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Fuelwood Supply: A Missed Essential Component in a Food Security Equation

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Abstract The current definition of food security neglects to explicitly account for the fact that most staple foods in many developing countries need to be cooked before they are edible. Because of this deficiency, household access and availability to cooking energy is not considered in many food security projects and programmes. In this paper we synthesize existing documents to promote explicit inclusion of cooking energy as a fundamental component in a food security equation. The synthesis showed that as fuelwood becomes scarce households adapt their cooking styles by omitting or substituting some essential energy-demanding dishes (e.g. dry beans) in order to save cooking energy. As a consequence, household members are denied essential nutrients supplied by the ingestion of such dishes, thereby compromising their nutritional well-being. We argue that when food is sufficiently available, fuelwood shortage may prevent households in poor countries from bringing about important improvements in their nutritional well-being. We therefore recommend to explicitly add cooking energy as a fundamental component of any food security project or programme.

Keywords: *cooking energy, dietary energy intake, food security, fuelwood supply, Malawi*

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1. Introduction

Food security has extensively been used as a measure of welfare of the rural households in many developing countries. A household is considered food secure if it has physical and economic access to sufficient, safe and nutritious food to meet its dietary needs and food preferences for a healthy and active life [1]. This formulation of food security, however, neglects to explicitly account for the fact that most staple foods in many developing countries need to be cooked before they are edible.

Because of this deficiency, many rural development projects and programmes designed to improve welfare of vulnerable households through enhanced food security are implemented without due consideration of access and availability of cooking energy that makes inedible food edible. The designers of these projects and programmes have understood household food security as the ability of the household to acquire the food needed by its members [2]. The strategies and activities of these projects and programmes have therefore focused mainly on improving the physical and economic access and availability of food at a household level. The exclusion of the household's cooking energy in the implementation strategies has jeopardized the realization of tangible improvements in the nutritional well-being of the targeted communities in many of these food security projects and programmes.

Access and availability of cooking energy to make inedible food edible is both a fundamental component of the food security equation, as well as a worrying future limitation for food security in many of the poorest countries of the world where forest ecosystems provide the most prevalent source of energy for cooking. In this paper we synthesize existing documents to promote explicit inclusion of cooking energy as an essential component in a food security equation. We will use Malawi as a particular example since it imminently faces some of the key questions related to household cooking energy on one hand and food security on the other.

2. Fuelwood and Food Security

Many authors have acknowledged food security as an essential condition for nutritional well-being of individual household members in a society [3,4,5,6]. Pinstrup-Anderson [2] argued that the extent to which household food security results in good nutrition depends on a set of other non-food factors such as sanitary conditions and water quality which make the food suitable for consumption. In this paper we explicitly add cooking energy to that list of essential non-food factors.

Fuelwood is the primary source of cooking energy for households in many developing countries [7,8,9]. Over 90% of the total household energy consumption in sub-Saharan Africa is supplied from fuelwood [10]. Table 1 shows household fuelwood consumption in relation to the other forms of energy in Malawi.

Table 1. Estimated household energy consumption in 2008, Malawi

Fuel type	Rural	Urban	National	%
Fuelwood	105320	10560	115880	89.1
Charcoal	2360	6340	8700	6.7
Crop residue	2980	11	2991	2.3
Electricity	70	1798	1798	1.4
Paraffin	240	430	670	0.5
Coal	0	5	5	0.0
LPG	0	2	2	0.0
Total	110970	19076	130046	100

Note: Units: TJ/yr. TJ = Terra joule (10^{12}J). **Source**: Unpublished.

Fuelwood dominates the overall household energy consumption, accounting for 89% of the total energy consumed by households. Fuelwood consumption estimates ranged from 95% in rural households to 55% in urban households. Charcoal is the next most common household fuel, accounting for approximately 7% of the total household energy consumption. Combining the consumption of charcoal and fuelwood, they together contribute approximately 96% of the total household energy consumed in 2008 in Malawi.

Unlike other fuel types, fuelwood is not uniform and homogeneous. The fuel is characterised by the heat it generates, the duration of burning, smell, smokiness and the amount of ash it produces. The type of food that a household cooks may therefore determine the type and quality of wood that is preferred. For instance, frying of groundnuts requires a quick burning fuelwood as opposed to slow heating required for cooking dry beans. Similarly, the type of fuelwood available to a household may determine the type of food the household cooks. For instance, if only twigs are available, households postpone cooking of beans until they get the right type of wood (e.g. split-wood) to cook such dishes [5].

Due to widespread deforestation in most developing countries, the woodlands and trees from which most fuelwood is obtained are depleted. For example, recent studies in Malawi show that the wood resource base is exponentially diminishing, principally because woodlands are cleared for crop production to feed the increasing rural-based population of 13.1 million [11]. The period between 1991 and 2008, an estimated 669,000 ha. of woodlands were converted to crop fields. In 2008 alone, the estimated forest area cleared for agriculture was 45,000 ha. [12]. These figures are significant if we relate them to the extent of the country's forest area of 3.2 million ha. reported in 2010 [13].The dwindling forest stocks have created a widespread scarcity of fuelwood, thereby posing a serious challenge for cooking energy provision to households [14].

To cope with increasing scarcity of fuelwood supply, Brouwer et al. [6] observed that rural households in central Malawi tend to adapt their cooking styles to prevailing fuelwood scarcity. Table 2 presents the adaptation of daily diets to increasing fuelwood scarcity observed by Brouwer et al. [6] in Ntcheu district of central Malawi.

Table 2. Adaptation of daily diets to fuelwood scarcity, Malawi

Dietary pattern	Adequate fuelwood availability	Fuelwood scarcity
Breakfast	Porridge	-
Lunch	Nsima with pumpkin leaves	Nsima with pumpkin leaves
Snack	Boiled maize kernels	-
Dinner	Nsima with cooked dry beans	Nsima with pumpkin leaves

Note: Nsima = a staple food in Malawi made from cornmeal.
Source: Brouwer et al. [6].

The authors observed that as fuelwood became scarce, households omitted morning breakfast and between-meal snacks in their daily diets. With increasing fuelwood scarcity, energy-demanding dishes of beans were replaced with vegetable dishes that required less energy to cook. In extreme fuelwood scarcity to prepare the remaining two meals (lunch & dinner), the households maintained the two meals in their diet because they both were considered important. Instead, they supplemented or substituted fuelwood with the alternatives, non-traditional fuels of maize cobs, maize stalks or cassava cuttings. These behavioural responses and actions may affect the quality and quantity of the foods prepared and consumed by households, thereby affecting the nutritional well-being of the household members.

3. Fuel use and Dietary Energy Intake

The same study of Brouwer et al. [6] evaluated the association between fuel use and dietary energy intake of household members when fuelwood became more scarce. In the study, four villages situated at increasing distances to woodland from where the villages collected their fuelwood were monitored of their fuel use and energy intake from cooked foods. Earlier observations showed that fuel use decreased in the villages at longer distances from the woodland [5], as such the authors used increased distances from woodland as a proxy to decreasing fuelwood availability.

Table 3. Estimated household energy consumption in 2008, Malawi

Energy intake from cooked foods (MJ/day)	Household fuel use (kg/day)			
	Distance from the woodland (km)			
	<1.5	2.5 – 3.0	4.0 – 6.0	>6.0
Total intake	0.08	0.55***	0.54***	-0.17
i. From cereals	0.05	0.59***	0.43***	0.01
ii. From other food groups	0.12	430	0.49**	-0.32

Note: ** = p<0.01; *** = p < 0.001. **Source**: Brouwer et al. [6].

A clear increase of the association between fuel use and energy intake was observed at increased distances from the woodland (Table 3). However, at greater distances (> 6 km) from the woodland, the association of the two variables became weak and turned to negative. The authors attributed this observation to the fact that as distances to wood collection areas increase further, households return to nearby areas and collect inferior, non-traditional fuels such as twigs or crop residues. Increased use of inferior fuels meant that large quantities (kg) were collected and used because of their low burning qualities. In addition, energy-demanding dishes of beans could not be cooked on these low quality materials. Therefore the increased amount of fuel materials collected and used for cooking went together with a reduction in intake of bean dishes, hence low dietary energy intake from them [6].

4. Discussion

The present paper reaffirms that fuelwood is the principal household fuel in many developing countries and Malawi in particular. Recent analyses [12] showed that fuelwood will continue dominating household energy mix, despite the fact that the energy policy of Malawi emphasises a shift from wood energy supply to electricity [15]. While rural electrification is very desirable, it will not provide households cooking energy unless the electricity is highly subsidized or free. In addition, to provide "peak time" electricity for cooking will require a considerable investment in stand-by capacity, which may be beyond the means of Malawi government for decades to come [12]. This argument is supported by the low score of the Energy Development Index (EDI) that ranks Malawi third position from the bottom of the countries on the energy development path [16]. EDI tracks energy development at household and community levels in a country, focusing on access to electricity and clean cooking facilities for the household, and access to modern energy use for public services and economic activities in a community. Regionally, sub-Saharan Africa is projected to increase the number of people without access to electricity by around 11% to 655 million in 2030. In Asian, the number is projected to nearly halve, going from 630 million in 2010 to 335 million in 2030. Latin America will achieve universal access to electricity by around the mid-2020s [16].

Although fuelwood remains a primary source of household energy in the decades to come, its dwindling supply is a worrying future limitation for food security. The household diet changes observed when fuelwood became scarce forms a point of concern for nutritional well-being of household members. The substitution of dry beans with vegetable leaves in situations of fuelwood scarcity denies the household members nutritional benefits provided by the ingestion of cooked beans. Dry beans are an important source of protein (16-33%); vitamins (thiamine riboflavin, niacin, vitamin B_6, and folic acid); minerals (Ca, Fe, Cu, Zn, P, K, and Mg); dietary fibre (14-19%) and free unsaturated fatty acids [17,18]. Despite the fact that dry beans form a small part of the overall diet overwhelmingly dominated by cereals in most households in poorest countries, its ingestion with cereals raises the protein quality comparable to that of animal proteins [19]. In areas where animal proteins are not easily available, replacement of beans by vegetables that are poor sources of protein might endanger the fulfillment of the special protein needs of young children, pregnant and lactating mothers [20].

5. Conclusion

The synthesis in this paper has shown a direct link of household cooking energy and food security. The link suggests that nutritional well-being of vulnerable households in food security projects and programmes cannot be fully achieved without due consideration of access and availability of cooking energy. When food is sufficiently available, fuelwood shortage may prevent households from bringing about important improvements in their livelihoods. Since most designs of rural development projects and programmes are based on universal principles, explicit inclusion of cooking energy in the official definition of food security will enhance its operational adoption in the design and implementation of food security projects and programmes.

References

[1] FAO, *Declaration on world food security*, World Food Summit, Food and Agriculture Organisation, Rome, 1996.

[2] Pinstrup-Andersen, P, "Food security: definition and measurement," *Food Security*, 1, 5-7, Jan. 2009.

[3] Pinstrup-Andersen, P. and Pandya-Lorch, R, "Food security and sustainable use of natural resources: A 2020 vision," *Ecological economics*, 26, 1-10, May 1997.

[4] FAO, *Forests for improved nutrition and food security*, Food and Agriculture Organisation, Rome, 2011.

[5] Brouwer, I.D., den Hartog, A.P., Kamwendo, M.O.K. and Heldens, M.W.O, "Wood quality and wood preferences in relation to food preparation and diet composition in Central Malawi," *Ecology of Food and Nutrition*,35 (1), 1-13, Feb. 1996.

[6] Brouwer, I.D., Wijnhoven, T.M.A., Burema J. and Hoorweg, J.C, "Household fuel use and food consumption: Relationship and seasonal effects in Central Malawi," *Ecology of Food and Nutrition*, 35 (3), 179-193, Jun. 1996.

[7] Akther, S., Miah, Md. D. and Koike, M, "Household adaptations to fuelwood shortage in the old Brahmaputra downstream zone in Bangladesh and implications for homestead forest management," *International Journal of Biodiversity Science Ecosystem Services & Management*, 6 (3-4), 139-145. Sept.2010.

[8] Palmer, C. and Macgregor, J, "Fuelwood scarcity, energy substitution, and rural livelihoods in Namibia," *Environment and Development Economics*, 14 (06), 693-715, Dec. 2009.

[9] Brouwer, I.D., Hoorweg, J.C. and Van Liere, M.J, "When households run out of fuel: Responses of rural households to decreasing fuelwood availability, Ntcheu district, Malawi," *World Development*, 25 (2), 255-266, Feb. 1997.

[10] Mearns, R,"Institutions and natural resource management: access to and control over woodfuel in East Africa," In *People and Environment in Africa*, Binns T (ed.). Wiley: Chichester; 103–104.

[11] NSO, *Population and housing census 2008*, Main report, National Statistical office, Zomba, Malawi, Sept. 2009.

[12] Openshaw, K, "Biomass energy: Employment generation and its contribution to poverty alleviation," *Biomass and Bioenergy*, 34, 365-378, Dec. 2009.

[13] FAO, *Global forest resources assessment 2010*, Food and Agriculture Organisation, Rome, 2010.

[14] Bandyopadhyay, S., Shyamsundar, P. and Baccini, A, "Forests, biomass use and poverty in Malawi," *Ecological Economics*, 70 (12), 2461-2471, Sept. 2011.

[15] Government of Malawi, *National Energy Policy*, Department of Energy Affairs, Lilongwe, 2003.

[16] IEA,"Measuring progress towards energy for all," In *World Energy Outlook 2012*, 18, 529-547. International Energy Agency, Paris, 2012.

[17] Kutoš, T., Golob, T., Kač, M. and Plestenjak, A, "Dietary fibre content of dry and processed beans," *Food chemistry*, 80, 231-235, May 2002.

[18] Reyes-Moreno, C. and Paredes-López, O, "Hard-to-cook phenomenon in common beans – a review," *Critical reviews in food science and nutrition*, 33, 227-286, 1993.

[19] Aykroyd, W.R. and Doughty, J, "Legumes in human nutrition," *Food and Nutrition*, 20, Food and Agriculture Organisation, Rome, 1982.

[20] WHO. 1985. "Energy and protein requirements," *Technical report series*, 724, World Health Organization, Geneva, 1985.