

The Value of Rural Women's Labour in Production and Wood Fuel Use

A Framework for Analysis

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How do gender-related factors influence cooking fuel use? Why does an LPG capital subsidy lead to fuel stacking rather than fuel switching? The insights gained from authors' research are supplemented by case studies, specifically aimed at exploring the connections between women's labour time and fuel use. Using these observations and case studies, an analytical framework is developed, which yields propositions that can be tested empirically, such as the high value of women's labour in production leading to the adoption of labour-saving cooking fuel and vice versa. This framework is used to assess the limitations of capital subsidies for LPG in remote rural areas where women's labour has a low opportunity cost.

In the Least Developed Countries (LDCs) as a whole, and in sub-Saharan Africa, the proportion of rural households relying on wood fuel for cooking is 86% and 87%, respectively (UNDP and WHO 2009: Figure 10). Among South Asian LDCs, 89.6% of the rural population in Bangladesh relied on wood fuel, while the figure is 83% for Nepal (UNDP and WHO 2009: Table 20). In rural India, wood fuel was the principal source of energy used for cooking by more than three-quarters (76.3%) of households in 2009–10 (NSSO 2012). Further, the proportion of rural households in India dependent on wood fuel shrank by just two percentage points in the 17-year period, from 1993–94 to 2009–10 (NSSO 2012). Electricity use spread much faster than Liquid Petroleum Gas (LPG) use, though not in the case of Nepal (AEPIC 2012). In the developing world, while the average annual increase in electrification was 111 million households in 2010–12, increase in “access” to non-solid cooking fuels was just 62 million (Foster 2016: Slide 4). Clearly, special attention must be devoted to the issue of cooking fuel to close this gap.

The inability of poor rural households to purchase LPG has been dealt with in a number of projects that sought to overcome the capital barrier by providing subsidised LPG stoves and cylinders, including the World Bank's Deepam project in India, which covered 1.2 million rural households in 2002, in the erstwhile Andhra Pradesh. How did this capital subsidy project fare?

A study by Rajakutty and Kojima (2002) found that 90% of subsidy recipients retained their LPG connections, though it is reported in the evaluation that officials thought the incidence of retention of LPG connections was much lower. The figure was bound to be high since selling or giving away one's subsidised connection was illegal. In other areas too, there have been reports of diversion of LPG from domestic to commercial use.

However, most households, almost 90% of those that retained their LPG connections, combined it with wood as their primary fuel. LPG was used more in the monsoon months when demand for labour was high, and less in the summer when cash earning opportunities were low.

The Government of India's new scheme called the Pradhan Mantri Ujjwala Yojana (Ministry of Petroleum and Natural Gas 2016) is expected to cover the cost of the initial connection for 50 million women, although they would still have to bear the cost of the stove and recurring costs of cylinders.

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Capital subsidies for LPG did not lead to fuel switching, but to the use of multiple fuels, identified as fuel stacking (Masera et al 2000). In the cases noted in the Deepam project and in an analysis of various projects in sub-Saharan Africa (Heltberg 2004), wood remained the primary fuel, with LPG being used for “other cooking,” such as making tea so that guests could be served quickly. A recent study in Rajasthan (Nielsen 2016) found that 24% of the studied households had LPG, but they used it only sparingly.

In Bhutan, even with more than 80% of rural households having electricity, wood fuel still constitutes 90% of rural energy use and is the main form of energy used in cooking (ADB 2014). In South Africa too, rural households have access to electricity, but continue to use wood fuel for cooking (Matinga 2010).

The main question we ask in this paper is: What analytical framework will explain the persistently high use of wood fuel and, more generally, how do gender-related factors influence cooking fuel use?

The methodology we use starts with empirical evidence, gathered from observations made in the course of research by two of the authors in China, in the late 1990s (Nathan and Kelkar 1997; Kelkar 2004). The insights gained from these observations are firmed up and supplemented by case studies, specifically aimed at exploring the connections between women’s labour time and fuel use, which were conducted in India and Nepal in 2016. These observations and case studies are generalised as stylised facts to develop an analytical framework, which yields propositions that can be tested empirically, such as the high value of women’s labour in production leading to the adoption of labour-saving cooking fuel and vice versa. The framework developed is used to assess the limitations of capital subsidies for LPG in remote rural areas where women’s labour has a low opportunity cost.

In bringing about a fuel substitution from wood to LPG, there is clearly a role for supply-side factors. Without a reasonably stable supply of LPG or some other clean and labour-saving fuel, substitution would not exist at all, or would be very limited. Our argument, however, is that supply-side conditions, though necessary, are not sufficient to bring about a fuel transition.

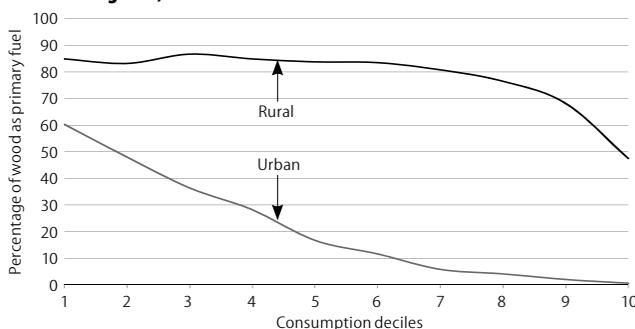
Limits of Household Income as an Explanatory Variable

Analyses of energy access postulate that the main factor determining use of energy is household income (Leach 1992; Heltberg 2004); some also introduce household size and educational level into the mix (Heltberg 2004; Rao and Reddy 2007). These analyses were related to the concept of the “energy ladder” (Leach 1992), where there is an income-determined switch from unclean, traditional fuels to clean, modern fuels.

But, did rural households behave as predicted by the above models, that is, would an increase in household income lead to fuel switching? For this analysis, we utilise the large-scale sample study of the National Sample Survey Office (NSSO 2012).

The latest Indian household energy use study for 2009–10 allows us to look at the relationship between household income, proxied by household consumption, and the primary fuel used for cooking, wood or LPG. Figure 1 shows that as

Figure 1: Rural–Urban Use of Wood Fuel by Consumption Classes (Wood as % of Cooking Fuel)



Source: Authors’ illustration from NSSO (2012).

household consumption increases in rural India, the proportion of households using wood fuel as the primary cooking fuel falls somewhat gradually, from 84.9% in the lowest consumption decile, to 80.8% in the sixth consumption decile and 76.5% in the seventh decile. It is only in the top two deciles that there is a relatively sharp fall to 68.2% and then to 47.5%. The income effect is clearly present only in the top two deciles. On the other hand, in the urban situation, there is a rapid fall from 60.3% of households depending on wood fuel in the bottom decile, to 16.7% in the fifth decile, and 0.6% in the top decile. It appears that in rural households, wood fuel use is more inelastic in response to higher household income than urban wood fuel use.

A study in Pakistan (Ouerghi 1993) had pointed out that wood fuel use in rural areas was not sensitive to the level of income, and this was also argued by Nathan and Kelkar (1997). If household income is inadequate, what can explain rural cooking fuel use? We begin by looking at the role of women’s labour in collecting fuel wood in rural areas.

Role of Women’s Unvalued Labour

Unlike urban wood fuel, rural wood fuel is largely collected and not purchased (Nathan and Kelkar [1997] and ADB [2014] for India, Pakistan and Sri Lanka; Karekazi and Kithyoma [2002] for Africa; and Kohlin et al [2011] for a global review). This means that it is not subject to the same logic of price comparison as is a purchased fuel. But, it is subject to the comparison of labour time spent in collection of wood for fuel and its alternative uses. The relevant cost in this context is not that of prices, but of the opportunity cost of labour time (Nathan and Kelkar 1997; Kohlin et al 2011), which is the cost in terms of the best opportunity foregone.

Given that women are the main collectors of wood fuel (Nathan and Kelkar [1997] and Parikh [2007] for India; ADB [2014] for Pakistan, Sri Lanka and Nepal; and, more recently, Nielsen [2016] for Rajasthan and Kerala, and Karekazi and Kithyoma [2002] for rural Africa), the comparison is between women’s time spent in collection and its next best use. In a labour-surplus economy, where there is no alternative productive use of the labour time saved, the opportunity cost of women’s labour time would be zero. Or, in the event that women’s labour time could be spent on collecting and selling, say, non-timber forest products (NTFP), the opportunity cost of

wood fuel would be the relatively low income earned from this NTFP activity.

This opportunity cost of women's labour time, the money that could have been earned, can be compared against the monetary cost of commercial fuel. Where the opportunity cost is low, fuel switching would be inhibited.

There is a difference in the opportunity cost of women's labour in remote rural areas that have seen poor commercial development and in areas with higher levels of commercial activity. The opportunity cost of women's labour is low in the former and high in the latter. Low opportunity cost of women's labour will inhibit the adoption of labour-saving equipment, while a high opportunity cost will promote it.

While areas with a high opportunity cost of women's labour are also likely to have more reliable LPG supply chains, the key factor is the opportunity cost relationship that results in the push for adoption of a labour-saving cooking system. We noted in our case studies that, even in areas with a reasonably reliable supply, as in Wayanad, Kerala, some women said that since they had sufficient labour time, they did not use LPG as the primary fuel. However, women in the same area who worked from 9 am to 5 pm daily in a workshop found it necessary to save time in cooking by using LPG as the primary fuel.

This relationship between the cost of the equipment that saves labour time and the income that can be earned with the time saved was recognised by Chayanov (1966) in his analysis of the failure of the spread of threshing machines. According to him, "in areas in which there are no crafts and trades in winter and, apart from the threshing itself, nothing in which the population can occupy itself. It is true that the introduction of the threshing machines eases the work and frees many hands ...; but since these hands can find no other work to do, this does not increase peasant family income by a kopek" (1966: 211). We differ with Chayanov (1966), by taking a gendered view of the rural family, where women and men have different responsibilities.

This analysis can explain the success of the Improved Cook Stoves (ICS) programme in China as compared to its acknowledged failure in India. Smith et al (1993) argued that it was China's relatively higher income that partially accounts for the difference in success rates, the rest being due to committed implementation. The counterargument is that the greater success of the ICS programme in commercially developed regions of China as compared to less developed regions, such as the remote uplands, or to similar regions in India was linked to differences in gender relations in the two types of regions (Nathan and Kelkar 1997; Kelkar and Nathan 2005; Lucas et al 2003).

This bears out Irene Tinker's (1990: 7) statement that "the central [rural] energy problem [is] of women's time." We now look at some observations and case studies on women's time in relation to rural energy use.

Case Studies

Observations in Yunnan in the course of studying tourism showed some contrasts in the adoption of ICS (Kelkar 2004). In a Hani village, where the entire village, including all women,

was very involved in tourism activities, there was a very high rate of adoption of ICS and electrical cooking. They continued to use some wood, but it was purchased. In contrast, in another Hani village further up the hillside and not at all involved with tourism, villagers continued to use the traditional three-stone wood stoves. On Lugu Lake, also in Yunnan, a Moso village where the women were fully involved in tourism, also cooked with wood, but they purchased it so as to save labour time.

The link between women's time and cooking energy use has been looked at in a few case studies in India and Nepal. In Dharmapathurpathi village in Dindigul, Tamil Nadu, in a self-help group (SHG) of 30, all women have LPG. This was important in saving time, not just in not having to collect wood, but also in cleaning vessels. Although they felt that food cooked with wood fuel is tastier, they opined that they would never go back to cooking with wood because they worked on the farm or as labourers from early morning onwards. There is a link here between women's involvement in non-household income earning and the adoption of LPG as the principal and only cooking fuel. Dindigul in Tamil Nadu is a commercially well-developed area, with substantial opportunities for women's employment all through the year.

By contrast, in Kenencherry village in Wayanad, Kerala, another group of women all used both LPG and wood fuel. The majority of cooking, however, was with wood, while LPG was used for tea and snacks and, occasionally, for cooking meat in a pressure cooker. They had purchased LPG with the money they earned from working in the government rural employment programme, Mahatma Gandhi National Rural Employment Guarantee Act. This saved them some time in cooking which they used instead to raise more livestock, or spend with their children or on watching tv. But, they said, "We are all housewives and have enough time to cook with wood." Wayanad is a not-so-developed district in what is one of the more developed states of India.

A third Indian case study was conducted in Santhaliguda village in the Koraput district of Odisha. Koraput is among the least developed areas of one of the poorest states in India. There are few opportunities for the involvement of women in economic activities outside traditional agriculture. A group of 15 women in Santhaliguda village used only wood for cooking. They had all at some time been given some form of ICS, but did not use them.

In a nearby Adivasi village, women in farmer households did not have LPG. The only non-farmer and non-Adivasi in the village, who ran a shop, used LPG. This shows that there was access to LPG, but it was not used by women in farmer households.

In the village of Lhisema in Nagaland, women undertake a number of economic activities, such as floriculture and commercial shawl weaving (Kelkar et al 2017). They use both LPG and wood, the former for making tea and snacks, the latter for the rest of their cooking. A shortage of wood was dealt with by growing fuel wood trees on a village wood lot.

In Nepal, case studies revealed that a combination of fuels was used. In Dalchowki village of Lalitpur district, the availability of electricity and investment in a milk chilling plant led to

increased commercial milk production, based on homestead buffalo rearing. All the women in the village had purchased LPG, but the main cooking was still done with wood, while LPG was used for making tea and snacks, or heating food. Women's non-domestic labour in rearing and milking buffaloes increased. But, this activity occurred in the homestead area, as men collected the fodder for feeding buffaloes. Since all work was done in the homestead area and did not take up the entire workday, women did not seem to find it useful to go beyond fuel stacking to fuel switching. Of course, the economic blockade on the India–Nepal border in 2015 would certainly have inhibited any complete fuel switching to LPG.

In Chyamrangbesi village of Kavre district, Nepal, an eco-village project had provided ICS to 45 households. In addition, 24 households also had biogas and eight households had purchased LPG on their own. Women mentioned that the ICS reduced wood requirement and, thus, the time spent on collecting wood by more than 50%. They were able to utilise this time to cultivate vegetables, rear livestock and engage in aquaculture. These income-generating activities were promoted simultaneously with the ICS and biogas. But, all the women continued to use wood fuel, even with the ICS, as the main cooking arrangement. Fuel stacking, the simultaneous use of various methods of cooking, held sway here, as in Dalchowki village in Lalitpur district.

These observations and case studies lead to the formulation that, in rural economies of developing countries, the value of women's labour time in production is crucial to fuel transitions, which, for the rural household, are really ways of saving women's time.

Rural Women's Productive Labour and Cooking Fuel Use

In this section, we systematise the links observed above, between rural women's work in production and cooking fuel use, into a framework that can be used to delineate the various ways in which the interactions work. The framework is meant to derive empirically testable propositions and structure empirical investigations. However, our framework has been developed to deal with the specific circumstance wherein wood for fuel is largely collected and not purchased. Thus, it will not apply to urban households or even to those rural households that mainly purchase wood. In such cases, one would expect straightforward income and price effects on fuel choice.

We use two variables: women's labour time and energy use. We depart from earlier analyses in not looking at time used in cooking (which includes both time in acquiring fuel and in cooking itself) separately, but in interaction with other demands on women's time in agriculture and enterprises. However, in this interaction, it is demand on labour time for production that is the dynamic element. An increase in the demand on women's labour time in production and its value (or income earned) will increase the pressure on women's overall labour time and, in turn, push for the adoption of labour-saving cooking systems.

In understanding changes in fuel use, it is useful to utilise a characterisation of fuel in terms of how much labour its use

requires. Collected or labour-intensive fuels are non-commercial fuels that are gathered such as wood, crop residue and animal dung. Their labour intensity is based on their being gathered by household labour, particularly women. The labour-saving commercial fuels are electricity, LPG, and kerosene, but some gathered, solid-biomass fuels could also become commercial. Wood is often purchased in peri-urban and urban areas, in which case, it is commercial. But, for the fuel-using household, when wood or other solid fuels are purchased, then there is saving of labour in collecting the fuel, though not in cooking with it.

Once wood becomes a commodity, then its use is also subject to the money metric. The cost of buying wood can be compared directly with the cost of LPG or kerosene. But, when wood is collected rather than purchased, then the manner of computing its cost is in terms of the labour time used in its collection, which does not lend itself to a direct money comparison.

We stylise the two variables—value of women's production time and the labour-using characteristic of fuel) at three levels—as low, medium and high. The meaning of low, medium and high in terms of the value of women's time in production is self-explanatory. But the use of low, medium and high in terms of the labour-using characteristic of fuel needs some explanation. Low labour-saving (or high labour-using) fuel is that where all or most of the primary fuel is collected. This would mainly be wood, but could also include crop residue and even animal dung.

In the medium labour-saving energy category, all or part of the wood is bought, as observed in the case of peri-urban settings. The fuel is the same—wood, but it is a shift to wood being purchased instead of being collected. The medium level could also be one featuring a shift from using a self-made to using a manufactured and purchased stove (ESMAP 2014); or a combination of different fuels, or fuel stacking, including both wood and LPG (Masera et al 2000). Some ICS could require a manufactured stove and also reduce fuel required, which translates into reduction in labour required for collection of wood. Such cases would also fall into the medium labour-saving category.

The high labour-saving (commercial) energy category is one where all fuel for cooking is purchased. While there may be some wood or other solid biomass in this mix, given the superior efficiency and time-saving characteristics of non-solid, modern fuels, one would expect a substitution of solid by non-solid fuels, and for LPG or electricity to be the primary fuel.

We now see how women and households in different types of rural economic situations fit into this framework. In an agrarian economy, with one main agricultural season and some extent of gathering of forest products, the demand on women's time for production and the value of women's production time is low (L). This goes up as women take up some non-agricultural or non-farm enterprises (NFES), or begin a second crop, leading to a medium (M) value of women's production time. This would go up even further as NFES grow in scale, or if there is male outmigration, requiring women to manage all agricultural tasks. In this situation, the value of women's time in production would be high (H).

Figure 2: Value of Women's Labour Time in Production and Choice of Cooking Energy Use

	Value of Women's Labour Time in Production			
	L	M	H	
Labour-saving in Energy Use	L	[a] L, L	[b] M, M	[c] H, M
	M	[d] L, H	[e] M, M	[f] H, M
	H	[g] L, H	[h] M, M	[i] H, H

The first capital letter refers to the value of women's labour in production and the second letter to the labour-saving characteristic of energy use. The small letters in square brackets refer to the cell.

We put forward the hypothesis that energy use decisions within the household are largely related to the value of women's labour time in production, though there is also the effect of *doxa* (Bourdieu 1978) or default options in decision-making. The reason for such a connection between the value of women's time in production and the type of energy used is that the opportunity cost of women's labour goes up with the increasing income from labour in additional types of production (Nathan and Kelkar 1997; Kelkar and Nathan 2005; Clancy et al 2011). While women's income-generating labour contributes to higher household income, however, as the nssso data shows, household income by itself has a very low elasticity with regard to fuel switching. Our case studies show that it is when the value of women's time in production goes up that there is fuel switching.

When there is a low value attached to women's time spent in production, there would be continued traditional collection of wood for cooking. Even if combined with electricity or kerosene for household lighting, the level of labour-saving in cooking energy acquired by the household would be low (L). With an increase in the value of women's time in production, there might well be a continuation of fuel wood use for cooking, but with a role for some labour-saving through the purchase of collected wood. This is the middle level (M) of labour-saving in cooking energy used by the household.

At the highest level of the value of women's time in production, there would be a complete shift to a high level (H) of labour-saving in cooking energy, or a high level of commercialisation, usually with modern fuels. However, in remote areas with high transport costs, even women whose production time is of high value may continue to use wood as cooking fuel, but buy it from the market.

The above structure of household fuel use can be represented by a 3x3 matrix, with the value of women's labour time in production as the explanatory variable in the vertical columns and the labour-saving characteristic of energy use as the dependent variable in the horizontal rows (Figure 2). Each of these variables takes three values: Low (L), Medium (M), and High (H).

The cells along the diagonal [L,L; M,M; and H,H] represent what economists call equilibrium positions: both the value of women's time in production and labour-saving in fuel use are in balance with each other. But, the balance in outcomes does not come about through a market-driven process since there is a negotiation of fuel use within the household. This negotiation

in fuel use lends an element of indeterminacy to the relationship between the value of women's time in production and the type of fuel used. We return to a discussion of ways in which women can change household bargaining in the concluding section. Before that, we deal in a little more detail with the manner in which women's labour is dealt with in the analysis.

Women's Labour Time

Feminist political economy has grappled with the problem of "the exclusion of social reproduction from what is recognized as work" (Bedford and Rai 2010: 7) and the resulting invisibility of much of women's work (Waring 1989). The manner in which production and social reproduction can be combined in political economy analysis remains a challenge.

We deal with this by integrating all kinds of work according to the time spent on it. Time, like money, is fungible. It can be used to undertake various kinds of work. But, as various time-use studies show, the manner in which men and women use their time differs (Antonopoulos and Hirway 2010). Women both spend longer hours at work and devote a greater portion of their time to tasks of social reproduction (largely cooking, care and other domestic work) and on production for household use; meanwhile, men spend more of their time on income-earning and market-based production.

Women's time at work is divided into two types: social reproduction and production work,¹ whether it is unpaid family work as in agriculture, or paid work in the market-linked enterprise, or as self-employed or wage-earning employees. Dividing and integrating these two types of work into women's time is the basis for our analysis of the manner in which women's time in production interacts with women's time in social reproduction to result in the choice of energy alternatives.

In fact, the interaction of women's energy use is not merely linked with women's own time, but also with men's time. For instance, the high migration of men in Nepal, in Kailali district, for example, has reduced the household time available for subsistence rice production, leading to women using power tillers for ploughing, pump sets for irrigation, and fans for winnowing and threshing of agricultural produce in place of the older labour-intensive human-cum-cattle-based agricultural tasks. In terms of Figure 2, this is a shift from column L to M and then H, a rightward shift increasing the value of women's time in production.

But, in the interaction between different types of time use, we suggest that the value of production time is the dynamic element that drives changes in the manner in which women's time in housework is organised. This relationship is explained in greater detail in the next section, where we look into the factors that affect household bargaining. As women increase the value of their time in production, the opportunity cost of time spent in collecting wood for fuel goes up. This would push them to take up labour-saving methods of cooking, thereby, shifting from collecting fuel wood to buying it. With an increase in the value of time in production, there would be further pressure to adopt labour-saving and clean technologies, such as LPG. In terms of Figure 2, there is a downward shift

from row L to M to H, increasing the use of labour-saving cooking systems.

The key proposition is that, an increase in the value of women's time in production increases pressure to economise on time spent in reproductive work and thus leads to the adoption of labour-saving technologies, such as LPG. In terms of Figure 2, the rightward shift across the value of women's time in the production column precipitates or brings about a downward shift in the labour-saving characteristic of energy use.

This analysis predicts that empirical observations would dominate along the diagonal. But, it may happen that women's labour allocation in cooking does not respond to the higher opportunity cost of women's labour as with an observation of cell c (H, L). There could be an increase in women's overall time spent on labour. This would be a case of mining the body. One could explain this phenomenon in terms of a continuation of social norms that dictate that women undertake household tasks, irrespective of their labour in production.

Positions above the diagonal would be those where social norms or doxa outweigh the effects of economic change. As discussed below, we would expect these to be temporary positions, which would change as the economic effect of women's higher contributions to household income triggers changes in household bargaining.

The contrary position would be that in cell g (L, H), where the low value of women's labour does not explain the high labour-saving fuel used. Here, again, another explanatory variable would be needed, that of fuel being a prestige good. This could happen with a high level of household income where, despite women not engaging in anything but household labour, LPG or electricity would still be used for cooking.

Women's Labour and Power in the Household

An economic change, such as an increase in the value of women's time in production, is not automatically accompanied by a change in the type of cooking fuel used. Fuel use is a matter of household decision-making, which is a bargaining relationship (Sen 1990; Agarwal 2016). If so, the value of women's labour in production must work to affect cooking fuel use through strengthening women's position in household decision-making, as per the theory of cooperative conflict in household decision-making (Sen 1990). It would strengthen women's fallback or breakdown position, and thus also their position in household bargaining. There could also be the additional effect of the perception of an increased contribution (Sen 1990). Thus, through both strengthening the fallback position and an increased contribution-perception response, the greater value of women's time in production as income earners will strengthen their position in household bargaining. Additionally, ownership and control of land and productive assets translate into capabilities, which increase their bargaining position in household decision-making (Kelkar and Krishnaraj 2013). Other analyses have added more factors that affect women's household bargaining position such as social norms, support from non-household sources, and so on.

However, it is necessary to go beyond a listing of factors to develop a hierarchy or priority of factors (Agarwal 2016). In the rural economies of developing countries that we are dealing with, both ownership of land and other assets are important, along with access to employment and income. Of the two, ownership of land and assets is likely to change slowly; landownership, according to Roland (2004), is a slow-moving institution. In India, even after changes to the law with regard to Hindu women's rights to ancestral property, there are relatively few instances of their actually securing such rights (Kelkar and Krishnaraj 2013). In Bangladesh, despite Hanafi Islamic law giving women a share equal to half of the men's share, social norms inhibit women from securing these rights (Kelkar et al 2004). On the other hand, access to employment and income have changed rapidly in these and other developing countries and are often a key objective of development programmes.

Such access to employment and income could enable women to overcome the negative effect of doxa or the taken-for-granted nature of much decision-making by individuals and households based on handed-down and unquestioned norms. Women and households exist within social groups and communities with norms transmitted as "the way things are." Thus, a woman in South Africa may say that she and other women continue cooking with wood because "[they] grew up with it," as revealed in Matinga's (2010) analysis of energy use in South Africa.

The "way things are" or customs are further sanctified as a feature of cultural identity, and women or households who transgress these norms can be accused of going against their culture. Even the accepted idea that, if women's time is available, then fuel should be collected and not purchased, is a default option dictated by custom. Customs can be expressed in different ways, even as a means of producing meaningful identities, such as "being Xhosa, being a 'good woman'" (Matinga 2010: 203) and, therefore, cooking with wood.

Thus, there is an inertia in sticking to row L or low labour-saving fuel use, despite shifts to column M or H with an increase in the value of women's time in production; that is, there is a tendency to remain, out of habit, in a state of high-labour intensity (in cooking) despite the higher value attached to women's time in production. Our model predicts that this is an unstable situation, one that is not along the diagonal. Rather, this is a "something's got to give" type of situation, where there will be increasing pressure from the greater value of women's time in production and women's enhanced agency to economise on time taken for cooking.

In overcoming these traditional norms or the effects of decision-making by habit or doxa, one factor that could help is the widespread involvement of those in activities and decisions that challenge these norms. When women enter or increase their involvement in production, not just as individuals but as part of groups like SHGs or savings and credit groups, they gain strength in numbers. Consequently, what is a deviation on the part of an individual woman can become established as a new norm or convention when this action is undertaken by large numbers of women.

This sequence of the breach of an older norm and the consequent establishment of a new norm has been noted in the context of microcredit in Bangladesh, where the older norm of women being economically dependent has over time been replaced by the norm of women becoming income earners (for example, Kelkar et al 2004; Kabeer 2001). In the context of indigenous societies in Africa, Ensminger and Knight (1997: 3) point out that some actors “will eventually focus on a particular outcome and others will in time follow suit, establishing a convention.” With many women establishing economic enterprises, their deviation from the older norm “makes possible the assertion of a new one” (Keesing 1997: 140).

Why is an increase in women’s labour time in social reproduction work unlikely to be the dynamic element in pushing for labour-saving devices and methods of cooking? For one, it would not have the effect of strengthening women’s fallback or independent income position. Again, in a continuation of the invisibility of social reproductive labour, there would not be an increase in the perceived contribution effect. Thus, we put forward the proposition that labour in production is the dynamic element, which would drive the move towards adoption of labour-saving devices and methods of cooking. But, the change in cooking fuel is not just a passive or automatic adaptation to change in the distribution of work among different uses, as it is also created by women’s agency in accessing different types of work and, through them, challenging dominant gender relations.

What this means is that the movements in Figure 2 towards greater labour-saving in fuel use do not automatically follow a higher value of women’s labour in production. Rather, they are brought about by women’s increasing power or agency in household decision-making on cooking energy use.

A qualification to the above analysis is that some forms of women’s labour in production may have less of an impact on women’s power in household decision-making than others. When women work as “contributing or unpaid family workers” their labour is subsumed under family income, and it is often understood that such labour is part of women’s familial or domestic duties (Kelkar 2016). On the other hand, women’s cash earnings, either as self-employed workers or as wage employees, are clearly recognisable forms of women’s contribution to household income. These are likely to have a greater positive impact on women’s power in the household than their contributions as unpaid family workers.

Through strengthening their position in household bargaining, women’s agency in household decision-making may lead to fuel use decisions that more closely correspond to women’s participation in production labour; that is, may move fuel use from the labour-intensive to the labour-saving kind. But, women’s agency may not make much of a change in fuel use when women themselves do not feel the constraint of high demand for their labour time in production. Whether this is so or not could be checked by examining whether the use of LPG is higher in women-headed households than in men-headed households, even where the value of women’s time in production is low and thus not a serious constraint on women’s available labour time.

An analysis of household consumption data in 20 countries showed that there was not much difference between women-headed and men-headed households in fuel choice. The difference was just one or two percentage points for India and Nepal, and generally below 4 percentage points for most countries, with a high of 12 percentage points only in the case of Nigeria (Foster 2016).

Thus, in a labour-surplus situation, there seems to be a limit to how much difference women’s agency can make to fuel use. This could be the reason why a review of fuel use in eight developing countries includes the observation that, “fuel stacking is much more common in cooking than in lighting, and *there is no end to fuel stacking* in this sector,” (Heltberg 2004: 29; emphasis added).

We have assumed all along that men’s labour is not a substitute for women’s labour in collecting wood fuel. This could be due to a strong taboo or doxa notion that men should not do women’s work, or because men are fully occupied in other work. In consonance with this notion, it was noted that in some Lao villages where women were fully occupied in weaving skirts for the export market, men did not undertake collection of wood, despite having spare time after the single agricultural season. Rather, wood was purchased from those households that were not occupied in weaving (Nathan 2003). Of course, to the extent that men’s labour does substitute for women’s labour in collecting wood, the move towards using labour-saving equipment would be weaker. Nonetheless, there is strong reluctance on the part of men to perform what are socially identified as women’s tasks.

Conclusions

Though our main concern in this paper is to develop a framework for analysis, there is an important policy question that we seek to answer. Why does an LPG capital subsidy lead to

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fuel stacking rather than fuel switching? In a stagnant rural economy, with the low value attached to women's time in production, the opportunity cost of women's labour is low, the default option of women collecting wood for cooking continues to be the norm, despite the capital subsidy. The policy conclusion is that a successful switch from wood fuel to LPG for cooking requires not just a capital subsidy. An

additional fuel subsidy could work, but there is the danger of diversion of LPG into higher-priced commercial use when the value of women's labour is low and there are constraints on women's agency. To make fuel switching effective, the capital subsidy needs to be accompanied by increased involvement in income-earning activities by women, thereby resulting in their enhanced agency.

NOTE

- 1 There are substantial debates on the right terms to be used for these two parts of labour. We do not go into those debates, but adopt terms that are relatively easily understood. Production is work that produces goods or services that form part of the system of national accounts (SNA); while social reproduction is all else that women do, including all forms of domestic work, child care and community work. The former is paid or recognised as contributing to household income, while the latter is unpaid. Collecting wood and cooking are both part of social reproductive work, as we are using the term. We will also use the term cooking or cooking system to refer to both the act of cooking and that of acquiring the fuel for cooking.

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