CHARCOAL PRODUCERS AND THE PANDEMIC: EFFECTS OF COVID-19 IN POKOT CENTRAL, KENYA

Maike Petersen, Chebet N. Kamurio, Chepkemoi D. Kortom and Marcus Nüsser

With 5 figures
Received 21 December 2020 · Accepted 20 June 2021

Summary: When the COVID-19 pandemic unfolded, public health measures were implemented globally. Early on, concerns grew that lockdowns and travel restrictions could have severe consequences, especially for marginalized communities in the Global South. In Sub-Saharan Africa, wood charcoal is not only an important cooking fuel, but provides income for many rural households. Despite its economic value, the charcoal sector is, however, largely unregulated and viewed exclusively as an environmentally damaging industry by policy makers and the public who make it responsible for large-scale deforestation. The present study employs a sustainable livelihood framework to assess the ability of charcoal producers in northwestern Kenya, to cope with a short-term shock such as the COVID-19 pandemic and preventive measures. It furthermore compares their access to health information to that of non-producers. A street survey of 139 respondents allowed to gain rapid insights into the realities of a group not accessible via online or telephone surveys. The results show that 87 % of charcoal producers face severe decline of this economic practice because of limited market access. These losses cause them food insecurities, while non-charcoal producers are more worried about social consequences of the restrictions. Though charcoal producers and non-producers feel equally well informed about the pandemic, producers are less likely to access reliable information channels than non-producers, resulting in an uneven distribution of health information across the community. By investigating the response of producers to an external shock and limited market access this study adds to the understanding of local vulnerabilities and the sustainability of rural livelihood strategies. This research argues for inclusive policy response to ensure consideration of the informal sector in crisis response as well as to provide adequate and low-threshold access to health information.

Zusammenfassung: Zur Eindämmung der COVID-19-Pandemie wurden weltweit Maßnahmen ergriffen. Dabei wurden bereits früh Bedenken geäußert, dass sich Lockdowns und Mobilitätsbeschränkungen besonders stark auf marginalisierte Gruppen im Globalen Süden auswirken könnten. Im subsaharischen Afrika stellt Holzkohle nicht nur einen wichtigen Energielieferanten dar, sondern dient auch vielen ländlichen Haushalten als Einnahmequelle. Trotz seiner wirtschaftlichen Bedeutung ist der Holzkohlesektor jedoch weitgehend unreguliert und wird in erster Linie als umweltschädigende Wirtschaftsaktivität angesehen. Mit Hilfe des sustainable livelihood frameworks werden in dieser Studie die Auswirkungen der COVID-19-Pandemie und der in diesem Zusammenhang erlassenen Restriktionen auf die Lebenssicherung ländlicher Holzkohleproduzenten im Nordwesten Kenias untersucht. Dabei wird deren Zugang zu Gesundheitsinformationen mit dem von Nicht-Produzenten verglichen. Eine Straßenbefragung von 139 Personen erlaubt Einblicke in die Lebenssituation von Menschen, die über Online- oder Telefonbefragungen nicht erreicht werden könnten. Die Ergebnisse belegen einen Rückgang der Produktionsmengen für 87 % der befragten Holzkohleproduzenten, der auf mangelnde Marktzugänge zurückzuführen ist. Diese massive Abnahme führt zu einer verschärften Ernährungsunsicherheit betroffener Haushalte, während Nicht-Produzenten sich in erster Linie um soziale Konsequenzen der Einschränkungen sorgen. Obwohl sich Holzkohleproduzenten und Nicht-Produzenten ähnlich gut über die Pandemie informiert fühlen, nutzen erstere häufig weniger verlässliche Informationsquellen, was zu einer ungleichen Verteilung von Gesundheitsinformation in der Gemeinschaft führt. Die vorliegende Studie erforscht die Reaktion von Holzkohleproduzenten auf einen externen Schock, der besonders den Marktzugang und damit das Potential zur Risikominderung einschränkt. Dadurch trägt diese Untersuchung zum Verständnis der Vulnerabilität von Holzkohleproduzenten bei und stellt die Rolle dieser Einkommensstrategie als Sicherheitsnetz in Frage. Durch den Fokus auf eine Gruppe innerhalb des informellen Sektors, stellt diese Forschungsarbeit die Notwendigkeit heraus, das Krisenmanagement besonders auf diese Bevölkerungsgruppen anzupassen und sicherzustellen, dass Gesundheitsinformationen für jeden zugänglich sind.

Keywords: charcoal production, COVID-19, Pokot Central, Kenya, dryland livelihoods, sustainable livelihood

https://doi.org/10.3112/erdkunde.2021.02.04 ISSN 0014-0015 (Print) · ISSN 2702-5985 (Online)

1 Introduction

In sub-Saharan Africa (SSA), livelihood security of rural households is often adversely affected by external shocks of diverse nature. These can include natural hazards, climate change, or policy interventions (Ansah et al. 2019; Connolly-Boutin and Smit 2016; Devereux 2016). A widely used approach to assess the suitability of different income strategies in the context of vulnerability, is the sustainable livelihood framework (SLF). It was first developed by Chambers and Conway (1992) as an actor-centred approach considering both tangible and intangible household assets as well as the social and environmental sustainability of different income strategies. The core of the SLF is the availability and accessibility of assets, also referred to as either human, natural, financial, physical, or social capital, that households can draw from to make a living and improve or sustain their wellbeing (Scoones 1998). In the context of vulnerability, the capabilities of households to cope with short-term stress, adapt to long-term trends, or mitigate seasonal variabilities are assessed. Furthermore, interdependencies between assets, risks, and transforming institutions are reconstructed (de Haan 2012). Since the 1990s the SLF has gained importance and proven to be a reliable approach in development research (Masanjala 2007; Sharaunga and Mudhara 2021; Ulrich 2014). More recent approaches, however, try to account for the highly dynamic nature of how rural communities adapt to different changes. This is, for example, realised by conducting longitudinal analyses over a longer time period (Ulrich et al. 2012), by comparing divergent pathways of similar localities (Roden et al. 2016), or by highlighting spatial dimensions of multi- and translocal communities (Dame 2018; Peth and Sakdapolrak 2020; Steinbrink and Niedenführ 2020). Furthermore, Sakdapolrak (2014) suggests to overcome the static nature of the SLF by focussing on livelihood styles and pathways to emphasise dependencies and to give more attention to power relations.

Three main strategies for households to mitigate or adapt to changing conditions or external shocks exist. These are migration, intensification (e.g. through the introduction of improved farming techniques), or the use of site-specific opportunities for diversification (Ellis 2000; Arouna et al. 2017; Asfaw et al. 2019; Dzanku 2019). As main rural income sources in SSA, farming and livestock keeping often complement each other (Liao et al. 2020; McCabe et al. 2010), while activities from the service or production sector also gain importance (Gebru et al. 2018; Lenaiyasa et al. 2020). One of such off-farm strategies is the production of wood charcoal, an activity, which is often viewed as the ultimate safety net for marginalized rural communities (Iiyama et al. 2017). Recent studies show that a large percentage of households in charcoal producing areas rely partly on this income source to expand their livelihood portfolio (Brobbey et al. 2019; Kiruki et al. 2020; Smith et al. 2017). Although the link between charcoal production and deforestation is less unambiguous than commonly assumed by policy makers and the media (Chidumayo and Gumbo 2013; Doggart et al. 2020), producers are broadly perceived as poor and inconsiderate exploiters of natural resources (Mwampamba et al. 2013). This leads to restrictive regulations and subsequently to the criminalization of the occupation. Besides a tremendous amount of lost tax revenues for the state, this leaves charcoal producers vulnerable to exploitation by other actors of the charcoal value chain; to policy interventions; and to other external effects (Neufeldt et al. 2015).

An example for such a perturbation is the unprecedented global crisis, which was actuated by the detection of the zoonotic transmission of a novel coronavirus (SARS-CoV-2) in December 2019. Infection with the virus can lead to the potentially lethal respiratory coronavirus disease 2019 (COVID-19) and since an increasing number of cases occurred around the globe, the world health organization (WHO) declared the outbreak a pandemic on March 11th, 2020 (WHO 2020a). Lack of immunity and treatment options required the implementation of strict public health measures to slow the spread and protect health care systems.

Due to the low coverage with health care facilities in SSA, low doctor-patient ratios, and few intensive care units, the fear from COVID-19 in those countries was high, already early in the global health crisis (Nuwagira and Muzoora 2020). Simultaneously, concerns were raised that SSA could be hit particularly strong by counter measures, aiming to prevent the spread of the disease (Ataguba 2020; United Nations 2020). Interruption of vaccination campaigns, limitations of international health aid and concentration of resources solely on the pandemic, can lead to an increasing number of victims of other, preventable diseases such as Malaria or maternal mortality as was the case during the Western African Ebola virus epidemic in 2014 (Elston et al. 2016; Sochas et al. 2017; Walker et al. 2015). The WHO already documented a severe decrease in reported cases of tuberculosis for 2020 which is likely to result in under-treatment and

hence an increased mortality of the disease (WHO 2020b). Furthermore, the closing of schools as practiced in many SSA countries is likely to affect future possibilities of children, especially girls. This measure does not only affect the young generation on the short term through missing school meals and the interruption of education for several months (Giannini 2020). Recent reports show an increase in teenage pregnancies, female genital mutilation, and subsequent child marriages (Dyer 2020; Maichuhie 2020; UNFPA et al. 2020) setting back international efforts to eliminate those practices, for years. All these consequences are in addition to a large-scale disruption of income for daily wage laborers and those involved in informal activities who are estimated to make up almost 90 % of workers in SSA (Bonnet et al. 2019). Discontinuation of income sources exacerbates food insecurities and enforces malnutrition of low-income households (Kansiime et al. 2020).

One group of low-income households affected by the counter measures are charcoal producers in remote areas as they strongly depend on access to urban markets. Thus, the present study employs the SLF to analyse how charcoal production as a livelihood reduces or amplifies the vulnerability of rural households, focussing on the effects of the COVID-19 pandemic and related policy interventions as a short-term shock (Fig. 1, dimension of "risk exposure, shocks"). It investigates how household assets, especially human, natural, and financial capital, are affected by the pandemic and examines the role of charcoal production in responding to it.

The approach is built around charcoal producers as the central actors and considers the social sustainability of the occupation as well as its potential to reduce but also intensify rural poverty and vulnerability. The SLF framework is slightly adjusted and instead of evaluating only desired and positive outcomes (Fig. 1, dimension of "mitigation"), this study also considers potentially negative effects which in turn could amplify risk exposure of rural households and communities (Fig. 1, dimension of "intensification").

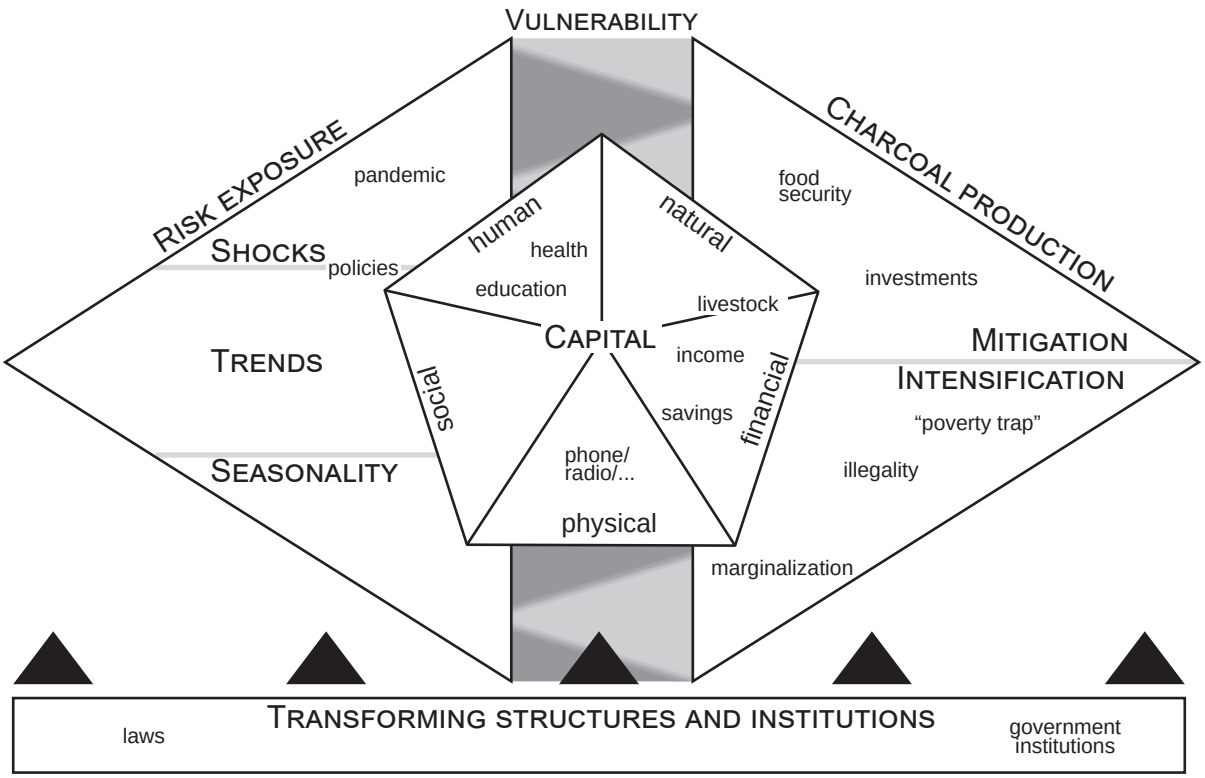


Fig. 1: The sustainable livelihood framework (SLF) adapted to charcoal producing rural households. The household and its capital are placed at the centre against the background of the vulnerability context. Vulnerability is defined by risk exposure to certain short-term shocks, long-term trends, and seasonality, which can be influenced by transforming structures and institutions. The role of charcoal production is analysed by examining its livelihood outcomes, which can either strengthen a households' capital and thus help to mitigate risks and reduce vulnerability, or it can result in adverse livelihood outcomes and intensify risk exposure.

The drylands of Pokot Central in northwestern Kenya were identified as a charcoal production area where land-use and land-cover change together with socio-economic transformations have shaped rural livelihoods over the past 30 years (Bergmann et al. 2019; Petersen et al. 2021). The present study is embedded in a four-year project on charcoal production in the area and its environmental and socio-economic interdependencies. To assess the producers' situation during the current pandemic, three main questions were asked:

- How does the COVID-19 pandemic and related regulations affect the charcoal producers of Pokot Central?
- What does this crisis mean for their livelihood security? Are they worse off than their community members who do not rely on charcoal production as an income source?
- Do charcoal producers have the same access to information and the same chances to protect themselves from an infection with the virus as non-producers?

To overcome the static nature of the SLF, the study includes current as well as former charcoal producers to retrace pathways out of this occupation. Power relations are investigated by comparing access to information as well as the consequences of the pandemic and related regulations.

2 Study area

The case study is located in the remote drylands of Pokot Central, an administrative sub-unit of West Pokot County (WPC) in north-western Kenya (Fig. 2). The study area is characterised by semi-arid conditions with an annual precipitation of approximately 400 mm at a high temporal and spatial variability (GeoInformatiks Ltd 2017). Population density in Pokot Central is growing (58 persons per km^2 in 2019) but below the national average of 82 persons per km^2 (KNBS 2019a). Since the 1970s the area is connected with urban centres in the south via the A1 Highway between Kapenguria and Lodwar. Apart from the improved access to urban markets, displacement and resettlement of people affected by violent events in the 1990s are relevant in the rise of wood charcoal production. As charcoal production is illegal in WPC, no official numbers on producers or production amount are available. Unpublished results from the present project, however, show that it is (or at some point, was) an important income source for approximately half of all households (n=280) sampled during a street survey in 2018/2019[1]. Production in the area is at household level and on a small scale with an average monthly output of approximately 500 kg per household (unpublished field measurements) as compared to large-scale production sites where one producer yields over 3,800 kg per month (Kambewa et al. 2007). Production hotspots are mostly located in the vicinity of the A1 highway where charcoal is sold to drivers of empty lorries returning from South Sudan and Turkana towards Kapenguria, Kitale, and other urban centres further south where charcoal consumers are clustered (Bergmann et al. 2019).

WPC is one of the lesser developed counties in Kenya with a poor health infrastructure.[2] The most recent census showed that only 15 % of the population of Pokot Central (older than 3 years old) own a mobile phone as compared to 47 % of all Kenyans and that radios (owned by 22 % of people older than 3 years in Pokot Central) and TVs (3 %) are uncommon in the study area (KNBS 2019b).

A first case of COVID-19 in West Pokot County was reported on July 29th, 2020. However, national restrictions and a general fear of the disease were already prevalent during the course of this study. Two days after the first case in Kenya was confirmed on March 13th, 2020, the government started to implement a series of measures to prevent the spread across the country. This included international travel restrictions, closure of schools and other learning facilities, a nightly curfew as well as a lockdown of the most affected counties, such as Nairobi and Mombasa until July 7th, 2020 (GoK 2020; Ministry of Health 2020a; Ministry of Health 2020b). Despite these measures the virus had spread to all 47 counties by August 4th. The COVID-19 restrictions fall in line with several events which severely impacted local communities and charcoal production in Pokot Central: in 2018 a national ban on charcoal production and transportation was put in place

[1] The street survey 2018/2019 followed the same approach as the survey in 2020 as described in the methods section of this paper. Instead of information on the COVID-19 pandemic it generated more information on charcoal production techniques, environmental effects, and the opinion on producers.

[2] WPC has a higher than national average mortality for children under five (127 per 1,000 live births compared to 54 per 1,000 live births), and low access to health care with an average distance to the nearest facility at 25 km and one health worker providing for 1,563 people (WHO recommendation is 1:400 (WPC GOVERNMENT 2018).

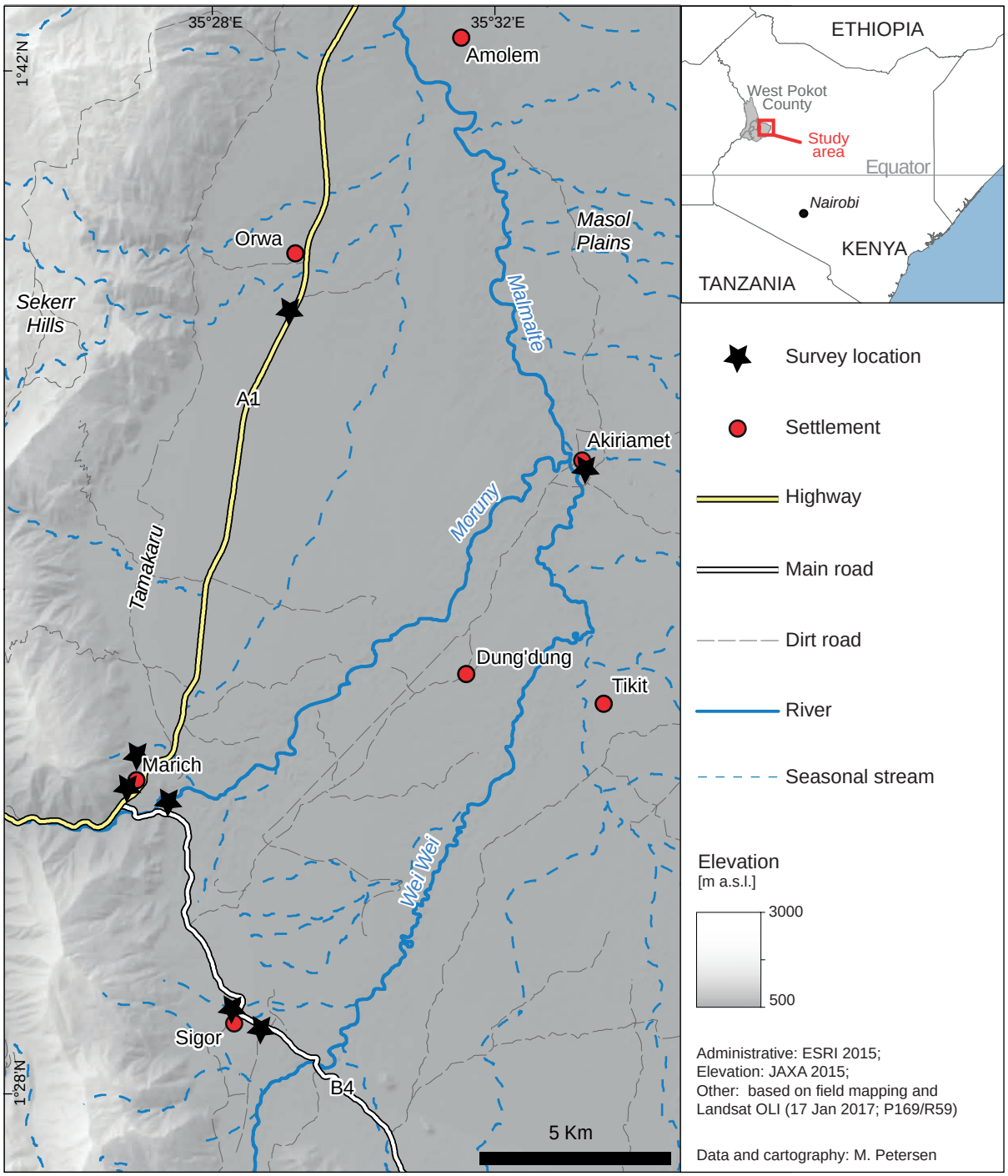


Fig. 2: Study area in West Pokot County, Kenya with locations of the street survey 2020

(Bourne et al. 2020; Kagombe et al. 2020; Njenga 2018), in December 2019 floods inflicted damage on human lives and infrastructure (Kipsang and Kakai 2019; Wainwright et al. 2020), and since the start of 2020 Eastern Africa is plagued by a massive desert locust invasion (Salih et al. 2020).

3 Methods

To assess the impact of COVID-19 and related restrictions on local charcoal producers, a questionnaire survey was conducted in June and July 2020 by two project members and co-authors, living in

the study area and being fluent in Pokot, Swahili, and English. They also provided inside knowledge of the local situation and supported the survey preparation.

A non-probability sampling strategy was applied in a street survey. Though this convenience sampling, approach does not result in representative data for the whole population, direct incorporation of probability sampling principles (Vehovar and Toepoel 2016) added a randomization to the data. This was achieved by purposively selecting survey locations and time. Interviewers were stationed at several central points within the study area during different times of the day. By collecting data on market days, locals practising mobile pastoral livelihoods could be included (Fig. 2). Further randomization was hoped to be achieved by targeting every fifth passer-by who lived in the study area and was older than 16 years. Since many people were not willing to respond, sticking to every fifth person, however, was not followed strictly.

The 15-minute questionnaire consisted of mostly closed-ended questions which were generally communicated as open-ended questions but field-coded by the interviewers. This allows respondents to answer in their own words and at the same time shortens questionnaire and coding time while it also reduces misinterpretation of answers during post-survey coding (De Vaus 2002) as interviewers agreed with respondents on the chosen codes (Bradburn et al. 2004). To allow for unanticipated replies, most closed questions had the option "other" where respondents were asked to specify. The interviewers asked the questions either in Swahili or Pokot, depending on which language the interviewee was fluent in, and recorded the coded answers in English. Though the translation was inevitable and conducting the interviews in teams to assure one person could ask a questions and the other record answers, misinterpretation or loss of information is a possible drawback (Mattissek et al. 2013).

After 13 questions regarding the socio-economic situation of the respondent, 25 closed questions inquired the current situation of charcoal producers, followed by 15 general questions about CODIV-19 in the area. Questions on livelihoods were asked on the basis of households, though it is acknowledged that answers may differ depending on which member of the household is questioned as perceptions and perspectives depend on the role of a household member. Questions on induvial worries and knowledge about preventive measures can only reflect the opinions of the interviewed person.

The questionnaire was transferred into a digital form using the Open Data Kit (ODK) app for data collection which required the interviewers to have access to smartphones, but eased data transcription as filled out forms were imported into an excel sheet directly (ODK 2018). Interviews were conducted exclusively outside and rules to prevent spread of COVID-19 were strictly obeyed. Case numbers in Kenya were followed closely, to shut down the survey as soon as local cases would have been reported. Over the course of ten days (June 26th to July 5th, 2020) a total of 139 questionnaires were collected. During the survey period elderly people were less open for unnecessary contact and generally underrepresented in public spaces, resulting in a lower average age of respondents (28 years), compared to a previous, similar study (37 years, unpublished data).

Uni- and multivariate descriptive statistical analysis focussed on frequency distribution of categorical variables which were most of the data as well as minimum, maximum, mean and standard deviation for metric variables (De Vaus 2002). While most analysis was conducted in Microsoft Excel, some metric variables were explored in R (R Development Core Team 2008).

4 Results

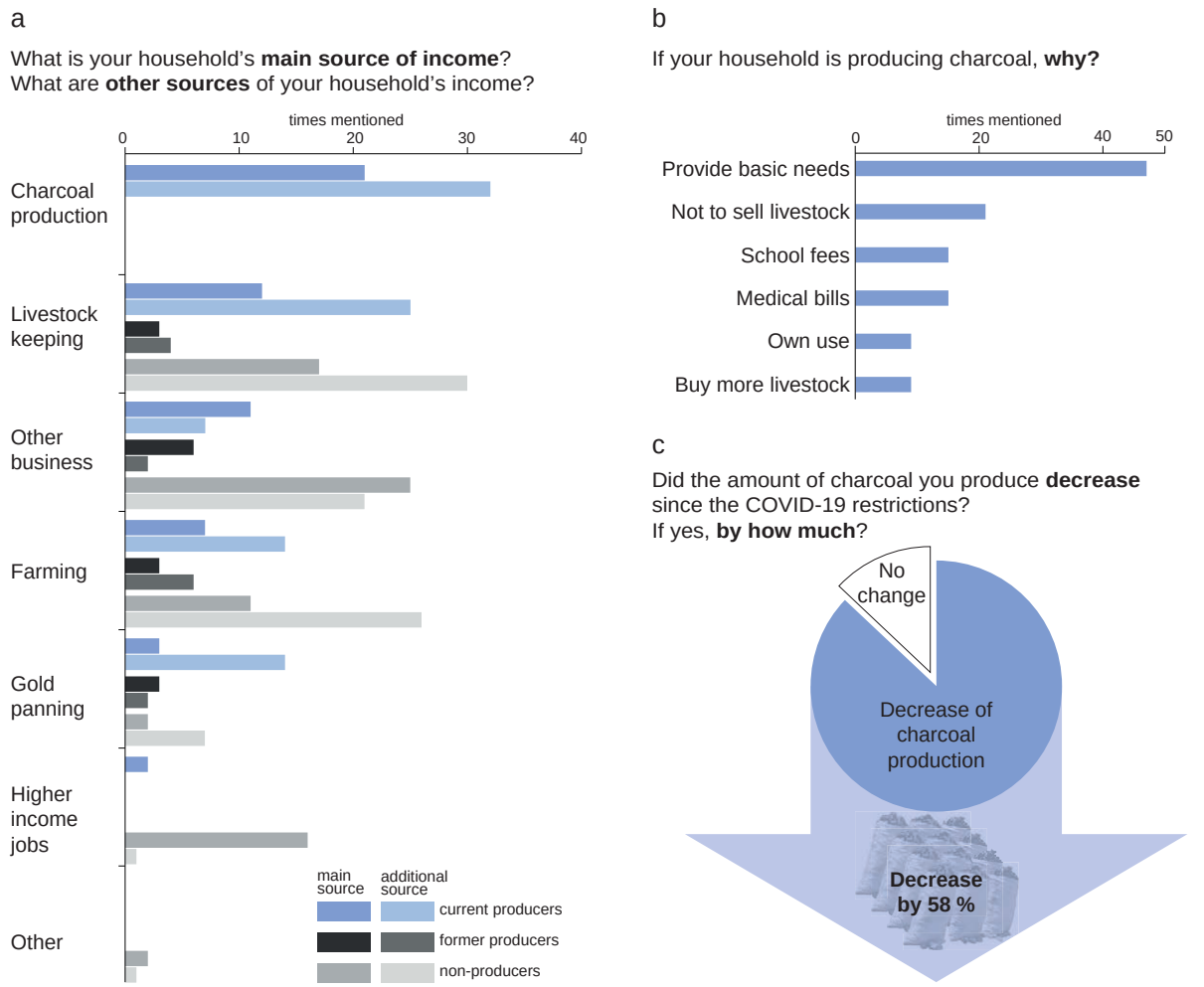
Of the 139 respondents, 54 stated that their households are currently practicing charcoal production (referred to as current (charcoal) producers) while 15 households had produced charcoal at least once in the past (referred to as former (charcoal) producers). Another 70 respondents are grouped together as non-producers, who are members of the general population and distinguish themselves from current and former producers in that they have never been engaged in charcoal production. Respondents' households usually have diversified livelihood portfolio, depending on more than one income source. Most common are traditional occupations such as livestock keeping (91), farming (67) and, gold panning (31) but many respondents also rely on other businesses (72). These include trading or selling of vegetables, fruits or food at roadsides or markets but also running a shop or restaurant as well as wage labour such as construction or cleaning (Fig. 3a). Only 19 households are involved in occupations that generate higher incomes, such as teachers or police officers, with two of them producing charcoal, too.

Almost all respondents from charcoal producing households (47 of 54 households) stated they need the income to provide basic needs for their family

such as food and clothing. Since livestock is considered an important source of respect and a safeguard it is sold only reluctantly, thus "not to sell livestock" in times when money is needed is a common reason to produce charcoal (21/54). It is also used to pay irregular or unexpected expenses related to education or health care (15/54). Though most people in Pokot Central rely on firewood for cooking (KNBS 2019b), some respondents produced charcoal also for their own use (9 of 54 households). The acquisition of more livestock (9/54) is a common reason for generating money via charcoal production (Fig. 3b).

Of the 54 charcoal producers 87 % stated that they produced less charcoal per month since COVID-19 restrictions were enforced, most of whom mentioned decrease or absence of customers who buy in bulk, or demand as main reasons of the reduction (42 of 47 households). But also fear of working in a team or to contract COVID-19 through the smoke were used to explain the decrease by one respondent, each. The reductions were considerable with an average decrease of 58 % causing severe consequences for producers (Fig. 3c). For 74 % of producers this led to problems feeding their families and 43 % stated they were forced to sell livestock. However, five respondents also mentioned that their health improved without the hard work and smoke from charcoal production.

Only 9 of the 47 charcoal producers who had reduced charcoal production because of COVID-19 restrictions were able to compensate their losses by picking up a new occupation (2) or by intensifying



Data and draft: M. Petersen; street survey 2020; n=139; a&b: multiple answers possible

Fig. 3: Grouped by current (blue), former (dark grey) charcoal producers and non-producers (light grey): Livelihood distribution of interviewed households (a). Main (dark) and additional (light) sources of income; Reasons for households to produce charcoal (b); Changes in charcoal produced by interviewed households since enforcement of national COVID-19 restrictions in Kenya and average decrease (c).

an old one (7), especially livestock keeping and gold panning. On average these 9 people were able to compensate for 75 % of their losses.

Respondents from charcoal producing households ranked the current situation against other recent events which had an impact on charcoal production. COVID-19 restrictions were identified as the most impactful followed by the government ban in 2018. Of those 15 who stated they had previously produced charcoal but then stopped, only 2 listed the COVID-19 restrictions as the cause to stop producing charcoal. More relevant were health reasons (5) and the charcoal ban in 2018 (4) but also the uptake of an alternative income source or reaching a certain amount of savings needed for investments (2).

Respondents were asked to rank their concerns on a scale from 0 (not at all) to 10 (very strong) of how COVID-19 restrictions would affect them in general, socially, and financially. While general worry is similarly distributed around a mean of 5.6 and 5.7 (Fig. 4a) for producers and non-producers respectively, non-producers fear effects on their social life more strongly than producers (Fig. 4b). Financial effects, however, worry producers more (5.7) than non-producers (4.9, Fig. 4c).

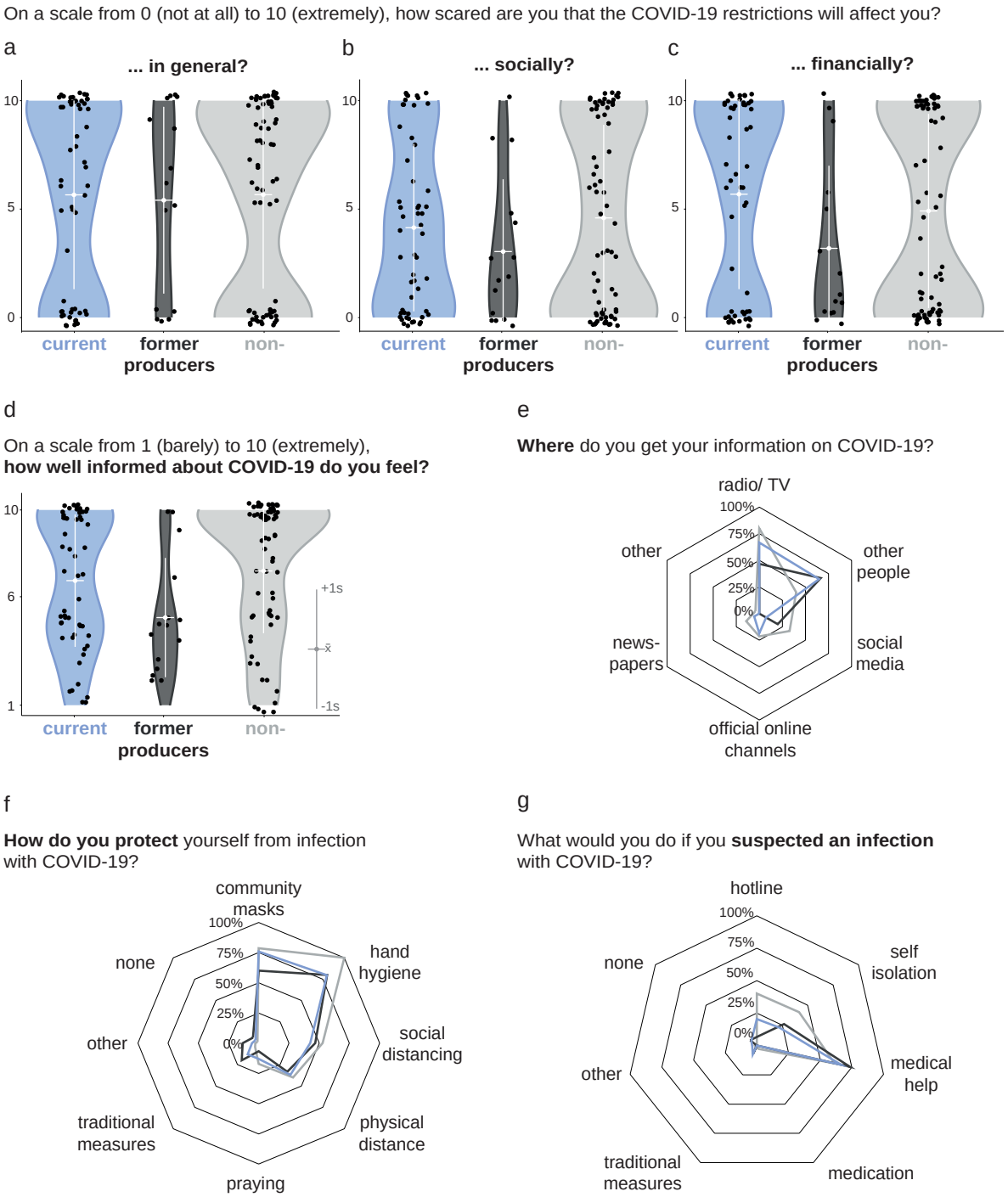
This is also represented by effects of COVID-19 restrictions on the respondent's lives. While the greatest concern for current charcoal producers is the increase in food prices (mentioned by 42 % of current producers and 18 % of non-producers), travel restrictions are the highest concern for non-producers (31 % of non-producers and only 11 % of current producers). Non-producers are also more worried about the interruption of education (31 %) than producers (17 %). Other prominent effects include limited supply of goods (38 %) and reduced income (31 %). While seven people stated that the situation also negatively affected their psychological wellbeing, eight mentioned that despite everything, they now have more time to spend with their families. Of note is the general bimodal distribution of responses as it is much more likely for individuals to be either very concerned or not concerned at all.

While the majority of respondents are concerned about infection with COVID-19 for themselves or their relatives, 22 interviewees stated not to be scared of the disease at all, the remaining 84 % are slightly more concerned about their friends and relatives (8.8, on a scale from 1-10; 10= very strong) than about themselves (8.6).

The survey also generated information on how well-informed respondents feel about COVID-19 and where their information was sourced from. All 139 respondents knew about the disease in general. They were asked to rank on a scale from one to ten how well informed they felt. One representing the lowest perceived level of information and ten the highest possible (Fig. 4d). Most respondents felt reasonably well informed (6.9) with the non-producers most confident in their knowledge about the pandemic (7.5). Current charcoal producers are slightly less confident on average (6.8) but are characterised by a more scattered distribution. The source of information on COVID-19 is likely to be a cross-correlated with respondents' literacy and poverty rates. While 80 % of non-producing respondents source their information (also) via radio and/ or TV, 67 % of producers use this source of information. However, 65 % of charcoal producers (also) rely on second-hand information they get from other people while only 40 % of non-producers take this kind of information into consideration (Fig. 4e). Official online channels by the Kenyan government or WHO are accessed similarly often by producers and non-producers (19 % and 21 % respectively) while non-producers are more likely to also rely on unofficial and potentially misleading sources from social media (33 %, as opposed to 7 % of producers) (Fig. 4e). Newspapers are not easily accessible in the study area, especially when transportation is limited, thus only a small portion of people is retrieving information from this source (6 % of producers and 14 % of non-producers).

To avoid infection, most people (110) practice a combination of several measures to avoid infection, most commonly, wearing a mask in public (105), washing hands regularly (91), social distancing (67) and distance to other people (53). Both groups would also turn to praying though only one male charcoal producer relies solely on this. Traditional measures were taken by 13 respondents (seven current, three former producers and three non-producers, Fig. 4f). Those would include slaughtering a black male goat and burying it at the Pokot border, so the infection could not pass as well as tying pieces of animal skin around one's neck and wrists or drinking goat's blood mixed with other traditional medicine.

When suspecting infection, most respondents would seek medical help (producers: 67 %; non-producers: 61 %). The recommended procedure, to call a national hotline and follow their instruction was mentioned by 20 % of charcoal producers and 40 % of non-producers. Similarly, less producers (22 %) than non-producers (40 %) would practice self-isolation (Fig. 4g). Other measures include informing their neighbours or, as mentioned by two respondents, even committing suicide.



Data and draft: M. Petersen; street survey 2020; n=139; e-g: multiple answers possible

Fig. 4: Grouped by current (blue), former (dark grey) charcoal producers and non-producers (light grey): Distribution of respondents' worry (on a scale form 0 (not at all) to 10(extremely)) to be affected by Kenyan COVID-19 related restrictions in general (a), socially (b) and financially (c). Respondents' perceived level of information (d, on a scale from 1 (barely) to 10(extremely well)) and their respective sources of information (e). Measures taken by respondents to prevent infection with COVID-19 (f) and if suspected infection with COVID-19 (g).

Trust in the government to handle the pandemic appropriately is at a medium level, around six, though the distribution of respondents reveals that non-producers have a more ambiguous view than charcoal producers who have a higher frequency of medium or strong trust in the government to handle the COVID-19 situation (Fig. 5a). Even though charcoal producers face more severe financial consequences, they rated the current restrictions to be adequate or rather too loose, while non-producers are almost equally divided between adequate, too loose, or too strict (Fig. 5b).

5 Discussion

The present study employs an SLF to assess the ability of charcoal producers to cope with a short-term shock such as the COVID-19 pandemic. Based on the 50 % of respondents in the study area whose households relied on charcoal production as an income source at least once, this livelihood plays an important role in Pokot Central. For a different Kenyan charcoal producing area in Kitui County, Kiruki et al. (2017) even report a higher percentage of 66 % of local households to be involved in this activity. Evidently, charcoal plays an important role in rural livelihood diversification throughout SSA (Schure et al. 2014; Zulu and Richardson 2013) though its significance varies depending on the specific situation of producers and production areas (Jones et al. 2016). For most households, charcoal is crucial to provide basic needs. It is thus playing a significant role in providing food security to households. It is also essential in transferring natural (wood) into human capital, as it is used to pay for education and health related costs. By producing it for their own use, some households further increase their food security as they gain access to an energy source independent from availability of dry firewood (the primary cooking fuel in the study area). By investing charcoal income into increasing livestock herds or avoiding sales of animals, households transfer communally owned natural into privately owned capital. The sustainable management of communally owned resources is a widely discussed issue (Ostrom et al. 1999; Andersson and Agrawal 2011). Wairore et al. (2015) report that land enclosures in West Pokot County can have both, beneficial as well as negative effects on the land and community but since land demarcation in West Pokot County is an ongoing process (WPC Government 2018) most residents of the study area continue to depend on the commons. In the absence of title deeds, livestock is the main way to accumulate financial capital. It serves as a form of savings account for people how have no access to official financial services while at the same time it has the potential to provide milk and meat (Behnke

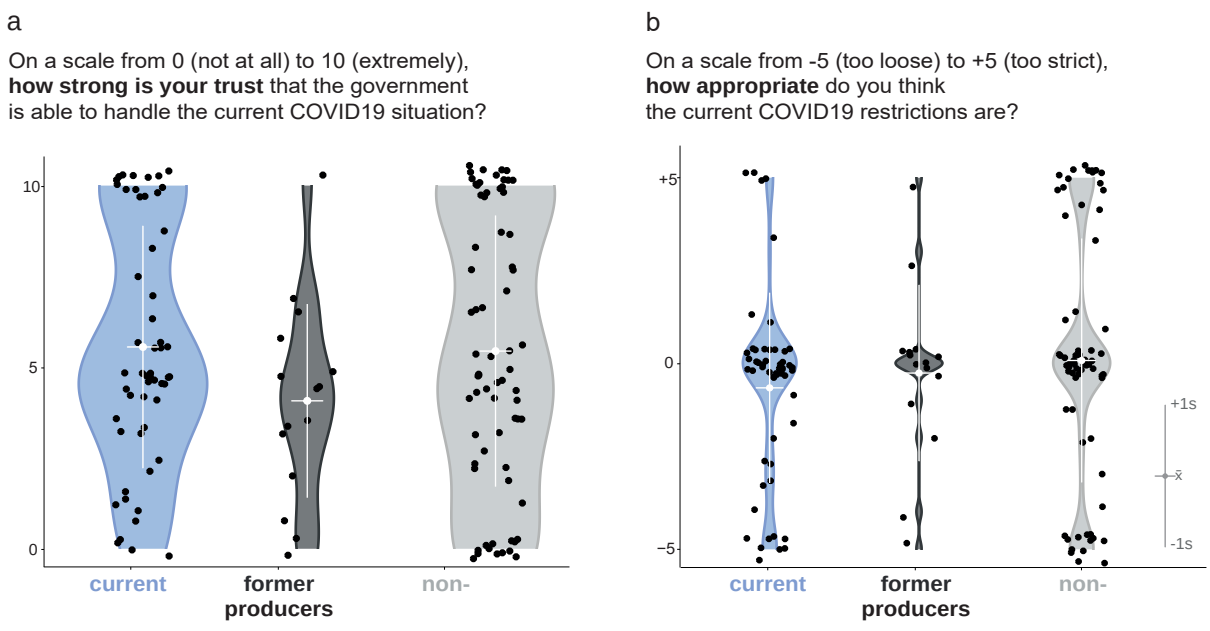


Fig. 5: Grouped by of current (blue), former (dark grey) charcoal producers and non-producers (light grey): Respondents' trust in the government to handle the current COVID-19 situation (a) and the perceived appropriateness of current COVID-19 related restrictions (b)

and Muthami 2011; Dovie et al. 2006). Since the income is essential in food provisioning, losses from charcoal production due to restricted market access have severe consequences for charcoal producing households. For them, COVID-19 related restrictions result in financial worries and food insecurity more often than for non-producing households. This indicates an elevated vulnerability towards such short-term shocks and the limited suitability of this livelihood as a coping strategy.

However, it can be argued that by including charcoal production into their livelihood portfolio, producers were able to increase other household assets, especially livestock, before pandemic-related shocks. Under these specific circumstances some were thus able to mitigate their losses by selling animals. The group of former charcoal producers within this study is too small to make reliable assumptions. However, their motivations to abandon this source of income, support other studies which indicate that some households are able to derive from it the capital needed for financial advancement or further livelihood diversification (Ndegwa et al. 2016). Though discussions remain, weather charcoal production is a "poverty trap" or a sustainable livelihood, it becomes clear that this occupation holds the potential to improve households' financial situation and wellbeing and thus reduce their vulnerability (Ainembabazi et al. 2013; Schure et al. 2014). It has further been identified as a reliable strategy to cope with other short-term shocks, such as animal or crop pests, theft, and violent conflict (Brobbey et al. 2019; Kiruki et al. 2020; Zulu and Richardson 2013). Their potential to adapt to long-term trends such as bush encroachment into former grazing areas and changing rainfall patterns was also discussed. (Gardner et al. 2016; Mwangi and Swallow 2005; Reed et al. 2007). However, the current situation shows that its suitability as a "safety net" in case of shocks is limited, depending on the nature of shock and is not given in case of an event that affects market access. Though no studies exist for the specific situation of charcoal producers during the Western African Ebola virus epidemic, Maconachie and Hilson (2018) researched the resilience of artisanal diamond miners in Sierra Leone, a group of people that is also often described as marginalized and whose income from mining was negatively influenced by Ebola related restrictions. Their diversified livelihood portfolio allowed them to switch between mining, farming, and other income sources to compensate their losses, a strategy that can also be observed among Pokot Central's charcoal producers.

An important lesson drawn from the present study is, that short-term shocks mostly affecting charcoal producers are related to policy interventions. While the pandemic itself affected only some producers who were afraid to get sick during the production process, limitations in the charcoal sector are directly linked to travel restrictions. As other important events, producers named government regulations of charcoal production while environmental shocks such as the 2019 floods and the 2020 locust invasion were ranked as unimportant to them. This shows the power of transforming structures and institutions and implies that policy makers can directly influence the severity of consequences for this group. It further emphasises the need to consider charcoal producers in the decision-making process. This is currently hindered by the informality and illegality of the sector, which generally increases the vulnerability of groups towards shocks as a study on small-scale gold and gemstone miners in Ghana and Kenya during the pandemic shows. They were also negatively affected by restrictions and were unable to access financial loans due to the informality of their work (Muthuri et al. 2021).

The bimodal distribution of general, financial, and social worries in relation to COVID-19 related restrictions indicates that while some households appear well prepared for such crisis many others are confronted with existential threats to their material and nonmaterial wellbeing. This hints at an unequal distribution of household assets among the community but would need further investigation to fully comprehend. While producers worry for their basic needs, non-producers are more concerned about social consequences and interruption of education. A recent study investigating short-term economic effects of the pandemic on rural livelihoods, not engaged in charcoal production, found that most households are able to spend the same amount of money on food provisioning as they did before the pandemic, decreasing expenditures for education, travels, and social support, instead (Janssens et al. 2021).

The weaker concern about the interruption of education is a further indication that producing households face more existential threats during the pandemic and worry first about food security before human capital. It is also in accordance with their lower level of education as compared to non-producers (Alfaro and Jones 2018; Mulenga et al. 2017). Charcoal revenues are often used to invest in school education and can thus increase a household's human capital. This might be one reason for the steady increase in school attendance of children over

the past years (WPC Government 2018). However, children from charcoal producing households are still less likely to attend school which might lead to adverse long-term effects for the next generation. Special support for these children is required to allow them to continue their education despite their families' difficulties to afford school fees or other school related costs.

An increased level of education is not only an important human capital on the household level. The current pandemic shows that certain crises can only be alleviated by collective measures (Elcheroth and Drury 2020). Access to health information is thus an essential requirement in any measures against the spread of infectious disease and should be of high priority. Results on personal response to suspected infection show that, even though perceived levels of information are similarly high for charcoal producers and non-producers, the quality of this information is divergent. Since non-producers have access to information sources with a higher integrity, they can derive more appropriate guidelines for this situation. Charcoal producers who rely more strongly on second-hand information and have less access to official information might risk spreading an infection by not practicing self-isolation. Though social media play a minor role for charcoal producers, its importance as an information source for non-producers further shows that media competency is an important skill that will gain importance in the future and should be treated as an aspect of human capital. While high-income countries also face difficulties in balancing freedom of speech and control of unreliable news, SSA countries are confronted with additional hurdles to reach residents with limited media access including illiteracy and missing infrastructure (Uzuegbu 2016). In addition, (traditional) religious beliefs and low trust in governments can complicate disease control as the history of Ebola outbreaks as well as the HIV/AIDS pandemic show (Blair et al. 2017; Blevins et al. 2019). Results from the present study indicate no such thing, however. Producers and non-producers show similar trust in the government regarding the pandemic and only some exceptions would in addition to conventional measures rely on traditional means to cope with COVID-19. Stigmata related to disease, however, remain a problem across SSA. Reports from Kenya reveal the severe personal consequences people have to face when associated with the novel virus. Those include shunning by families and friends after quarantine but fear from possible consequences also led several patients to committing suicide (Matara 2020; Mboya 2020). Though the present study did not focus on stigma related to COVID-19 the problem is visible within the results as two respondents also voiced their readiness to commit suicide when suspecting infection with COVID-19. These responses and the reported cases are a clear indication of fragmented and false information circulating in many communities. The Western African Ebola virus epidemic and HIV/ AIDS demonstrated how stigmatization can cause people to hide symptoms, not seek medical help, and hinder contact tracing, thus accelerating disease spread and increasing fatality (Peprah and Gyasi 2021; Rankin et al. 2005; Strong and Schwartz 2019). While stigmatization of people living with HIV/AIDS is also rooted in its mode of transmission, the fear from infection plays an important role (Roelen et al. 2020; Skinner and Mfecane 2004).

6 Conclusion

This study found charcoal producing households to be more vulnerable to a short-term shock such as the COVID-19 pandemic, than non-producing households. Thus, the pandemic revealed some of the limitations of charcoal production as a sustainable livelihood. Producers encounter more existential worries when travel restrictions cut off their market access. Though most producing households are facing severe food insecurities due to the decrease in charcoal sales, previous income did allow some of them to transfer communally owned natural capital into livestock which can either have direct nutritional value or can be used to generate an income through sales. This shows that charcoal production has the potential to contribute to a diversified and sustainable livelihood portfolio but only if complemented by other shock-resistant income sources. Results indicate that charcoal producers are particularly affected by policy interventions restricting traveling and charcoal transportation. It is thus upon official decision makers to consider the group of rural, small-scale charcoal producers when reacting to a health crisis or other events to secure their food security and wellbeing. Programs specifically designed for them and other low-income households which offer children free meals in school are necessary to increase the motivation for families to send children (back) to school and can be an essential step in increased food security for the time after COVID-19.

Education should have a high priority as the study further found that information regarding the pandemic is unequally distributed among the community. The producers have fewer human and physical capi-

tal to access health information. As the current crisis demonstrates, limited or false information could result in negative consequences not only for themselves but also for their communities when protective measures in case of (possible) infection are not followed correctly. The need for improved risk communication and distribution of health information is further highlighted by stigmata in context of the novel virus, though this concerns not only charcoal producers in particular. This will require the development of new, low-threshold ways to deliver high-quality health information to remote and marginalized groups in SSA.

The study concludes that a future health crisis could be tackled more effectively and with less secondary damages to livelihoods if lessons drawn from the current pandemic are used to improve public health responses.

Acknowledgements

Research for this paper was generously funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) in the context of the project "Producing Charcoal in the Sub-Saharan Drylands: The Contested Fuelscape of Central Pokot, Kenya" (NU 102/14-1). Special thanks go to our respondents in Pokot Central for their hospitality and participation in the study and to the Marich Pass Field Studies Centre. We also thank two anonymous reviewers for their comments on the manuscript.

References

Ainembabazi, J. H.; Shively, G. and Angelsen, A. (2013): Charcoal production and household welfare in Uganda. In: Environment and Development Economics 18 (5), 537–558. https://www.jstor.org/stable/26379187

Alfaro, J. F. and Jones, B. (2018): Social and environmental impacts of charcoal production in Liberia: Evidence from the field. In: Energy for Sustainable Development 47, 124–132. https://doi.org/10.1016/j.esd.2018.09.004

Andersson K. and Agrawal, A. (2011): Inequalities, institutions, and forest commons. In: Global Environmental Change 21 (3), 866–875. https://doi.org/10.1016/j.gloenvcha.2011.03.004

Ansah, I. G. K.; Gardebroek, C. and Ihle, R. (2019): Resilience and household food security: a review of concepts, methodological approaches and empirical evidence. In: Food Security 11 (6), 1187–1203. https://doi.org/10.1007/s12571-019-00968-1

Arouna, A.; Lokossou, J. C.; Wopereis, M. C. S.; Bruce-Oliver, S. and Roy-Macauley, H. (2017): Contribution of improved rice varieties to poverty reduction and food security in sub-Saharan Africa. In: Food Security Governance in Latin America 14, 54–60. https://doi.org/10.1016/j.gfs.2017.03.001

Asfaw, S.; Scognamillo, A.; Caprera, G. D.; Sitko, N. and Ignaciuk, A. (2019): Heterogeneous impact of livelihood diversification on household welfare: cross-country evidence from Sub-Saharan Africa. In: World Development 117, 278–295. https://doi.org/10.1016/j.worlddev.2019.01.017

Ataguba, J. E. (2020): COVID-19 pandemic, a war to be won: understanding its economic implications for Africa. In: Applied Health Economics and Health Policy (18), 325–328. https://doi.org/10.1007/s40258-020-00580-x

Behnke, R. H. and Muthami, D. (2011): The contribution of livestock to the Kenyan economy. IGAD LPI Working Paper. Nairobi. Internet: https://cgspace.cgiar.org/bitstream/handle/10568/24972/IGAD_LPI_WP_03-11.pdf?se (28.02.2021).

Bergmann, C.; Roden, P. and Nüsser, M. (2019): Contested fuelscapes: producing charcoal in sub-Saharan drylands. In: Area 51 (1), 55–63. https://doi.org/10.1111/area.12394

Blair, R. A.; Morse, B. S. and Tsai, L. L. (2017): Public health and public trust: survey evidence from the Ebola Virus Disease epidemic in Liberia. In: Social Science & Medicine 172, 89–97. https://doi.org/10.1016/j.socscimed.2016.11.016

Blevins, J. B.; Jalloh, M. F. and Robinson, D. A. (2019): Faith and global health practice in Ebola and HIV emergencies. In: American Journal of Public Health 109 (3), 379–384. https://doi.org/10.2105/AJPH.2018.304870

Bonnet, F.; Vanek, J. and Chen, M. (2019): Women and men in the informal economy – a statistical brief. Manchester, UK. https://www.wiego.org/publications/women-and-men-informal-economy-statistical-brief

Bourne, M.; Sola, S.; Njenga, M.; Koech, G.; Kirimi, M.; Ignatius, S. and Otieno, E. (2020): Towards sustainable charcoal production and trade in Baringo County. https://www.cifor.org/knowledge/publication/7719/ (09.09.2020).

Bradburn, N.; Sudman, S. and Wansink, B. (2004): Asking questions: the definitive guide to questionnaire design - For market research, political polls, and social and health questionnaires. San Francisco.

Brobbey, L. K.; Hansen, C. P.; Kyereh, B. and Pouliot, M. (2019): The economic importance of charcoal to rural livelihoods: Evidence from a key charcoal-producing area in Ghana. In: Forest Policy and Economics 101, 19–31. https://doi.org/10.1016/j.forpol.2019.01.013

Chambers, R. and Conway, G. (1992): Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper. Brighton.

Chidumayo, E. N. and Gumbo, D. J. (2013): The environmental impacts of charcoal production in tropical ecosystems of the world: a synthesis. In: Energy for Sustainable Development 17 (2), 86–94. https://doi.org/10.1016/j.esd.2012.07.004

Connolly-Boutin, L. and Smit, B. (2016): Climate change, food security, and livelihoods in sub-Saharan Africa. In: Regional Environmental Change 16 (2), 385–399. https://doi.org/10.1007/s10113-015-0761-x

Dame, J. (2018): Food security and translocal livelihoods in high mountains: evidence from Ladakh, India. In: Mountain Research and Development 38 (4), 310–322. https://doi.org/10.1659/MRD-JOURNAL-D-18-00026.1

De Vaus, D. (2002): Analyzing social science data: 50 key problems in data analysis. London.

Devereux, S. (2016): Social protection for enhanced food security in sub-Saharan Africa. In: Towards a food secure future: Ensuring food security for sustainable human development in Sub-Saharan Africa 60, 52–62. https://doi.org/10.1016/j.foodpol.2015.03.009

Doggart, N.; Morgan-Brown, T.; Lyimo, E.; Mbilinyi, B.; Meshack, C. K.; Sallu, S. M. and Spracklen, D. V. (2020): Agriculture is the main driver of deforestation in Tanzania. In: Environmental Research Letters 15 (3), 034028. https://doi.org/10.1088/1748-9326/ab6b35

Dovie, D. B. K.; Shackleton, C. M. and Witkowski, E. T. F. (2006): Valuation of communal area livestock benefits, rural livelihoods and related policy issues. In: Land Use Policy 23 (3), 260–271. https://doi.org/10.1016/j.landusepol.2004.08.004

Dyer, O. (2020): FGM: nearly 3000 girls are paraded in Kenya as pandemic hinders control efforts. In: British Medical Journal 371. https://doi.org/10.1136/bmj.m4165

Dzanku, F. M. (2019): Food security in rural sub-Saharan Africa: exploring the nexus between gender, geography and off-farm employment. In: World Development 113, 26–43. https://doi.org/10.1016/j.worlddev.2018.08.017

Elcheroth, G. and Drury, J. (2020): Collective resilience in times of crisis: lessons from the literature for socially effective responses to the pandemic. In: British Journal of Social Psychology 59 (3), 703–713. https://doi.org/10.1111/bjso.12403

Ellis, F. (2000): The determinants of rural livelihood diversification in developing countries. In: Journal of Agricultural Economics 51 (2), 289–302. https://doi.org/10.1111/j.1477-9552.2000.tb01229.x

Elston, J. W. T.; Moosa, A. J.; Moses, F.; Walker, G.; Dotta, N.; Waldman, R. J. and Wright, J. (2016): Impact of the Ebola outbreak on health systems and population health in Sierra Leone. In: Journal of Public Health 38 (4), 673–678. https://doi.org/10.1093/pubmed/fdv158

Gardner, C. J.; Gabriel, F. U. L.; St. John, F. A. V. and Davies, Z. G. (2016): Changing livelihoods and protected area management: a case study of charcoal production in south-west Madagascar. In: Oryx 50 (3), 495–505. https://doi.org/10.1017/S0030605315000071

Gebru, G. W.; Ichoku, H. E. and Phil-Eze, P. O. (2018): Determinants of livelihood diversification strategies in Eastern Tigray Region of Ethiopia. In: Agriculture & Food Security 7 (1), 62. https://doi.org/10.1186/s40066-018-0214-0

GeoInformatiks Ltd (2017): West Pokot County Spatial Development Plan (2017-2027). WPC Government. Nairobi.

Giannini, S. (2020): School, health and nutrition: why COVID-19 demands a rethink of education to address gender inequalities. UNESCO News. https://en.unesco.org/news/school-health-and-nutrition-why-covid-19-demands-rethink-education-address-gender-inequalities (11.09.2020).

GoK (Government of the Republic of Kenya) (2020): Address to the Nation by H. E. Uhuru Kenyatta. Latest News. https://www.president.go.ke/2020/03/15/address-to-the-nation-by-h-e-uhuru-kenyatta-c-g-h-president-of-the-republic-of-kenya-and-commander-in-chief-of-the-defence-forces-on-covid-19-commonly-known-as-coronavirus/ (09.09.2020).

de Haan, L. (2012): The livelihood approach: a critical exploration. In: Erdkunde 66 (4), 345–357. https://doi.org/10.3112/erdkunde.2012.04.05

Iiyama, M.; Neufeldt, H.; Njenga, M.; Derero, A.; Ndegwa, G. M.; Mukuralinda, A.; Dobie, P.; Jamnadass, R. and Mowo, J. (2017): Conceptual analysis: the charcoal-agriculture nexus to understand the socio-ecological contexts underlying varied sustainability outcomes in African landscapes. In: Frontiers in Environmental Science 5, 31. https://doi.org/10.3389/fenvs.2017.00031

Janssens, W.; Pradhan, M.; de Groot, R.; Sidze, E.; Donfouet, H. P. P. and Abajobir, A. (2021): The short-term economic effects of COVID-19 on low-income households in rural Kenya: an analysis using weekly financial household data. In: World Development 138, 105280. https://doi.org/10.1016/j.worlddev.2020.105280

Jones, D.; Ryan, C. M. and Fisher, J. (2016): Charcoal as a diversification strategy: the flexible role of charcoal production in the livelihoods of smallholders in Central Mozambique. In: Energy for Sustainable Development 32, 14–21. https://doi.org/10.1016/j.esd.2016.02.009

Kagombe, J.; Kiprop, J.; Langat, D.; Cheboiwo, J.; Weseka, L.; Ongugo, P.; Mbuvi, M. T. and Leley, N. (2020): Socio-economic impact of forest harvesting moratorium in Kenya. Nairobi.

Kambewa, P. S.; Mataya, B. F.; Sichinga, W. K. and Johnson, T. R. (2007): Charcoal - the reality: a study of charcoal consumption, trade, and production in Malawi. Small and Medium Forest Enterprise, Report 21. IIED. London.

Kansiime, M. K.; Tambo, J. A.; Mugambi, I.; Bundi, M.; Kara, A. and Owuor; C. (2020): COVID-19 implications on household income and food security in Kenya and Uganda: findings from a rapid assessment. In: World Development: 105199. https://doi.org/10.1016/j.worlddev.2020.105199

Kipsang, W. and Kakai, O. (2019): West Pokot landslides: fallen bridges hamper relief efforts. Nation, 27.11.2019. https://nation.africa/kenya/counties/west-pokot/west-pokot-landslides-fallen-bridges-hamper-relief-efforts-227018 (09.09.2020).

Kiruki, H. M.; van der Zanden, E. H.; Kariuki, P. and Verburg, P. H. (2020): The contribution of charcoal production to rural livelihoods in a semi-arid area in Kenya. In: Environment, Development and Sustainability. https://doi.org/10.1007/s10668-019-00521-2

Kiruki, H. M.; van der Zanden, E. H.; Malek, Z. and Verburg, P. H. (2017): Land cover change and woodland degradation in a charcoal producing semi-arid area in Kenya. In: Land Degradation & Development 28 (2), 472–481. https://doi.org/10.1002/ldr.2545

KNBS (Kenya National Bureau of Statistics) (2019a): The 2019 Kenya population and housing census - volume II: Distribution of population by administrative unit. Government of Kenya. Nairobi.

– The 2019 Kenya population and housing census - volume IV: Distribution of population by socio-economic characteristics. Government of Kenya. Nairobi.

Lenaiyasa, M. L.; Bruyere, B. L.; Salerno, J. and Pickering, T. (2020): Pastoralists' use of income diversification as a strategy for adapting to social-ecological change in Samburu, Kenya. In: Regional Environmental Change 20 (1), 21. https://doi.org/10.1007/s10113-020-01612-x

Liao, C.; Agrawal, A.; Clark, P. E.; Levin, S. A. and Rubenstein, D. I. (2020): Landscape sustainability science in the drylands: mobility, rangelands and livelihoods. In: Landscape Ecology. https://doi.org/10.1007/s10980-020-01068-8.

Maconachie, R. and Hilson, G. (2018): 'The war whose bullets you don't see': diamond digging, resilience and Ebola in Sierra Leone. In: Journal of Rural Studies 61, 110–122. https://doi.org/10.1016/j.jrurstud.2018.03.009

Maichuhie, K. (2020): West Pokot records dramatic rise in FGM cases. Nation, 11.06.2020. https://nation.africa/kenya/gender/west-pokot-records-dramatic-rise-in-fgm-cases--653240 (11.09.2020).

Masanjala, W. (2007): The poverty-HIV/AIDS nexus in Africa: a livelihood approach. In: HIV/AIDS, gender, agency and empowerment issues in Africa 64 (5), 1032–1041. https://doi.org/10.1016/j.socscimed.2006.10.009

Matara, E. (2020): Nakuru man dies by suicide while awaiting Covid-19 test result. Nation, 25.07.2020. https://nation.africa/kenya/counties/nakuru/nakuru-man-dies-by-suicide-while-awaiting-covid-19-test-result-1906170 (17.09.2020).

Mattissek, A.; Pfaffenbach, C. and Reuber, P. (2013): Methoden der empirischen Humangeographie. Braunschweig.

Mboya, J. (2020): The high cost of Covid-19 stigma on women. Nation, 21.08.2020. https://nation.africa/kenya/life-and-style/saturday-magazine/the-high-cost-of-covid-19-stigma-on-women-1923040 (03.09.2020).

McCabe, J. T.; Leslie, P. W. and DeLuca, L. (2010): Adopting cultivation to remain pastoralists: the diversification of Maasai livelihoods in Northern Tanzania. In: Human Ecology 38 (3); 321–334. https://doi.org/10.1007/s10745-010-9312-8

Ministry of Health (2020a): Update of Coronavirus in the country and response measures on April 7th, 2020. Press Release. Government of Kenya. Nairobi. https://www.health.go.ke/wp-content/uploads/2020/04/FINAL-UPDATE-7TH-APRIL-2020.pdf (09.09.2020).

– (2020b): Update on novel Coronavirus on March 30th 2020. Press Release. Government of Kenya. Nairobi. https://www.health.go.ke/wp-content/uploads/2020/03/covid-19-30th.pdf.pdf

Mulenga, B. P.; Hadunka, P. and Richardson, R. B. (2017): Rural households' participation in charcoal production in Zambia: does agricultural productivity play a role? In: Journal of Forest Economics 26, 56–62. https://doi.org/10.1016/j.jfe.2017.01.001

Muthuri, J. N.; Jain, A.; Ndegwa, A. A. O.; Mwagandi, S. M. and Tagoe, N. D. (2021): The impact of Covid-19 on gold and gemstone artisanal and small-scale mining in sub-Saharan Africa: the case of Ghana and Kenya. In: Africa Journal of Management, 1–27. https://doi.org/10.1080/23322373.2021.1878808

Mwampamba, T. H.; Ghilardi, A.; Sander, K. and Chaix, K. J. (2013): Dispelling common misconceptions to improve attitudes and policy outlook on charcoal in developing countries. In: Energy for Sustainable Development 17 (2), 75–85. https://doi.org/10.1016/j.esd.2013.01.001

Mwangi, E. and Swallow, B. (2005): Invasion of Prosopis juliflora and local livelihoods: case study from the Lake Baringo area of Kenya. Nairobi. http://apps.worldagroforestry.org/downloads/Publications/PDFS/wp-03mwangi.pdf

Ndegwa, G.; Anhuf, D.; Nehren, U.; Ghilardi, A. and Iiyama, M. (2016): Charcoal contribution to wealth accumulation at different scales of production among the rural population of Mutomo District in Kenya. In: Energy for Sustainable Development 33, 167–175. https://doi.org/10.1016/j.esd.2016.05.002

Neufeldt, H.; Langford, K.; Fuller, J.; Iiyama, M. and Dobie, P. (2015): From transition fuel to viable energy source: improving sustainability in the sub-Saharan charcoal sector. ICRAF Working Paper No 196. World Agroforestry Centre. Nairobi. https://www.worldagroforestry.org/publication/transition-fuel-viable-energy-source-improving-sustainability-sub-saharan-charcoal (21.06.2021).

Njenga, M. (2018): Banning charcoal isn't the way to go. Kenya should make it sustainable. The Conversation, 16.05.2018. http://theconversation.com/banning-charcoal-isnt-the-way-to-go-kenya-should-make-it-sustainable-95610 (09.09.2020).

Nuwagira, E. and Muzoora, C. (2020): Is Sub-Saharan Africa prepared for COVID-19? In: Tropical Medicine and Health 48 (1), 18. https://doi.org/10.1186/s41182-020-00206-x

ODK (2018): Open Data Kit. ODK. https://getodk.org/ (09.09.2020).

Okoi, O. and Bwawa, T. (2020): How health inequality affect responses to the COVID-19 pandemic in Sub-Saharan Africa. In: World Development 135, 105067. https://doi.org/10.1016/j.worlddev.2020.105067

Ostrom E.; Burger, J.; Field, C. B.; Norgaard, R. B. and Policansky, D. (1999): Revisiting the commons: local lessons, global challenges. In: Science 284 (5412), 278–282. https://doi.org/10.1126/science.284.5412.278

Peprah, P. and Gyasi, R. M. (2021): Stigma and COVID-19 crisis: a wake-up call. In: The International journal of health planning and management 36 (1), 215–218. https://doi.org/10.1002/hpm.3065

Petersen, M.; Bergmann, C.; Roden, P. and Nüsser, M. (2021): Contextualizing land-use and land-cover change with local knowledge: a case study from Pokot Central, Kenya. In: Land Degradation and Development 32 (10), 2992-3007. https://doi.org/10.1002/ldr.3961

Peth, S. A. and Sakdapolrak, P. (2020): Resilient family meshwork. Thai–German migrations, translocal ties, and their impact on social resilience. In: Geoforum 114, 19–29. https://doi.org/10.1016/j.geoforum.2020.05.019

R Development Core Team (2008): R: A language and environment for statistical computing. http://www.R-project.org (21.06.2021).

Rankin, W. W.; Brennan, S.; Schell, E.; Laviwa, J. and Rankin, S. H. (2005): The stigma of being HIV-positive in Africa. In: PLOS Medicine 2 (8); e247. https://doi.org/10.1371/journal.pmed.0020247

Reed, M. S.; Dougill, A. J. and Taylor, M. J. (2007): Integrating local and scientific knowledge for adaptation to land degradation: Kalahari rangeland management options. In: Land Degradation & Development 18 (3), 249–268. https://doi.org/10.1002/ldr.777

Roden, P.; Bergmann, C.; Ulrich, A. and Nüsser, M. (2016): Tracing divergent livelihood pathways in the drylands: a perspective on two spatially proximate locations in Laikipia County, Kenya. In: Journal of Arid Environments 124, 239–248. https://doi.org/10.1016/j.jaridenv.2015.08.004

Roelen, K.; Ackley, C.; Boyce, P.; Farina, N. and Ripoll, S. (2020): COVID-19 in LMICs: the need to place stigma front and centre to its response. In: The European Journal of Development Research 32 (5), 1592–1612. https://doi.org/10.1057/s41287-020-00316-6

Sakdapolrak, P. (2014): Livelihoods as social practices - re-energising livelihoods research with Bourdieu's theory of practice. In: Geographica Helvetica 69 (1), 19–28. https://doi.org/10.5194/gh-69-19-2014

Salih, A. A. M.; Baraibar, M.; Mwangi, K. K. and Artan, G. (2020): Climate change and locust outbreak in East Africa. In: Nature Climate Change 10 (7), 584–585. https://doi.org/10.1038/s41558-020-0835-8

Schure, J.; Levang, P. and Wiersum, K. F. (2014): Producing woodfuel for urban centers in the Democratic Republic of Congo: a path out of poverty for rural households? In: Forests, Livelihoods, and Conservation 64; 80–90. https://doi.org/10.1016/j.worlddev.2014.03.013

Scoones, I. (1998): Sustainable rural livelihoods: a framework for analysis. IDS Working Paper 72. Institute of Development Studies. Brighton.

Sharaunga, S. and Mudhara, M. (2021): Analysis of livelihood strategies for reducing poverty among rural women's households: a case study of KwaZulu-Natal, South Africa. In: Journal of International Development 33 (1); 127–150. https://doi.org/10.1002/jid.3516

Skinner, D. and Mfecane, M. (2004): Stigma, discrimination and the implications for people living with HIV/AIDS in South Africa. In: SAHARA-J: Journal of Social Aspects of HIV/AIDS 1 (3), 157–164. https://doi.org/10.1080/17290376.2004.9724838

Smith, H. E.; Hudson, M. D. and Schreckenberg, K. (2017): Livelihood diversification: the role of charcoal production in southern Malawi. In: Energy for Sustainable Development 36, 22–36. https://doi.org/10.1016/j.esd.2016.10.001

Sochas, L.; Channon, A. A. and Nam, S. (2017): Counting indirect crisis-related deaths in the context of a low-resilience health system: the case of maternal and neonatal health during the Ebola epidemic in Sierra Leone. In: Health Policy and Planning 32 (3), iii32–iii39. https://doi.org/10.1093/heapol/czx108

Steinbrink, M. and Niedenführ, H. (2020): Translocal livelihoods: new perspectives in livelihood research. In: Steinbrink, M. and Niedenführ, H. (eds.) (2020): Africa on the move: migration, translocal livelihoods and rural development in Sub-Saharan Africa. Cham, 35–52. https://doi.org/10.1007/978-3-030-22841-5_3

Strong, A. E. and Schwartz, D. A. (2019): Effects of the West African Ebola epidemic on health care of pregnant women: stigmatization with and without infection. In: Schwartz, D. A.; Anoko, J. N. and Abramowitz, S. A. (eds.) (2019): Pregnant in the time of Ebola: women and their children in the 2013-2015 West African Epidemic. Cham, 11–30.

Ulrich, A. (2014): Export-oriented horticultural production in Laikipia, Kenya: assessing the implications for rural livelihoods. In: Sustainability 6 (1), 336–347. https://doi.org/10.3390/su6010336

Ulrich, A.; Ifejika Speranza, C.; Roden, P.; Kiteme, B.; Wiesmann, U. and Nüsser, M. (2012): Small-scale farming in semi-arid areas: livelihood dynamics between 1997 and 2010 in Laikipia, Kenya. In: Journal of Rural Studies 28 (3), 241–251. https://doi.org/10.1016/j.jrurstud.2012.02.003

UNFPA (United Nations Population Fund); Avenir Health; Johns Hopkins University and Victoria University (2020): Impact of the COVID-19 pandemic on family planning and ending gender-based violence, female genital mutilation and child marriage. Interim Technical Note. New York. https://www.unfpa.org/resources/impact-covid-19-pandemic-family-planning-and-ending-gender-based-violence-female-genital (21.06.2021).

United Nations (2020): UN working to avert dual crises as COVID-19 hits hunger hotspots. United Nations COVID-19 Response. https://www.un.org/en/un-coronavirus-communications-team/un-working-avert-dual-crises-covid-19-hits-hunger-hotspots (11.09.2020).

Uzuegbu, C. P. (2016): Effective information service delivery to rural dwellers in Sub-Saharan Africa: whose job? In: IFLA Journal 42 (1), 49–58. https://doi.org/10.1177/0340035215608860

Vehovar, V. and Toepoel, V. (2016): Non-probability sampling. In: Christof W.; Joye, D.; Smith, T. W. and Fu, Y.-C. (eds.) (2016): The SAGE Handbook of Survey Methodology. London.

Wainwright, C. M.; Finney, D. L.; Kilavi, M.; Black, E. and Marsham, J. H. (2020): Extreme rainfall in East Africa, October 2019–January 2020 and context under future climate change. In: Weather 76, 26–31. https://doi.org/10.1002/wea.3824

Wairore J. N.; Mureithi, S. M.; Wasonga, O. V. and Nyberg, G. (2015): Enclosing the commons: reasons for the adoption and adaptation of enclosures in the arid and semi-arid rangelands of Chepareria, Kenya. In: SpringerPlus 4 (1), 595. https://doi.org/10.1186/s40064-015-1390-z

Walker, P. G. T.; White, M. T.; Griffin, J. T.; Reynolds, A.; Ferguson, N. M. and Ghani, A. C. (2015): Malaria morbidity and mortality in Ebola-affected countries caused by decreased health-care capacity, and the potential effect of mitigation strategies: a modelling analysis. In: The Lancet Infectious Diseases 15 (7), 825–832. https://doi.org/10.1016/S1473-3099(15)70124-6

WHO (2020a): WHO Director-General's opening remarks at the media briefing on COVID-19. World Health Organization. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020 (07.09.2020).

– (2020b): Global tuberculosis report 2020. World Health Organization: Geneva. https://apps.who.int/iris/bitstream/handle/10665/336069/9789240013131-eng.pdf (09.02.2021).

WPC Government (2018): County integrated development plan for West Pokot County (2018–2022). WPC Government. Kapenguria.

Zulu, L. C. and Richardson, R. B. (2013): Charcoal, livelihoods, and poverty reduction: evidence from sub-Saharan Africa. In: Energy for Sustainable Development 17 (2), 127–137. https://doi.org/10.1016/j.esd.2012.07.007

Authors

Maike Petersen (Corresponding author):
Prof. Dr. Marcus Nüsser:
SAI, Department of Geography
Heidelberg University
Voßstr. 2, Building 4130
69115 Heidelberg,
Germany
maike.petersen@uni-heidelberg.de
marcus.nuesser@uni-heidelberg.de

Chebet N. Kamurio
Without affiliation
Kapenguria, Kenya
nancychebetm2017@gmail.com

Chepkemoi D. Kortom
Without affiliation
Kapenguria, Kenya
chepkemoidinah@gmail.com