

Article

Nested Scales of Sustainable Livelihoods: Gendered Perspectives on Small-Scale Dairy Development in Kenya

Pratyusha Basu ^{1,*}  and Alessandra Galiè ²
¹ Department of Sociology & Anthropology, University of Texas at El Paso, El Paso, TX 79968, USA

² International Livestock Research Institute (ILRI), Nairobi 00100, Kenya; A.Galie@cgiar.org

* Correspondence: pbasu@utep.edu; Tel.: +1-915-747-5964

Abstract: The sustainability of rural development programs has often been conceptualized through the Sustainable Livelihoods Framework, or SLF. This article utilizes the SLF to examine the outcomes of small-scale dairy development in western Kenya and thus connect local perspectives on livelihoods with broader ideas of sustainable livelihoods. Drawing on individual interviews conducted with farmers in three dairy development sites in western Kenya, it examines compatibilities and contradictions between productivity and sustainability, and how gender becomes a vantage point from which the links between micro- and macro-sites, or nested scales of sustainable livelihoods, become visible. Three main kinds of benefits related to dairy development are identified by respondents: increase in income, access to market, and ability to keep improved cattle. In conjunction with these benefits, respondents identified problems related to women's independent access to income, wider community consumption of milk, and lack of infrastructure, respectively. This study thus shows that while income and productivity is prized by all respondents, gender enables this broader goal to be viewed in more nuanced terms—not only within the household, but also through links between the household and the wider community and state. Gender thus becomes salient across the nested scales of sustainable livelihoods and provides insights into how a more encompassing notion of sustainable livelihoods can be implemented.

Keywords: gender and development; sustainable livelihoods; rural development; community; dairying; improved cattle; milk; infrastructure



Citation: Basu, P.; Galiè, A. Nested Scales of Sustainable Livelihoods: Gendered Perspectives on Small-Scale Dairy Development in Kenya. *Sustainability* **2021**, *13*, 9396. <https://doi.org/10.3390/su13169396>

Academic Editor: Frank Trovato

Received: 2 July 2021

Accepted: 16 August 2021

Published: 21 August 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Sustainability—the attempt to seek a balance between economic development, environmental protection, and social equity—has become a central paradigm of development, as exemplified by the United Nations' 2030 Agenda for Sustainable Development [1]. Within international development agencies, the Sustainable Livelihoods Framework or SLF has become a standard way to incorporate sustainability in the planning, implementation, and evaluation of rural development programs [2–6]. A main strength of this framework is its linking of livelihood outcomes to household assets and livelihood strategies, as well as wider institutional contexts and temporal events, so that livelihoods become multi-scalar constructions [7,8]. However, the SLF has also been criticized because power relations are not overtly addressed within its various components, especially gender inequalities in intrahousehold ownership of property and income, and the inability of households and communities to have effective control over governmental policies and market trends [8,9]. Empirical applications of the SLF have thus been especially attentive to social inequalities, and a number of studies have considered sustainable livelihoods through the lens of gender [10,11].

This article utilizes the SLF as a conceptual tool to analyze the outcomes of small-scale dairy development in western Kenya and thus connect local perspectives on livelihoods with broader ideas of sustainable livelihoods. Drawing on qualitative interviews conducted

with dairy farmers in western Kenya, its objectives are to understand (i) whether gender shapes differing views on the preferred outcomes of dairy development, and (ii) how gendered constructions situate small-scale dairy practices, not only within the household, but also within wider scales of community and state practices. Specifically, it seeks to make two main contributions to understanding gender and sustainable livelihoods. First, this study examines whether men and women dairy farmers view the adoption of new development opportunities mainly through an economic notion of productivity, or also mention aspects compatible with sustainability. Thus, it identifies whether the prevailing neoliberal economic policy context is reflected in support for market-led development within local communities, and how a program-led focus on productivity could translate into a relatively more sustainable model at the level of the community. Second, it considers how gendered experiences of development are shaped by material processes within as well as beyond the household. This link between micro- and macro-sites, or nested scales, shows how gender becomes a vantage point from which the larger context of sustainable livelihoods can be made visible.

The next section of the article provides an overview of the SLF and outlines study sites as well as procedures for data collection and analysis. The third section provides a thematic analysis of dairy farmer interviews focusing on three locally valued outcomes of dairy development and considers how these outcomes are rendered more complicated when gendered perspectives are taken into account. The final sections reflect on how interview findings provide ways to connect dairy development to economic, social, and environmental sustainability. Overall, this article seeks to show how a qualitative approach to livelihood construction, as conceptualized by the SLF, provides valuable insights into the intersections of gender and sustainable livelihoods.

2. Materials and Methods

Small-scale dairying has been a prominent part of rural development initiatives in western Kenya, drawing support from both the Kenyan government and international development agencies [12]. Given that dairying practices are linked to economic imperatives, crop-livestock ecosystems, as well as gender divisions of labor, they become a useful context for understanding whether and how development outcomes mesh with economic, environmental, and social sustainability. This article utilizes three dairy development hubs associated with the East Africa Dairy Development (EADD) program as case studies, and follows a qualitative research design that thematically analyzes responses to open-ended interview questions. Before outlining the research design, we examine how the SLF has been utilized in existing studies of gender and sustainable livelihoods.

2.1. Reviewing Approaches to Gender and Sustainable Livelihoods

Sustainable livelihoods emerged as a key concept in rural development practice in the aftermath of the 1987 Brundlandt Report on ‘Our Common Future’ which posited sustainable development as the goal of economic growth [13]. A key feature of sustainable development was the invocation of the needs of future generations, which was reflected in Chambers and Conway’s definition of sustainable livelihoods [2] (p. 6):

“A livelihood comprises the capabilities, assets . . . and activities required for a means of living; a livelihood is sustainable [when it] can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term.”

By invoking both intergenerational and local–global connectedness, this definition brought wider temporal and spatial considerations to the heart of sustainable livelihoods.

The Sustainable Livelihoods Framework (SLF) comprises various interconnected components—(a) beneficial livelihood outcomes, (b) range of possible livelihood strategies, (c) household capitals or resources, (d) wider institutional context, including governmental

and private sectors, and policies, laws, and cultural norms, and (e) temporal events that shape vulnerability or resilience, such as climate and market fluctuations [3,7]. These components are depicted in Figure 1 which provides an overview of the SLF drawn from various sources [3,7]. Gendered approaches to the SLF have usually focused on the household capitals component—drawing attention to gender differences in work required to maintain resources and produce outcomes, and inequalities in access, ownership and decision making over livelihood resources and outcomes [10,11,14]. In the process, gendered approaches to sustainable livelihoods have often linked gender to the sphere of the household, even as all resources or capitals do not only pertain to the household level [10,15]—for instance, while human, physical and financial capital may remain embedded within the household, social and natural capital straddle the household and community. Our study therefore utilizes the SLF to connect the household to spaces beyond it—in our case, the community and the state.

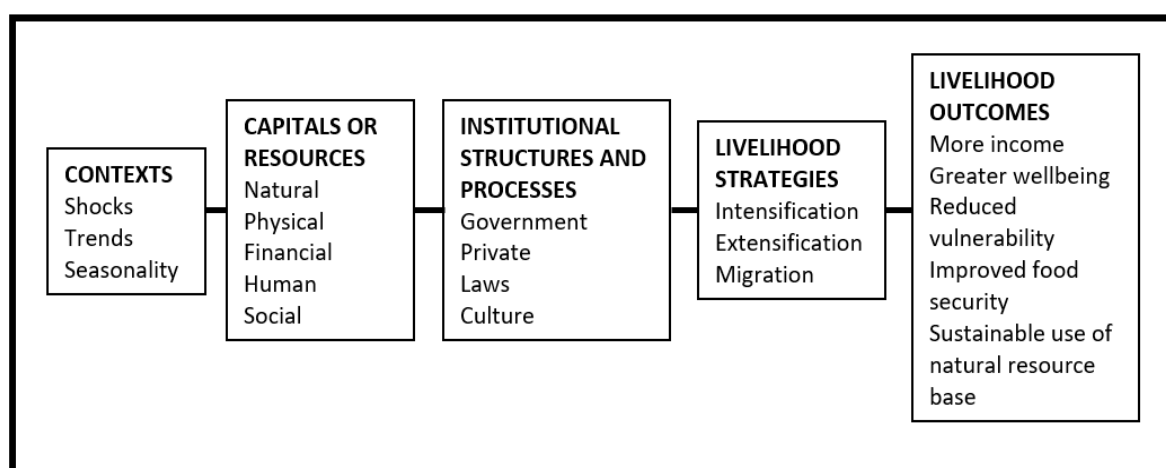


Figure 1. Components of Sustainable Livelihoods Framework (SLF). Source: Adapted by authors from Scoones (1998, p. 4) and Carney et al. (1999, pp. 9, 11); see [3,7].

Sustainable livelihoods, however, are not only a framework or tool but also an epistemological approach to development that favors participatory approaches. This becomes clear in the extent to which qualitative or mixed-methods approaches are utilized in sustainable livelihoods analyses, so there is concerted and intensive engagement with individual viewpoints and community histories [10,15]. This can partly be attributed to the emergence of the SLF alongside participatory approaches to development [9] and the mainstreaming of gender in the 1990s [16–18]. Gendered analyses of development have shown how broader governmental and market contexts circumscribe household choices, rather than merely attributing livelihood strategies to individual and social desires [10]. Historical and biographical approaches have also viewed gender relations as transforming over time both due to development initiatives and wider societal changes, so the temporal dimension becomes explicit [10,15]. Our article utilizes individual interviews, a popular technique for qualitative data collection, to provide a complex view of how livelihood is shaped by gender and other inequalities. Through this, our focus is on understanding how local outcomes emerge from community-level engagements with development programs, rather than on evaluating whether local outcomes match the desired goals of development programs.

Sustainability has often been debated between those who view it as an element that can be added to improve existing economic development programs, and those who consider it a paradigm shifting concept for development, thus requiring new livelihood practices. The former approach becomes visible, for instance, in concepts like ‘sustainable intensification’, which suggest that productivity and sustainability are compatible [19]. In the case of dairy development, possible cycling of organic materials through crop-livestock systems makes the program especially amenable to maintaining environmental sustainability [20,21]. The

latter approach becomes visible in the linking of sustainability to more explicit notions of collective and individual empowerment [22,23]. A gender analysis of dairy development then provides an understanding of how encounters between community-level inequities and broader goals of development programs enable or preclude sustainable development.

2.2. Study Sites: Dairy Development in Western Kenya

This article is based on interviews with farmers associated with the East Africa Dairy Development (EADD) program in the Rift Valley region of western Kenya. The EADD program was undertaken in two phases, from 2008–2013 in Kenya, Uganda, and Rwanda; and 2014–2018 in Kenya, Uganda, and Tanzania—data for this study was gathered at the end of the first phase in 2013. The collection of interview data at the end of the first phase of the EADD program in 2013 ensured that all respondents were familiar with its services. The EADD dairy commercialization model is centered on hubs comprised of chilling plants and agrovet shops which enable collection and marketing of milk as well as access to a wider range of dairy inputs [24]. These services are usually not readily available in rural areas, whether due to distance or unwillingness of private vendors to serve rural customers. The objective of the EADD is to improve small-scale dairying through an integrated value chain development approach whereby increased milk productivity results in higher incomes [25–27]. The EADD thus follows the productivity approach of the 1960s–1990s ‘Green Revolution’ in agricultural development, but differs from it in seeking to be attentive to gender inclusivity from the outset [28].

This study draws on interviews conducted in November–December 2013 with 36 dairy farmers, 19 women and 17 men, in 3 dairy development sites. Details on respondent and household characteristics are provided in Table 1. The average age of women respondents was 40 years and they ranged in age from 24 to 68 years. For men, the average age was 47, and they ranged from 30 to 72 years. All respondents had some amount of school education, except one woman respondent who had never been to school, and 8 women and 13 men had completed secondary education. The 36 interview respondents belonged to 21 households, with 7 households interviewed per site. Households ranged in size from 2 to 10 members and the average household size was 6 (Household size includes adults and children currently residing in the house. Children who would usually be away at school were not counted). Fewer than 5 acres of land was owned by 9 households and 3 households owned more than 20 acres of land. In terms of crossbred cows currently being milked, 8 households had 1 to 2 cows (land owned ranged from 1 to 6 acres), 10 households had 3 to 6 cows (4 to 15 acres land), and 3 households owned more than 6 cows (land owned was more than 20 acres).

In 15 households, both women and men were interviewed, while in 6 households, only women or men were interviewed, including 3 female-headed households. Interview sites and respondents were selected in consultation with hub employees and EADD officials so as to identify those regularly supplying milk to the EADD hub and intensively engaged with dairy work. While this biased the study towards successful outcomes, it also enabled an understanding of issues that lurk behind successful facades, providing better insights into the implications for sustainability. At the beginning of data collection in each study site, a list was drawn up of possible households whose members could be interviewed, usually a list of 5–10 households. This list had to include at least one female-headed household. In some cases, when we arrived at a home, either the man or the woman was not available that day. In these cases, instead of skipping the household, we conducted the interview with the available member. This became important because in some households, neither member was available on the day of the interview.

Table 1. Characteristics of respondents and households.

Site	HH No.	Gender	Age in Years	Education	HH Size	Cross-Bred Cows Being Milked	Land in Acres	Crops	Livestock (Other Than Cattle)
SITE A	HH1	man	41	Form IV	10	9	50	potatoes, vegetables	chicken, sheep
		woman	36	University					
	HH3 (FHH)	woman	60	No school	6	8	20	potatoes, vegetables	chicken, sheep, donkey
		man	51	O level					
	HH4	woman	40	Std 7	7	12	20	potatoes, cabbage, kale	chicken, sheep
		man	43	Std 8					
	HH5	woman	35	Std 5	6	5	12	maize, potatoes, vegetables, carrots	chicken, sheep, donkey
		man	50	Std 7					
	HH6 (FHH)	woman	50	Std 7	4	6	15	potatoes, vegetables, maize	chicken, sheep
		man	32	O level					
SITE B	HH1	woman	28	Std 8	8	3	5	maize, potatoes, peas	chicken, sheep, donkey
		man	41	Form IV					
	HH8	woman	30	Form IV	5	3	10	potatoes, onions, vegetables	chicken, sheep
		man	58	Diploma from Germany					
	HH6	woman	50	Form IV	7	2	6	tea, maize, potatoes, onions, beans, sweet potatoes, bananas	chicken, goats
		man	40	Std 7					
	HH7	woman	25	Std 7	10	2	1	maize, potatoes, beans, millet, bananas, vegetables	chicken, goats
		man	44	Graduate					
	HH8	woman	24	College	4	2	1	maize, cabbage, potatoes, beans	chicken, donkey
		man	30	Diploma in teaching					
SITE C	HH9 (FHH)	woman	29	Std 8	4	1	1	beans, vegetables, maize	donkey
		man	37	Diploma in teaching					
	HH10	woman	37	Diploma in teaching	4	6	4	maize, beans, potatoes, vegetables	chicken, donkey
		man	72	Std 4					
	HH11	woman	65	Std 6	4	4	3	potatoes, maize, beans, sweet potatoes, millet	chicken, donkey, sheep, goats
		man	71	Std 8					
	HH1	woman	68	Form IV	2	4	9	tea, maize, vegetables, sorghum	chicken, donkey, sheep, goats
		man	40	Form IV					
	HH2	woman	36	Form IV	5	4	4	maize, vegetables, tea, casava, bananas, beans	–
		man	64	O level					
	HH7	woman	51	Std 8	8	4	10	vegetables, maize, tea, beans	chicken
		man	38	Form IV					
SITE C	HH9	man	37	Form IV	4	2	6	tea, maize, pineapple, cassava, sugarcane	fish, chicken, sheep
		woman	35	Form IV					
	HH11	woman	35	Std 8	7	2	2	maize, potatoes, sweet potatoes, vegetables	chicken, goats
		man	55	Form IV					
	HH12	woman	40	Std 8	6	3	7	tea, maize, vegetables, potatoes, beans, bananas	chicken, sheep, goats
		man	55	Form IV					

In terms of the three study sites, one site was located near the town of Eldoret in the northern part of the Rift Valley, and the other two were located near the town of Nakuru in the southern part of the Rift Valley (Figure 2) (The broader project encompassed dairy development sites in Kenya and Uganda [29], but this article only focuses on Kenya because the hubs here were similar to one another and hence could be compared in terms of the outcomes of dairy development). All three sites comprised of a mix of Kalenjin ethnic groups—the site near Eldoret was comprised of Pokot and Marakwet people, while the two sites near Eldoret were more diverse and included Kipsigis and Nandi people.

These three sites were chosen for study because they all had successful hubs associated with them, and the choice of northern and southern sites was to ensure that possible ethnic differences across sites could be incorporated. Subsequent analyses of interviews showed that respondents across the sites had similar perspectives on dairy development, so ethnicity did not emerge as a difference.

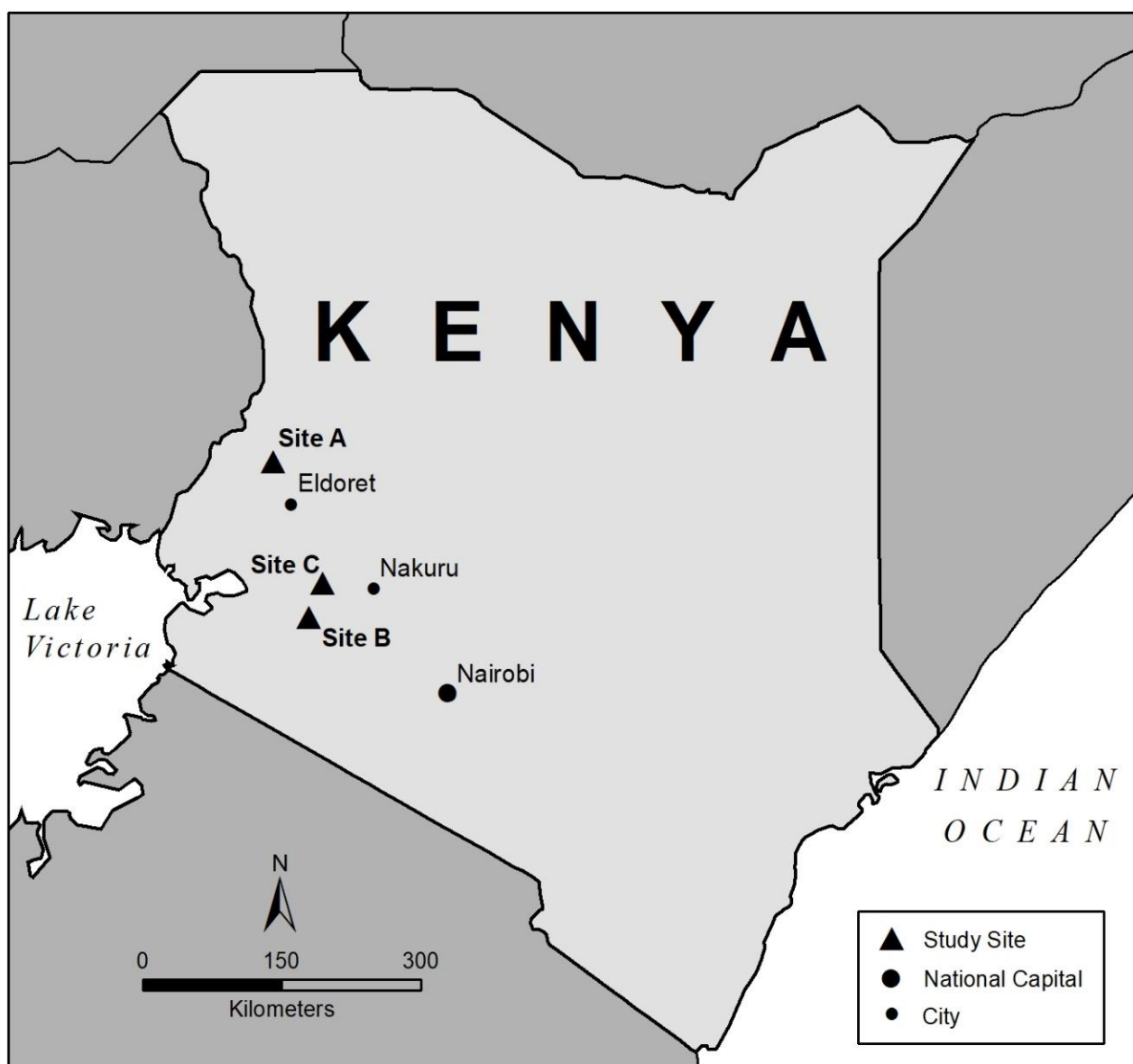


Figure 2. Study sites in Kenya.

In all three study sites, crossbred (improved) cows were the main dairy animals, and the work of milking and feeding cattle was often the responsibility of women [29]. Men were household-level decision makers in terms of cattle and responsible for engaging with hub services, especially in terms of buying feed supplements and medicines, and sometimes in terms of taking milk to the chilling plant and collecting payments. This gender division in dairying work has also been found in other studies on Kenya and various regions of sub-Saharan Africa [30–35]. Across the hubs, milk payments were provided on a monthly basis, and hubs provided agrovet and credit facilities to farmer members. All hubs had a chilling plant where milk was stored prior to being transported to a private milk company, which was the main buyer and processed the milk for consumer

use. Each hub was managed by a board consisting of men and some women members, and its employees and board members worked from an office in the hub premises.

2.3. Data Collection: Conducting Qualitative Interviews

This article draws on two questions asked during field study: What are the benefits you have derived from supplying milk to the hub? What are the problems you have faced in supplying milk to the hub? 'Benefits' and 'problems' were not defined prior to the interview, and respondents could provide their own understandings of these terms. Outcomes of dairy development were thus classified subsequent to the interviews rather than prior to them. This is viewed as enabling a more valid elicitation of member perspectives than would happen if they were asked to speak about pre-specified outcomes.

Interviews were conducted by research assistants who had previous experience with qualitative data collection and were familiar with gender and development issues in the local context. In Kenya, the data collection team consisted of the first author and two women research assistants. Interviews were separately conducted with women and men farmers, and interviewed adults were usually those that were most involved with household dairy work as well as the hub. The interview schedule consisted of both close- and open-ended questions, and its topics included household agricultural land and sources of income, ownership of cattle and land, presence of other forms of livestock, who conducted dairy work within the household, and experiences with the EAAD program. The questions on benefits and problems were thus situated within a more comprehensive understanding of the household dairy economy.

2.4. Data Analysis: Descriptive Themes

Audio-recorded interviews were transcribed and translated at the conclusion of data collection. Interview transcripts were analyzed by the authors through two rounds of coding using QSR International's NVivo 10 Software. In the first cycle of coding, open coding was utilized to identify the benefits and problems mentioned by respondents. These codes or categories, as far as possible, were verbatim (descriptive or in vivo) codes which followed the content and (translated) language used by respondents [36] (pp. 70–77), and are listed in Table 2. For 'benefits,' 29 categories were identified, and after combining overlapping categories and removing some categories mentioned in only one interview, 12 categories were chosen for further analysis. In the case of 'problems,' 31 categories were identified, out of which 18 categories were chosen for further analysis. Additionally, pertinent issues related to cattle ownership, milk production, dairy work, gendered access to milk and income, and household resources (food, electricity, water, cooking fuel) were also analyzed across all interviews to gain a deeper insight into the gendered aspects of the benefits and problems being discussed. In second cycle coding, focused coding was undertaken [36] (pp. 155–159) to organize the identified verbatim codes around three themes: income, market, and improved cattle.

In further analyses, quotes were selected by authors from the coded text which provided insights into how benefits and problems were being articulated. Interview quotes become important to providing (partial) access to the viewpoints of respondents, as well as maintaining the qualitative aspect of the research. Quotes selected for this article reflect both perspectives that were frequently repeated as well as those that diverged from the general consensus. Interview quotes provided in Section 3 are identified in terms of the anonymized site label (Site A, B or C), interview number for household (HH), woman or man respondent and, where pertinent, female headed household (FHH). Most quotes only pertain to the respondent, but where longer conversations are reported, 'I' refers to the interviewer and 'R' to the respondent.

Table 2. Codes and themes from interviews.

CODE	NUMBER OF INTERVIEWS		
	MEN	WOMEN	TOTAL
	17	19	36
Benefits of dairy development			
Theme: income			
form and frequency of payment	13	15	28
increase in income	14	12	25
advances and loans	13	10	23
good prices	8	7	15
more milk for home	4	5	9
Theme: market			
access to market	9	10	19
cooperative as reliable	11	2	13
Theme: improved cattle			
knowledge and training	15	7	22
access to inputs and services	13	5	18
access to improved breeds	9	3	12
increase in milk production	6	5	11
access to AI	8	2	10
Problems faced in dairy development			
Theme: income			
problems with prices	10	3	13
problems with payments	5	5	10
problems with hiring labor	3	5	8
insufficient income from milk	3	0	3
Theme: market			
problems with roads/transport to hub	16	2	18
lack of value addition at hub	6	0	6
reduced milk for home/community	2	3	5
no collection of evening milk	2	0	2
Theme: improved cattle			
need for more training	8	6	14
problems with water	4	9	13
problems with AI	8	3	11
problems with cattle feed	5	5	10
problems with quantity of milk production	4	4	8
problems with services	2	4	6
problems with zero grazing	6	1	6
problems with open grazing of cattle	2	2	4
problems with land	1	3	4
problems with cattle health	1	2	3

As a qualitative analysis, this study follows an ‘emergent methodology approach’ and seeks to identify or explain specific processes—in this case, how and why dairy development programs become acceptable to small-scale farmers [37,38]. It therefore does not make any claims about what kind of dairy farmers are likely to become part of dairy development programs, nor does it seek to measure the extent to which dairy development becomes a profitable enterprise. The generalizability of this study therefore is in terms of the themes it develops, rather than the characteristics of the population it studies.

3. Results and Discussion

The benefits identified by respondents can be grouped into three main themes: increase in income, access to market, and ability to keep improved cattle. This section analyzes these benefits as well as problems that were associated with them by women and men respondents. These articulations reveal gender differences and inequalities, as well as links between the household and the wider community and state. Table 2 provides a count of the number of interviews that mentioned the identified themes and subthemes. Overall, more of the interviews mentioned the benefits of dairy development than the problems faced in conducting dairy development. While this can be traced to the conditions under which the interviews were conducted (with respondents chosen by local hub representatives and at a time when the program was seeking to be continued), it also reflects a relatively high level of support for the EADD program among both men and women respondents. The main benefit identified in a majority of interviews was the income provided by dairy development. In terms of gender differences, more men identified improved cattle as a benefit than women. This could be because, as other studies in Kenya have shown, women are less likely to own cattle and land than men, even as they are responsible for cattle-related work, especially milking [29,33–35]. Many of the aspects identified as benefits were also mentioned in problems facing dairy development. Thus, prices and artificial insemination services were identified as both benefits and problems, which could be traced to differences across the study sites, but also reflected that respondents were seeking improvements without necessarily wanting to disparage what was currently available. A noteworthy aspect of problems faced is related to water—more women than men respondents pointed out issues with access to and availability of water. The gendered nature of household work is reflected in this, as well as the value of utilizing gender as a frame for understanding sustainable livelihoods. This section delves further into these gendered perspectives on dairy development’s benefits and problems.

3.1. Household Income or Gendered Control?

Across interviews with both women and men, income was mentioned as one of the most important benefits of the dairy development program. Some descriptions of the economic security provided by selling of milk were as follows:

It has benefitted us in many ways—education, life in general. I have changed my life; it has stabilized me financially. . . . there is no poverty in this house because we get that money. (*Site C, HH1, man*)

. . . it is because of the current economy . . . [giving] us a lot of problems. So we need something from which we can generate [income]. So that we can be able to pay [school] fees for these young children, and maybe for basic needs, small basic needs. (*Site B, HH7, woman*)

In all cases, dairying was pursued as part of a diverse set of livelihood options (Table 1), which included crop and livestock farming. Potatoes, vegetables, and maize were grown by households across all study sites, and tea was cultivated in some households in Sites B and C. All households reared chicken either for egg sales or household consumption, and many households also owned sheep, goats, and donkeys. In four households, income was also obtained from salaried work or pensions (government jobs or teaching). This dependence on multiple income sources can be viewed as an aspect of maintaining sustainable livelihoods. In a few cases, dairying was the sole source of income, either reflecting the

presence of adequate resources to maintain productive cows, or lack of resources to pursue both crop and dairy farming. At the time of the interviews, dairy income also became important to some households due to the loss of maize to disease.

I hardly buy [food], except recently when there was crop failure due to that peculiar disease. You know we've had a very peculiar disease affecting maize, so actually that has forced us at times to buy maize. (*Site C, HH7, man*)

Maybe for now we buy maize, because there was that disease which affected the maize. . . . otherwise, we have all those other things. We also have vegetables. (*Site B, HH1, woman*)

Income from milk thus both stabilized and supplemented household livelihoods, and in some cases enabled access to staple food sources.

Respondents were asked about the main ways in which dairy income was utilized, and almost all of them mentioned school fees. Alongside, as mentioned above, income was also used for other household needs, including buying food (maize), and purchasing crop and dairy farming inputs.

Both of us [husband and wife engage in dairy farming] because we want money for our children's school fees. . . . the maize is [not] enough for household consumption, so we buy maize and buy everything else with the money we get from selling milk. (*Site A, HH5, man*)

Because of the income we get from taking milk, it has really assisted us to pay school fees for our children. They also provide services like AI [artificial insemination]. Also advance; we usually take advance. (*Site C, HH12, woman*)

From the hub, farmers can buy cattle feed and medicines as well as avail of veterinary services on credit, with the expenditure on these services deducted before income is disbursed. Almost all farmers viewed these deductions as important for quick and easy access to services, and hence crucial to maintaining cattle productivity.

Yes, surely I have benefited in several ways. One of which we have talked about which is AI services. They also treat our animals because they have trained veterinary personnel. So when the animal is sick you can call them whether you have money or not, and then later on they recover their money from the sale of milk. . . . We can even get things like salt lick for the animals. (*Site C, HH7, man*)

In these interview extracts, the multiple benefits mentioned seem to connect dairy income to all aspects of the household, from the care of cattle to the care of children.

Two interpretations can be attached to the link between milk income and children's education. First, it raises questions about why education is costly enough to count as a substantial expense. Is school education expensive in this area? Are we speaking of preference for schools with higher costs, such as private schools? Second, this focus on school education may also be linked to a possible diversification in future livelihoods. In other words, children's education is a path out of small-scale agriculture into urban occupations. The interviews did not ask questions about education in the local area or seek views about the long-term prospects of small-scale dairying. However, it can be speculated that when uses of dairy income are considered, a move away from farm work can be discerned in the value attached to using that income for children's education.

The frequency of payment was a key subtheme in the discussion of dairy development's benefits. Thus, the aspect of income that seemed to be most gratifying for respondents was that it was disbursed on a monthly basis. This meant that the money could 'accumulate' and hence be used for a substantial purpose. When respondents compared this monthly disbursement to the daily payments provided by local milk buyers, their argument was that small daily sums were more likely to be frittered away on household expenses, so monthly disbursements were more favored.

... if you sell to hawkers, you will be getting your money maybe daily or weekly, but with the cooperative they pay you per month. So it will help us to ... do something better. (*Site B, HH1, woman*)

You know these bicycle guys [local milk buyers] pay you in cash there and then, and then you misuse the money. Come end of the month, you don't get anything. (*Site C, HH2, man*)

However, women respondents mentioned that they were willing to sell small quantities of milk to local buyers. According to two woman respondents,

... I get money to spend on daily needs that may arise; that is when I sell to hotels. (*Site B, HH6, woman*)

... right now there is no maize in the house, so we sell to hotels and get quick money to buy flour. It is not yet end month [so income from dairy is not available]. (*Site A, HH4, woman*)

Other studies have also noted the value of both monthly and daily income for women—monthly income provides an amount that can be invested, but buying food requires some access to cash on a daily basis [29]. Thus, the preferred form and frequency of payment may differ by gender as well as by the use to which the dairy income is being put.

Another aspect of dairy income that respondents valued was the fact that they could take advances on the strength of future income. Similar to deductions at source for the cost of dairy inputs, some respondents mentioned that they could ask the hub for advances in case of emergencies.

You sell to the hotels and individuals in small quantity. But the dairy is helpful—when I take all my milk there, I can always go and ask for an advance there depending on the amount of milk I take. But if I sell in small quantities, it won't help. (*Site A, HH3, woman FHH*)

Quite recently, one of my children got sick and I did not have any money. So I rang the manager, I explained the problem to him, he called me to the office, we talked, he advanced me [Ksh] 1500 which was needed by the doctor. So that is one of the advantages. (*Site C, HH7, man*)

Some respondents also mentioned that in the absence of an advance, they would have to sell their cattle. Dairy income thus protected livestock resources from having to be sacrificed.

... when we did not have money, we went to the dairy to ask for a loan [advance] to pay school fees. [Otherwise] we would sell calves, and at times full grown cattle, depending on the amount we needed for the children. (*Site A, HH3, woman*)

... if you get a problem of maybe fees or something else, you just go and take an advance direct. So it [dairy income] has reduced unnecessary selling of animals. (*Site A, HH7, man*)

This suggests that the hub could function as a source of local assistance in the case of a household emergency, further binding farmers to the hub. Because hubs are often built upon previously existing dairy farmer collectives, this role of the hub could also reflect the continuation of longer histories of formal community cooperation. Additionally, the income and advances from the dairy hub act as a buffer that saves livestock assets—otherwise, the selling of cattle in emergencies could substantially deplete the future economic strength of households. Because women's livestock, including small ruminants and poultry, could be the first to be sold in the case of economic need, this may save women's assets within the household [31,33].

In all interviews, both women and men mentioned that the spending of milk income was a joint household decision. Especially in the case of devoting income to children's education, there was no disagreement within the household. A hint of gender inequality, however, emerged in some interviews that raised the issue of the need for women to have an independent source of income. As other studies have shown, men are more likely to

benefit from dairy commercialization than women [39,40]. In this vein, women respondents mentioned that they needed access to their own source of income, one over which she could have complete decision making power, and this was also alluded to by a man respondent in another interview.

Sometimes conflicts can arise from simple things like begging, but we were taught [as part of dairy training] how to be independent, so that we don't depend on our husbands. . . . So we have supported our children, because we are able to buy our daughters what we feel is good without asking the men. (*Site A, HH1 woman*)

Women have their own personal needs; things that she can't ask me at times. At times they have these 'merry-go-rounds' [informal rotating savings groups] for women . . . (*Site C, HH2, man*)

This suggested that women's valuing of household-level benefits of dairy income could coexist with their awareness of gender inequalities which prevents their having control over that income. In contrast to dairy income, women are likely to have greater control over income related to chicken and vegetables as other studies have shown [31,33]. This raises questions about the long-term sustainability of small-scale dairying as a household enterprise because there could be the possibility of women moving to other occupations where income would be controlled to a greater extent by them.

The long-term sustainability of dairy development is thus likely to be affected by the branching out from agriculture of succeeding generations, as well as women's willingness to move to other occupations where they can control income and reduce their labor responsibilities. Though diversification and transformation in livelihoods is inevitable and possibly necessary, the move away from small-scale dairying will be beneficial for all when it is accompanied by the rise of alternative rural livelihoods (for women) or well-paid urban jobs (for educated youth). In the meantime, dairy income provides the framework for present and future household economic security when men invest it in children's education and household needs.

3.2. Access to Market or Community Consumption?

Alongside income, respondents mentioned access to a market for milk as one of the main benefits of dairy development. All three study sites have a chilling plant associated with the hub which has enabled milk bulking and strengthened their ability to supply milk to processors. Men respondents characterized the hub as 'reliable' in terms of maintaining relatively constant prices and being able to buy all the milk that they were willing to sell. In recounting the history of milk markets in the area, respondents mentioned the Kenya Cooperative Creamery (KCC) which was privatized in 2000 as part of the liberalization of the dairy sector. As one respondent mentioned,

. . . after the collapse of KCC, there were so many co-ops buying milk from the farmers. They were not reliable; some even went away with the farmers' money. Quite recently, this [dairy hub] came and proved reliable. . . . But in earlier times KCC was very reliable, I don't know what became of it anyway. (*Site C, HH7, man*)

In 2003, the government bought and renamed the company New KCC, but it is not clear if this transformation into a state corporation presages eventual transformation into a farmers' cooperative as it was originally, or a further round of privatization. Other respondents mentioned declines in crop markets and prices that led them to turn to milk marketing.

First of all, when I was still young and still in school, I used to like agriculture. I started farming potatoes first, then I started growing pyrethrum. Pyrethrum got spoilt [market collapsed], then I came to this great house [dairy hub] which I see is supporting me very much. . . . because that is where we sell, there is no other market. You have to join the cooperative so that you can get the support. (*Site A, HH5, man*)

In supporting EADD, respondents are therefore seeking to cope with the loss of existing marketing channels brought on by liberalization of dairy farming, as well as fluctuating prices of commercial crops, especially pyrethrum.

Given that negative market experiences were part of recent history, farmers also mentioned some anxiety about the future prospects for milk marketing. One respondent alluded to the dissatisfaction that emerges if payments are delayed.

Another thing, they should pay promptly. When they specify a payment day, they should not delay for three days, because farmers start saying ‘these people are lying to us’. (*Site C, HH12, man*)

The price at which milk was being bought was also a source of dissatisfaction for some respondents, even as one respondent attributed low prices to the processors who were buying the milk rather than to the dairy hub.

We are really not satisfied, but we know the cooler [chilling plant, hub] is not to blame because it depends with the people who collect milk from the cooler. Before it was KCC which was collecting the milk. Then it did not go well, so they gave it to [another processor] and the prices went down, so they looked for [yet another]. [The current processor] . . . sometime their prices had gone up to [Ksh] 30 and at times 22, so it is fluctuating. But the cooler is not to blame—the cooler belongs to us and we cannot harm ourselves; the problem is with the ones who buy from the cooler. (*Site B, HH1, man*)

There are two contrasting perspectives presented here, as some respondents want the hub to take more responsibility for prompt payment, while others argue that, even as prices could be better, the hubs are ultimately dependent on the processors.

As mentioned above, selling to local milk buyers is not preferred among respondents partly because local buyers cannot buy large quantities of milk and hence pay small amounts, but also because they are viewed as unreliable. A preference for the EADD hub and selling to major milk processing companies thus works against a local dairy economy. One respondent mentioned antipathy towards local buyers of milk.

. . . what is very important here is if the government . . . will assist us to abolish all this hawkers. Then we will have a lot of milk volume in the cooler. Because we are not able by ourselves [to draw people away from hawkers]. . . It is very hard because people go through short-cut routes [and sell to hawkers]. (*Site C, HH1, woman*)

However, as some studies have shown, some local milk buyers are also women who depend on this small trade for their livelihoods [41,42]. Dairy development programs, however, often do not promote a variety of milk selling channels but privilege the large processors. While this is justified as promoting reliable markets, it also reduces milk-related livelihood opportunities in the local context.

Another form of milk sales that declined with the entry of the hub is selling to neighbors. One respondent argues that because all their neighbors have cows, they no longer constitute a market for milk.

. . . [earlier] we had milk and we did not have a place to take it. Some you decide to make sour milk so that you can sell to the neighbors. Now every neighbor has their own cows and their own milk, so who will you sell to, so it becomes a waste. (*Site B, HH1, man*)

As the interview continued, this respondent mentioned that some neighbors may not have cows, but immediately suggested that the cooler should start an evening milk collection so that he could sell all the household milk production.

. . . you know it’s better to sell that [evening milk] to the neighbors because there are some who do not have cows. All the morning milk goes to the cooler, but if we had time and the evening milk was a lot, we would take it to the cooler

[too]. Transport will be expensive; but if there was collection we would take in the evening. (*Site B, HH1, man*)

The transformation of milk from food to commodity can be seen in this unwillingness to sell to neighbors. However, in other interviews, the social value of selling to neighbors was clearly mentioned.

A neighbor will always be a neighbor. You know if you deny them, they will see you as a bad person, hence disagreements will arise. Even though the money is less, it's better to sell to the neighbors. (*Site C, HH2, man*)

You know, here in the village, you also need to be one and need to help each other. There will be a time when I will not have that milk, and they will not be in a position to help me because I have been selling all the milk to the cooling plant. (*Site B, HH7, woman*)

Thus, while many respondents profess market rationality, it is moderated in some instances with the need for community cohesion and mutual assistance, and hence social sustainability.

Reduction in household practices of milk processing are also another instance of the transformation of milk from food to commodity. Excess milk is often converted to sour milk (mursik) through a traditional process of fermentation, and this sour milk is available for both household consumption and selling or sharing with neighbors. As dairy income becomes more important, this form of milk processing has also declined.

R: ... we used to make [sour milk, cheese] at the time when milk wasn't being taken to the cooler because milk was in plenty. The cooler has overtaken the process.

I: Is that a problem? Do you see that as a loss?

R: It's not a loss.

I: Why?

R: Because the money we receive from the cooler is benefiting us more.

(*Site A, HH1, woman*)

I: You don't process milk. Is there a reason why you don't do that?

R: I have no time to do that.

(*Site A, HH5, woman*)

The presence of a market for milk thus means that milk leaving from the local area returns as individual household income, losing some of its community value and also not taking on the forms it would in local cultures of food.

It might be useful at this point to consider studies which mark the presence of non-market rationalities in rural communities. In one study conducted in India, dairy farmers mentioned that they preferred to keep their milk for children's consumption within the household and did not sell it [43]. This may be linked to low milk productivity among these households, but it does suggest that the selling of milk has to be introduced rather than being a pre-existing economic impulse. Increase in household milk production has also been shown to contribute to better nutrition at the household level in East Africa [44]. In a study of coffee cooperatives in Uganda, it was noted that they were willing to enroll members who were not sufficiently productive, or even did not produce coffee, in order to ensure that nonproducers can share in economic benefits. The discussion of the value, or lack of value, of setting aside milk for neighbors could thus be part of a larger discussion of whether markets can function as an infrastructure for justice [45]. Within a market justice orientation, a dairy hub could set aside some milk for community consumption—whether through schools or local food assistance agencies—ensuring that the ability to profit from milk marketing does not only attach to local producers and distant consumers, but also contributes to local food security. This would ensure that the hub would function as a community organization by replicating the local ethic of sharing food with neighbors, but

also ensure that those who remained outside networks of sharing would have some access to milk.

Men often understood the question of milk processing not as household-level processing but as the shift from milk bulking for sale to private processors to milk packaging for local sales. They thus wanted the hub itself to become the processing center, rather than supply to an external processor. While this may be connected to wariness related to market collapses, it also highlights the logical next step if increased prices and profits are sought from milk. Whether this would enrich individual households or the community as a whole was not mentioned. The focus then was on greater control over processing of local production, rather than greater concern for local consumption, yet both men and women suggested that loyalty to the hub was ultimately in their own interests. Thus, as mentioned earlier, one man respondent emphasized that ‘the cooler belongs to us’ (*Site B, HH1, man*), and a woman respondent highlighted the value of loyalty to the hub.

My contribution may be—what I can do is to make sure I take milk every day to the dairy, and also other people take milk there, so that milk production can go up because they get better services from the hub. (*Site C, HH12, woman*)

The cooperative orientation is thus present in the local context in terms of respondents seeking to strengthen the hub.

A final note in terms of market access is the quality of roads and availability of transport to the hub. As a highland region, some roads here are not all-weather roads and may become unpassable during the rainy season.

Yeah, once in a while it has affected [milk transport]. When there is say . . . heavy rainfall, it is hard for the motorbikes to come here. But since we know that there is an advantage to taking milk there [to the hub], we persevere. To benefit, you have to persevere. (*Site C, HH11, man*)

The extent to which road quality impedes further growth of market-oriented small-scale dairying thus has to be considered, and the building of transport infrastructure in the Rift Valley region becomes one part of the wider policy context within which small-scale dairying has to be situated [46,47]. As the next section details, infrastructural issues also emerge in the discussion of improved breeds.

3.3. Improved Breeds or Inadequate Infrastructure?

Improved cattle have been central to the commercialization of small-scale dairying across the Global South [48]. In the study sites, access to training and services needed to maintain improved cattle was another frequent theme around which benefits of dairy development were articulated. Respondents mentioned that they had increased milk production and income, in some cases while keeping the same number of cows (e.g., *Site C, HH2, man*; *Site A, HH5, man*; *Site A, HH1, woman*), so dairy intensification seemed to be well on its way. Improved cattle had also made the local cattle economy more profitable as cows now fetched higher prices. As one respondent put it,

We were cultivating pyrethrum but the price was so little, and selling of sheep and cows directly, but local ones. But now if you sell one cow, you get more than [Ksh] 40,000. (*Site A, HH1 man*)

Access to training included workshops providing knowledge about growing new grass varieties, and field visits to various cattle breeding organizations to learn about improved breeds. As respondents mentioned,

[Dairy hub] has helped us most through, first thing, capacity building. They have done much about giving us new technologies. Second, has arranged trips for accessing places in Nairobi, Nakuru, and Eldoret. So we have gone on a tour. Then, creation of awareness of something new, so that is much the hub has done for us. In fact, even upgrading of animals through AI services, and buying bulls directly from farms, [private agricultural research center], and even we have gone to [agricultural university]. (*Site A, HH1, man*)

... there was a field day, last October I think, quite recently, and we learned a lot of things. Right now, I'm planning to plant Boma Rhodes and other supplementary fodder for the animals. Yeah, we were really encouraged. (*Site C, HH7, man*)

As already discussed in terms of income, dairy inputs (e.g., feed supplements, salt lick, vaccines, medicines) and cattle services (e.g., veterinary services, artificial insemination) obtained through the hub were also important contributors in the maintenance of improved cattle (e.g., *Site C, HH7, man*). This was especially important because improved cows needed to be protected from sickness to ensure high milk production (e.g., *Site A, HH3, woman FHH*).

Access to improved breeds, however, was an outcome that was articulated more by men than women respondents, as compared to income and market access (Table 2). This could be linked to the fact that women are less likely to own cattle, including improved breeds [29,31,33]. A connected issue is that fewer women compared to men listed access to inputs and services as a beneficial outcome of hubs. This may have to do with men dominating access to hub services, as part of their greater access to the space of the hub.

Despite overall support for improved breeds, practices associated with improving breed quality and milk production had not been adopted by respondent households, especially artificial insemination (AI) and zero grazing. In terms of AI, some respondents mentioned that this had not been implemented due to lack of infrastructure needed to preserve genetic material (e.g., nitrogen). Other respondents viewed this as an individual issue, in terms of their lack of knowledge about AI.

... they took us as far as Nakuru to get bulls which have changed the cattle breeds a little, so it's improving. They also brought us AI, but we were not able to use it because we were unable to tell when a cow was on heat, so we didn't use that much. Bulls are the only [means] that have been used to change. (*Site A, HH4, man*)

Most respondents were satisfied with the quality of bulls being provided, so AI was not a concern for them. As mentioned above, EADD had enabled respondents to buy bulls from private organizations and university agricultural research centers.

Some respondents mentioned that they would prefer AI services because they did not want to expend resources on maintaining bulls.

Another thing [needed] is improving of AI services. If you have two bulls it is a problem. because they are eating a lot of pasture minus getting milk. So we want AI ... that will give us more milk. (*Site A, HH1, man*)

The unwillingness to maintain bulls coincided with the unwillingness to keep local or non-improved cattle breeds in general. Productivity was therefore the sought-after characteristic of cattle, and any cattle that did not meet productivity criteria were deemed unnecessary.

[We don't have local cattle breeds] mainly because of production. Because when you keep so many of them, you produce maybe very little milk, and they consume a lot. ... We are still also removing the ones we are having now ... Or we may use for ploughing the farm. So in future we shall only keep two bulls [oxen] for ploughing the farm. (*Site B, HH1, woman*)

The loss of local breeds of cattle could have connotations for environmental sustainability, as cattle that have made evolutionary adaptations to local conditions are lost. However, this loss was not mentioned by any of the respondents, so it is not part of discourses around dairy development in the study area.

Zero grazing, the confinement and stall feeding of cattle, is another key aspect of milk productivity especially for improved dairy cattle. In the case of most respondents, zero grazing was not practiced, and instead, grazing land was divided into paddocks within which cattle were rotated. Most respondents mentioned that they did not practice zero grazing either because they had sufficient grazing land (e.g., *Site C, HH11, man*), or because they lacked sufficient land (e.g., *Site B, HH6, man*). In either case, land becomes the

justification for not practicing zero grazing. One woman, who had obtained training in dairy farming, objected to the idea that a small amount of land cannot provide sufficient fodder. According to her,

Yes, there is an issue of land. When you go and tell them [other dairy farmers], let's plant this and this, they say we have no land to plant all those things. So they don't know that even a small [amount of] land can be used to feed a cow. . . . you also source the feeds from outside, because there are people who have enough land and they can plant fodder for sale. (*Site B, HH1, woman*)

The planting of new forms of grass is another way in which local environments are being modified, besides possible effects on changes in cultivation of food crops as land is devoted to fodder. Similar to cattle breeds, this too was not an issue raised by respondents.

For many respondents, zero grazing was expensive because their cows did not produce sufficient income to justify the additional cost.

You can save [money] because the animals are not zero grazed, which would have been more expensive. But because they graze on their own it is cheaper. (*Site A, HH1, woman*)

It is expensive to do zero grazing, and the income cannot compensate the expenses that you would have used in zero grazing that cow. (*Site A, HH7 man*)

The expenses associated with zero grazing are possibly linked to the need to set aside land for fodder; buy fodder, cattle feed, and feed supplements; and possibly hire a laborer to cut and carry grass. While both men and women were asked about zero grazing, more of the men respondents provided some detail about problems faced in zero grazing. Women's comments were mostly restricted to the household not practicing zero grazing. One reason for this could be that stall feeding of cattle is likely to be women's work [29,32], so women's lack of interest in zero grazing was their unwillingness to add to their already existing responsibilities for cattle-related work. In the wider context of global consumption of livestock products, open grazing of cattle has become part of practices associated with organic food, especially among affluent, Western consumers. The maintenance of grazed cattle can therefore be a profitable strategy in the long-term.

As mentioned in the case of roads, absence of infrastructure is another impediment to improving livelihood outcomes in rural Kenya [49]. In fact, there were dire infrastructural problems being faced by respondent households at the time of this study, even as they had been successfully supplying milk. One major problem cited in terms of maintaining improved cattle was lack of piped water to the house, and this has also been mentioned in other studies in the region [50]. Out of the 21 respondent households, 10 had some access to piped water or boreholes, but all ultimately depended on local streams during seasonal water shortages. In some cases, households had access to piped water through gravity tanks that had been constructed by European nongovernmental organizations, though this also meant that the tank had to be maintained by the community. One man respondent mentioned the problems associated with bringing water to cattle or taking cattle to water sources.

Work [associated with cattle] has increased, and the biggest challenge we have is water. Grade cows cannot stay without water, so you have to make sure that you go to the river and fetch drinking water. You know this water may not be enough for the cattle because it is little. And then bringing cows home from the forest is hard because the place is hilly and the cows are fat. So we find it very hard because we take them there and we have to walk them slowly back home and that also reduces the milk production. (*Site A, HH4, man*)

Water also became a way to distinguish improved cattle from non-improved cattle. As one respondent described his knowledge of improved cattle,

I can tell this cow can produce a lot of milk because we have different breeds of cow. We have Ayrshire, Friesian, even though they are not pure bred. The pure

breeds which are pedigree can produce 30–40 L. But ours still go to the river for water (laughs). (*Site A, HH5, man*)

‘Going to the river’ thus described the limitations faced by local dairy cattle.

The lack of water supply infrastructure also added to women’s work burdens within dairy farming households. Women often had to travel to rivers and wells to bring water home, seeking assistance from children and using donkeys for transport. One woman respondent mentioned the gender aspects of water-related challenges.

I: Is it hard for women or is it hard for both women and men?

R: Men want to travel also, and at times the cattle need to be taken to the river. The problem is if the cattle don’t take water, then milk production will go down ... If there is no water then there will be no milk.

(*Site A, HH4, woman*)

Women therefore had to take cattle to the river when men were absent. Another woman respondent mentioned the gender division of labor associated with water.

I: Who does the cattle work mostly?

R: It is him who cuts the Napier [grass].

I: What do you do?

R: I go to the river to fetch water.

(*Site B, HH6, woman*)

For women, the responsibility of fetching water for the household extended to ensuring that livestock too had enough water for their needs.

A number of households in the study area lacked electricity connections—among respondent households, only six had access to electricity, six depended wholly on kerosene for lighting, and nine depended partly on solar—and lack of electricity is also an issue across a large part of Kenya [51]. One household expressed the desire to obtain biogas from dairy cattle, connecting this to the value of zero grazing.

What they can do is train, educate us and give us a sample of zero grazing, because other areas that I have gone, there are many things that zero grazing has helped like biogas. Maybe if we can be trained to do zero grazing, so we can get this biogas. We would have used that as source of lighting and for cooking. Trees are decreasing everyday, so soon there will be no firewood. So if they can assist us with that, it would be good. (*Site A, HH4, man*)

The woman in the same household mentioned problems with going to the cattle shed in the dark.

We are told that there are some places where they make biogas in Eldoret. If we can have that in the homestead, when a cow gives birth at night ... you just light that, instead of using firewood which keeps going off, and you have to keep going to and fro to light it. (*Site A, HH4, woman*)

Given that firewood is also collected by women, usually from trees within the housing compound but sometimes from surrounding farms, women’s unpaid work again substitutes for lack of infrastructure. Among respondent households, all used firewood for cooking. While biogas would be an advantage over the use of firewood, it would be useful to consider how the use of solar energy can be upscaled to provide relatively environment-friendly access to lighting and heating in the region. Respondents did not mention the use of cattle dung as fertilizer, possibly because they were not always specifically asked this question, but that is another aspect of sustainability that can be incorporated within dairy programs, especially where cows continue to be grazed.

Overall, the outcomes of dairy development can be interpreted with more nuance when considered in conjunction with gender within and beyond the household because this draws attention to issues such as control of dairy income, community consumption, and infrastructure. The next section situates these outcomes within the components of

the SLF, and addresses the wider neoliberal context within which these outcomes are being articulated.

4. Dairy Development as Nested Scales of Sustainable Livelihoods: Households, Communities, and the Neoliberal State

Through the interviews, dairy development emerges as a household-level livelihood whose practice affects the broader community and is affected by state-level programs and policies. This multi-level nature of dairy development is depicted in Figure 3—while its broad categories are borrowed from existing visualizations of the SLF, this schema views households as being encompassed by the community, and the community in turn being encompassed by the state, illustrating the nested scales within which sustainable livelihoods are constructed. At the household-level, the beneficial outcomes of dairy development as identified by interview respondents were regular monthly income, reliable access to market, and training and services required to maintain improved cattle. This suggests that interview respondents valued the program due to its ability to increase dairy cattle productivity and transform milk into income. The economic basis of sustainable livelihoods was thus the most prized aspect of the program. While both men and women identified these beneficial outcomes, it was also mentioned that women seek an independent source of income, which sometimes leads them to sell milk to local buyers to obtain cash for daily household needs. The control of dairy income by men then might cast doubts on the household-level social sustainability of this livelihood because it may make women reluctant to pursue dairy development if a livelihood option becomes available whose income they can control. As other studies have shown, while milk sold to neighbors and local buyers is often considered women's income, this meaning may change if the amount obtained from such sales changes from being small to becoming substantial [39,40]. In this context, the extent to which the dairy development program can designate part of dairy income as women's income needs to be explored.

Dairy income was viewed as being useful in paying school fees by both men and women respondents. This could suggest a transition from agricultural to non-agricultural livelihoods, but because the interview did not ask further questions on education, this cannot be verified on the basis of the study data. In future field research, it may be useful to inquire into how school fees become such an important part of household expenses, and whether this is due to cost of private schools. It can be speculated that if school fees were subsidized in the region, a greater part of income could be utilized to improve dairy practices. This would further feed into the goal of higher productivity that seems to be the aim of household dairying for the respondents.

Moving beyond the household, it is worth considering how the new channel for milk sales provided by the hub could affect the economic bases and social cohesion of the wider community. Local milk buyers can neither buy large quantities of milk nor promise relatively constant prices and hence are looked upon unfavorably by the respondents. Alongside, the desire to turn as much milk as possible into income leads to lower levels of milk processing at home, and this both takes away a source of nutrition that could be available to the local community as well as truncates local cultures of milk consumption. However, as respondents emphasized, milk supply in the area was so high that neither local buyers nor neighbors could absorb all of it. They also mentioned the presence of a social ethic which ensures that a neighbor needing milk will not be turned away. Despite these assertions, a sustainable development program could seek to serve not just the needs of individual households but also address the needs of the broader community, so that a conflict between productivity and social sustainability is not precipitated.

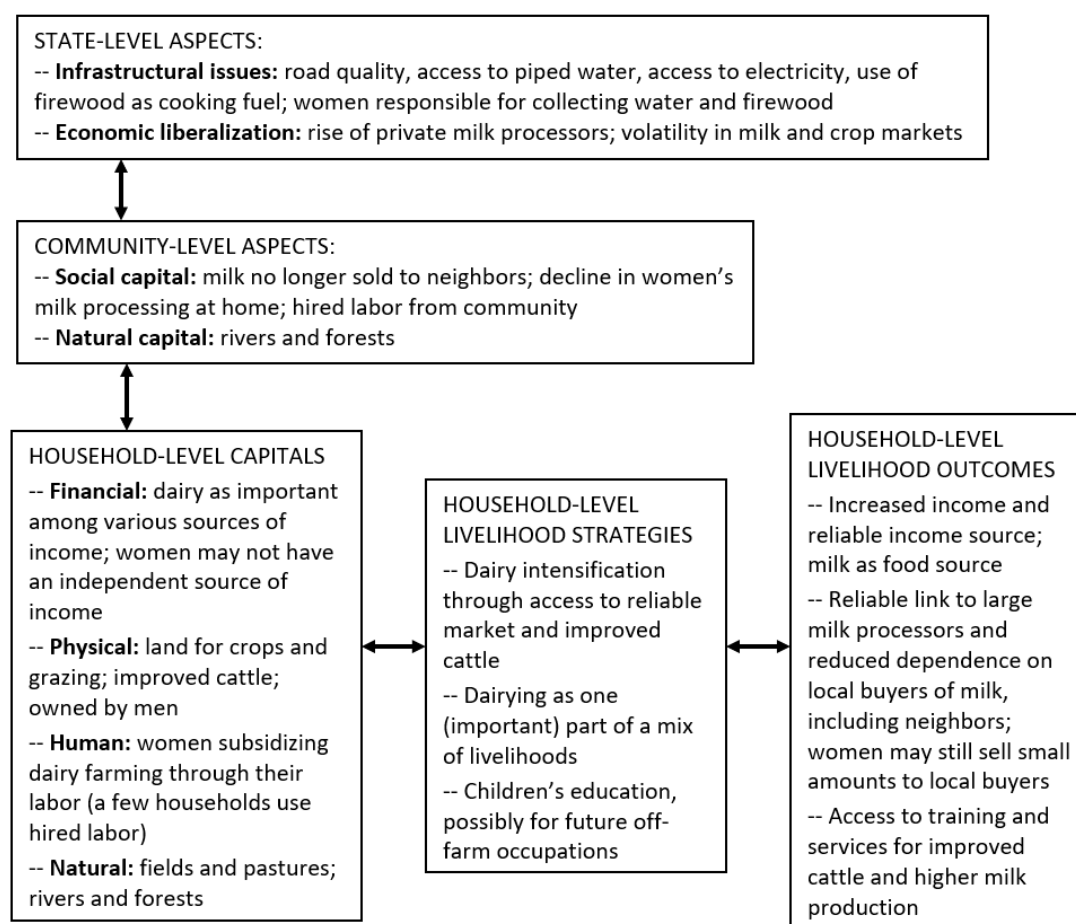


Figure 3. Gendered perspectives on Kenya's small-scale dairy development in terms of the SLF.

At the state level, sustainable rural livelihoods are not possible without government-led investment in basic infrastructure, including roads, piped water, electricity, and environment-friendly fuel sources. Thus, even as all interview respondents mentioned their success with household dairying, this success was being produced despite lack of good roads and electricity, and through women's collection of river water and firewood. As neoliberal policies encourage the privatization of basic service provision, it is likely that low-income communities will not be at the forefront of infrastructural projects, possibly leading to migration from rural to urban areas. Alongside, the dairy sector itself is likely to face market volatility, so the reliability of private processors is uncertain, even as that is the key reason why the hub is currently preferred. At the global level, large milk producers such as India and New Zealand are constantly seeking new markets, and it remains to be seen whether small-scale producers in Kenya can withstand competition from imports if and when the milk market is further liberalized. Sustainability is therefore led by government policies and not always an aspect of livelihoods that can be controlled at the level of the household.

5. Conclusions

This article has examined how perspectives on small-scale dairy development in western Kenya varied by gender of dairy farmer, and has argued that these gender differences are useful in understanding various facets of sustainability associated with the program as outlined in the Sustainable Livelihoods Framework (SLF). The main finding from this study is that both men and women respondents value income and market access provided by the program, while men respondents value access to improved cattle to a greater extent than women. The main gender issue at the level of the household is that dairy income is

not controlled by women. This means that women are potentially willing to shift their labor to other activities whose income is in their control, casting some doubt on the social sustainability and gender equity of dairy commercialization efforts. The SLF also enables a consideration of the broader spatial and temporal context within which livelihoods are located. In this case, household-level economic sustainability through dairy development may deprive the wider community of access to milk. While interview respondents emphasize that this is not the case, there is a need to consider income inequalities within the community and how that affects sustainable rural livelihoods. Finally, lack of water supply and electricity leads to increase in women's work, so the role of the state in providing infrastructure also becomes important in terms of gender and sustainable livelihoods. Development programs therefore need to situate households in the broader community and national context to be able to fulfil sustainability goals.

In all this, environmental sustainability seems to be pushed into the background. The only environmental issue that was overtly raised was loss of trees due to their conversion into firewood. While this is not directly connected to dairy development, it is part of a broader lack of access to energy infrastructure. However, some ideas can be drawn from the discussion of artificial insemination and zero grazing during interviews. The adoption of improved cattle may affect local diversity of cattle breeds, and this needs to be considered in breeding programs. The continuation of pasture grazing at the time this data was collected suggested that cattle had access to more healthy ways of living. Sustainability in this case moves from being focused on human livelihoods to also considering animal environments. Additionally, respondents mentioned that small ruminants, such as sheep and goats, were difficult to graze in the same pasture as cows due to fear of overgrazing, which may suggest that livestock diversity would reduce over time. Because small livestock are often controlled by women, this reduction may have gender connotations associated with it. Overall, while cattle productivity is what is sought by respondent households, there are also aspects of social and environmental sustainability pursued by them that can be considered by the dairy development program. This article thus suggests that sustainability can underlie even productivity-oriented development programs, especially in the case of small-scale rural livelihoods.

Author Contributions: Conceptualization, P.B. and A.G.; methodology, P.B. and A.G.; formal analysis, P.B. and A.G.; writing—original draft preparation, P.B.; writing—review and editing, P.B. and A.G. All authors have read and agreed to the published version of the manuscript.

Funding: Fieldwork in Kenya was partly supported by a 2013 Fulbright research award held by Pratyusha Basu, and ILRI's Livelihoods, Gender and Impact Program.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and retroactively approved through an ethical opinion provided by the Institutional Research Ethics Committee (IREC) of the International Livestock Research Institute (ILRI) on 18 August 2021 (Ref: ILRI-IREC2021-OL-01).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study, in anonymized form, are available on request from the authors.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. UN (United Nations). Transforming Our World: The 2030 Agenda for Sustainable Development. Available online: https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E (accessed on 19 August 2021).
2. Chambers, R.; Conway, G. Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. IDS Discussion Paper 296. Institute of Development Studies: Brighton, UK, 1992. Available online: <https://www.ids.ac.uk/publications/sustainable-rural-livelihoods-practical-concepts-for-the-21st-century/> (accessed on 19 August 2021).
3. Scoones, I. Sustainable Rural Livelihoods: A Framework for Analysis. IDS Working Paper 72. Institute of Development Studies: Brighton, UK, 1998. Available online: <https://www.ids.ac.uk/publications/sustainable-rural-livelihoods-a-framework-for-analysis/> (accessed on 19 August 2021).

4. Farrington, J.; Carney, D.; Ashley, C.; Turton, C. Sustainable livelihoods in practice: Early applications of concepts in rural areas. *Nat. Resour. Perspect.* **1999**, *42*, 1–2.
5. Serrat, O. The Sustainable Livelihoods Approach. In *Knowledge Solutions*; Springer: Singapore, 2017.
6. UNDP. Guidance Note: Application of the Sustainable Livelihoods Framework in Development Projects. Available online: <https://www.latinamerica.undp.org/content/rblac/en/home/library/poverty/guidance-note--application-of-the-sustainable-livelihoods-framew.html> (accessed on 19 August 2021).
7. Carney, D.; Drinkwater, M.; Rusinow, T.; Neefjes, K.; Wanmali, S.; Singh, N. Livelihoods Approaches Compared. DFID. Available online: <https://www.eldis.org/document/A28159> (accessed on 19 August 2021).
8. Scoones, I. Livelihoods perspectives and rural development. *J. Peasant. Stud.* **2009**, *36*, 171–196. [CrossRef]
9. Morse, S.; McNamara, N. Sustainable Livelihood Approach: A critical analysis of theory and practice. In *Geographical Paper No. 189*; University of Reading: Reading, UK, 2009. Available online: <https://www.reading.ac.uk/web/files/geographyandenvironmentalscience/GP189.pdf> (accessed on 19 August 2021).
10. Whitehead, A. Tracking Livelihood Change: Theoretical, Methodological and Empirical Perspectives from North-East Ghana. *J. South. Afr. Stud.* **2002**, *28*, 575–598. [CrossRef]
11. Arku, F.; Arku, C. Development studies discourse: How gender-sensitive are sustainable livelihood frameworks? *Int. J. Peace Dev. Stud.* **2011**, *2*, 67–74.
12. Muriuki, H. *Dairy development in Kenya*; FAO: Rome, Italy, 2011.
13. WCED (World Commission on Environment and Development). *Our Common Future*; Oxford University Press: Oxford, UK, 1987.
14. Okali, C. Linking Livelihoods and Gender Analysis for Achieving Gender Transformative Change. LSP Working Paper 41. Livelihood Support Programme, FAO: Rome, Italy, 2006. Available online: <http://www.fao.org/documents/card/en/c/eee6f2f0-98f3-590c-babf-f18ffd060f36/> (accessed on 19 August 2021).
15. Lemke, S.; Yousefi, F.; Eisermann, C.A.; Bellows, C.A. Sustainable livelihoods approaches for exploring smallholder agricultural programs targeted at women: Examples from South Africa. *J. Agric. Food Syst. Community Dev.* **2012**, *3*, 25–41. [CrossRef]
16. Jain, D.; Moser, C.O.N. Gender Planning and Development: Theory, Practice and Training. *Fem. Rev.* **1995**, *49*, 117. [CrossRef]
17. Young, K. *Planning Development with Women: Making a World of Difference*; St. Martin's Press: New York, NY, USA, 1993.
18. Kabeer, N. *Reversed Realities: Gender Hierarchies in Development Thought*; Verso Books: New York, NY, USA, 1994.
19. Pretty, J.; Bharucha, Z.P. Sustainable intensification in agricultural systems. *Ann. Bot.* **2014**, *114*, 1571–1596. [CrossRef]
20. Basu, P.; Scholten, B.A. Crop–livestock systems in rural development: Linking India's Green and White Revolutions. *Int. J. Agric. Sustain.* **2011**, *10*, 175–191. [CrossRef]
21. Prasad, C.S.; Anandan, S.; Gowda, N.K.S.; Schlecht, E.; Buerkert, A. Managing nutrient flows in Indian urban and peri-urban livestock systems. *Nutr. Cycl. Agroecosystems* **2019**, *115*, 159–172. [CrossRef]
22. Krishna, S. Redefining Sustainable Livelihoods. In *Women Reclaiming Sustainable Livelihoods: Spaces Lost, Spaces Gained*; Harcourt, W., Ed.; Palgrave Macmillan: London, UK, 2012.
23. Lienert, J.; Burger, P. Merging capabilities and livelihoods: Analyzing the use of biological resources to improve well-being. *Ecol. Soc.* **2015**, *20*, 20. [CrossRef]
24. Baltenweck, I.; Omondi, I. A View into the Dairy Market Hubs Approach. ILRI Brief. International Livestock Research Institute: Nairobi, Kenya, 2020. Available online: <https://www.ilri.org/publications/view-dairy-market-hubs-approach> (accessed on 19 August 2021).
25. Baltenweck, I. Linking poor livestock keepers to markets. *Rural* **2014**, *21*, 22–24.
26. Rao, E.J.; Omondi, I.; Karimov, A.A.; Baltenweck, I. Dairy farm households, processor linkages and household income: The case of dairy hub linkages in East Africa. *Int. Food Agribus. Manag. Rev.* **2016**, *19*, 95–108. [CrossRef]
27. Kilelu, C.W.; Klerkx, L.; Leeuwis, C. Supporting smallholder commercialisation by enhancing integrated coordination in agrifood value chains: Experiences with dairy hubs in Kenya. *Exp. Agric.* **2017**, *53*, 269–287. [CrossRef]
28. Omondi, I.; Zander, K.; Bauer, S.; Baltenweck, I. Using Dairy Hubs to Improve Farmers' Access to Milk Markets: Gender and Its Implications. In Proceedings of the Tropentag 2014, Bridging the Gap between Increasing Knowledge and Decreasing Resources Workshop, Prague, Czech Republic, 17–19 September 2014; International Livestock Research Institute: Nairobi, Kenya, 2014. Available online: <https://www.ilri.org/publications/using-dairy-hubs-improve-farmers-access-milk-markets-kenya-gender-and-its-implications> (accessed on 19 August 2021).
29. Basu, P.; Galiè, A.; Baltenweck, I. Presence and property: Gendered perspectives on participation in a dairy development program in Kenya and Uganda. *Women's Stud. Int. Forum.* **2019**, *74*, 68–76. [CrossRef]
30. Kristjanson, P.; Waters-Bayer, A.; Johnson, N.; Tipilda, A.; Njuki, J.; Baltenweck, I.; MacMillan, S. Livestock and Women's Livelihoods: A Review of the Recent Evidence. ILRI Discussion Paper 20. International Livestock Research Institute: Nairobi, Kenya, 2010. Available online: <https://cgspace.cgiar.org/handle/10568/3017> (accessed on 19 August 2021).
31. Hovorka, A. Women/chickens vs. Men/cattle: Insights on gender-species intersectionality. *Geoforum* **2012**, *43*, 875–884. [CrossRef]
32. Njarui, D.; Kabirizi, J.; Itabari, J.; Gatheru, M.; Nakiganda, A.; Mugerwa, S. Production characteristics and gender roles in dairy farming in peri-urban areas of eastern and central Africa. *Livest. Res. Rural. Dev.* **2012**, *24*, 122. Available online: <http://www.lrrd.org/lrrd24/7/njar24122.htm> (accessed on 19 August 2021).
33. Njuki, J.; Sanginga, P. *Women, Livestock Ownership, and Markets: Bridging the Gender Gaps in Eastern and Southern Africa*; Routledge: London, UK, 2013.

34. Gallina, A. Gender Dynamics in Dairy Production in Kenya: A Literature Review. CCAFS Working Paper 182. CGIAR Research Program on Climate Change, Agriculture and Food Security: Copenhagen, Denmark, 2016. Available online: <https://ccafs.cgiar.org/resources/publications/gender-dynamics-dairy-production-kenya-literature-review> (accessed on 19 August 2021).
35. Tavenner, K.; Crane, T.A. Gender power in Kenyan dairy: Cows, commodities, and commercialization. *Agric. Hum. Values* **2018**, *35*, 701–715. [\[CrossRef\]](#)
36. Saldanha, J. *The Coding Manual for Qualitative Researchers*; Sage: Newcastle-upon-Tyne, UK, 2009.
37. Small, M.L. How many cases do I need? *Ethnography* **2009**, *10*, 5–38. [\[CrossRef\]](#)
38. Suter, W.N. Qualitative Data, Analysis, and Design. In *Introduction to Educational Research: A Critical Thinking Approach*; SAGE Publications: Thousand Oaks, CA, USA, 2012; pp. 342–386.
39. Lenjiso, B.M. Defeminizing effect: How improved dairy technology adoption affected women's and men's time allocation and milk income share in Ethiopia. In *Gender, Agriculture and Agrarian Transformations*; Sachs, C., Ed.; Routledge: London, UK, 2019.
40. Tavenner, K.; Van Wijk, M.; Fraval, S.; Hammond, J.; Baltenweck, I.; Teufel, N.; Kihoro, E.; De Haan, N.; Van Etten, J.; Steinke, J.; et al. Intensifying Inequality? Gendered Trends in Commercializing and Diversifying Smallholder Farming Systems in East Africa. *Front. Sustain. Food Syst.* **2019**, *3*, 10. [\[CrossRef\]](#)
41. Galiè, A.; Njiru, N.; Heckert, J.; Myers, E.; Alonso, S. Gendered Barriers and Opportunities among Milk Traders in the Informal Sector in Peri-Urban Nairobi. Poster Prepared for the 2019 Agriculture, Nutrition and Health (ANH) Academy Week, Hyderabad, India, 24–29 June 2019. International Livestock Research Institute: Nairobi, Kenya, 2019. Available online: <https://www.ilri.org/publications/gendered-barriers-and-opportunities-among-milk-traders-informal-sector-peri-urban-0> (accessed on 19 August 2021).
42. Tavenner, K.; Crane, T.; Saxena, T. "Breaking Even" under Intensification? Gendered Trade? Offs for Women Milk Marketers in Kenya. *Rural. Sociol.* **2021**, *86*, 110–138. [\[CrossRef\]](#)
43. Daftary, D. Market-driven dairying and the politics of value, labor and affect in Gujarat, India. *J. Peasant. Stud.* **2017**, *46*, 80–95. [\[CrossRef\]](#)
44. Galiè, A.; Kantor, P. From gender analysis to transforming gender norms: Using empowerment pathways to enhance gender equity and food security in Tanzania. In *Transforming Gender and Food Security in the Global South*; Njuki, J., Parkins, J., Kaler, A., Eds.; Routledge: London, UK, 2016.
45. Neiman, N. *Markets, Community and Just Infrastructures*; Routledge: London, UK, 2020.
46. ODI (Overseas Development Institute). Leaving No One behind in the Roads Sector: An SDG Stocktake in Kenya. Available online: <https://odi.org/en/publications/leaving-no-one-behind-in-the-roads-sector-an-sdg-stocktake-in-kenya/> (accessed on 19 August 2021).
47. Khanani, R.S.; Adugbila, E.J.; Martinez, J.A.; Pfeffer, K. The Impact of Road Infrastructure Development Projects on Local Communities in Peri-Urban Areas: The Case of Kisumu, Kenya and Accra, Ghana. *Int. J. Community Well-Being* **2021**, *4*, 33–53. [\[CrossRef\]](#)
48. Basu, P. Success and Failure of Crossbred Cows in India: A Place-Based Approach to Rural Development. *Ann. Assoc. Am. Geogr.* **2009**, *99*, 746–766. [\[CrossRef\]](#)
49. Briceno-Garmendia, C.M.; Shkaratan, M. *Kenya's Infrastructure: A Continental Perspective*; World Bank: Washington, DC, USA, 2010.
50. Ransom, E.; Bain, C.; Bal, H.; Shannon, N. Cattle as technological interventions: The gender effects of water demand in dairy production in Uganda. *FACETS* **2017**, *2*, 715–732. [\[CrossRef\]](#)
51. Lee, K.; Brewer, E.; Christiano, C.; Meyo, F.; Miguel, E.; Podolsky, M.; Rosa, J.; Wolfram, C. Electrification for "Under Grid" households in Rural Kenya. *Dev. Eng.* **2016**, *1*, 26–35. [\[CrossRef\]](#)

Short Biography of Authors

Dr. Pratyusha Basu is an Associate Professor of Geography in the Department of Sociology and Anthropology and Director of the Asian Studies Program at the University of Texas–El Paso. She has a Ph.D. from the University of Iowa, Iowa City and an M.A. from Jawaharlal Nehru University, Delhi (India). Her research focuses on rural economies, rural-to-urban transitions, and gender identities in the Global South, and her main field sites are India and Kenya. Specific topics include women's work in small-scale dairy development, rural displacements, urban environments, social movements, and animal geographies. She mainly utilizes qualitative and ethnographic methods in her research. Dr. Basu's book, "Villages, Women, and the Success of Dairy Cooperatives in India," is an ethnographic analysis of how changing gender and class relations have enabled the adoption of crossbred dairy cattle in rural India. Her research has been published in a variety of journals, including *Annals of the Association of American Geographers*, *International Journal of Environmental Research and Public Health*, *International Journal of Agricultural Sustainability* and *Women Studies International Forum*.

Dr. Galiè currently works as Team leader: Gender, for the International Livestock Research Institute (ILRI) based in Nairobi, Kenya. She holds a PhD from Wageningen University, Netherlands, and an MA in Social Anthropology of Development from the School of Oriental and African Studies, University of London. Dr Galiè has worked on gender analysis for agricultural development for over 20 years with a focus on empowerment in both livestock and crops. She has published extensively on these topics and some of her articles have received international awards. In 2021, a systematic review of literature on empowerment listed her as one of the 15 most influential authors on empowerment.