVID-19 pandemic (Sanderson Bellamy et al., 2021). In this context, the commercialisation of smallholder agriculture production systems has emerged as a popular approach to promoting rural development and creating livelihood opportunities (Wangu et al., 2021).

Scholars have postulated that smallholder farmers' participation in global value chains can create business opportunities for rural development (Matthys et al., 2021; Wangu et al., 2021). However, participation in these value chains necessitates commercialisation of agricultural production and, by extension, farmers moving from subsistence to intensive production; being dependent on external inputs; and pursuing production that meets market standards (Wangu et al., 2021). Farmers compliance with quality standards forces them to rely on inputs, services, and advice from experts - for example, related to accepted pesticide residue levels and product specification - can increase production costs and reduce profitability (Macharia, 2015; Wangu et al., 2021). It can also expose households to food insecurity, reduce dietary diversity, and increase reliance on purchased foods which may expose households to price volatility (Wangu et al., 2021).

One of the major shortcomings of current approaches to food system transformation and commercialisation smallholder agricultural production system is that there is insufficient consideration of the potential adverse impacts of market-led policies and interventions on poor rural households' livelihoods, prosperity, and economic opportunities (Davis et al., 2022). To date, the commercialisation of smallholder agriculture has been premised on the idea that the nature and scale of the envisioned changes from food system transformation efforts will automatically lead to improved rural livelihoods. However, there is growing evidence that food system transformation can lead to unsustainable outcomes and perpetuate injustice within social-ecological systems due to information, power, and agency relationships between food system actors (Wangu et al., 2021).

Food systems are shaped by competing interests and uneven power relationships (Ruben et al., 2021; Wangu et al., 2021). Food system stakeholders differ in their priorities and ability to exert agency and influence decision-making processes (Wangu et al., 2021). Consequently, it is imperative that an intersectional approach is taken to food system transformation processes; this will ensure that all actors' interests and goals are accommodated (Davis et al., 2022). Moreover, there is a need for nuanced rather than "one size doesn't fit all" approaches to food system transformation'; this will ensure that less powerful food systems stakeholders, such as smallholder farmers, are not adversely impacted (Dengerink et al., 2021). Ensuring that livelihoods and socioeconomic inclusion and environmental sustainability are prioritised as outcomes of food system transformation strategies is key to creating just and equitable food systems (Davis et al., 2022).

Although studies in Kenya have explored the commercialisation of smallholder agriculture and participation in global value chains and its impact on income and livelihoods (Wangu et al., 2021), there is a paucity of studies that have explored the implications for environmental sustainability, household dietary diversity and food (in)security. This study therefore explores how policymakers and



practitioners can transform the agricultural sector in Kenya by commercialising smallholder agricultural production systems to increase productivity and improve farmers' livelihoods. This will positively impact the environmental sustainability of agricultural production and result in improved household dietary diversity and food security in Kenya.

Study design and methodology

This study was conducted in the seven counties in the Mau-Cherangany complex and included Narok, Bomet, Kericho, Nandi, Uasin Gishu, Elgeyo Marakwet and Trans Nzoia which are important agricultural production areas in Kenya. The study areas were chosen for several reasons: (1) the area is the research area of the Prosperity Co-learning Laboratory (PROCOL-Africa) Kenya citizen science project; (2) agricultural production is the main livelihood and economic activity for the residents of the counties; and (3) the area is undergoing significant land use change which has adversely impacted the integrity of the main water towers and soil fertility in Kenya.

Farmers' sampling approach and data collection

Data collection was undertaken by a trained team of citizen scientists based in the study area who are part of the PROCOL-Africa network in Kenya. Farmers were selected through a convenience and purposive sampling strategy by a team of PROCOL-Africa citizen scientists' network in Kenya. The citizen scientists facilitated data collection. Additional data was collected through key informant interviews with 85 farmers through participatory photography and mapping exercises involving 45 farmers. The participants selected were predominantly smallholder farmers producing cash crops (i.e., avocados, mangoes, tea, and coffee). Some farmers kept bees and livestock such as cattle, goats, sheep, poultry. The questionnaire used in the interview contained questions related to the commercialisation of agricultural production; crops grown; livestock kept; marketing channels; knowledge of environmental impacts of agricultural production; knowledge of socio-economic impacts; and approaches to addressing perceived impacts.

Ethical consideration

This study had ethical clearance from the University College London (UCL) in the United Kingdom and a research permit from the National Commission for Science and Technology (NACOSTI) in Kenya. Informed consent was obtained from all the study participants and participants signed an informed consent form before the data collection activities commenced. Study participants were informed about the expectations regarding their participation in the research study; what kinds of data would be collected; and the overall purpose of the research. Participants were also informed that they could withdraw their participation, consent and/or leave the study at any point if they felt like doing so, without explaining why and with no negative consequences. Participants were invited to ask clarification questions regarding the research approach and purpose and answers were provided to all questions. All discussions and interviews were audio recorded and the audio recordings were stored in an institutional encrypted laptop at the end of each data collection day. Data were also backed up on an encrypted external storage device during the fieldwork. All participants' data were anonymised by attaching a random ID number to each participant and study location.

Data analysis

The recorded interviews and photovoice discussions were transcribed and translated into English from Swahili and other local languages used by farmers including Kalenjin and Maasa. Thematic content

analysis was undertaken using NVIVO software. Ideas were identified and grouped into themes. Supporting quotes were identified to support and contextualise these themes.

Findings

In all seven counties, there has been a gradual shift towards the production of cash crops such as avocado, maize, tea, and coffee. Agricultural commercialisation has driven land use change, creating a homogeneous landscape with new exotic crops, and accelerating the loss of native flora and fauna. A shift away from subsistence to cash crop production has led to a reliance on consumption of purchased foods, which are subject to price fluctuation, and has negatively impacted household food security. The adoption of new farming techniques has led to reliance on external farm inputs such as fertiliser, pesticides, and fuel and exposure to the power asymmetries and vagaries of the market:

“The cost of production has increased [...] hence low profits, middlemen do not disclose the final exporting price to the farmers” (Photovoice discussion, Nandi hills)

“High cost of farm inputs such as fertilizer, low prices of tea [farm products] is a challenge, sometimes the buyers reject our tea bringing us to a loss” (Key informant 1, Bomet)

Farmers are aware that their production practices can have a negative impact on the environment, as well as human health and well-being:

“Farming can cause water pollution when fertilizers and herbicides are eroded to the rivers” (Photovoice discussion, Nandi hills)

Herbicides used to control weeds have led to the loss of native plant biodiversity and reduced farmers' access to indigenous vegetables previously consumed in households. However, some companies are training farmers on the prudent use and handling of pesticides to mitigate the negative impacts:

“Sometimes farmers are also trained on the use of farm chemicals, proper hygiene in farms, first aid [...] then they are given certificates” (Photovoice discussion, Nandi hills)

To protect the environment in which they produce their crop, farmers are also being encouraged by private companies and non-governmental organisations (NGOs) to plant trees so that they can derive additional income and products while, at the same time, reducing their environmental impact:

“Tea is mostly planted with Grevilia spp. [trees] which conserves the environment and can later be used as firewood, it is also an income source for farmers” (Photovoice discussion, Nandi hills)

NGOs usually come in with diversification projects encouraging farmers not to all produce the same crop varieties [...] and give training to farmers on the importance of planting trees [...] and conserving the environment. [the private companies] there are programs called CSR (Community Social Responsibility) [...] protecting catchments (Photovoice discussion, Kericho)

There was unanimous agreement among farmers that agricultural commercialisation had increased their income and created new opportunities for rural development:

“The communities that have planted avocados are making a lot of money [...] avocado is a high-value tree, they can now pay school fees, buy food and clothing. Youths have got employment in these farms such as weeding and planting. Women are also engaged together with their husbands [...] they get income selling hence improving the living standards of their families while others are even avocado farm owners” (Photovoice discussion, Bomet)

However, additional costs such as certification costs and increased quality standards requirements increased production costs and limited farmers' access to export markets:

“There is certification of farms globally which needs funding [investment of economic resources]” (Photovoice discussion, Bomet)

Discussion

Transformation pathways that do not consider the needs of local communities may, conversely, have unintended impacts on households' dietary diversity, food, nutrition, and livelihood security, and foster a dependency on inputs such as chemical fertilisers and pesticides, as well as advisory services, which may lead to increased production costs (Wangu et al., 2021). The findings of this research highlight that, as farming systems change towards monoculture production systems, food systems increasingly contribute to wicked problems and societal challenges, such as climate change and biodiversity loss, that are of growing concern to farming communities as well as society more broadly. Similar trends have been observed in Brazil where there has been the expansion of soybeans and meat production has led to environmental degradation and biodiversity loss (Maluf et al., 2022). The findings of this research support calls for redesigning food systems around the adoption of agroecological production practices that ensure agricultural production systems are biodiverse and ecological, economic, and social sustainable (Gliessman, 2016).

A trend towards uniform landscapes with low biodiversity and dominated by monoculture production of maize or avocado, as documented by this study, may be detrimental to environmental sustainability and household food security. Previous research has shown that farm production diversity is positively correlated with indicators of household dietary diversity (Kissoly et al., 2020). It is therefore imperative that policies nudge farmers to biodiverse farm production systems as a way of ensuring food security and attaining sustainability goals.

The results of this study highlight the risks of indiscriminate and overuse of pesticides and other external inputs on the environment and biodiversity, but equally on human health (Macharia, 2015). The use of pesticides can have unintended consequences for the environment including the loss of beneficial organisms such as pollinators and the loss of indigenous vegetables which provide nutritious alternatives to commercial vegetables. In Kenya, indigenous vegetables have been shown to increase household dietary diversity and thus food security (M'Kaibi et al., 2015; Ng'endo et al., 2016; Oduor et al., 2019). Misuse of pesticides creates food safety risks for consumers if the proper withdrawal periods are not observed and/or water resources are contaminated (Macharia, 2015).

The results of this study highlight the imperative for policymakers and practitioners to ensure that food justice is enshrined in food systems transformation that is realised through the commercialisation of agricultural production systems. Increased income derived from agricultural commercialisation can increase access to diversified foods purchased from local markets (Ng'endo et al., 2018; Ruben et al., 2021). The results of this study show that farmers produced food for both home consumption and commercial purposes, but often farmers rely on purchased foods from local shops and markets which is in agreement with the research results of Ng'endo et al., (2018) in western Kenya. There are opportunities for farmers to tap into the increasing and emerging market demands for products such as avocados. Moreover, there are opportunities for value addition associated with agricultural commercialisation that can create local employment, increase the market value of farm produce, and improve rural livelihoods (Matthys et al., 2021; Ng'endo et al., 2018).

Theoretical implications of this study

In this current digital age, the use of participant-led photography in qualitative research has become more commonplace and accessible to a wider section of society (Sanon et al., 2014). One advantage of adopting Photovoice as a research method and citizen science approach is that it invites the public

to participate in both scientific thinking and the data collection process (Dickinson et al., 2010). This research approaches acknowledges the agency of the public to be part of finding solutions to the challenges they face in their day-to-day lives (Strasser et al., 2019).

Policy implications of this study

The findings of this research underscore the imperative for policymakers and practitioners to implement holistic policies and intervention strategies that ensure that food system transformation realised through commercialisation of smallholder production systems does not result in unintended, adverse outcomes. Food system transformation should not contribute socioeconomic exclusion, biodiversity loss, food insecurity, environmental degradation, and negative nutritional security of poor rural households. Robust governance mechanisms are needed to reconcile the diverse and competing goals of different food system actors and realise a just and equitable food system transformation processes and outcomes. Power and information asymmetries and policy incoherence need to be addressed to ensure the agenda of transformation is not captured and driven by a minority of powerful individuals and/or business interests.

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