PARI Policy Brief No 21

PARI
March 2020

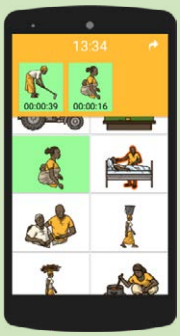
THE FORGOTTEN AGRICULTURE-NUTRITION LINK

Estimating the energy requirements of different farming technologies in rural Zambia

Worldwide, 821 million people do not have access to enough calories, they are undernourished. In addition, close to two billion people lack micronutrients, they are malnourished and suffer from hidden hunger. Smallholder farmers are particularly affected by both under- and malnutrition. Therefore, the linkages between agriculture and nutrition are vital to study. So far, most studies have explored the link between the quantity or diversity of food produced and nutritional outcomes. Another link has been largely neglected: between the technologies used in farming and energy requirements. Given that most smallholders rely on hand tools, which requires heavy work, shifting to animal- or machine-based agricultural production may influence the energy required to perform farming activities and thereby the nutritional status of smallholder farming households. This study compared the energy requirements of farm households in the Eastern Province of Zambia at three levels of mechanization (hand tools, animal draught power and tractors) to assess the relevance of this largely neglected agriculture-nutrition linkage.

Methodology

The data was collected using a smartphone application, which allows people to record their daily activities and nutrition in real-time, thereby avoiding recall bias. Data was collected from male and female adults and children from 62 farm households, out of which some used manual tools, some used draught animals and some used tractors for land preparation. Energy requirements were derived by multiplying time spent on activities with estimates of the energy spent on such activities following the *Ainsworth's Compendium of Physical Activities.*



Research findings

Farming is highly energy demanding. For example, depending on the farming period, between 3000 and 3800 calories per day were needed for adult men, considerably more than the often-stated average of 2800 calories. Overall, energy required for farming largely determines daily energy requirements. During land preparation, for example, farming was responsible for up to 44% of the daily energy requirements for men and 29% for women (and up to 19% for boys and 15% for girls, see Table 1). Mechanized farming thus required less energy: the average male needed 533 calories less and the average female 483 calories less per day during land preparation when using tractors rather than manual labour (see also Figure 1).

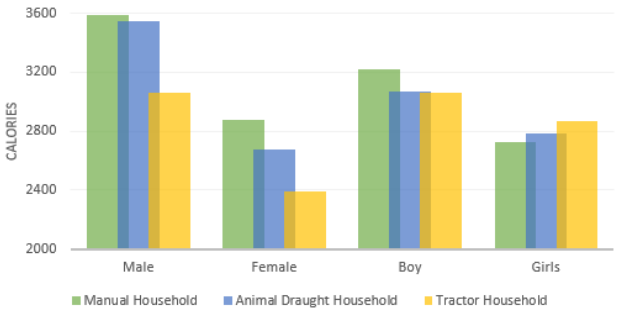


Figure 1: Caloric energy requirements during land preparation. For calculations of the energy requirements see working paper

Not only farming is energy demanding. Often neglected, transportation activities such as walking to the fields and transporting goods constituted a large share of the daily requirements. This suggests a need to focus more on transportation technologies. Also, domestic chores such as washing clothes and cooking food require much energy. This affects in particular female adults and girls - but also boys. This highlights the need for rural electrification, for example, using solar power, which enables the use of technologies for domestic chores.

Table 1: Daily share (%) of non-basal energy requirements for selected activities by household members

	Manual Household				Animal Draught Household				Tractor Household			
	Male	Female	Boy	Girl	Male	Female	Boy	Girl	Male	Female	Boy	Girl
Land preparation												
Farming	44	29	15	13	35	18	19	15	28	13	11	15
Transportation	18	13	14	21	27	10	16	19	20	11	21	17
Domestic chores	3	24	21	17	1	36	12	17	3	29	20	17
Weeding												
Farming	46	41	39	34	38	33	35	35	36	31	25	30
Transportation	16	12	15	15	28	12	14	19	24	13	23	19
Domestic chores	2	18	12	15	1	26	14	10	1	18	11	13
Harvesting/Processing												
Farming	35	27	23	12	25	26	27	13	29	25	13	16
Transportation	21	11	14	16	36	10	18	17	19	9	19	10
Domestic chores	2	25	17	24	2	28	7	17	3	25	14	20

Energy intake often does not match energy needs. For best health, energy requirements should match caloric intake. However, while members of households relying on manual tools have high energy requirements due to manual farm labour, they typically ate less than mechanized households with lower energy requirements. This may help to partially explain why many poor households suffer from undernutrition, especially since highly energy demanding farming steps often correspond with the hunger months when the last harvest dwindles and the new harvest is not yet ready.

POLICY RECOMMENDATIONS

Include linkages between farm technologies and nutrition in agricultural research and policy making: Focusing on such linkages can help to better understand which agricultural growth pathways contribute most to positive nutritional outcomes, especially for members of rural households who are vulnerable to undernutrition or other forms of malnutrition.

Monitor the impact of caloric energy saving technologies on obesity: Obesity is on the rise in many rural areas of developing countries. Therefore, the impact of saving caloric energy requirements through farm mechanization should be carefully monitored.

Promote agricultural mechanization to save human energy: Mechanization of crop production and post-harvest processing saves human energy and thus, seems to be a promising way to reduce undernutrition in smallholder farming households.

Conduct more research on other mechanization-nutrition linkages: Mechanization may affect household nutrition (and well-being more generally) through additional not yet explored pathways.

This Policy Brief is based on the study:

Daum, T., Capezzone, F., & Birner, R. (2019). The forgotten agriculture-nutrition link: Estimating the energy requirements of different farming technologies in rural Zambia with time-use data. Available at www.research4agrinnovation

PARI implementing partners: ZEF/University of Bonn, University of Hohenheim, the Forum for Agricultural Research in Africa (FARA) and its national partners, the African Growth and Development Policy Modeling Consortium (AGRODEP) facilitated by the International Food Policy Research Institute (IFPRI, Africa Office), and research collaborators in India.

PARI is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ).

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