



Review

Fuelling women's empowerment? An exploration of the linkages between gender, entrepreneurship and access to energy in the informal food sector



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ABSTRACT

This interdisciplinary review paper explores linkages between access to energy, women's empowerment and entrepreneurship. This will be discussed in the context of the informal food sector. Despite expectations that access to energy for productive uses empowers women by enabling them to generate an income, women in developing countries face a range of barriers when establishing and operating enterprises, including access to energy. The literature reviewed in this paper suggests that, although improved access to energy for women in the informal food sector may create a range of benefits for women, the empirical evidence base upon which such claims are made is limited. Access to a range of energy services suitable to their enterprise would provide women with building blocks to operate their enterprise, alleviate restrictions on growth, increase their sustainability, and provide them with increased control over enterprise operation. These may help to create an enabling environment for empowerment, rather than directly contributing to it. Consideration of the gendered dynamics and logics of entrepreneurship in the design of development interventions, in particular with regard to motivations for operating an enterprise, spatial distribution of enterprises, growth strategies and risk behaviour, may lead to more sustainable and empowered enterprises in the long-term.

1. Introduction

Access to sustainable energy for all is a critical challenge for global development and is closely linked to poverty and development [1–4]. Lack of access to energy at home and for income-generating activities is associated with high levels of poverty, low productivity, heavy workloads, and a high exposure to health risks [5]. Women in particular are disproportionately affected by energy poverty, which is defined as the ‘absence of sufficient choice in accessing adequate, affordable, reliable, high quality, safe, and environmentally benign energy services to support economic and human development’ [6]. While affecting the poor in general, energy poverty has a female face [7], as women and girls bear the primary responsibility for collection of firewood, cooking and other domestic work. These tasks expose them to negative health impacts and increases their domestic and reproductive burdens [8–11]. To highlight the severity of the challenge: around 3 billion people still rely on ‘raw’, unconverted, biomass for cooking and heating, which affects health, education and gender equality, and a further 1.5 billion lack access to electricity [12]. Modern energy services (MES), which include energy carriers such as electricity, LPG and petroleum, are

important for stimulating sustainable development and reducing poverty, through providing energy for cooking, heating and cooling, lighting, mechanical power, and mobility [13].

Access to MES is high on the agenda of policy makers, energy practitioners and development agencies, as the United Nations’ Sustainable Development Goals demonstrate [3,14]. However, most efforts so far have prioritised domestic energy access over productive uses of energy, despite evidence suggesting that the latter increases productivity and enables business development, ultimately contributing to improved social and economic outcomes for individuals [2,15]. This effect applies in particular to women, since supporting their economic activity is a key pathway to reducing women's poverty and gender inequality [16,17]. As a consequence, energy access efforts need to evolve from the traditional focus on domestic energy in the family residence to include energy for small-scale production [18]. Systematic data on the impact of such access is urgently needed, as, although the links between energy access, income generation and poverty alleviation are undisputed, most evidence confirming this link is anecdotal and focused on rural areas [19–24].

This paper provides a comprehensive, interdisciplinary review of

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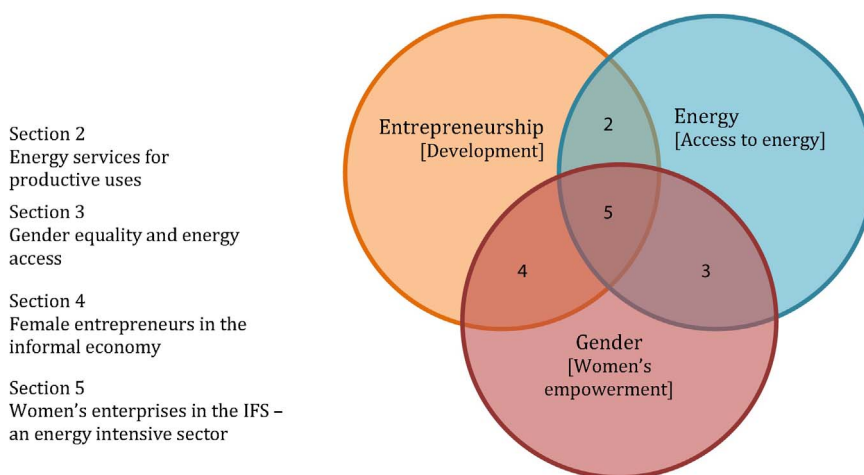


Fig. 1. An interdisciplinary (thematic) review of the literatures on access to energy, women's empowerment and entrepreneurship.

available literature, concentrating on micro-level enterprises that form the bottom layer of economic systems in developing countries. The focus is the informal food sector (IFS), as it is a sector that is both highly dependent on energy and dominated by women. The aim is to highlight what is known about the impact of access to modern energy on small enterprises in this sector, of which the vast majority are found in urban and peri-urban settings. In particular, the discussion focuses on enterprises involving women, and explores the linkages between energy, women's empowerment and entrepreneurship. The structure of the paper is visualised in Fig. 1. It commences with a discussion on how energy access for productive uses is expected to advance development (Section 2.) In Section 3, attention is directed to women's empowerment, whilst exploring the relationship between gender equality and energy. Section 4 engages with the literature on the informal economy, gender and enterprise, whilst Section 5 zooms in to the IFS. The final section highlights what is known and what is not known about the impacts of access to modern energy on small enterprises, establishes the connections between energy, entrepreneurship and women's empowerment in the IFS, and discusses the policy implications of our findings.

2. Access to energy services for productive uses

There is a significant body of literature supporting claims that access to energy advances development, and stimulates to the establishment and growth of enterprises [2,3,15,19,21,25–30]. Energy uses most commonly mentioned in this regard are:

- **Cooking, heating and cooling** [8,10]: It is well known that the majority of households and small enterprises in the developing world rely on traditional fuels (wood, biomass, dung) for their cooking and heating needs, with technology ranging from three-stone open fires, through improved cook stoves, to substantial brick and mortar models [10]. Solid fuels such as wood are mainly used for cooking and heating, whereas transitional fuels (kerosene, charcoal) and modern fuels such as electricity may have cooking and heating as well as cooling applications. For example, the ability to cool products is an important benefit for enterprises in the food sector, as it contributes to reduced food waste and improved quality of products, but also enables entrepreneurs to buy in bulk and refrigerate stock for future use.
- **Lighting**: Electric lighting can increase the total number of productive hours available for enterprises [31–33]. Although traditional light sources such as candles and paraffin lamps can be used, their quality is lower than electrical light. In addition, (street) lighting could provide safety for entrepreneurs and their customers, extend-

ing their work-hours and attract customers. This effect has an important gender component, as studies have documented that provision of street lighting increases women's perceptions of safety [30,32].

- **Mechanical power**: The introduction of mechanical power through modern energy services increases the efficiency and effectiveness of productive activities. Bates et al. [34] and de Gouvello and Durix [35], for example, demonstrated that mechanical services in enterprises have great potential to reduce time spent on fuelwood-gathering, improve air quality, and raise household and community incomes. Mechanical power also contributes to the more informal aspect of incomes by reducing much of daily drudgery that pervades the lives of the poor [30].
- **Mobility**: Often overlooked in discussions of the contribution of modern energy services to poverty alleviation is affordable mobility. Low mobility of the poor stifles the attainment of better living standards, by reducing the ability to earn income and access services such as markets. Options are often constrained by lack of infrastructure, fuel scarcity, distances or time involved with travel and the associated expense [36,37].

The transitions from traditional energy sources to modern energy services are not linear [38–41], but complex [42]. The model of energy ladders assumes a linear transition from traditional biomass fuels to transitional fuels and finally to modern energy services. A key assumption in the model is that, as incomes increase relative to the cost of modern energy carriers, people will always seek to move up the energy ladder, away from traditional fuels towards modern fuels [43–46]. This concept has been criticised, however, for not fully capturing the intricacies of how households and enterprises consume energy [39,40,44], and several studies have contradicted the model. Musango [47], for example, found that, despite increased electrification, households in Gauteng (South Africa) use traditional energy services alongside electricity for economic reasons. Similarly, Akpalu et al. [38] concluded that the concept of energy ladders was not robust as kerosene was the only price-elastic fuel in their sample, whereas the demand for energy carriers, such as wood, charcoal and LPG, was price-inelastic.

Current evidence suggests that, in many cases, even if modern energy services are available, households and enterprises switch back and forth between energy sources, or use them simultaneously. They often remain users of traditional fuels for various reasons, including cost, availability, suitability, and habit, culture and traditions [43,44,48]. However, although traditional biomass fuels are increasingly being embraced as a pillar of low-carbon growth in the developed world [49], in the developing world biomass remains widely viewed as

a retrogressive source of energy associated with low efficiency, negative health effects, environmental degradation and poverty [50,51]. There is also wide recognition that modern methods of using traditional energy sources in modern appliances could reduce environmental impacts by increasing combustion efficiency and reducing exposure to smoke related respiratory health issues [52,53]. In practice, however, the vast majority of projects on traditional fuels have focused on domestic appliances such as improved cook stoves, and so ignores the question of fuel technology for productive uses [31,41,43,47].

Many studies have, however, advocated access to energy and appropriate appliances for productive uses, with a view to stimulating enterprises, creating jobs, increasing income and alleviating poverty [19–24]. Of the few who have studied outcomes, Kirubi [54] reported significant positive impacts on increased productivity per worker, price reduction per unit and increase in gross revenue per day after the introduction of electricity and appliances in enterprises. However, a more contentious study by Oakley et al. [55] assessed the prospects of poverty alleviation through employment-creation and income-generation in small enterprises in South Africa and found that, although the number of enterprises spiked after the introduction of electricity and profits increased, few additional jobs were created, and most enterprises were short-lived. Rather than bringing new-income into the community, the introduction of electricity in the community led to a more equitable redistribution of income. Kooijman-van Dijk [19] highlighted the differences between opportunities for poor men and poor women to establish enterprises, and stressed that the uptake and use of energy carriers and appliances is one among a range of often interrelated barriers that women must overcome to establish and operate an enterprise. This point indicates a need to explore the gender dimension of enterprise establishment and growth in relation to energy access.

3. Fuelling women's empowerment: gender equality and energy access

Gender equality is recognised as a universal human right and features as one of the Sustainable Development Goals. It encompasses equal access to services and resources, decent work, and representation in political and economic decision-making processes [56]. Yet many societies worldwide remain highly unequal, in energy terms and in others. Women's limited access to energy affects both domestic and entrepreneurial activities [22,26,57–59]. Women play a central role in socio-economic development as food producers, health-care providers, and providers of reproductive tasks. As a consequence of their different roles and responsibilities, women have different energy needs from men, both for domestic and productive uses, and energy policies and plans rarely offer due consideration to their needs, concerns and contributions to development [60–62]. Gender-neutral policies related to energy and enterprises tend to benefit men more than women because women face higher barriers and restrictions in setting up and running enterprises, as we will discuss in depth elsewhere in this paper. This general tendency is exacerbated by the fact that women are often excluded from decisions about energy plans and policies [29,59], despite suggestions that access to energy sources or technologies can help alleviate some of the inequality challenges that women face [4,32,60,63].

Skutsch [64] gave detailed examples of ways in which energy projects and initiatives may positively impact upon gender empowerment. She identified three gender goals in women's empowerment in the context of energy projects and programmes. The first consists of welfare needs, which refers to improvements in women's welfare, higher quality of life, reduction of drudgery, and more equal working hours for men and women. This goal includes reducing health and safety issues associated with security during collection of fuel wood, and the severe health impacts which can be caused by indoor air pollution from the use of dirty fuels in domestic activities

[8–10,24,50,53,65,66]. The second goal considers empowerment, because women are often held back from engaging in economic activities as well as social and political functions. Therefore, this goal focuses on increasing political and decision-making power for women with regard to the way in which projects plan and introduce energy technologies and on creating more equality in the public sphere [64], for example by increasing their access to information services [67]. The third goal, that of productive needs, refers to situations in which access to energy can contribute to the improvement of the productivity of women and the creation of economic opportunities which may lead to increased economic independence [20,51,64,68]. Although access to electricity could, in principle, afford opportunities for women's income generation, health benefits, studying after dark and access to media [31,67], whether such opportunities will result in achieving gender goals will, in practice, depend on many other social, cultural and economic factors [67]. Clancy et al. [69], questioned some of these assumptions in a paper on gender and renewable energy and asked in how far access to electricity may deepen gender inequalities if not directed to the energy needs of women, e.g. by extending women's working days rather than reducing their burdens.

Gender equality is achieved through empowerment, and claims that access to energy can also 'unleash a process of women's empowerment, bringing in changes in gender relations' [4] are widespread in the literature. Much depends on what is meant by women's empowerment. According to the UN Women [70], empowerment means 'that people – both women and men – can take control over their lives: set their own agendas, gain skills (or have their own skills and knowledge recognised), increase self-confidence, solve problems, and develop self-reliance. It is both a process and an outcome'. Pertaining to women's economic empowerment, a woman is empowered when she 'has both the ability to succeed and advance economically and the power to make and act on economic decisions' [71]. The above definitions characterise empowerment as a bottom-up process rather than a top-down strategy. Congruently, development agencies cannot claim to empower women, but rather, women must empower themselves [72]. What can be done by these agencies, however, is to facilitate and encourage this process by creating appropriate conditions. Unfortunately, the empowerment process is difficult to measure and it is important to note that such claims in the literature are often based on advocacy and donor-led publications rather than based on academic research, as we will show in the following sections.

Women's empowerment spans several dimensions, including the economic, socio-cultural, familial/interpersonal, legal, political, and psychological [73–76]. Five key elements may be involved, including:

- (i) The contextual factors in a women's life affect the opportunities available to her [76]. These include local contextual factors such as educational opportunities, culture and religion, which may affect her ability to leave the house (e.g. to obtain energy sources), but also personal circumstances, including whether she is the head of household with economic decision-making capacity or considered to be economically dependent.
- (ii) Women's access to resources, that is, material, human and social resources [75], and the ability to exercise control over these [76]. The resources, which may include access to energy, appliances and capital, form the building blocks that define the conditions for agency. Access and control of them can be an important precondition for empowerment.
- (iii) Agency refers to the ability of women to define their goals and act upon them [76]. This factor represents both observable and non-observable processes of empowerment, such as the motivation to act upon a goal or ability to negotiate in a range of contexts [75].
- (iv) Existing achievements reflect the outcomes of transformation processes and the (in)equality of the choices that affect these outcomes [75].
- (v) Women's transformative processes, which represents the shift from

being disempowered to being empowered, influences various aspects of women's lives at household level and beyond [72].

Access to energy services in women's enterprises may affect one or more of the elements of empowerment summarised above, through fuel-switching or the use of multiple fuels to suit enterprise needs. Access to electricity, for example, may allow women to extend business hours by providing light, and enable refrigeration of products, thereby increasing the range of products that women can offer and reducing wastage. Subsequently, these benefits may lead to increased profits. In this example of access to electricity, improved access to resources provides women with increased choice as enterprise owners. By providing women with a choice in the adoption of energy sources in their enterprise, women's agency is affected, and may affect achievements in the long-term. Reducing gender-related drudgery, for example, may allow a woman more time to partake in societal processes, allow access to media, which are both factors commonly considered important ingredients for empowerment [67,77,78]. Although on its own, access to electricity and other energy sources may not necessarily lead to greater equality or fundamental change in gender roles, it 'can at least relieve some of the most burdensome and unhealthy aspects of their daily lives and expand the development options available to women, their families and their communities' [26]. This assertion suggests that, by affecting women's transformative processes, access to energy may gradually lead to equality between genders and facilitate empowerment.

Although the above shows a theoretical connection between access to energy and empowerment potential, academic evidence confirming this connection is lacking. Furthermore, this one-dimensional account provides no insight into the underlying dynamics of energy access in enterprises. This point was illustrated by Sovacool et al. [79] in a study of a government-managed, multilaterally-sponsored energy programme (1999–2004) that distributed a small diesel engine, with a variety of end-use equipment, to expand access to energy services and to raise village incomes. Despite the fact that the implementation of these 'Multi-Functional Platforms' was strongly focused on women, they do not automatically result in more empowered women. Instead, the authors identified some 'pushback' from men. This is illustrated by a quote from one of the participants: 'Mali is an extremely patriarchal society where women are not allowed to drive a motorbike nor are they allowed to have a car. It is nonsensical to think that men will suddenly let them manage and operate complex electrical equipment' [79]. Although the project was praised in the early days of its implementation for its focus on women, there is little information available on the sustainability of the programme or any long-term changes in gender patterns that it might have achieved. This inconclusive outcome can, in part, be attributed to the dominant development model at the time, which focused on specific energy interventions and projects (e.g. the distribution of a new technology or practice). The few studies that have evaluated this flagship project reported problems with maintenance; lack of policy coordination; regional poverty limiting the ability of entrepreneurs to sell their products; and dependence on imported technologies and fuel [79–81].

Limited critical evaluation of projects in the post-intervention phase is common as those advocating for change are locked into project-focused mind-sets or circumstances, which limits scope for more fundamental structural change. As Nygaard puts it, 'in the struggle for donor resources in the international development arena, it is tempting to market concepts that are innovative and that meet the major donor concerns of the time in order to obtain the funding' [80]. Furthermore, the project-based development aid described by Nygaard generally supports a 'development' industry with limited institutional memory due to staffing and subcontracting arrangements. As a result, it may not be in the best interest of donors and those executing projects to reveal weaknesses or failures in their own projects, or they may not feel accountable to present project failures. Post-project evaluation is

therefore often a missed opportunity to learn from failure and gain a deeper understanding of why some interventions are successful and others not are lost to future interventions. Furthermore, Denton emphasised that initiatives such as the multifunctional platforms discussed elsewhere in this paper are often difficult to scale from individual project interventions to national programme and policies (even if political will is there) [81]. The current development model attempts to change this mind-set and seeks to achieve structural change, often targeting the policy sphere. However, developing and implementing sustainable energy-related policies that specifically contribute to women's empowerment and raises their capacity as entrepreneurs (as opposed to policies that will benefit the poor, both women and men) will be challenging. Crucially, Nygaard warns that, in the context of the Multi-Functional Platform, the 'analysis of the dilemma between mobilising funding and implementing practical programmes provides an argument for building development aid on existing structures instead of inventing new complicated all-embracing concepts and approaches' [80]. Nevertheless, such evidence underlines that, even if providing access to energy is empowering in principle, how this translates to empowerment in practice also depends on local contextual factors and enabling environments. It also raises a range of additional questions, including whether more empowered women have better access to energy than less empowered women, what kind of energy services women need in order to reap empowerment benefits, and whether there are potentially perverse impacts of access to energy in the context of women's enterprises.

4. The gendered spaces of the informal sector entrepreneurship

The majority of entrepreneurial activities of women in developing countries are concentrated in the informal sector [1,77,82–85], which is an important source of employment [86]. The informal sector provides between 50–75% of total employment [87] and over 72% of non-agricultural employment in Africa [88,89]. This paper defines the informal sector as comprising enterprises and employees that are not formally registered [90–92]. Fernández-Pacheco [93] identified three main types of informality: (i) subordinated informality, practised through subcontracting; (ii) subsistence informality, including own account and unpaid work; and (iii) informality associated with small-scale firms with five or fewer employees. Our study focuses on the latter two. The informal economy has distinct gender characteristics: women generally outnumber men as a percentage of workers [17,94–96] and, on average, women earn lower wages than men [97]. Women's informal activities are generally located at the least profitable end of the formal economy in a narrow range of increasingly saturated, low-income activities, such as small-scale production of food items [98,99]. Such activities have relatively low rates of return compared to men's activities, because of: (i) women's domestic responsibilities; (ii) unequal access to skills and resources; (iii) the gender division of labour within the informal economy; and (iv) social and cultural barriers that restrict women's mobility [77,84,96,100–104].

The informal sector is often characterised by lower entry barriers than the formal economy, including less stringent requirements for skills or qualifications, fewer regulations on registration, and limited start-up capital [84,101,105–114]. These factors encourage the urban poor to enter the informal sector and motivate women in particular, because, in many cases, they face a range of additional restrictions and responsibilities with regard to household tasks, reproductive responsibilities, culture and religion – all factors that tend to prevent women from entering the formal economy [84,100,107–109,115]. This is particularly important for the informal food sector, in which women can employ their cooking skills to earn a living. Downing and Daniels [116] called this the 'spatial entrapment' of women to encapsulate the restrictions inherent in their reproductive and household duties, which often confine them to an area of extra-household activity. An informal enterprise allows women to locate their businesses close to (or at)

home. Furthermore, it provides flexibility, and therefore an opportunity for women to combine income-generation with their other responsibilities [109,117–119]. Despite lower barriers compared to the formal sector, women in the informal sector still face a range of entrance hurdles, including time and space constraints on their productivity and deficient infrastructure [120,121]. There are also barriers in relation to local and national markets, including gender discrimination and stereotyping [107], which could help to explain why women's firms might, at first glance, seem less dynamic in terms of size, profitability and technology [122].

Meagher [100] stresses that overcoming the impediments to women's access and full participation in economic opportunities requires systematic removal of the cultural, regulatory and economic barriers present. Reforms in the informal sector are often inspired by a neo-liberal agenda [123–125], which can in some respects contribute to cracks in the vicious circles that restricted women's enterprises, but can also come at a price of vulnerability for women [126,127]. 'Smart economics' approaches, for example, rationalise investing in women for more effective development outcomes and present them as 'power-houses of growth' and 'secret engines'. In doing so, this approach exploits women's apparent capability to withstand economic crisis and carry on [128,129]. Such approaches are considered by Chant and Pedwell [84] as placing superhuman burdens on women, rather than having an empowering effect. Other important areas of vulnerability are caused by the removal of social safety nets [130] and increased competition [131]. Men and women respond differently to this vulnerability: whereas men tend to be more competitive, territorial and open to hiring personnel, women often diversify services and products to reduce risks, and collaborate among themselves to achieve strength in numbers [107]. Yet, very little is known about the way in which access to energy affects the obstacles that women face in their entrepreneurial activities, e.g. whether it increases women's vulnerability or lessens it.

5. Growth, gender and entrepreneurial logic in the informal sector

Research on informal sector entrepreneurship has diversified from a focus on barriers to entry to include the different logics that affect the informal entrepreneur's potential for success [105,132,133]. One group of scholars, including Berner et al. [105] and Gomez [106], explored entrepreneurial logics and claim a fundamental and qualitative difference between survival and growth-oriented enterprises, a term first coined by Rogerson [23]. These authors argued that growth-oriented enterprises are characterised by: a male majority; barriers to entry (including financial- and skills-based); embedding in business networks; and a business strategy in which the owner displays a willingness to take risks. In addition, growth-oriented enterprise owners were also able to accumulate part of the income generated, and utilise more capital [134]. Survivalist enterprises, in contrast, were argued to have a female majority; few barriers to entry due to low capital, skills or technological requirements; were embedded in social networks of family and relations; and adopted a risk-averse enterprise strategy. There was often an obligation in such enterprises for the income generated to be shared [105]. Other authors have softened this distinction and identified (i) growth-oriented entrepreneurs, who have a single firm, use hired labour and seek external sources of capital; (ii) survivalist entrepreneurs who seek security and stability often by establishing a micro enterprise to generate an income and have diversified income sources; and (iii) strictly survivalist entrepreneurs, who were generally very poor and often involved in agriculture [135]. In a later study, Downing [116] remarked that men dominate the growth-oriented category. Reynolds et al. [136], instead, focused on motivations for starting an enterprise and distinguished between necessity-based entrepreneurs and opportunity-driven entrepreneurs. Where the former are in business to satisfy part of the basic needs of the household, and started their business as a means of surviving [27,137], the authors argued that the latter seek to expand the business and

improve the living standards of the household at the same time [136].

A number of studies have argued that the barriers to moving upwards are significant, and that few survivalist enterprises (often between 1% and 4%) [106,138] are expected to cross over to become growth-oriented [106,138–140]. This low conversion rate has caused some authors to argue that growth-oriented enterprises may benefit more from access to credit than their survivalist counterparts [106,138–140]. Such findings are further supported by Kooijman-van Dijk [19] who pointed towards the large differences between survivalist, necessity-driven enterprises and growth-oriented, opportunity-driven enterprises. She highlighted that only very few of the poor are engaged in the latter. The unequal access that firms, including women's enterprises in the informal food sector have to business development services, credit and social networks make it difficult for survival entrepreneurs to obtain investment capital [106,134,141,142]. But many survivalist enterprises do not accumulate capital or reinvest their own profits, and they are thus assumed to be operating under a 'non-entrepreneurial' culture [143].

Within this vision, the absence of growth is generally presented as lack of interest in enterprise expansion among survival entrepreneurs. It is usually explained as the result of a situation in which the poor are not looking for the specialisation and skills necessary to operate at a larger scale because they barely have sufficient income to satisfy household needs, let alone reinvest profits in the business [105,106,144]. Rather than actively pursuing growth of the enterprise, survivalist enterprises are said to expect their business to provide an income, which can then be invested in other household activities and strategies, such as education for children. [106]. Furthermore, the increasing role of women as the sole provider of a family's basic needs requires them to have an income [145,146]. As a consequence, many women have micro-enterprises, including in the informal food sector, because they are responsible for the food security in their household and not because of a desire to run an expanding enterprise [106].

The strength of the survivalist-versus-growth enterprise typology lies in its heuristic starting point and eye-opening value to start understanding the linkages between entrepreneurship and access to energy for women in the informal food sector. The simplistic, dichotomous presentation of these categories increases the risks of intellectual 'lock-in'. We argue that explaining absence of growth and scaling up of enterprises in the informal food sector and other sectors in terms of 'lack of entrepreneurial interest' is an unhelpful and gender-blind way to evaluate the real value of informal enterprises. A key reason for this perspective is its lack of responsiveness to the poverty and gender dimensions that may affect opportunity, strategy and choices available to entrepreneurs. If survivalist and growth-oriented enterprises are different groups, as suggested by many authors as discussed above, rather than different stages in the trajectory of firms with little chance of moving from one category to the other, this creates a gender-lock. Adopting this perspective, we can see that women's enterprises are located predominantly in the survivalist category, with few prospects for becoming growth-oriented, because they do not pursue growth of a single enterprise by reinvestment, nor do they seek credit. We need to take into account the gendered nature of the informal sector and mounting evidence indicating that, on average, women's enterprises have less access to capital than those of men [147–151], that women are constrained by their reproductive responsibilities [148,150,152], and are hindered by the gendered structure of informal labour markets [16,23,84,100]. It is therefore hardly surprising that women's informal enterprises are concentrated in Berner et al.'s [105] survivalist camp rather than in the growth camp. We observe that this gender-lock implicitly represents survivalist enterprises as 'female' and growth-oriented, 'real businesses' as led by men. In reality, their mutual relationships are likely to be far more complex than suggested here, with the expectation that many entrepreneurs will be somewhere in between these polarised categories.

We will demonstrate the dangers of this conceptual narrowness

through an example of risk management and gender. An important reason for survivalist entrepreneurs not seeking expansion is the way in which they treat risk. Wright [153] argued that ‘the poor are too smart or too risk-averse to put all their eggs in one basket and invest exclusively in one activity or enterprise’ (p. 40). Because of the high personal dependence on the enterprise's income, entrepreneurs often adopt a risk-averse entrepreneurial strategy. This approach includes relying on diversified income streams so that the failure of a single enterprise has only a limited, manageable, impact on total household income [106,144,153,154]. Therefore, what might be assumed to be a lack of priority for survivalist entrepreneurs to expand a single business may be a deliberate choice because no single income is expected or trusted to provide an escalator of sustained growth of income [106,153,155]. With regard to gender, female-run micro-enterprises demonstrate different investment patterns from those of their male counterparts, with the later showing a greater willingness to take risks [84,156–158]. A Canadian study on business expansion found that women preferred to adopt a slow and steady rate of expansion rather than fast-paced growth and personal considerations appeared to override economic considerations in enterprise expansion decisions [158]. Although the situation in the informal sector in developing countries is very different, the study nevertheless raises that women and men may have different preferences for the way in which they expand their enterprises.

In the informal sector, women commonly adopt a risk-diversification strategy in their enterprises [84,154], with surplus revenues typically used to open one or more new enterprises rather than growing the size of the existing ones [106,143,148,159]. For example, a female entrepreneur might decide to start a sewing business in addition to her activities as a food vendor to diversify her income stream rather than to attempt to increase volume of sales or size of her food sector enterprise. Cliff [158] investigated the gender dimension of entrepreneurs' attitudes towards growth in the formal sector and found that male and female entrepreneurs were equally likely to desire business growth. However, important differences were found with respect to how they wished to expand, in particular regarding the thresholds of maximum business size, which the entrepreneur was willing to manage. The thresholds of female entrepreneurs were smaller than those set by their male counterparts for reasons including locus of control over the enterprise and ability to devote time and energy to the enterprise and maintain work/family balance. Such entrepreneurship strategies, in addition to securing household income, can be argued to provide women with more flexibility to engage in other activities, especially household and care responsibilities [152]. Although such strategies may not result in ‘expansive’ growth, they can hardly be called non-entrepreneurial. An important insight from this literature is that perhaps women do not want to grow an enterprise, but would rather have a multiple-pronged enterprise which ensures a minimum but low-risk income. Rather, they reflect dynamism present in entrepreneurs regardless of their motivations for starting an enterprise [160]. Explicit recognition of the acceptability of this alternative route in development policy may also bring important empowerment benefits to women.

What appears to be a lack of appetite to expand an enterprise could, therefore, be the result of an alternative entrepreneurial logic in a context in which resources are in short supply. Crucially, it does not automatically imply that female entrepreneurs would not be interested in growth if circumstances allowed. In our view, the mainstream narratives of entrepreneurship lack a nuanced appreciation of gendered interest and strategy in pursuing growth, and more work is needed to fill this gap. This argument is supported by Ahl and Marlow [161], who indicated that the literature on female entrepreneurship is ‘theoretically naïve and unaware’ (p. 556). Gomez [106] has called for the adoption of a gender lens when analysing enterprise development and entrepreneurialism, because, she argues, ‘it is no coincidence that almost all those who graduate are men’ (p.15). She adds that to date ‘the gendered spaces of entrepreneurial work constitute an underexplored frontier’

[107, see also, 162, 163].

With regard to the core concern of this paper, the nature of the informal food sector and existing gender dynamics may result in a situation in which simply providing access to modern energy services is not sufficient to contribute to achieving all gender goals, particularly in the area of productive needs [68]. In line with this realisation, a three-country study conducted by Kooijman-van Dijk and Clancy [164] concluded that ‘access to electricity in enterprises is having a stronger impact on non-financial aspects of poverty through the products and services of the enterprises than on financial poverty reduction through increasing incomes from enterprise operation’ (p. 20). Such insights suggest that, although access to modern energy services may help the development of women's informal food enterprises, evidence of the effects on enterprise success and empowerment is lacking.

Yet, access to energy may contribute to achieving gender goals by other ways than directly increasing profit, productivity or enabling expansion of an enterprise. For example, it may affect the potential of women to empower themselves through entrepreneurship in the informal sector. This effect is illustrated by a recent study on women's informal food enterprises in South Africa [165], which found that, despite entering the informal sector out of necessity, enterprise owners expressed a deep sense of independence and improved empowerment. The study indicated that their enterprise provided them with agency in their lives and a sense of freedom. This kind of empowerment may partially be enabled by access to energy. Such examples demonstrate the value of moving beyond the binary conceptualisation of survivalist versus growth-oriented enterprises. By doing so, space is created to better understand the dynamics of these enterprises in introducing changes to their business that suit their personal circumstances. Crucially, it supports the idea that there are intermediate business positions that need to be explored in both evaluative research and policy formulation.

6. Women's enterprises in the IFS: an energy intensive sector

To further explore the linkages between access to energy, enterprise and empowerment, the review now turns to a highly energy-intensive sector, that of informal food. Two main distinctions can be identified within the IFS: (i) food preparation and vending, consisting of food items that are prepared at home or on-site and sold on the streets, at markets, or from home; and (ii) food processing, which transforms agricultural or foraged products into a processed product. Enterprises in this sector are generally highly energy-intensive. The sector is dominated by women's enterprises, and studies in Zimbabwe and Senegal report levels of between 80% and 85% of female traders [98,166,167]. IFS enterprises have an important role in providing an income for poor women, and play a key role as food-energy support instruments in urban landscapes [168–170]. Existing studies on the IFS have focused on related geographical and socio-economic patterns [171,172], including the importance of location on enterprise performance [170], nutrition and food security [173,174], hygiene and contamination [175–178], and policy and regulatory environments [179,180]. However, despite the importance of the IFS for women's income-generating activities, and the high dependence on energy of the sector, empirical evidence on the links between energy access, women's empowerment and IFS enterprises is limited.

Energy is a critical input in the IFS. Yet, a clear understanding of the energy-access dynamics in IFS enterprises is lacking. The majority of energy-related evidence found in IFS studies simply re-states the type of energy used for cooking, heating and cooling as part of another discussion [see, for example, 181 who identified energy needs of the fish processing sector in Nigeria]. Some studies, however, provide more detail on the energy aspects of the sector, reconfirming that the use of traditional firewood and charcoal remains widespread [67,103,165,167,181,182]. Clancy et al. [29], for example, established that IFS enterprises are significant users of fuel-wood. Fuel-wood is

often purchased, forming a significant financial input for micro-enterprises, with estimated energy costs ranging from 20% to 25% of total costs.

There is some evidence that a lack of adequate, affordable, reliable and safe energy supply may affect women's ability to operate their enterprises profitably and safely [77,165]. This research is supported by evidence from a study by Kimemia and Annegarn [167], who found that a lack of proper premises for cooking and serving customers (e.g. adequate structures and shelters in which to cook and serve food in all weather conditions), together with inadequate energy services, in terms both of quality and quantity, were among the main challenges faced by IFS enterprises. Survival entrepreneurs benefit disproportionately from improvements in basic service and infrastructure compared to their growth-oriented counterparts, including access to energy [105]. The availability of electricity and transport connections can mitigate the severe competitive disadvantage that survival entrepreneurs have to cope with [105]. Furthermore, improving the provision of energy, water, sanitation and waste disposal can reduce the health and time burden of poor women in survivalist enterprises.

Nevertheless, the continued use of traditional energy sources in the IFS can be motivated by a number of reasons besides cost. One of these appears to be customer demand, as many traditional foods have specific preparation requirements. This point is illustrated by King et al. [183], who found that street food vendors in Ghanaian slums prepared traditional dishes with wood because customers preferred the taste that this method imparts. Modern energy carriers were utilised for other dishes. Similarly, Polak [184] highlighted the crucial role of wood fired ovens for making traditional Tunisian bread (chobbs), which is a trade dominated by women and represents an important source of their income. Although the majority of Tunisian households use LPG, chobbs remains prepared in ovens fuelled by firewood and rosemary shrubs as this method represents traditional values and continuity and appeals to the tongue and the nose. This phenomenon is not unique to the IFS or developing countries, however. For instance, pizza restaurants in many developed countries respond to customer demand for pizzas prepared in a wood-fired oven [185].

The studies presented in this section highlight the links between energy and enterprise in the IFS and emphasise that, depending on enterprise needs, access to a range of energy sources may significantly affect enterprise operation and performance.

Kimemia and Annegarn [167] reported that around 60% of the enterprises in their study indicated satisfaction with the performance of their business, and the authors stressed that the IFS is a 'thriving informal business sector that yearns for a tailored assistance in order to attain growth' (p. 110). Several studies highlight that access to appropriate energy sources is an important component of such tailored assistance. Several studies have raised the issue of spatiality as a factor affecting the success and energy access of enterprises. With regard to geographical factors, Acho-Chi [170] highlighted that a well-located site (e.g. near a transport node or public space) was an important asset for an IFS enterprise to ensure the largest possible client base, and choice of location was guided by ease of access, relative distance to other food points, rent patterns but also transport and energy costs. Others, including Haan [165] and Bressers et al. [95], identified that, although location is an important choice for enterprises, it can in some instances restrict access to energy. Haan's [165] study found in a study among women's enterprises in the IFS in Cape Town that location influenced both energy sources used and products sold related to the permanence of the structure from which an enterprise was operated or its customer base.

Other studies have focused on energy transitions and fuel-switching behaviour in the IFS. A study among female food vendors in Accra, Ghana, emphasised the importance of LPG in these enterprises and identified a transition from traditional fuels to LPG in response to a mixture of customer needs, flexibility of the enterprise through the use of portable cylinders and potential to grow the enterprise [85].

Kimemia and Annegarn [167] found that, driven by affordability, many IFS enterprises used traditional fuels and stoves for a range of dishes, but that they aspired to the use of modern fuels, mainly with the long-term goal of using LPG, but with improved stoves as a stopgap measure. Allerdice and Rogers [186] found that IFS entrepreneurs required electricity to draw in customers by extending operating hours, but that this power source also improved working conditions, automated production, preserved products and enabled the business to communicate beyond the local markets. Along similar lines, Acho-Chi [170] identified the need and aspiration for proper 'modern preservation technologies' in the IFS, including affordable refrigeration units and heating units to store and reheat leftover foods. The adoption of this energy-related technology was expected to reduce food loss due to low demand or decrease quality of the product. Additional studies have also demonstrated the aspiration to improve enterprises by adopting additional energy sources. Graffham et al. [166] found that IFS enterprises in Lusaka and Harare were willing to pay for both running water and electricity. Importantly, these findings suggest that enterprise owners are interested in improving their enterprises, thus providing evidence of a development away from a purely survivalist orientation. Due to the high energy needs of the IFS, the practice of incorporating a variety of energy sources, rather than seeking to switch to only modern fuels, may be a logical and financially sound option for these businesses.

Studies exploring the gender and empowerment dimension of the IFS have predominantly focused on the division of labour. Davies et al. [103], for example, identified that cassava processing, grating, dewatering, and milling are activities led by men, and peeling, washing, drying and frying operations by women. In Ethiopia, the time-consuming and laborious task of producing traditional butter (kibe) and fermented milk (ergo) is performed by women [187]. In other examples, men deal with livestock and women control the food-processing aspect (e.g. milking and dairy processing) in West Africa [103]. In a Kenyan case study on pastoralists, Dietz et al. [188] found that women process, market and decide on quantity of meat produced and sold. Despite the importance of energy in IFS enterprises, which require energy for thermal use, lighting and mechanical application, as well as for mobility, and the strong presence of women in this sector, the gender-empowerment-energy nexus has remained unexplored. As a consequence, there is currently limited insight into the kinds of energy services that women need in order to generate empowerment benefits, within or beyond the enterprise, and into the barriers and opportunities for achieving women's empowerment by providing access to energy in the IFS.

7. Discussion and concluding remarks: energy access, women's empowerment and entrepreneurship – the evidence

This interdisciplinary review aimed to: (i) assess the evidence base with regard to the impact of access to energy in women's enterprises in the informal food sector and with regard to empowerment; and (ii) explore the linkages between energy, women's empowerment and entrepreneurship. Based on our review of the existing literature, we have argued that access to energy for enterprises may have a facilitating role in women's empowerment, rather than direct empowerment effects. Throughout the paper, we have also identified significant knowledge gaps in the energy-entrepreneurship and empowerment nexus and highlighted the need for further empirical studies in the IFS to build an evidence base in this field. The remainder of this paper will highlight the main points from evidence currently available and bring together the concepts of energy for productive uses, entrepreneurship and women's empowerment in the IFS, and identify areas for future research.

7.1. Existing evidence on benefits gained by women's IFS enterprises from access to energy

The findings from this review suggest that adequate energy services (for cooking, heating cooling, lighting, mechanical power and transports) have the potential to benefit IFS enterprises and may facilitate the empowerment process of women in this sector.

However, empirical evidence confirming such claims is limited. The few existing studies highlight a range of potential benefits for women resulting from energy access in the IFS including a cleaner work environment with less air pollution and lighting for safety; reduced wastage as a result of refrigeration; increased profits because of product diversification; reduced time-poverty because of automated production, drudgery or wood collection; flexible and extended opening times due to lighting; and occupation of more profitable locations as a result of improved mobility. Empirical evidence confirming the above benefits for women's enterprises is, however, scarce. This situation can, in part, be attributed to funding priorities and the detachment of development aid from impact research. Furthermore, the current evidence base strongly suggests that the opportunities for achieving gender goals and making tangible contributions to women's empowerment depend on other factors, including resources, skills, competition and (global) markets.

Access to energy in enterprises alone cannot empower women, and this review has established instead that, the *appropriateness of the energy service* is crucial to support growth and sustainability of women's enterprises. Existing evidence suggests that women adapt their enterprises to the energy-related constraints of their location and personal circumstances. Yet, to promote and run their IFS enterprises sustainably, women often require access to a range of different energy sources to power the different activities needed to operate their enterprise, preserve foods and prepare traditional and modern foods. Instead of solely focusing on facilitating access to modern energy, as is often the case in development aid projects, there is a need to facilitate a diverse combination of energy services to provide women with more flexibility, choice and agency. Providing such services could assist women to gain equally worthwhile empowerment benefits from their entrepreneurial activities.

A key finding emerging from this review is that improved access to energy, although not directly increasing women's empowerment, can facilitate the empowerment process in several ways at both the home and enterprise levels. Access to electricity, for example, may provide access to media and lighting for activities in the evening, and could enable women to engage in broader fora, both political and social. With regard to the enterprise, access to appropriate energy services allows women to exercise increased choice and control over the way in which their enterprises are run. Control over, and access to, resources were identified as key building blocks of empowerment, upon which the conditions for agency are defined. Access to energy in the IFS can be such a building block. As a consequence, energy access can be an important pre-condition for women's empowerment, particularly in the highly energy-intensive IFS, as it may provide the control and agency that women need. These conditions might put enterprise owners in a better position to achieve their own goals, hereby contributing to more sustainable and empowered enterprises in the IFS in the long term. Examples of this form of empowerment are reflected in the changes in the range of products that women entrepreneurs can offer or in the increased flexibility of opening times, which allow women to better combine reproductive and household tasks with entrepreneurial activities.

Choice and agency are important parts of the empowerment process. The example of access to electricity for lighting will show this in the context of energy access. Access to adequate lighting allows a woman to operate with longer opening times, and may allow her to sell more products and, in the long term, grow her enterprise. However, she does not have to follow this trajectory. It is by no means clear that

growth is, or should be, the goal of many women's IFS enterprises. But making this choice available, however, is an important part of the transformative process that constitutes empowerment. Expensive and unreliable energy services limit this choice and force women into using a limited range of energy sources. This situation can have a disempowering effect, as it may result in an unsafe working environment, restricted opening times, and inferior enterprise locations. The findings from this review, therefore, suggest that, although access to energy itself is no panacea for women's empowerment, it may alleviate restrictions on the operation and profitability of women's enterprises and thus indirectly have some positive impacts on empowerment.

Hypothetically, access to appropriate, safe, affordable and clean energy sources and appliances could have a role to play with regard to women's empowerment in the IFS. Although we would like to support this statement, we have found insufficient evidence to confirm this assertion at this point in time. Furthermore, this review has emphasised that access to energy is not sufficient to fuel this process. Our study further highlighted that the troubling reality of women's enterprises in the IFS is that they often operate in difficult circumstances. Among the difficulties are lack of protection or security afforded by regulations that govern the formal sector, lack of skills, access to resources, and pervasive gender stereotyping as regards entrepreneurship. Women's empowerment in the IFS might not necessarily increase equity between men and women, but could allow women to become less unequal in their entrepreneurial activities. However, even this would require gender-focused work to increase protection for enterprises, to build capacity among women entrepreneurs, and provide the necessary resources and support to those women that want to grow their enterprises. Energy access interventions should, therefore, feature a wide range of support, including capacity-building, education and finance for entrepreneurs interested in growth. At the same time, there also has to be a recognition that many women's enterprises may remain 'un-entrepreneurial' in the traditional sense, as many women have a different, low-risk strategy to ensure an income flow. Energy support to women in the IFS should take cognisance of the fact that women have entrepreneurship strategies ranging from survival to growth, with many intermediate steps in between.

Despite the significant importance of energy access as a resource for IFS enterprises, and the high concentration of women in the sector, the gender-empowerment-energy nexus has remained largely unexplored. This point is an interesting observation, considering the significant attention that the topic has received in the (largely donor-driven) development community. An underlying factor that has resulted in this lack of knowledge is that donor funding rarely funds academic research, despite significant gaps in knowledge identified by the research community. This gap creates an imperative for the energy and gender research community to explore knowledge gaps and identify research needs in support of gender empowerment efforts in the area of energy access with stakeholders beyond academia. At present, notwithstanding a few exceptions, there are limited empirically-based insights into the nature and magnitude of the energy services that women need to be able to reap empowerment benefits from IFS enterprises; whether and how empowerment in their enterprise extends to the household level; and what the barriers and opportunities are for achieving women's empowerment by providing access to energy in the IFS. These are all critical areas for further enquiry.

7.2. IFS entrepreneurship, energy and empowerment: breaking the gender-lock: entrepreneurial strategies and women's empowerment in the IFS

A second contribution with regard to women's empowerment in the IFS comes from the enterprise and informal sector literatures. This research has provided critical insights into the gender dynamics of enterprise strategies that may affect women's empowerment and their energy needs, and affects how energy interventions directed at women could be approached. Although we critique the binary distinction

between survivalist and growth-orientation in enterprises presented in Section 5 for its failure to accommodate the true range of entrepreneurial approaches, important insights were gained from this literature.

Uncritical application of the entrepreneurship literature would suggest that women's survivalist enterprises in the IFS are disempowered, because many do not follow the 'traditional' growth-oriented model. The current conceptualisation of 'growth' and 'success' in the entrepreneurship literature shows little sensitivity to the range of outcomes that are possible and the goals that many entrepreneurs, particularly poor women, may espouse through their enterprises. This insight supports earlier findings in the literature, which challenges the gendered assumptions informing entrepreneurship theory, particularly the deeply embedded prevailing hetero-normative assumptions [161]. Women's enterprises in the IFS need to be seen in a more nuanced light. Rather than being restricted by the survivalist- versus growth-orientated categorisation of enterprises, we suggest a more holistic approach for understanding entrepreneurial logic. Such an approach would clearly be more responsive to the reality of gender dynamics in the IFS and would seek to take into account women's access to resources, such as energy, opportunity, contexts, risk management and family well-being as integral part of a logical entrepreneurial strategies. Although the traditional responsibilities for family work and support place a heavy burden on women, they are widely engaged in IFS entrepreneurship activities, which offer a long-term opportunity for empowerment by 'breaking' the mould of traditional family-labour interactions, thus 'fuelling' the empowerment process. Energy can be considered to be an enabler in this process, and access to energy may help to facilitate a situation in which women have more choice, more agency and more resources.

We provided evidence in this review that neither the survivalist- nor the growth-oriented model accommodate the 'risk-diversified' entrepreneurial strategies often adopted by women, under which they may prefer to open multiple micro-enterprises to the expansion of a single enterprise. We interpret women's engagement in pluri-activity as a strategy to ensure maintenance of at least a minimum flow of income in a highly uncertain business world, while at the same time providing the basic necessities of family life, such as food as well as balancing reproductive tasks [104] at home with entrepreneurship. Suggesting that women 'lack entrepreneurial attitudes', based on a narrow notion that enterprises need to grow, is unhelpful because it does not recognise the solid logic on which many women's entrepreneurial strategies are constructed, and disregards women's dynamism in the sector. We therefore call for increased conceptual flexibility when investigating entrepreneurship in the IFS, to accommodate gendered patterns of enterprise development, in which women have the freedom to introduce changes to their enterprises that suit them in their specific contexts, rather than being pigeonholed into a 'survivalist' category.

Despite the potential for empowerment of women in the IFS, leading to increased opportunity for exercising their agency and acting upon self-identified goals [75,76,165], entrepreneurship should not be idealised. Although the informal sector is characterised by strong entrepreneurial dynamism [160], and often seen as a means of combatting economic sluggishness and socio-economic problems, the potential for empowerment of women in the IFS should not be exaggerated. Many entrepreneurs in the sector experience serious hardship because of time and resource constraints, narrow markets, gender stereotyping, stiff competition, and lack of opportunities to acquire skills and to access capital [84,128]. Lack of access to modern energy sources and technologies is one among a range of barriers that women face in operating enterprises in the IFS, and solving these problems would be only one step towards enterprise based empowerment. Furthermore, projects to improve the energy situation will always be few and far between, depending on the international development arena. Therefore, a structural solution would be better suited to address issues of women's empowerment and energy access for productive uses, despite the challenge of creating sustainable policies with this purpose.

7.3. Conclusion and suggestions for further research

In conclusion, this interdisciplinary review of the existing literature has shown that providing access to energy services to IFS enterprises has some potential to bring empowerment benefits to women and affect the way in which women run their enterprises, their choice and agency and their ability to 'take control over their lives' [70]. We have interrogated the links between energy access, entrepreneurship and women's empowerment and highlighted that participation in the IFS already provides many women with an opportunity to engage in transformative processes, by increasing their agency, access to resources, self-reliance and opportunity for achievements. The study also shows, however, that there is little empirical evidence on how access to energy promotes women's empowerment in the IFS, despite claims that this is the case.

Further studies could contribute to building this evidence base by investigating the sector-specific needs of IFS enterprises and critically evaluating the enabling policy and regulatory environments. Such research must establish a robust and convincing empirical basis by (i) exploring the empowerment benefits that women derive from entrepreneurial activities in specific contexts both at the enterprise and household level; (ii) by mapping gendered patterns of IFS development and entrepreneurial strategies; and (iii) by evaluating the contribution of energy access to success of IFS enterprises.

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