

Energy choices in SME's in rural areas

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1 Introduction

“Access to energy is central to poverty alleviation. [...] Access to affordable energy services are critical for increasing agricultural productivity, encouraging economic activity, generating employment and income opportunities, and improving the quality of life particularly for women and children.”

“The availability of jobs, productivity increases or economic opportunities is severely limited without access to modern energy services and fuels—which can catalyse the creation of microenterprises, livelihood activities beyond daylight hours and locally owned businesses.”

These quotes from the World Summit on Sustainable Development in 2002 (UN 2002) and from the Millennium Development Goals Plan of Action (UN 2005), indicate that an influential international body of policy makers believe that modern energy services can have a positive impact on the development of small enterprises, and that this can lead to a reduction in poverty. Since the World Summit, the topic ‘productive uses’ of energy has climbed on the agendas of many development agencies, including bilateral donors and the Global Environment Facility and its implementing and executing agencies (UN Development Programme, UN Environment Programme, World Bank, FAO, UNIDO, and regional development banks) as was stated in the GEF-FAO Workshop on Productive Uses of Renewable Energy (2002). Indeed, the strategic priorities of the UNDP and GEF in the field of energy both include productive activities, the UNDP promoting rural energy services for household and productive activities, and the GEF, promoting productive uses of renewable energy.

Productive uses of energy are an interesting topic both from the point of view of poverty reduction, through creating opportunities for income generation, and from the point of view of energy supply, as income generation increases the ability to pay for energy services. Many programmes from governments and development agencies are based on these assumed positive linkages between energy supply and opportunities for income generation, looking for win-win situations. However, there is little knowledge about such linkages to underpin these strategies. Although there are many examples of best cases where provision of energy services has indeed lead to establishment or growth of small enterprises, these have often been gathered and presented with the goal of advocacy. Although these receive less attention, there are also many examples of cases where this has not happened. However, understanding of the factors and underlying mechanisms that influence the role of energy in the establishment and growth of small enterprises is lacking. Also, where modern energy services have lead to use in enterprises, what have been social and economic impacts, both in the enterprises and in the community? Research is needed to understand the linkages between energy services and productive uses. Identifying factors that can play a role in shaping these linkages can be a first step. Because these factors can be expected to differ depending on the entrepreneurs themselves, the energy supply characteristics, economic circumstances and other forces, it is a necessary second step to understand the mechanisms at play.

¹ Please correspond with the author if you have any remarks on or related to this paper.

This paper is based on ongoing PhD research which aims to contribute to the emerging paradigm on energy and development with empirical evidence at micro level, contributing to understanding of linkages between the fields of energy, enterprise development and poverty. Such understanding would support future policy formulation and strategies in the fields of energy, enterprise development and poverty reduction. This research takes the perspective of the livelihoods of entrepreneurs as a starting point to increase the depth of understanding on the choices made by entrepreneurs involving their enterprise and the role of energy in this. The study of livelihoods involves the broad livelihoods framework, including the entrepreneur's assets and strategies, and context factors such as institutions.

In this paper, a short overview will be provided of the research methodology and argumentation for case study selection which serves to lift the level of conclusions above that of examples. The core of the paper is formed by a description of field research findings and preliminary analysis². Finally, the propositions that have been formed in the initial stage of the research will be discussed in the context of programmes and initiatives on productive uses of renewable energy.

2 Field research in Uttarakhand, India

2.1 Research methodology and selection of case studies

The research makes use of case studies. Three different levels of case studies are used: the level of the entrepreneur, the level of the community, and the district level. The enterprises, communities and districts are selected using purposive rather than random sampling, so that researched cases at each level provide information on proposed factors influencing energy choices, such as enterprises size, distance of community to a motorable road, or economic situation in a district.

Case studies will be performed in India. In India about 150 thousand of the 586 thousand villages remain to be electrified, many of these in hilly areas, forest areas, or island. Aggregated data on the access to other modern energy carriers is not available, but it can be assumed that lack of access to these carriers, such as LPG or diesel, will be mainly within those areas where access to grid electricity is not available.

A pilot field study was performed in the state of Uttarakhand, India. In Uttarakhand, which largely consists of hilly and mountainous areas with much forest coverage, 2785 villages are not yet electrified. In total more than 1000 villages or hamlets have been identified for electrification through renewable energy sources (MNES 2004). Many villages in Uttarakhand have been connected to the grid over the past decade, and it is these villages that were selected as a starting point for the pilot study. The findings from the enterprises in these villages were contrasted with finding from nearby villages without access to grid electricity, and to nearby villages with access to modern energy carriers that function as regional commercial centres for these villages.

From the perspective of small enterprise development, Uttarakhand is an interesting state because many initiatives for the social and economic development of the rural areas are being established since Uttarakhand became an independent state in 2000. Also there are many enterprises in the rural areas of the state- just over half of the registered 215 thousand enterprises are in rural areas.

² A more detailed description of findings is provided in the discussion document "The role of modern energy in poverty reduction through small enterprises – the case of Uttarakhand, India", A.Kooijman 2004, and the findings will also be used for the complete case study to be published as a PhD dissertation.

2.2 Livelihoods in Uttarakhand

Uttarakhand is a hill state in the Indian western Himalayas, with a total population of 8.5 million, of whom 74% live in rural areas (Government of Uttarakhand 2004). Research was performed in three districts of Uttarakhand: Nainital, Almora and Bageshwar. Enterprises and households were visited in these districts in towns, roadhead villages and remote villages. In total 46 enterprises were included in 8 remote villages, 8 roadhead locations³ and three towns.



Figure 1: location of research districts in Uttarakhand, India (adapted from: Office of the Registrar General, 2004)

The focus of the research is on the different types of enterprises that are common in the researched districts and for the types of location. The selected villages are typical for the region considering livelihoods assets and opportunities. Households cultivate their own land for part of their own food consumption, and depend on other sources of income to be able to buy food and to cover other expenditures.

2.3 Field study findings

The findings from the field study can be described at different levels of aggregation and using different cross sections. For this paper the main findings will be presented at sector level for selected enterprise sectors to give an indication of typical enterprises and their energy choices. Further, some propositions following analysis of types of markets will be put forward.

The enterprise sectors presented here are: flourmills, tailors, and jam making. These first two sectors are common in the research area, the last is representative of agro processing: a sector that the state government considers to have high potential for the state of Uttarakhand. The case enterprises were also selected to contrast on characteristics that were expected to be of major significance for energy choices and impacts, namely type of energy service required, and the type of market (local or distant). An overview of these characteristics for the analysed enterprises is given in Table 1.

Enterprise	Energy service	Energy supply option	Market
Flourmill	heavy mechanical labour (grinding)	water, electricity, diesel	local
	lighting	electricity, none	
Tailor	small appliances (sewing)	human energy, electricity	local
	lighting	electricity, none	
	heating (ironing), press	woodfuel/(char)coal, electricity	
Jam making	heating (cooking)	woodfuel, LPG, electricity	distant
	drying	electricity, solar heat	
	Processing (cutting, pulping)	manual, electricity	

Table 1: energy and market characteristics of the selected enterprises

³ A roadhead village is located on an all-season road that is accessible by car, a remote village is not accessible by motorised transport. The remote villages included in this study were between 20 minutes and 5 hours walk from the road.

2.3.1 Flourmills

The main energy service required by flourmills is mechanical grinding. Flourmills in the researched district operate on diesel, even though a few had operated on electricity from the grid earlier. Where this choice is available, diesel is preferred above electricity, even though per unit electricity may be cheaper. However, because the base tariff for commercial connections is high and fixed, the use of diesel is more flexible for seasonal load patterns.

In the research district flourmills are traditionally water powered. However, these traditional mills are gradually being substituted by diesel-powered mills. Reasons for this switch are firstly related to the water supply: seasonal availability of water in small streams, and regular damage to mills in larger rivers due to flooding, and secondly related to customer demand: diesel powered mills can be placed in the village near the customer.

Flourmillers also use the engine to run different appliances such as for rice husking, pressing mustard seed, cotton ginning. This diversification of services, and investment in different machines making use of one engine was found only in roadhead villages.

The uptake of modern energy services has allowed the establishment of a rising number of small enterprises. Many of the markets have reached the point of saturation, where millers indicate that there is not enough work due to the increase in number of millers (and also due to food support policy: in some areas the government shops now provided flour rather than grains as they did until recently) From the point of view of the community, however, the availability of modern energy services in flourmills had led to benefits in terms of comfort (reduced walking distance to the nearest flourmill) and in terms of price where competition between flourmills has reduced the price for customers.

The market size for the flourmills hardly grows with increasing numbers of enterprises. The people who make use of a new flourmill also made use of a flourmill before, and the poorest groups in society still grind grains themselves-although this was found only in the most remote of the visited villages.

2.3.2 Tailors

There were no tailors in the visited remote villages, but many in the roadhead villages. A small number of tailors in towns were visited to contrast the market situation for tailors.

Energy services that may be used by tailors are: lighting, sewing and ironing or pressing. Although electricity was available, in the roadhead villages tailors generally did not have an electricity connection to their shop. In contrast, in nearby towns, nearly all tailors do have an electricity connection. Here, electricity is used for light and an electric iron; one tailor also had an electric press. None of the tailors used an electric sewing machine, although one tailor who had used an electric sewing machine in the past, had replaced it for a manual machine

While all tailors without an electricity connection use coal heated irons, there are distinct differences in energy used for lighting. While in towns these tailors use pressurised kerosene lamps in the evening after dark, tailors in villages do not work in the evenings.

It is not possible to set out all possible factors playing a role in the energy choices made by the tailors in these cases, but it is obvious that one of the most important factors is the size and



Figure 2 Mr Bishan Singh Adhakari, flourmiller

demands of the market which plays an important role in the demand for tailor work and thereby also for lighting. Also for the purchase of other electrical appliances such as irons or electrical sewing machines, the customer demand is the decisive factor. The main advantage of these electrical appliances is increased comfort for the entrepreneur, rather than improved service for the customer, and it was found that smaller enterprises are not inclined to invest in such technologies. Especially electrical sewing machines are much more expensive than manual driven sewing machines, and they are perceived by the tailors as no faster but less reliable.

A further barrier to the uptake of electricity by the tailors is that the cost of having a commercial electricity connection is higher than the cost of a household connection. In some villages where the type of connection was apparently monitored, no tailors had an electricity connection in their shop, while in other similar villages the tailors were using household connections. In towns tailors do use commercial connections.

2.3.3 Jam making

The observed enterprises produced a range of products based on local fruits and vegetables such as jam, pickles and squash. Energy services in the production process include drying, processing, heating and storage. Here we will discuss only heating. Both researched enterprises use LPG for heating. This is not related (only) to scale of production, as nearby bakeries operating at similar or larger scale use wood. It is thought that the markets for the products play a role in the energy choice. The markets are upper class markets, largely in distant cities, and partly tourists and upper class citizens in nearby towns. To access these markets, guaranteed high quality is important, especially as this concerns foodproducts. Two aspects of quality favour LPG above woodfuel: firstly hygiene is easier to maintain with LPG stoves than with woodfueled stoves, secondly the smell and taste of wood is negative to the foodproducts concerned.

The jam making enterprises require different capabilities from the entrepreneur compared to flourmillers and tailors for example. The enterprises employ staff, contrary to flourmills and tailors which are all owner-run enterprises. Knowledge of upper class markets and the capability to access these markets, and knowledge of quality standards is necessary to enter the market of this type food product. These capabilities were found to be lacking, even for sales people working in the enterprise, which shows that such skills cannot easily be picked up.

2.3.4 Propositions from distinguishing between market types

The analysis of the enterprises and their energy choices makes clear that many strategies followed by the entrepreneurs are related to the market for their products and services. The analysis of case study finding aggregating for two types of markets: distant and local, brings forward a list of propositions to be tested in further research.

Enterprises with local markets

- The establishment of enterprises with local markets is the most common development in enterprise development. The impact of modern energy services on the establishment or growth of small enterprises with products for local markets may be initially significant, but will decrease quickly due to market saturation if:
 - there is low expenditure on goods other than basic necessities,
 - local markets in these areas are small due to low population density and travel time.
- In areas where customers' ability or willingness to pay extra for improved product quality or improved services is very limited, the advantage of many electrical appliances is much reduced. The main advantage may then be improved comfort of the entrepreneur, and the priority given to this is related to the living standards of the entrepreneur.

Enterprises with distant markets

- The impact of modern energy services on the establishment or growth of small enterprises with products for distant markets is low if networks with or assistance from organisations or persons with knowledge of these markets are lacking.
- Modern energy services in production enterprises for distant markets create new income generation opportunities for remote areas.
- In remote areas where the local markets are small due to poverty, the benefit of improved energy services will be mainly for enterprise that are able to access a distant market.

3 Discussion

The preliminary findings and propositions presented above exceed the level of 'examples'. However, more research is necessary to test the propositions and to substantiate the findings in order to be able to make a further step towards understanding underlying mechanisms in energy choices of entrepreneurs and the role of energy in the establishment and growth of small enterprises in rural areas. Such research will be performed by the author as part of the ongoing PhD research project. Empirical evidence from other research areas would be beneficial to gain insight into the validity of mechanisms outside the research area, and the author would welcome insights from experiences of practitioners and researchers in this area.

Although the presented research does not focus on renewable energy, the findings are thought to be relevant for stakeholders in the field of productive uses of renewable energy. The selected case study villages are less remote in terms of distance to towns and roads than most villages that receive electrification through decentralised renewable energy services, therefore the findings are likely to show more developments in enterprises.

These preliminary insights lead to a cautionary remark for renewable energy projects and programmes focussing on productive uses of energy. For the establishment and growth of enterprises, markets and access to markets are the key issues. Without the establishment of access to distant markets, the benefits of productive uses of energy depend on the local market. Because the areas where renewable energy projects are typically being planned are remote areas where local markets are small, it seems likely that the impacts of renewable energy will be limited unless access is created to distant markets.

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