Social equity implications of agricultural intensification and commercialization, with a focus on East African dairy systems

Implications for low-emissions development

Working Paper No. 327

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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Abstract

Low-emission development (LED) is becoming an increasingly important reference point for guiding and evaluating agricultural interventions. In the dairy sector, LED effectively is pursued through standard intensification practices, which reduce greenhouse gas (GHG) emission intensities. However, with focus on technical practices and outcomes, little attention is being paid to the social distribution of burdens and benefits. This working paper reviews literature on the relationship between agricultural intensification and gender equity outcomes in Kenya and Ethiopia's dairy systems. Findings indicate that intensification and related commercialization often increase women's labor burden in households and women's disenfranchisement from economic opportunities. If LED interventions based on intensified dairy want to avoid creating perverse effects, they need to anticipate and measure social equity, as well as develop social interventions to accompany the technical interventions.

Keywords

Low-emission development, gender, social differentiation, social equity, intensification, livestock systems, dairy.

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Contents

Acronyms

CSA	Climate-smart agriculture
GHG	Greenhouse gas
LED	Low-emission development
NDC	Nationally determined contribution
SI	Sustainable intensification

Introduction

As an emerging organizing conceptual framework for agricultural development, climate-smart agriculture (CSA) has consistently focused on technical environmental and productivity outcomes (Notenbaert et al. 2017; Neufeldt et al. 2013, Thornton et al. 2018), without often paying meaningful attention to the social distribution of the costs and benefits associated with pursuing or achieving those outcomes (Taylor 2017; Karlsson et al. 2018). This is particularly true in the livestock sector, which has disproportionately focused on global environmental targets relating to reducing GHG emissions intensities, overlooking measurement of social outcomes that accompany the changes in technical practice.

Similarly, the literature that centers on the concept of sustainable intensification (SI) also emphasizes the measurement of environmental and productivity outcomes. Here, "environmental" more often refers to localized effects such as soil fertility maintenance or water use. In principle, the SI concept does include a social equity dimension. It is generally underdeveloped (Bullock, Kariuki 2019; Snyder, Cullen 2014) with few exceptions (Fischer et al. 2018; Ndiritu et al. 2014; Theriault et al. 2017).

What these two different, though fundamentally compatible bodies of literature share is a conceptual focus that assesses and develops agricultural technologies and practices to simultaneously achieve multiple environmental, economic, and social objectives (Campbell et al. 2014). However, they both typically overlook measurement of social outcomes that accompany the changes in technical practice. Although, applying critical social science perspectives to agrarian transformations helps to highlight how technical change and social change are inextricably intertwined.

Most support for climate change mitigation in the dairy sector of East Africa presently focuses on the development and implementation of national policies designed to transform sectors through technological changes in value chains and households. This creates a top-down structure and technical emphasis on low-emission development (LED) interventions, with little attention given to rural landscapes' social equity outcomes. As the global LED agenda begins to take hold in African livestock development planning, it will be important to develop a more nuanced understanding of how intensification, especially in the smallholder

dairy sector, leads to socially differentiated costs and benefits. Such an understanding should enable LED interventions to anticipate and accommodate social equity outcomes alongside environmental and productivity outcomes. This, in turn, should support the identification of both synergies and trade-offs between environmental, economic, and social targets in low-emission development.

Commercial orientation of production is generally seen as a driver, or at least a necessary precondition, for the adoption of intensification technologies. However, looking at the history of dairy development in industrial countries reveals that rapid commercialization through large-scale investment in intensification also creates a significant risk of concentrating power and land-holding in agrarian settings through uneven distribution of labor and other assets, uneven knowledge and capacities to adopt, the political economies of scale by which profit margins become so low per unit that producers need to increase the scale of their operations to achieve a viable livelihood (Clay et al. 2020; Clay, Yurco 2020). In as much as mitigation interventions are centered on intensification and commercialization, this indicates foreseeable social equity outcomes, which are rarely addressed directly in LED policy and planning processes.

At this point, it is important to specify the relationship between LED and intensification in the livestock sector. First, LED in dairy is generally more focused on reducing GHG emissions *intensities* rather than total emissions. Emission targets are articulated in country specific Nationally Determined Contributions (NDCs). This is primarily in deference to the first leg of the CSA concept, which is productivity or food security, depending on to whose definition one refers. Thus, one of the primary goals of LED in the dairy sector is to improve production efficiency per unit of product, usually milk or meat[1]. In smallholder dairy production systems, this is typically achieved through the classic suite of intensification technologies, such as keeping fewer animals, while improving feeding, health maintenance, breeds and manure management[2].

[1] See Weiler et al. 2014 for insights on multifunctionality in East African livestock systems.

[2] See Ericksen and Crane 2018 for a full review.

Because intensification is the primary means of pursuing LED for smallholders in the dairy sector, the objective of this working paper is to review the literature regarding the relationships between dairy intensification and the social distribution of its burdens and benefits for smallholders. The equity of outcomes can occur at many different scales, within and between households, in communities and at regional scales. While our primary interest is in dairy intensification in Ethiopia, we have broadened the scope of our search to include smallholder dairy in Kenya, which is already much more intensified, to enable some comparative lessons. We decided not to address pastoral systems because both their technical and social organizations fundamentally differed from sedentary smallholder dairying.

Independent literature searches were conducted by each of the three authors, using various combinations of the following words and phrases in Google Scholar: intensification, commercialization, agriculture, livestock, dairy, Kenya, Ethiopia, social equity, social differentiation, gender, youth, and women. To be included, an article needed an explicit focus on agricultural intensification practices and some dimension of their socially distributed impacts. Articles that only address technical dimensions of intensification have not been included. The search results were merged into a single library of 44 articles, including a few review articles. Selected articles were coded using NVIVO qualitative analysis software. The primary objective of coding was to analyze prevalent research approaches in the field and their substantive findings. We developed a coding tree to guide the coding of themes and subthemes such as gender, age, and wealth as axes of social differentiation. Any other emergent social factors were included in the analysis.

The rest of the paper is divided into three sections. The first section outlines the relationship between LED and dairy intensification. This is followed by examining evidence from Kenya, where dairy intensification and commercialization have been happening for several decades. The next section focuses on evidence from Ethiopia, where dairy intensification and commercialization and in the early days. Finally, the Discussion section distills key findings and observations, explores their implications for LED planning in East African dairy sectors, and then proposes priorities for moving research on this topic forward.

Dairy intensification and social implications

Dairy intensification and the requisite technologies and practices that support intensification are intended to improve household income through increased milk production. Most LED livestock interventions relevant to East African smallholders that reduce emissions intensity can be categorized into three broad categories: improving feed quality and availability, manure management, and animal husbandry[3] (Ericksen, Crane 2018). Implementing LED involves a mix of on-farm technical practices, institutional delivery of material, information inputs for improving production efficiencies (Didanna et al. 2018). However, in most East African contexts, development of the dairy sector is often favorably viewed by policy makers, but it is important to recognize how development policies can generate different outcomes in terms of benefits to different communities and social groups (Staal et al. 2008). The literature primarily focuses on how gender roles and practices generate differentiated outcomes for women and men in labor, decision-making over benefit distribution, and livestock resources.

Introducing intensification technologies presents both opportunities and challenges within households and communities. Access to improved feed and better cross-bred cows are key technical requirements. However, behavioral incentives related to the household labor devoted to animal care, control over dairy revenues, and the drivers for common action and coordinated supply are critical for engagement in dairy upgrading (Ruben et al. 2017). In other words, dairy intensification requires more than technical options and a better understanding of how the introduction of dairy technologies influences existing, often gender unequal, relationships. Technological changes typically involve renegotiation, reassignment, or reinforcement of roles and responsibilities within households (Ruben et al. 2017). Such changes can alter traditional patterns of access to resources such as milk, land, and income (Gallina 2016).

[3] Authors looked at feed quality interventions that included improved forage species; supplementation with feed blocks; producing silage from maize; improving pasture on rangelands; manure management, and animal husbandry interventions that included reducing the chronic disease burden from intestinal parasites and ticks; slaughtering meat animals at a younger age; and the use of artificial insemination (AI) to improve animal genetics (Ericksen, Crane 2018).

Increased engagement in commercial marketing leads, in many cases, to a shift in intra-household time allocation and resource distribution (Fafchamps 2001). Intensification causes changes in intra-household gender dynamics, which can compromise or limit the adoption of new production practices. This is because women, whose labor is typically utilized to support intensification processes, may refuse to engage in costlier and labor-intensive technologies without receiving adequate benefits, such as higher income and improved decision-making power (Udo et al. 2011).

Kenya's lessons and experiences

Kenya has one of the largest dairy industries in sub-Saharan Africa. The sector is the largest agricultural sub-sector and accounts for about 8% of its GDP (Odero-Waitituh 2017). In Kenya, the focus on intensification of dairy production among smallholder farmers began with independence in 1963 until the late 1980s, but tight government controls hampered its growth (Olwande et al. 2015). However, liberalization of markets in the early 1990s as a result of structural adjustment programs by the World Bank and International Monetary Fund (IMF) opened opportunities for informal milk trade and led to tremendous growth of the sector (Olwande et al. 2015).

Despite increased levels of intensification, limited access to knowledge and information on dairy production, processing, and marketing remains a critical constraint for both women and men farmers (Gallina 2016). The differing roles and responsibilities of women and men in cattle production tend to be systematically overlooked in the delivery of extension services. Consequently, the dissemination of innovative livestock practices and technologies rarely targets women (Gallina 2016). This male bias in the provision of dairy information marginalizes or altogether prohibits women from gaining access to services and subsequently adopting sustainable management practices and technologies. For example, male heads of household in dairy in coastal Kenya were more likely to receive dairy advice from development or extension agents than female heads (Mullins et al. 1996). Beyond gender, youth participation in dairy intensification is also constrained by young women and men's limited access to dairy technical and social services (Bullock, Crane 2020).

Dairy labor

Smallholder dairy farms depend heavily on family labor (Staal et al. 2008). In recent decades and across various regions, women have been providing a substantial amount of daily labor without concomitant decision-making power over cattle and income (McDermott et al. 2010; Tavenner, Crane 2018a; Mullins et al. 1996; Njuki et al. 2013). Greater intensification increases women's labor burden, especially in households that cannot afford to hire a day laborer (Tavenner, Crane 2018b). Although not as common, wage laborers may provide labor in smallholder dairy systems. Dairy operators hire long-term or casual labor, which creates employment among some of society's poorest segments, including landless households (Staal et al. 2008). For example, in the Kenyan highlands, about half of all smallholder dairy farms employed a full-time laborer, meaning that consideration of the employment implications for the very poor are significant (McDermott et al. 2010).

Dairy decision-making over resources and income

Despite women's significant, often central, roles in small-scale livestock systems, they often exercise limited decision-making regarding livestock enterprises. Women's ownership, circumstances, and livestock types they keep vary by region (Kristjanson et al. 2010). Decision-making over land, cattle, and income from milk sales varies but is often limited. In Kilifi, farm ownership was heavily skewed toward men, with 84% of the study farms reported owned by men (Mullins et al. 1996). In four central Rift Valley counties – Bomet, Nandi, Uasin Gishu, and Kericho – both men and women respondents reported men as being the decision-makers for cattle sales (69% of male respondents and 77% of female respondents), followed by joint decision-making (31% of male respondents and 23% of female respondents). Women were never reported to be the sole decision-makers for cattle sales, and men were reported as the main decision-maker for purchasing cows (Tavenner et al. 2018). Men often control incomes earned from formal milk sales, often larger volumes than the milk that women may sell through informal channels (Tavenner, Crane 2018a).

In Kalenjin communities in Kenya, men's ownership of cattle has shaped their control over decision making on production and control of income from cows for generations. Dairy intensification practices among the Kalenjin increased women's labor and reinforced masculinities and men's privileges that include ownership of cows, milk income, and other commodified products (Tavenner, Crane 2018a). Women's ownership in smallholder dairy

systems in Kenya is limited. Among the few cases that explore the effects of intensification, there is strong evidence suggesting that intensification and commercialization tend further to disenfranchise women (Tavenner, Crane 2018b). Basu et al. (2019) found that women were responsible for making decisions regarding the quantity of milk to be retained for home consumption, while men controlled the income obtained from milk sales. Dairy intensification has, in other regions of Kenya, been found to concentrate men's control of productive resources and monetary benefits, despite women's contribution to the production system (Tavenner et al. 2018).

Njuki et al. (2016) found that, although women gained control over evening milk sales decisions, men increasingly controlled overall total dairy income in advanced intensification-level households that sold more milk. A recent study carried out with young women and men in Kenya's Kiambu County, a peri-urban location, found that married women assume control over dairy enterprises and manage cows, milk sales, and join cooperatives, often because men have traveled to the capital or nearby towns in search of off-farm income sources. By contrast, young married women in rural locations, often Kalenjin, exercise limited rights to own dairy cows or control milk (Bullock, Crane in review).

Women's control over morning and evening milk, and participation in formal and informal markets, varies widely. Women often have greater control over the evening milk than morning milk and greater decision-making authority over milk sold in local and informal markets (Tavenner, Crane 2019; Kristjanson et al. 2010). Furthermore, the informal dairy economy affords women greater entrepreneurial opportunities than engagement in the formal sector (Tavenner et al. in press).

Early lessons from Ethiopia and social equity implications

Ethiopia and Kenya are similar in that both countries have policies that support dairy commercialization. In addition, gendered inequalities that limit women's access to productive resources and decision-making in both countries constrain women's potential to benefit from dairy intensification processes. However, evidence from Ethiopia is very limited. One important difference is that milk is not nearly as important in Ethiopian culinary traditions as in Kenya. Country contexts differ markedly in terms of milk's role in diets that influence demand and the level of development of dairy infrastructure and institutions to support commercialization.

Dairy Policies

Ethiopian national support for smallholder dairy transformation is more recent than in Kenya. While the dairy sector's potential to grow has been noted, it has not been intensified and is largely subsistence-oriented. Ethiopia is estimated to have the largest cattle population in Africa, and milk production is dominated by small-scale landholders (Chagwiza 2014). Four main dairy production systems exist: a small but growing commercial sector comprised of large private and state farms; small urban/peri-urban systems raising exotic and local cattle with access to milk collection centers or co-operatives; smallholder mixed farming systems in the highlands using indigenous breeds; and pastoral or agropastoral systems in the lowlands (Staal et al. 2008).

Smallholder farmers' market integration has been a key focus of national policies, particularly in peri-urban locations surrounding Addis Ababa. Since the 1960s, three distinct periods can be identified in Ethiopia: the later years of the Imperial Regime (pre-1974), the socialist Derg Regime (1974-1991) and the structural adjustment and market liberalization policies since 1991 (Staal et al. 2008). Over the last half-century, the main thrust of successive regimes of dairy development policies has been to improve commercial dairy production around Addis Ababa, mainly through promoting improved genetics through cross-bred and exotic cows and related feed and management technologies (Staal et al. 2008). Dairy development efforts in the country have been concentrated in the highlands, especially around Addis Ababa, because they have good access to the urban market and a relatively favorable climate for improved dairy cattle breeds and less animal disease-stress (Staal et al. 2008; Yilma et al. 2011). Dairy technology adoption and the subsequent commercialization of milk are still primarily focused among smallholder farmers in peri-urban areas of Addis Ababa (Lenjiso 2019).

Several governmental policies and interventions have been put in place more recently to foster the development of the incipient modern dairy value chain to supply the growing urban market in Ethiopia (Chagwiza 2014). The government seeks to stimulate a dairy transformation from a subsistence-oriented production system into a market-oriented system characterized by new technology adoption and improved productivity (MoFED 2010). Development interventions in the dairy sector are intended to contribute to poverty

alleviation by increasing smallholder dairy producers' income and creating employment (Yilma et al. 2011).

Increasing population, urbanization, and the rise in consumers' income is expected to increase the demand for milk and milk products (Chagwiza 2014). The increasing trend of urbanization and population growth has led to the expansion of specialized medium-to-large scale dairy enterprises that collect, pasteurize, pack, and distribute milk to consumers across of the country (Yilma et al. 2011). However, many challenges, including those related to supply and demand and social, inequalities raise concerns about the potential for commercialization of the dairy sector to be sustainable and socially equitable.

Sociocultural contexts and institutions

The importance of milk in the diet of Ethiopians differs according to the farming systems and socio-cultural contexts. In the lowlands, where livestock keeping is the main occupation, milk is consumed by all societal groups (Yilma et al. 2011). It is important to note that dairy does not have a prominent place in Ethiopian highland culinary traditions, and drinking milk is considered something that is only for young children. In addition, Christians of the Ethiopian Orthodox Church, who represent more than 43 percent of the population, abstain from consuming animal products including milk and milk products during fasting, which lasts for about 250 days a year, including a solid 3-month period (ibid). During prolonged fasting periods, both demand and prices are depressed (Chagwiza 2014).

Ethiopia's milk marketing system is not well developed, and many smallholder milk producers have limited market access. Milk and milk products are sold in both formal and informal marketing systems. About 95% of the marketed milk at the national level is channeled through "informal" value chains (Yilma et al. 2011). One effort to improve markets has been to support the creation of cooperatives to improve commercialization. These organizations have been targeted as key institutions in national plans to foster rural economic development (Chagwiza 2014). In the Selale Oromia region, a recent study found that even poor landholders join cooperatives, which implies that coops may play an important role in poverty alleviation among dairy producers (Chagwiza 2014). Additional constraints that undermine the dairy sector's development include poor veterinary services, particularly with respect to inefficient and untimely artificial insemination (AI) services; lack

of crossbreed heifers; shortage of feeds, especially agro-industrial by-products; and inefficient and inadequate milk processing technologies (Yilma et al. 2011).

Women's roles in dairy: labor, decision-making, income

Women in Ethiopia seldom own productive assets, which reduces their access to resources and their say in decision making within and beyond their households (Dito 2011). Marriage and the level of assets men and women bring to the marriage differ from one area to another and have a significant bearing on women's bargaining in the household (Dito 2011). In addition to women's labor, the wealth brought into the marriage by women in the form of livestock, land and household furniture is one of the benefits men expect to gain from marrying and these assets positively correlate with her bargaining power in the household (Dito 2011).

Gender divisions household labor and in livestock production are common in Ethiopia. In Northwest Ethiopia, women's tasks include cleaning the stalls, dung processing, feeding, forage preparation and milking (Elias et al. 2015). Men are mainly involved in pen construction, herding, livestock selling, and feeding and forage preparation (ibid). Market integration requires more labor to carry out dairy production activities, such as milking, cleaning the barns and transporting the milk to the collection centers and availability of family labor is often a critical factor determining the transformation from extensive to intensive dairy production systems (Chagwiza 2014). In Ethiopia, where subsistence dairy farming is still widely practiced, dairy intensification has resulted in shifts in dairy roles and responsibilities and intra-household income control structure and shifted the control of milk income from women to men among those household that adopt dairy technologies (Lenjiso 2019).

Traditionally, women have played a central role in Ethiopian subsistence-oriented dairying systems and performed most dairy activities, including managing the cows and calves, milking the cows, and processing the milk into cottage butter and cheese for household consumption and for sale in the local market (ibid). The income generated from butter and cheese sold in local markets is an important source of income that women fully control (Lenjiso 2019; Lenjiso et al. 2016). However, intensification, especially adopting new technologies, increased women's intra-household workload and led to changes in cattle

management practices in milk market–integrated households (Lenjiso et al. 2016). Overall household incomes from milk increased, but men's income share increased significantly with dairy technology adoption, while women's income share reduced significantly (Lenjiso 2019). In agriculture or dairy, commercialization has been shown to increase family labor demands, which namely fall on women. Despite women's increased labor contributions, they are often simultaneously marginalized or excluded from dairy benefits associated with commercialization, such as increased income and access to markets and services.

Discussion

Agricultural intensification has been a major development priority across Africa for decades. Most research in this domain has focused on technical practices, and their adoption and associated gains in productivity and profitability, outcomes that lend themselves to relatively easy quantitative measurement. However, surprisingly little attention has been paid to the social distribution of the impacts of intensification. Smallholder agriculture in Africa typically reflects gendered roles and, similarly, gendered distribution of costs and benefits within households, so it is logical to expect that intensification will have strong gendered impacts, specifically in the areas of asset ownership, labor, and decision-making over benefits.

A recurring theme in this review is that introduced intensification technologies often reinforce men's rights of access and control of dairy assets while increasing women's labor and resulting in women losing decision-making power in domains they once controlled. Women exercise limited rights of ownership to livestock, especially larger livestock such as cows. Gender blind dairy interventions tend to reinforce men's cultural claims to livestock assets, that is commonly linked to women's labor and decision-making power over income. The introduction of new technologies often increases demand for new tasks on farms and women often bear the brunt of new labor requirements.

In cases where women control a crop or commodity, commercialization and intensification have resulted in women losing decision making power and access to income streams to men (e.g., milk sales). This is associated with cultural norms relating to men's role as the "head of household" and breadwinner. However, it can also be affected by perceptions of formal market relations and financial exchanges as a masculine sphere. Intensification dynamics contingent upon cultural gender norms often reveals the precise mechanisms and outcomes to be context specific. One exception is when a new practice involves capital intensive mechanical technologies, which are viewed as being within men's domain. Because livestock often has highly variable cultural, especially gendered, significance attached to them, site-specific research is an important step in the careful design of livestock interventions.

Research in support of agricultural development, including LED, can be designed to identify gender norms, roles, and dynamics in relation to production activities in households and

value chains. Furthermore, although gender gets the most attention, household structure, age, and ethnicity all influence an individual's potential to gain from intensification practices (see Dancer, Hossain 2018). Consequently, intersectional approaches should elaborate on other key variables in social differentiation that affect and are affected by intensification processes (see Tavenner, Crane 2019). Additional research that supports the design of more gender-responsive or transformative agricultural development and LED interventions includes understanding how new forms of income from commercial agriculture are distributed and spent within households, cultural heterogeneity relating to livestock norms, and the role that informal markets play in influencing equitable outcomes from commercialization.

To achieve impact, research findings that identify social dynamics relevant to distributional equity need to be translated into practical recommendations that development institutions can use to design and promote equitable outcomes from agricultural intensification and commercialization.

In effect, development investors can use research to design gender-responsive or even gender transformative approaches to intensification interventions. By way of an example, where cattle are a masculine domain, rather than trying to improve women's access to cattle-incomes, a gender-responsive intervention could be to promote other activities for women, such as poultry or small stock, where women often exert greater control (see Bebe et al. 2002; Tavenner, Crane 2018b). Women's participation in formal milk markets should be strengthened to ensure their access to milk income. However, this could be achieved only through social interventions and institutional innovations (Lenjiso et al. 2016), which can address gendered disparities within households and markets. On-farm, women tend to spend substantially more time on domestic and dairying activities. Consequently, interventions that support women's benefits from intensification should focus on time- and labor-saving technologies to reduce their household workload.

Gender transformative approaches might, alongside technical interventions, include household-based joint trainings to sensitize women and men about the benefits of sharing decision making power and income more equitably. Promoting intra-household planning and decision-making around dairy intensification and commercial development has been shown

to have the potential to stimulate a positive family environment (Udo et al. 2007). This involves engaging all family members to develop a common vision, renegotiate the division of labor to meet the demand for increased labor, and share the incentives and economic benefits of enhanced productivity and sustainable natural resource management (Udo et al. 2007).

In short, pursuing socially equitable growth targets requires technical interventions to address underlying norms and values that influence the distribution of benefits associated with agricultural intensification. Simultaneously addressing technical, social, and institutional organization of sectors shows some promising ability to achieve greater gender equity (Udo et al. 2007; Ruben et al. 2017). However, it is important to note that the deliberate transformation of gender norms is fraught with ethical considerations relating to cultural self-determination, which should be addressed at a more philosophical level (Tavenner, Crane 2019).

Conclusion

Dairy development interventions have traditionally been centered around improving productivity to ensure national food security and profitability for smallholder livelihoods. The climate change mitigation agenda adds a new metric to assess success, the reduction of GHG emissions intensities. In addition to overall productivity, this shifts the measurements of success in the direction of global environmental objectives, which countries have formalized through agreements in their nationally determined contributions (NDCs). However, our review indicates that intensification and commercialization – the practical actions through which low-emissions dairy development is pursued among smallholders in East Africa – often lead to gender-differentiated results, including women's disenfranchisement in economic decision-making and opportunities and increased labor. This highlights a fundamental tension between global environmental objectives and localized social objectives.

Over-reliance on reduced GHG emission intensities as a measure of success risks glossing over issues relating to distributional equity and reinforcing, or worse, exacerbating existing inequalities. Greater attention to localized social equity objectives and outcomes must be considered alongside environmental measures and outcomes. As low-emission dairy development initiatives move forward, funders and implementers should pay close attention to distributional equity outcomes associated with new technical changes. Furthermore, they should strive to design social interventions that improve the potential for equitable outcomes and track the impacts of LED interventions on social equity outcomes.

References

Basu P, Galiè A, Baltenweck I. 2019. Presence and property: Gendered perspectives on participation in a dairy development program in Kenya and Uganda. In: *Women's Studies International Forum*. Pergamon. Vol. 74:68–76.

Bebe B, Udo H, Thorpe W. 2002. Development of smallholder dairy systems in the Kenya highlands. *Outlook on Agriculture,* 31(2):113–120.

Bullock R, Crane TA. 2020. Youth opportunity spaces in low-emission dairy development in Kenya: Research findings and policy recommendations. CCAFS Info Note. Wageningen, The Netherlands: CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS). Available at: https://hdl.handle.net/10568/107010

Bullock R, Crane TA. *In review*. Young women and men's opportunity spaces in dairy intensification in Kenya.

Bullock R, Kariuki J. 2019. A review of gender and sustainable land management: implications for research and development. ILRI Discussion Paper 36. Nairobi, Kenya: ILRI.

Campbell BM, Thornton P, Zougmoré R, Van Asten P, Lipper L. 2014. Sustainable intensification: What is its role in climate smart agriculture? *Current Opinion in Environmental Sustainability,* 8:39–43.

Chagwiza C. 2014. Engaging cooperative farmers in agricultural intensification: Case studies on honey, dairy and linseed value chains in Ethiopia. Doctoral Dissertation. Nijmegen, The Netherlands: Radboud University.

Clay N, Garnett T, Lorimer J .2020. Dairy intensification: Drivers, impacts and alternatives. *Ambio,* 49: 35–48.

Clay N, Yurco K. 2020 Political ecology of milk: Contested futures of a lively food. *Geography Compass*.

Dancer H, Hossain N. 2018. Social difference and women's empowerment in the context of the commercialization of African agriculture. Working paper 8. Agricultural Policy Research in Africa (APRA).

Didanna HL, Wossen AM, Worak TK, Shano BK. 2018. Factors influencing intensification of dairy production systems in Ethiopia. *Outlook on Agriculture,* 47(2):133–140.

Dito B. 2011. Essays on women's bargaining power and intra-household resource allocation in rural Ethiopia (Unpublished Doctoral Thesis). Rotterdam, The Netherlands: Erasmus University of Rotterdam, Institute of Social Studies (ISS).

Elias A, Nohmi M, Yasunobu K, Ishida A. 2015. Does gender division of labour matters for the differences in access to agricultural extension services? A case study in North West Ethiopia. *Journal of agricultural science,* 7(1):138.

Ericksen P, Crane T. 2018. The feasibility of low emissions development interventions for the East African livestock sector: Lessons from Kenya and Ethiopia. ILRI Research Report 46. Nairobi, Kenya: International Livestock Research Institute (ILRI).

Fafchamps M. 2001. Networks, communities and markets in Sub-Saharan Africa: Implications for firm growth and investment. *Journal of African Economics,* 10:109–142.

Fischer G, Wittich S, Malima G, Sikumba G, Lukuyu B, Ngunga D, Rugalabam J. 2018. Gender and mechanization: exploring the sustainability of mechanized forage chopping in Tanzania. *Journal of Rural Studies,* 64:112–122.

Gallina A. 2016. Gender dynamics in dairy production in Kenya: A literature review. CCAFS Working Paper no. 182. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark: CCAFS.

Karlsson L, Naess LO, Nightingale A, Thompson J. 2018. 'Triple wins' or 'triple faults'? Analysing the equity implications of policy discourses on climate-smart agriculture (CSA). *The Journal of Peasant Studies,* 45:150–174.

Kristjanson P, Waters-Bayer A, Johnson N, Tipilda A, Njuki J, Baltenweck I, Grace D, and MacMillan S. 2010. *Livestock and women's livelihoods: A review of the recent evidence.* Discussion Paper No. 20. Nairobi, Kenya: ILRI.

Lenjiso B. 2019. Defeminizing effect: how improved dairy technology adoption affected women's and men's time allocation and milk income share in Ethiopia. In: Sachs, C. *Gender, Agriculture and Agrarian Transformations*. London: Routledge. P 129–146.

Lenjiso BM, Smits J, Ruben R. 2016. Smallholder milk market participation and intra-household time allocation in Ethiopia. *The European Journal of Development Research, 28*(5):808–825.

McDermott JJ, Staal SJ, Freeman HA, Herrero M, Van de Steeg JA. 2010. Sustaining intensification of smallholder livestock systems in the tropics. *Livestock Science,* 130(1-3):95–109.

MoFED. 2010. Growth and transformation plan, 2010/11–2014/15, Volume I: Main text. Ministry of Finance and Economic Development, FDRE, Addis Ababa.

Mullins G, Wahome L, Tsangari P, Maarse L. 1996. Impacts of intensive dairy production on smallholder farm women in coastal Kenya. *Human Ecology,* 24(2):231–253.

Ndiritu SW, Kassie M, Shiferaw B. 2014. Are there systematic gender differences in the adoption of sustainable agricultural intensification practices? Evidence from Kenya. *Food Policy,* 49:117–127.

Neufeldt H, Jahn M, Campbell BM, Beddington JR, DeClerck F, De Pinto A, Gulledge J, Hellin J, Herrero M, Jarvis A, LeZaks D, Meinke H, Rosenstock T, Scholes M, Scholes R, Vermeulen S, Wollenberg E, Zougmoré R. 2013. Beyond climate-smart agriculture: toward safe operating spaces for global food systems. *Agriculture and Food Security,* 2(1):12.

Njuki JM, Wyatt A, Baltenweck I, Yount K, Null C, Ramakrishnan U, Webb Girard A, Sreenath S. 2016. An exploratory study of dairying intensification, women's decision making, and time use and implications for child nutrition in Kenya. *The European Journal of Development Research,* 28(4):722–740.

Notenbaert A, Pfeifer C, Silvestri S, Herrero M. 2017. Targeting, out-scaling and prioritizing climate-smart interventions in agricultural systems: Lessons from applying a generic framework to the livestock sector in Sub-Saharan Africa. *Agricultural Systems,* 151:153–162.

Odero-Waitituh JA. 2017. Smallholder dairy production in Kenya; a review. *Livestock Research for Rural Development,* 29(7):139.

Olwande J, Smale M, Mathenge MK, Place F, and Mithöfer D. 2015. Agricultural marketing by smallholders in Kenya: A comparison of maize, kale and dairy. *Food Policy, 52*:22–32.

Ruben R, Dekeba Bekele A, Megersa Lenjiso B. 2017. Quality upgrading in Ethiopian dairy value chains: dovetailing upstream and downstream perspectives. *Review of Social Economy,* 75(3):296–317.

Snyder KA, Cullen B. 2014. Implications of sustainable agricultural intensification for family farming in Africa: anthropological perspectives. *Anthropological Notebooks,* 20(3):9–29.

Staal SJ, Nin Pratt A, Jabbar M. 2008. Dairy development for the resource poor. Part 2: Kenya and Ethiopia. Dairy development case studies. FAO/PPLPI Working Paper No. 44. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).

Tavenner K, Crane TA. 2018a. *Do direct payments to women incentivize participation in low emissions dairy development interventions? Evidence from Kenya*. Nairobi: International Livestock Research Institute (ILRI). Available at: https://hdl.handle.net/10568/97495

Tavenner K, Crane TA. 2018b. Gender power in Kenyan dairy: cows, commodities, and commercialization. *Agriculture and Human Values, 35*(3):701–715.

Tavenner K, Crane, TA. 2019. Implementing "gender equity" in livestock interventions. In: Sachs C, Ed. *Gender, agriculture and agrarian Transformations: Changing relations in Africa, Latin America and Asia*. [No city]: Routeledge.

Tavenner K, Fraval S, Omondi I, Crane TA. 2018. Gendered reporting of household dynamics in the Kenyan dairy sector: trends and implications for low emissions dairy development. *Gender, Technology and Development,* 22:1–19.

Tavenner K, Saxena T, Crane TA. in press. 'Breaking even' under intensification? Gendered trade-offs for women milk marketers in Kenya. *Rural Sociology*.

Taylor M. 2017. Climate-smart agriculture: what is it good for? *The Journal of Peasant Studies,* 45(1):89–107.

Theriault V, Smale M, Haider H. 2017. How does gender affect sustainable intensification of cereal production in the West African Sahel? Evidence from Burkina Faso. *World Development*, 92:177–191.

Thornton PK, Whitbread A, Baedeker T, Cairns J, Claessens L, Baethgen W, Bunn C, Friedmann M, Giller KE, Herrero M, Howden M, Kilcline K, Nangia V, Ramirez-Villegas J, Kumar S, West PC, Keating B. 2018. A framework for priority-setting in climate smart agriculture research. *Agricultural Systems,* 167:161–175.

Udo H, Aklilu H, Phong L, Bosma R, Budisatria I, Patil B, Bebe B. 2011. Impact of intensification of different types of livestock production in smallholder crop-livestock systems. *Livestock science,* 139(1-2):22–29.

Udo H, Bebe BO, Samdup T, Sutresniwati I, Budisatria I, Asgedom A, Phong L. 2007. Livestock Intensification in mixed farms: benefits and trade-offs. In: *Fishponds in farming systems*. Wageningen, The Netherlands: Wageningen Academic Publishers. P. 271–280.

Yilma Z, Guernebleich E, Sebsibe A, Fombad R. 2011. *A review of the Ethiopian dairy sector*. Addis Ababa, Ethiopia: FAO Sub Regional Office for Eastern Africa (FAO/SFE) 10.

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