

‘UNWASTING’ WASTE: VALORISATION OF COCOA POD HUSKS FOR BLACK SOAP PRODUCTION

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With 3 figures and 1 table

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Summary: This article examines how agricultural waste - in the form of cocoa pod husks (CPHs) - can be valorised through integration into alternative production networks. Drawing on the case of CPH-based black soap production in Ghana, we use the Global Production Network (GPN) approach to analyse how local value creation and enhancement of agricultural waste is affected by underlying production network structures. We argue that the transformation of CPHs into soap represents both a spatial and structural shift: although CPHs originate within the global cocoa-chocolate production network, their revaluation unfolds in a distinct, small-scale, locally embedded production network. This overlap creates frictions that constrain value capture, particularly for small-scale producers. Based on qualitative interviews, we show how actors’ embeddedness - societal, territorial, and network embeddedness - mediates upgrading opportunities. While cosmetic companies benefit from greater network embeddedness and capital, small-scale producers face regulatory barriers, information asymmetries, and limited collective organisation. Although cocoa farmer cooperatives represent important agents of collective power, existing support schemes often fail to align these structures with the specific requirements and dynamics of black soap production networks. By integrating literature on agricultural by-products, waste, and upgrading into GPN analysis, the article contributes to a deeper understanding of value creation beyond conventional production networks and calls for more inclusive and network-sensitive development strategies.

Keywords: Black soap, cocoa, Ghana, global production networks, waste valorisation, upgrading

Introduction

Agricultural production generates large quantities of by-products and waste with much of the latter being discarded, thereby contributing to environmental pollution and neglecting their economic potential (TORRES-LEÓN et al. 2018). Farmers are increasingly challenged with proper waste management, therefore, handling the problem through valorisation and upgrading of agricultural by-products and waste becomes more economically attractive, since it has the additional advantage of generating new income and employment possibilities (TORRES-LEÓN et al. 2018).

In economic geography, prominent theories concerned with globalised trade structures like the global production network (GPN)¹⁾ approach tend to neglect waste arising during different production steps. Analyses are centred around the main product or commodity and trace their movements to final consumption or usage - but “all global pro-

duction networks [...] are processes of material transformation turning natural resources into commodities and waste by-products” (COE 2021: 58). Various authors have offered criticism of this approach and developed alternative frameworks: The Global Destruction Networks (e.g., HEROD et al. 2014) and Global Recycling Networks (e.g., CRANG et al. 2013) approaches. Consequently, a body of literature has emerged, addressing the topics of waste and recycling. Studies of secondary materials such as electronic waste (e.g., LEPAWSKY & BILLAH 2011, WONG 2022) and plastic waste (e.g., SCHLITZ 2020, KENZHEGALIYEVA & LUND 2024), have received considerable attention. While some recent studies have begun to address agricultural waste and by-products in global value chain contexts (e.g., KLEIN et al. 2021), these aspects have remained largely overlooked in the global cocoa-chocolate production network and in GPN research more broadly.

This paper addresses this gap by applying a GPN perspective to the handling of agricultural by-products and waste. Thus, the following research question guides the analysis: *How is local value creation and enhancement from agricultural waste affected by underlying production network structures?* We aim to highlight

¹⁾ In this paper we use the acronym ‘GPN’ to refer to the GPN approach, and ‘global production networks’ to refer to the empirical phenomenon (see COE & YEUNG 2019).



how a main, usually disposed by-product in agriculture, can be used for further value creation and enhancement.

To do so we will use the case of cocoa pod husk (CPH), which is left over in large quantities during cocoa production. We will focus on CPH in Ghana as an example country, the second-largest cocoa bean-producing country globally (ICCO 2023). Specifically, the focus is on the production of soap from CPH-based potash, called ‘alata samina’ or ‘ose dúdú’. This black soap is historically embedded in West Africa, so local production and market structures already exist. Currently, only 1 % of CPHs are used for soap making (ANTWI et al. 2019: 131) which raises the question to what extent further growth is possible. This paper offers an initial attempt to approach this issue by seeking to reveal major constraints of creating and enhancing the value of CPHs. Additionally, it provides a basic understanding of the relevant production steps and involved actor relationships of CPH-based soap - which has never been considered from an economic geographical perspective before.

Section 2 presents the GPN framework to critically analyse the handling of waste in agri-food networks. This is followed by an introduction to the global cocoa sector and the by-products of cocoa cultivation in section 3 with a focus on the possibility to valorise CPHs for soap production. Section 4 illustrates the applied methods, before in section 5 the case of Ghanaian CPH-based soap making is analysed. Finally, conclusions will be drawn.

2 Agricultural waste and the Global Production Network approach

Since the 2010s, economic geography has made a significant contribution to social science studies on recycling and waste (e.g., LEPAWSKY & BILLAH 2011, CRANG et al. 2013), building particularly on the Global Value Chain (GVC, e.g., GEREFFI et al. 2005) and Global Production Network (GPN, e.g., HENDERSON et al. 2002) approaches, as noted by SCHLITZ (2020). Both the GPN and the earlier GVC approaches have proven useful in understanding the interplay between economic networks and environmental change not only, but also in relation to the analysis of waste and its valorisation (e.g., PICKREN 2015, SCHLITZ 2020, DACHS et al. 2025). The original GVC framework tends to focus on linear relationships of power between companies and their institutional contexts. In contrast, the GPN framework offers a more comprehensive per-

spective, moving beyond simple linearity to encompass diverse network configurations and prioritising spatial considerations through the concept of embeddedness (COE et al. 2008). “This network interpretation is an important reference for waste research” as LASER (2024: 121) points out. This wider lens allows for the inclusion of a broader range of actors - including consumers, non-governmental organisations (NGOs), farmer associations, and trade unions - in the analysis, a feature particularly important for our research objectives. While numerous productive hybrids of GPN and GVC have since emerged, we therefore adopt the GPN approach.

Since COE & YEUNG (2015) made proposals to change and expand the GPN approach, a distinction has been made between the original GPN approach and the more recent development GPN 2.0. With the extension in GPN 2.0, an attempt was made to make GPN a comprehensive broader dynamic theory that contributes more to explaining patterns of uneven territorial development in the global economy (COE & YEUNG 2015: 22). However, the approach is primarily lead firm focused (VICOL et al. 2019) and concentrates on the three basic competitive dynamics (optimising cost-capability ratios, sustaining market development and financial discipline (COE & YEUNG 2015)) which are not very relevant to the objective of our article. For this paper, we refer to the analysis categories from the original GPN, as these seem appropriate for the objectives of this article. Central to it are three conceptual categories: Value, power and embeddedness (HENDERSON et al. 2002). The latter is differentiated into societal (the cultural, social and political origin of an actor), territorial (how actors are connected to certain places) and network embeddedness (the involved network and structure of relationships) (HESS 2004). Power (corporate, institutional and collective) is conceived as being created “through network relationships and thus [is] a ‘collective’ endeavour, with resources being the medium through which power is exercised” (HESS 2008: 455). Lastly, value analysis focuses on the processes of value creation (the generation of value through processes such as labour and production), enhancement (upgrading activities to improve quality or productivity) and capture (the retention of value within specific locations) (HENDERSON et al. 2002). Value can be enhanced by upgrading through which actors improve their position or performance in global production networks. While there are different definitions of upgrading (FOLD & LARSEN 2011), this paper draws on HUMPHREY & SCHMITZ (2002), as well as RIISGAARD et al. (2010) who differentiate upgrading

between improvements (process, product, volume upgrading), functional up- or downgrading, and improved value chain coordination (vertical and horizontal contractualisation). Furthermore, KRISHNAN et al. (2023) propose analysing environmental upgrading through both processes - strategic changes by GVC actors to improve environmental management - and outcomes, which include tangible environmental improvements and enhanced corporate reputation and legitimacy.

An important shortcoming of the GPN approach is its dealing with (agri-food) waste. Most GPN research focuses on the connections between production and initial purchase (BROOKS 2012), meaning already-used goods or by-products have not been extensively examined. However, adding value to agricultural by-products is rarely approached from a GPN perspective (see e.g., FRANZ et al. 2018, DACHS et al. 2025).

In their critique of GPN literature excluding waste products, CRANG et al. (2013) point out that the disposal of waste is often considered the end of the chain or network while the beginning and end points of resource recovery are not clear-cut. However, "discarded consumer goods become captured within other networks which work to move them eventually either to sites of secondary processing, treatment and revaluation [...] or to sites of 'disposal'" (GREGSON et al. 2010: 6). Moreover, it has often been overlooked that constituent parts of products "had complex social and spatial lives prior to coming together in any particular commodity" (HEROD 2014: 424). As agricultural waste was not previously used and never went through a complete life cycle, its position in production networks and value needs to be reconceptualised. Hence, we follow the critique of LEPAWSKY & BILLAH (2011) that the notion of value needs to be reconceptualised in global production networks. But in contrast, we argue that value is an inherent characteristic in goods and resources but is only given economic value through added labour or by movement to a different global production network, undergoing initial value creation, followed by value enhancement. We therefore concur with WONG (2022) that waste contains unrealised value, meaning that the revaluation of waste can introduce raw materials into a new production network. Recognising the embodied "latent use value" (WONG 2022: 6) within waste, we focus on labour processes and the agency of network actors. Thus, waste resulting from agricultural production possesses value - however, how the latter can be created depends on GPN-immanent dynamics and structures.

This perspective enables a new approach to a large amount of agricultural waste, which occurs for example in coffee (e.g., CAMPOS et al. 2021), rice (e.g., VITALI et al. 2013) or sugarcane production (e.g., KONDE et al. 2021). As these by-products are renewable, abundant and thus cheap, making them interesting for industrial processing and thus value creation and enhancement (VÁSQUEZ et al. 2019).

One possibility to add value is through the enhancement process of upgrading of economic activities. Regarding Global South actors, it has been studied primarily how they improve their position within global production networks dominated by companies from the Global North (e.g., GIBBON & PONTE 2005, FOLD & LARSEN 2011) via upgrading. Yet, little attention has been paid to how upgrading enables them to create their own production network (HERNÁNDEZ & PEDERSEN 2017). Often characterised by weak network embeddedness and production network knowledge², smallholders depend on other network actors, like a farmers' cooperative in spatial proximity, and on external support for upgrading opportunities (BOLWIG et al. 2010, RIISGAARD et al. 2010, ASAMOAH & ANNAN 2012, DACHS et al. 2025). Following this, FOLD & LARSEN (2011) see smallholders' upgrading possibilities to be limited due to a lack of public and private support in traditional markets, high entry barriers to contract farming and lead firms' intention for product differentiation. In the context of agri-food production networks, we argue that using waste as a resource for value creation can be considered upgrading since it enables producers to improve their position in a network. New income opportunities arise through the use of agricultural waste, allowing actors to enhance their position and livelihood by participating in a new global production network, regardless of their original network.

3 Cocoa pod husks as by-products in the global cocoa-chocolate production network

Cocoa cultivation is seasonal and prone to pests and diseases, which threatens farmers' livelihood, especially during the economically unstable off-seasons (HÜTZ-ADAMS et al. 2016). While existing analyses of the global cocoa-chocolate production network primarily focus on food-related cocoa-derivatives (e.g., GRUMILLER 2018, NEILSON et al. 2018, QUINTERO

² "Production network knowledge is the specific knowledge about the architecture of a production network" (BOLLHORN & FRANZ 2016: 411).

RIZZUTO 2020), research on waste products remains scarce, with only a few recent exceptions (e.g., DACHS et al. 2025). Yet, agricultural by-products - including the CPH, pulp and bean shells - constitute around 80 % of the fresh fruit's weight (ADOMAKO 2006: 1) and are mostly generated during early processing on the farm. For each ton of dried cocoa beans, ten tonnes of fresh CPHs are generated (KALVATCHEV et al. 1998: 24), which are usually not used any further and therefore have no value for farmers. CPHs create a significant challenge for waste management (HÜTZ-ADAMS et al. 2016) but also unused economic potential (LU et al. 2018), looking at the global export sales of cocoa by-products: In 2024, the value of exported cocoa waste worldwide was at approximately 750,651 USD which is an increase of almost 150 % compared to 2021 (INTERNATIONAL TRADE CENTRE 2025: n. p.).

Although CPHs hold significant commercial potential, they are often discarded on farm due to infrastructural limitations and a lack of market incentives (VÁSQUEZ et al. 2019). There are no strong market drivers that foster the exploitation of its economic potential. This underutilisation represents not only a missed economic opportunity but also an environmental concern: "This large-scale generation of residual biomass represents a critical environmental concern for cocoa-producing countries" (VÁSQUEZ et al. 2019: 73). In light of these issues, various actors in the global cocoa-chocolate production network have started to explore economically viable cocoa by-products, although most existing research has focused on their biochemical properties (e.g., CAMPOS-VEGA et al. 2018, LU et al. 2018, PANAK BALENTIĆ et al. 2018). In this context, potash-based black soap production emerges as particularly relevant as it represents one of the few local, small-scale valorisation strategies in which CPHs are central: Burning CPHs into potash could serve as an opportunity for environmental upgrading as CPHs promote the spread of a fungal rot when left on the farms. Simultaneously, attention must be paid to the environmental and health risks associated with heat and smoke development from burning CPHs. Still, a long-term pilot study (ADOMAKO 2006) found that the only economically viable CPH-based application was potash for local use - mainly for black soap production. This research indicates that local CPH-based black soap production holds economic potential and value. Despite this, research on CPH-based black soap is surprisingly limited. Most existing studies focus on its chemical composition (e.g., TAIWO 2001, OYENIRAN et al. 2015, OGUNBIYI & ENECHUKWU 2021), or health benefits (GYEDU-AKOTO et al. 2015), while its economic

and socio-material role in the cocoa production network remains underexplored. ADEWUSI & AKANLE (2020), as well as ALABI & MAKINDE (2023) highlight its socio-economic value in Nigerian contexts, showing that with appropriate support, black soap could even develop into an export product. Although data on volumes and market shares are lacking in Ghana, field observations suggest that black soap represents a promising avenue for local value creation and diversification.

The production process (see Fig. 1) not only demonstrates how CPHs are transformed into a marketable product but also highlights the involvement of additional materials such as palm kernel shells or coconut husks - further illustrating how waste from multiple crops can be recombined into alternative commodity chains. Thus, black soap is not merely one example among many, but an analytically significant case for understanding how agricultural waste can be valorised through small-scale, locally embedded production networks.

4 Methods

Empirically, the analysis of the case study is based on 21 qualitative semi-structured interviews (see Tab. 1), following LONGHURST (2009), with small-scale soap producers, cosmetic companies, cocoa cooperatives, non-governmental organizations, Cocoa Research Institute of Ghana (CRIG), Cocoa Health and Extension Division (CHED), Ghana Food and Drug Authority (FDA), scientists, and an agribusiness. All interviews were recorded and later transcribed; the average duration was 50 minutes. In addition, ten short semi-structured interviews with cocoa farmers and black soap vendors were conducted and documented as field notes. This interview method was chosen because it offers a way of investigating complex phenomena as it provides insights into a range of opinions from different stakeholders and, despite its flexibility, ensures comparability to some degree (LONGHURST 2009). Bilingual Twi-English interpreters helped with the qualitative semi-structured interviews. The selection and approach of experts took place after an analysis of the sectors' actors. The experts were contacted online, in person or found through recommendation by other stakeholders. The selection of soap vendors took place by random sampling in predefined markets (Makola market and Kejetia Market). The selection of interviewees was based on their position in the black soap production network to cover all

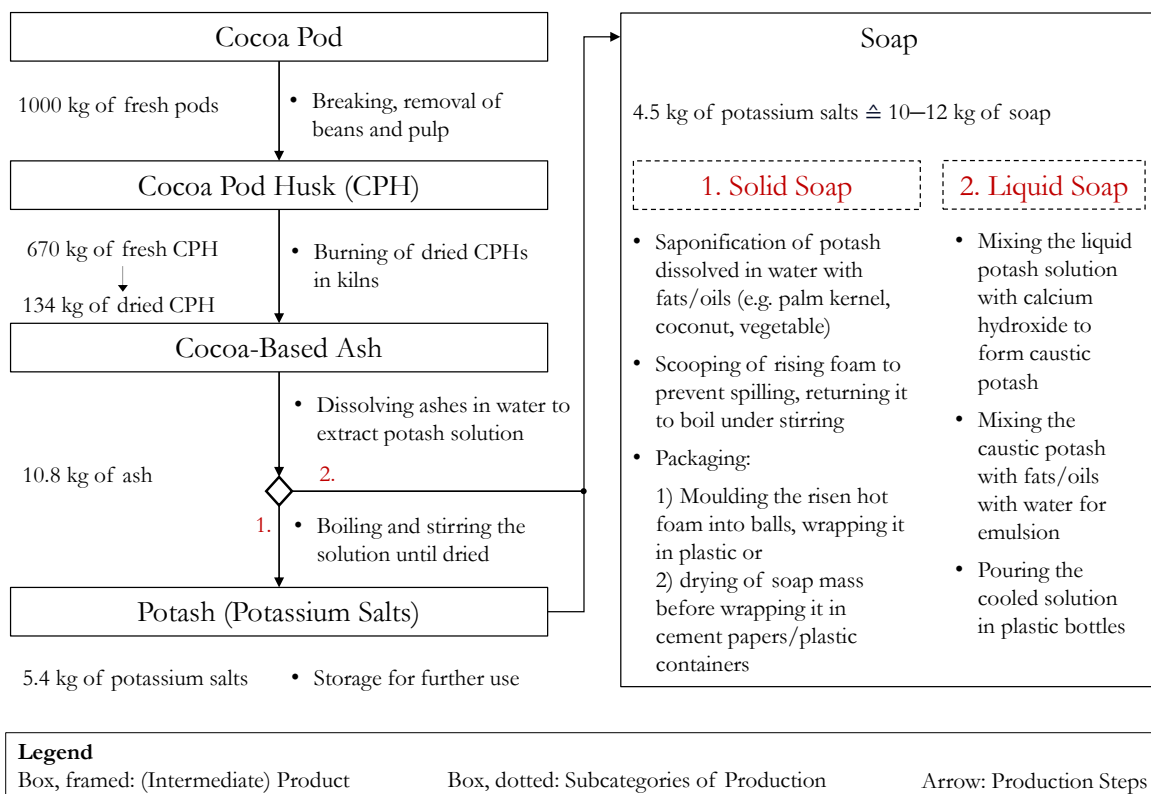


Fig. 1: Production process of raw CPH-based soap. Own illustration based on CRIG (2012) and ODDOYE et al. (2013).

relevant stakeholders. In addition to the interviews, field observations were carried out on cocoa farms as well as cosmetic stores and supermarkets. All interviews and field notes from observations were ana-

lysed using qualitative content analysis following the approach of MAYRING (2022).

The geographical focus of the fieldwork was on the Central, Eastern and Ashanti Region of Ghana

Tab. 1: Overview of interview partners

Method	Sample size	Respondent
Long semi-structured interviews, transcript	6	Ghanaian cosmetic company
	2	Cocoa Research Institute of Ghana (CRIG)
	1	Cocoa Health Extension Division (CHED)
	1	Food and Drug Authority (FDA) Ghana
	2	Scientist (KNUST University)
	3	Non governmental institution
	2	Cocoa cooperative
	1	Agribusiness
	3	Rural soap producer
Short semi-structured interviews, notes	4	Cocoa farmer
	6	Small-scale soap vendor

(Fig. 2), as these regions are among the most important cocoa-growing areas in Ghana (AWAFO & OWUSU 2022). Figure 2 shows only major cities and regions where data collection took place. All empirical research was conducted in 2022 and was accompanied by a local joint consumer study on the Ghanaian use of cocoa by-products (AHMAD et al. 2023).



Fig. 2: Map of Ghana and relevant places of data collection (Cartography: C. Reichel)

5 Upgrading cocoa pod husks for soap making in Ghana

Ghana's cocoa industry employs about 800,000 smallholders (AHOA et al. 2021: 1). In the 2023/2024 season, the country produced about 530,000 tonnes of cocoa beans (ICCO 2025: 2). The Ghanaian cocoa sector is comprehensively regulated. The central regulatory authority with strong institutional power is the Ghana Cocoa Board (COCOBOD) (AMUZU et al. 2022). "COCOBOD is a government-owned organisation that controls and oversees the general activi-

ties in the cocoa industry" (AHOA et al 2021: 12440). Through a complex system of different subdivisions and regulations, income stability for farmers, sale, export prices and quality of harvested beans are supposed to be guaranteed. COCOBOD is also responsible for research and training, improving farmers' technical and business skills, and cocoa plant health. In exercising this control, COCOBOD is also responsible for disseminating cocoa cultivation-related knowledge to farmers, thereby ensuring that their operations align with COCOBOD's interests. As the central actor in Ghana's cocoa-chocolate production network, COCOBOD controls every step of the production network in the country and has extensive institutional power. However, this applies only to the production and trade with beans - COCOBOD does not stipulate the use of cocoa by-products and waste, as this would contradict with COCOBOD's interest in farmer's focus on cocoa production. This means that farmers are restricted in their use of cocoa beans but can use waste materials freely for further processing and upgrading. Although the government is trying to support local value creation and enhancement of residual materials through economic promotion initiatives, this is not encouraged on a large scale. Nonetheless, COCOBOD uses cocoa by-products for its own product development, for example cosmetics, through its research unit CRIG. Farmer cooperatives play a key role in Ghana's cocoa production network by supporting smallholders through premiums, training, and improved market access. ASAMOAH & ANNAN (2012) highlight the cooperative's potential to strengthen the social and economic position of smallholders while enhancing traceability and fostering collective self-organisation. These cooperatives also reflect the agency of Ghanaian cocoa farmers who, despite their limited visibility in dominant global production network narratives, are able to organise collectively, mobilise collective power, and facilitate income diversification projects.

5.1 The Ghanaian black soap production network

While the Ghanaian black soap production network can be situated within the global soap production network, it represents a structurally distinct, locally embedded entity emerging from the global cocoa-chocolate production network. CPHs are positioned at the intersection of the cocoa-chocolate and the black soap production network as they are both a waste product and a resource respectively: As a dis-

carded by-product of cocoa, CPHs serve no specific function in the global cocoa-chocolate production network and are not assigned value by actors within it. However, they are being reappropriated and valorised in alternative production contexts. By processing CPHs into potash-based soap, it is integrated into a new production network where it is subsequently processed, sold and consumed. This indicates that there are interconnections between the networks of actors that extend beyond the point of origin of the by-product. Furthermore, not all processing, trading, and distribution steps are conducted by actors as part of the original production network: Thus suggesting that a distinct production network can be assumed. If actors from another network involved in processing, trading, or distributing a product derived from waste or by-products are also active in the original production network, we argue that this constitutes an overlap between networks. However, if these stages are carried out exclusively by actors external to the original network, and the product is not reintegrated into the original production network (e.g., as an input or marketed output), we consider this a separate, independent production network. Figure 3 helps to visualise these boundaries and intersections by illustrating the material flows and actor constellations involved. Although the black soap production network is certainly shaped by global dynamics - such as overlaps with the global cocoa-chocolate production

network, the export of some of the products, and the involvement of international NGOs and companies in the transfer of knowledge and market competition - it remains largely embedded within the Ghanaian context. For this reason, we do not refer to it as a global production network in the following analysis.

In contrast to the Ghanaian cocoa sector, the black soap production network is neither highly regulated by state agencies nor dominated by a small number of lead firms. Instead, it resembles the highly fragmented global soap production network in which several lead firms capture the largest share of revenues (EMERGEN RESEARCH 2025). Unlike the latter, however, the black soap production network is shaped by competition between different national brands and manufacturers. This competition exists on the one hand between different black soap manufacturers, but on the other hand, they are also in competition with manufacturers of other soap products.

This is also visible in Ghanaian supermarkets and stores, where multiple soap brands from a few international lead firms like Unilever (e.g., Geisha, Lifebuoy, Lux, Dove) or PZ Cussons (e.g., Carex, Camel, Imperial Leather) are sold next to processed black soaps by local producers, such as Mansuki Ghana Limited (MGL Naturals) and Tiwajo Industry Limited (Paridox). The local companies, together with individual raw black soap producers form most of the local black soap production network. In 2021,

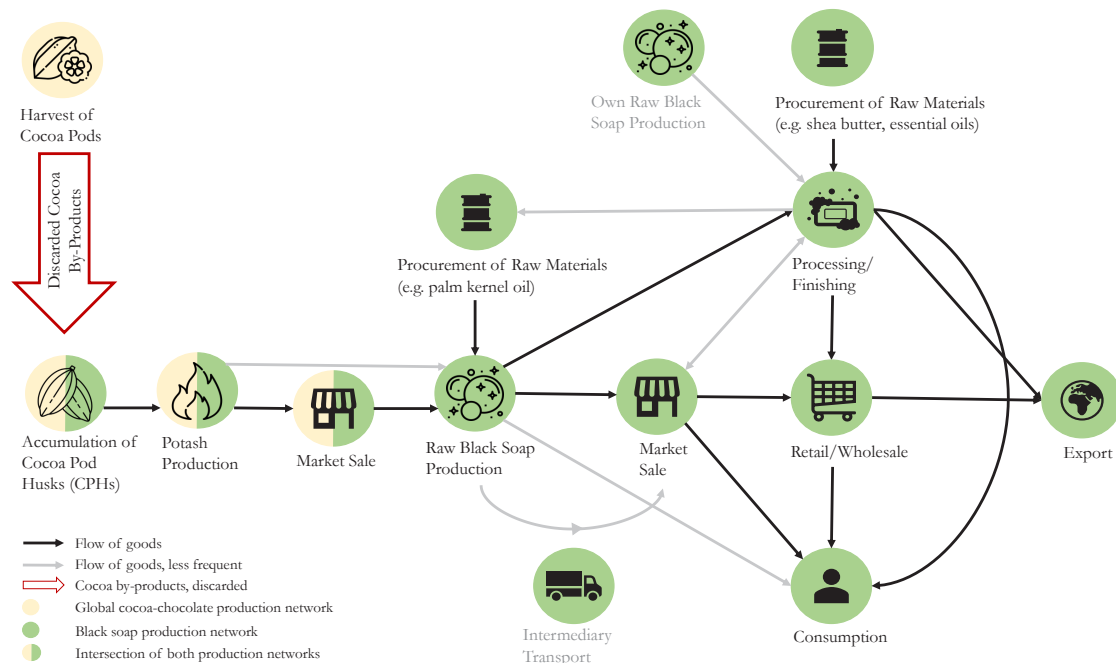


Fig. 3: Illustration of the commodity flows and conversions in the production and processing steps of CPH-based soap in Ghana

Unilever Ghana introduced Geisha Black Soap, a new variety of their bar soaps. So far, other lead firms of the global soap production network have not penetrated the black soap production network as directly. As this paper analyses CPH-based soap, it focuses mainly on the black soap production network but takes into account that it is influenced by the power structures and actors of the surrounding global soap production network.

In Ghana, potash production from CPHs is already established on a small scale and, regarding CPH-based soap, high local demand and profitable production were observed (GYEDU-AKOTO et al. 2015). Around a third of the population uses this traditional soap, buying mostly the raw and solid form at local markets (AHMAD et al. 2023: 22). To understand how CPH-based soap is embedded in Ghana, Figure 3 illustrates its production and processing steps.

After opening the cocoa pods, CPHs are left on farms from where they can be collected and dried. In most cases, this work is done by members of the farming household or relatives, as the farmers “give it to them [potash producers] for free [...] people cannot just come from outside and pick it” (soap producer 2). However, some farmers have started to recognise its economic value and sell their CPHs to potash producers. As large amounts of CPHs are needed for potash production (see Fig. 1), they are gathered from different farms. For this production step, other organic materials like plantain leaves could be added, depending on the available materials and consistency of the preferred output. Generally, potash is produced during the dry season, so production is not affected by rainfall, thus providing an alternative value creation possibility and source of income outside the cocoa season. However, due to the prevailing dryness, if CPHs are burnt directly on the farm or in the immediate proximity, it creates a high risk of burning down the farm. This is nevertheless still done but farmers “normally break the pod at the place where they don’t have much [sic] cocoa trees and that is the place they [potash producers] normally burn it” (agribusiness) or use aluminium tanks so “the fire doesn’t spread on the farm” (cocoa cooperative 2).

The potash is sold on markets or, less frequently, directly to soap producers who use it as a base for raw black soap. The latter is mostly produced by small-scale individual soap producers although local cocoa cooperatives and commercial soap production sites do also exist. At this stage, oils, primarily palm kernel oil, are added, which are sourced from producers, traders or markets. Companies that order soaps from specific producers sometimes supply

them with the needed raw materials. Raw soap is sold on local markets by producers or on larger, centralised markets, for example by vendors in Kumasi or Accra. They sell soaps from several producers who deliver them directly to the market, or from intermediaries who buy the soap from producers. Transportation by producers is either done by tricycles, taxis or larger trucks.

Black soap is not only produced for cosmetic companies but also the individual end consumer. This mainly occurs in rural areas where soap production happens right in the community. In contrast to this, cosmetic companies are located within or close to cities. Rather than producing raw black soap, they concentrate on refining the raw black soap by adding fragrances and moisturisers or transforming it into liquid soap. None of the companies interviewed produced everything from potash to finished soap; only one (cosmetic company 4) produced 30 % of the raw black soap itself. However, all companies have established partnerships with small-scale producers. In these cases, they source the raw materials directly from them and only engage in upgrading-related activities such as finishing, labelling, branding and marketing. This enables greater value capture. The finished soap is either sold through retailers or wholesalers or again on markets. In some cases, cosmetic companies have their own shops where they sell their products. Finally, processing companies, wholesalers and retailers partially export the soap.

5.2 Factors influencing actors’ value-creating and enhancing abilities

During the production steps of black soap, different aspects limit the scope of value-creating and enhancing activities. As the most frequent problems, all stakeholders mentioned high costs and insufficient financial resources which may amplify the impact of other factors. In addition, the “geographical mismatches between supply (remote agricultural [...] sites) and demand (urban centres)” (COE 2021: 61) hinders actors, for example in transport or providing technical systems for supply chain management.

A recurring element in the qualitative interviews that permeates the entire network is actors’ (low) network embeddedness that thus underlies many value-creating and enhancing possibilities. Black soap production is in large parts centralised in Bawjiase, Central Region, the region that is said to be the origin of raw black soap production in Ghana. Although not close to any cocoa farms, Bawjiase is a central hub

where knowledge and skills, materials and soap production facilities converge. From here, soap production skills are taught, mainly informally by individuals. At this geographical node of the production network, actors' network embeddedness is particularly high. As a deeply traditional, local product, raw black soap plays an important role in society and most Ghanaians are in favour of using it - however, many state that they personally do not use black soap (AHMAD et al. 2023: 23, 31). A possible reason might be that many Ghanaians prefer industrial and international soap, as black soap is seen as a cheap and low-quality product: "Especially the low class-income in Ghana, they don't want to use black soap because they feel like it's a primitive ingredient or substance for them. However, the funny thing is that the returnees, the diaspora, the expatriates are using black soap because they see it as a healthy quality product" (cosmetic company 1). Cosmetic companies would favour selling in Ghana if the general perception were to change: "If Ghanaians would embrace and buy black soap, sales is the best, the best place is Ghana" (cosmetic company 4). Hence, by educating potential customers about the characteristics of black soap, cosmetic companies try to improve their share of the national market.

5.2.1 Value creation and value enhancement limits of raw black soap

Processing CPHs to potash and then to black soap creates new economic value; however, raw black soap itself is perceived and handled as raw material. This allows for adding further value but in turn, is limited by different factors. As presented in section 5.1, most small-scale soap producers purchase all the necessary materials. Hence, black soap production is generally price-sensitive as raw material prices change significantly due to seasonality and ongoing inflation. To counter this, producers can buy in bulk; which is, however, not financially possible for most small-scale soap producers. They can buy materials on account or source financing through loans from local banks or loan and savings institutions. However, because of high repayment rates and strict financing conditions, the latter is a risky option: "The idea is to pay weekly. But then, because of how the business is and they [the producers] are unable to pay, they [the saving institution] can come and arrest you" (soap producer 3).

The opportunities for greater value capture are limited for small-scale producers, as generally, at the local level, higher profits are not achieved through

higher unit prices but through larger volumes. The ability to produce in large volumes depends on the source of knowledge about soap production, which in turn is determined by the actors network embeddedness: One soap producer and cocoa farmer, who had been trained in a cocoa livelihood diversification programme, was able to produce twice in the last half year (30–50 pieces of soap). Since she does not have market access, she relies on customers in the local community. This illustrates the coexistence of two overlapping yet discrete production networks. The actor engaged in cocoa production can be regarded as a constituent of the global cocoa-chocolate production network, whereas the same actor, in their capacity as a soap producer, belongs to the black soap production network, which is itself a component of the broader global soap production network. Despite their network embeddedness in the global cocoa-chocolate production network, which provides them with market access, the actor does not exhibit the same level of network embeddedness in the black soap network. Consequently, their market access within the black soap production network is constrained, underscoring the disparate levels of embeddedness and opportunities across these interlinked yet discrete networks. In comparison, the other two soap producers interviewed gained their knowledge by learning from other producers or their families. They produce 6,000 pieces of raw black soap every other week and 500 pieces twice a week, respectively, and are connected with black soap production network actors who purchase larger amounts of soap. Thus, a strong market position and network embeddedness are important for successfully maintaining and improving a position in the black soap production network. This illustrates how actors that are well integrated in the global cocoa-chocolate production network are disadvantaged in the black soap production network if they do not have the same degree of network embeddedness. Thus, although volume upgrading is the most straightforward way to make a profit, many producers are inhibited by the lack of financial resources, stable market conditions or relationships. Additionally, their weak network embeddedness is exacerbated by constrained and risky financing options.

Another option to enhance the value of black soap apart from volume upgrading is product upgrading which means "moving into more 'sophisticated' products with increased unit value" (RIISGAARD et al. 2010: 198). As this entails greater cost in additional raw materials, it is currently mostly done on the level of cosmetic companies that source raw black soap as raw material and only use it as a base for processed black soap. The quality of additional ingredients influ-

ences the level of product upgrading which only few, mostly exporting, companies can afford. However, even using low-quality ingredients would most likely not be viable for many of the small-scale producers: The processed soap would still have to be sold at a higher price to be profitable for which these producers lack potential customers due to their low network embeddedness. Thus, for small-scale producers, volume as well as product upgrading are constrained by the same factors albeit in different respects.

Whereas raw black soap is treated as a raw material, the sale of processed soaps falls under the regulatory oversight of the FDA, which holds significant institutional power in structuring market access. As one FDA representative explained: “Most of the small-scale manufacturers that we regulate, they source these *alata samina* as raw products, and then they end up the process into the finished products” (interview FDA). Registration requirements imposed by the FDA act as a barrier for many small-scale producers, especially as many are not aware of it before investing capital for production. Lacking financial resources and formal support structures, they are frequently unable to comply. In the absence of institutional support structures that connect small-scale soap producers horizontally and vertically, individual soap producers remain structurally disadvantaged. They are neither collectively organised - unlike cocoa farmers - to assert shared interests, nor embedded in vertical alliances with more powerful actors such as cosmetic companies. As a result, they struggle to reach wider markets, and their opportunities for product upgrading remain limited. In contrast, cosmetic companies are able to leverage their higher network embeddedness to enhance their products and bypass regulatory obstacles. This asymmetry highlights how both the absence of collective power and the presence of institutional power (e.g., through the FDA) co-structure the limitations of small-scale upgrading.

5.2.2 Traceability within overlapping global production networks

As the two different production networks (cocoa-chocolate and [black] soap) overlap, both networks affect all black soap related activities and actors in regard to CPHs. This has significant implications for traceability, as knowledge and information do not flow freely across the boundaries of the two production networks. Thus, many individual actors do not have production network knowledge about the whole network, neither in terms of production nor processing.

This affects the position of small-scale soap producers within a network: Generally, they lack product differentiation which together with their small production volumes makes the individual rather insignificant and easily substitutable. Without knowledge of producers’ intermediary customers or their own status within a broader production network, power asymmetries emerge in the network’s architecture. This can result in actors being unable to benefit from the structures of the network or to collaborate with other actors on an equal footing.

For cosmetic companies, their lack of (global) cocoa production network-related embeddedness and general territorial embeddedness, leads to a lack of traceability, making it difficult to identify the origins and composition of their raw black soap. Furthermore, due to their lack of network embeddedness their production network knowledge is limited, and they are dependent on suppliers: “The system is not transparent enough to ensure proper consistent quality. Because you are not there” (cosmetic company 3). The core of this issue lies in the lack of trust and standards at the production level as small-scale soap producers do not follow specific guidelines and ingredients can vary. “There is no documentation, they don’t keep papers, they don’t have systems. So, you are pretty much blind on that side” (cosmetic company 3). This makes consistent quality a fundamental problem. Thus, companies need to perform quality checks which are done internally or by sending samples to Ghana’s national regulatory bodies to enforce sale, product and service standards. Also, companies set up in-house production facilities whenever the capacity and resources are available:

“But some of the suppliers were not meeting our target. First, our volumes, second, our quality. This pushed us to do more, to do some on our own so that we can meet some quality standards [...] if we allow them to produce for us, normally we’re having issues with sometimes colour change, consistency, pH. We have to step in at the point and bring our own science together to become more consistent” (cosmetic company 4).

A less resource-intensive alternative is long-term cooperation with local soap producers or communities. In so doing, the network embeddedness of these actors would be increased. Here, cosmetic companies either collaborate with individuals, groups, or rural cocoa cooperatives that produce soap. These relationships are often formed through informal network connections, “they know themselves, they don’t have an official cooperation, but this person knows another person because normally they meet at the farms” (cos-

metic company 4). This required network embeddedness makes participation difficult for external actors - both for new producers and new processing companies. Again, this informality links to the lack of traceability, as information is seldom disclosed: "Some other [potash] suppliers sometimes use the back of plantain, others use the cocoa pods. But mostly they won't tell you what exactly they use for that finished product" (cosmetic company 5); rural small-scale producers seem to be unaware of this lack of knowledge. While soap producer 2 states that her soap is made of CPHs, it was clarified that she buys already-made potash which means she cannot know the exact ingredients. This also applies to raw black soap since producers either do not know about its components in detail or do not declare them on their product - thereby interrupting the information flow. Because it is traded as raw material, a precise understanding of its origins and composition is not seen as being relevant for small-scale producers or possible for cosmetic companies. This constrains the potential for value capture among small-scale producers. To improve traceability, some companies supply small-scale producers with the raw materials or even train them in soap production. Through this, major soap production companies expand and maintain their network position and power within the black soap production network. This can even be extended by companies sourcing all required raw materials from their own network and providing financing and market access.

5.2.3 Deviating underlying motivations

Small-scale soap producers are supported and trained by two parties: On the one hand, there are the actors of the global cocoa-chocolate production network, who offer smallholder cocoa farmers the opportunity to enter into soap production through income diversification and livelihood measures implemented by cocoa farmer cooperatives. This, in response to worldwide challenges in the cocoa sector - for example, poverty among farmers - is intended to support the farmers financially at the local level, especially in the cocoa off-seasons. While this social dimension seems to be relevant, environmental aspects, and therefore environmental upgrading strategies, do not appear to be central to the actors' motivation. These activities have a positive impact on corporate social responsibility and marketing strategies. This form of support focuses on small-scale soap producers that are part of the global cocoa-chocolate production network.

Lead firms in the global cocoa-chocolate production network have no interest in gaining significant power within the black soap production network or striving for a lead firm position within it. As these activities are supplementary to cocoa production and not directly economically motivated, they do not represent a risk to the profitability of cocoa-chocolate lead firms' business models. On the other hand, small-scale soap producers are supported by firms from the global soap production network as these companies want to ensure consistent quality and reliable supply. For such cooperation, the original affiliation to one of the two networks is initially not decisive as small-scale producers benefit from the soap companies network embeddedness and power. This further reinforces the notion that these two production networks (cocoa-chocolate and [black] soap) are separate but overlapping.

Although training enables soap producers to enter the black soap production network, they do not inevitably gain a powerful position within it as they lack the necessary network embeddedness. Different power relations restrict actors' activities, especially if they are not aware of them. Ignorance of these structures can also diminish external support. For instance, the FDA registration impedes market access even for small-scale producers already supported by company-led international cocoa programmes: A Cocoa Life (cocoa sustainability programme by Mondelez International) farmer explained "[the producers] are going to sell some [black soap] in Accra and people complained that it's not registered. So, we ask them to stop. So, we are working on the documents for them to get the paper. Then they can continue the process for soap" (soap producer 2). Even though this seems to be a recurring problem for different actors, none of the interviewees had managed to solve it.

These limits to market access imply that while cocoa farmers are technically taught how to generate additional income, they do not learn how to compete in the black soap market. This is because the individuals responsible for conveying the technical expertise and providing the financial resources are not embedded in the soap production network in a meaningful way, neither in terms of network nor territorial embeddedness. Consequently, they are lacking in the requisite knowledge to navigate the intricacies of the production network. In the case of Cocoa Life, ways are therefore being sought to market the products of the entire training group under one label to facilitate market access and marketing. In this way, the programme aims for small-scale producers to profit from the lead firms' network embeddedness - though in

this case, success in the black soap production network is not guaranteed as the lead firm belongs to another production network.

To address the issue of different motivations and lack of production network knowledge, cosmetic companies could collaborate with cocoa cooperatives as both groups are highly embedded within their respective networks. Through this, cross-network embeddedness would be strengthened which can result in a better understanding of network dynamics, production requirements and market demand.

6 Conclusion

This article has explored how agricultural by-products - specifically CPHs - can be valorised through their integration into a distinct, small-scale, locally embedded production network. Using the case of CPH-based black soap production in Ghana, we applied a GPN perspective to analyse how local value creation and enhancement from agricultural waste is shaped by underlying network structures. The valorisation of CPHs constitutes both a spatial and structural shift: while CPHs originate in the global cocoa-chocolate production network, their transformation into soap leads to the formation of a largely separate production network. Yet overlaps between these networks create frictions that constrain the ability of local actors to create, enhance, and capture value. Structural barriers - such as limited access to capital, restrictive FDA registration requirements, and insufficient knowledge of soap-making techniques and market demands - impede upgrading efforts. Although support programmes like Cocoa Life promote income diversification, they often lack a nuanced understanding of the soap production network and therefore do not sufficiently equip farmers to compete in this market. In addition, information asymmetries, low transparency, and weak traceability exacerbate fragmentation and hinder coordination across the network. These conditions limit small-scale producers' embeddedness and reinforce unequal value distribution. Breaking down these barriers requires targeted interventions that strengthen network embeddedness, reduce regulatory and informational hurdles, and foster greater collaboration across the overlapping production networks.

Conceptually, our contribution lies in advancing a deeper understanding of valorisation of agricultural by-products that contributes to local value creation beyond conventional production networks by integrating literature on agricultural by-products, waste,

and upgrading with GPN analysis. Responding to critiques that "value" remains under-theorised in GPN literature, we argue that agricultural waste embodies latent use value which is realised only through labour and societal embedding in new production contexts. In so doing, we draw on and expand the work by LEPAWSKY & BILLAH (2011), WONG (2022), and RIISSGAARD et al. (2010). Our findings suggest that waste valorisation constitutes a form of upgrading - albeit one that is highly dependent on network embeddedness and power asymmetries.

Empirically, our study highlights how different actors face varying constraints and opportunities. Small-scale soap producers often remain confined to volume upgrading due to a lack of financial resources, and network embeddedness, as well as awareness of regulatory barriers. Their limited collective organisation stands in contrast to cocoa farmer cooperatives, which play a key role in Ghana's cocoa sector by supporting market access, transfer of knowledge, and income diversification. Strengthening similar collective structures among soap producers could enhance their ability to negotiate, coordinate, and scale upgrading efforts. At the same time, cosmetic companies benefit from greater embeddedness and thus capture higher value, yet they remain limited by low traceability and fragmented sourcing relationships. While various actors in our research were involved in volume and product upgrading, environmental upgrading barely mattered.

We argue that cross-network collaboration between cocoa cooperatives and cosmetic firms offers a promising strategy to mitigate structural barriers and redistribute value creation potential more equitably. Recognising the embedded overlap between production networks - rather than treating them as discrete domains - can serve as a foundation for fostering more inclusive forms of upgrading and sustainable resource use. Such partnerships could not only address structural barriers but also contribute to reducing power asymmetries and strengthening local capacities at the cooperative level.

By highlighting agricultural waste as a source of value creation and power negotiation, this paper contributes to a broader research agenda that situates waste not at the margins but at the centre of global production network dynamics. Future research should continue to explore how by-products are repositioned across networks and how institutional, corporate, and collective forms of power shape these transformations. Furthermore, the transformation of environmentally driven upgrading into strategies for different kinds of actors could be examined.

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