

Taking human beings into account

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Human labour is one of the most important resources available to small-scale and subsistence farmers. Achieving a good quality harvest and the process of storing, processing and selling crops require considerable efforts. In carrying out the necessary tasks, physical strength, health and motivation are as important as other critical resources such as tools, animals or technologies. The study of the physical and mental capacities of human beings in relation to work is part of the science of ergonomics.

Within each farm household or community, choices have to be made and tasks prioritized. Ergonomics provides an approach and tools for understanding how human resources can best be employed and how farmers can get the best returns for their efforts and investments. Post-harvest activities could often be better managed if ergonomics factors were taken into account.



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There are four main categories of post-harvest activity: separation, preservation, storage and transportation. Potentially, most small-scale farmers can increase efficiency and productivity in each of these areas. Before suggesting how ergonomics can guide effective decision making, we will look more closely at the types of work involved in each of these activities.

What's involved

Separation or extraction involves removing the valuable part of a plant – fibre, protein, starch – by threshing, hulling, pressing, peeling or grinding. At subsistence level separation involves much hard work and returns are often low because of wastage and impurities.

Preservation includes the use of chemical and natural treatments to prevent spoilage by insects and fungi. However, it also includes processes such as drying, cooking, smoking and pickling. Small-scale farmers often lack the facilities to make the best use of these techniques. Encouraging farmers to add value to their farm products is currently seen as a way of alleviating poverty. Effective processing, however, is not simply a matter of introducing appropriate technologies. The farm

household should also have the capacity to integrate these new activities into ongoing tasks and existing divisions of labour.

Storage. Even with a good harvest, most farm families find it difficult to store their staple commodities from one season to the next, particularly in semi-arid areas where there is only one annual crop. It is a major challenge to store home-grown staples for almost a year with only basic preservation. A well-constructed store that offers good protection is essential. Re-arranging or removing the contents of the store from time to time can help ensure good air movements, and occasional pest control treatments – natural or artificial – can also help. Successful storage requires time and effort.

Transportation is another burdensome task. If farmers decide to sell their crop, transport needs increase dramatically. This can involve either heavy investments of time and physical effort or profits being lost as middlemen are paid to transport farmers' products to market. An important and often neglected aspect of marketing is the burden it places on women, especially in the poorest households, who have to head-load goods to market.

Frequently suggested ways of reducing cost and effort are selling goods locally, adding value by drying or cooking, or storing produce until times of greater scarcity. How appropriate these strategies are for specific local situations should be evaluated from an ergonomics perspective before they are implemented.

Implications and solutions

The physical energy and time required for post-harvest activities represent a significant drain on smallholders' resources. They may be less arduous than land preparation activities but they are usually associated with higher levels of drudgery. There is also a gender bias. As far as subsistence crops are concerned, it is usually the women who are most involved in post-harvest activities. There is very little published information on the intensity and duration of post-harvest tasks but Table 1, compiled by Bleiberg *et al.* (1980) from a study of rural women in Burkina Faso, shows the amount of energy a woman would usually spend on farm-related activities.

Table 1. Rates of energy spent by female farmers engaged in various activities

Activity	Energy expenditure	
	Watts	kJ/min
Standing	95	5.7
Walking	210	12.6
Washing clothes	225	13.5
Fetching water from well	285	17.1
Thinning	248	14.9
Grinding	290	17.4
Hoeing	302	18.1
Pounding	317	19.0

Adapted from Bleiberg *et al.*, 1980.

In many agricultural development projects there is an implicit expectation that hunger and poverty could be reduced if farmers were able to grow more crops more reliably. The needs and capabilities of those involved in such initiatives are frequently

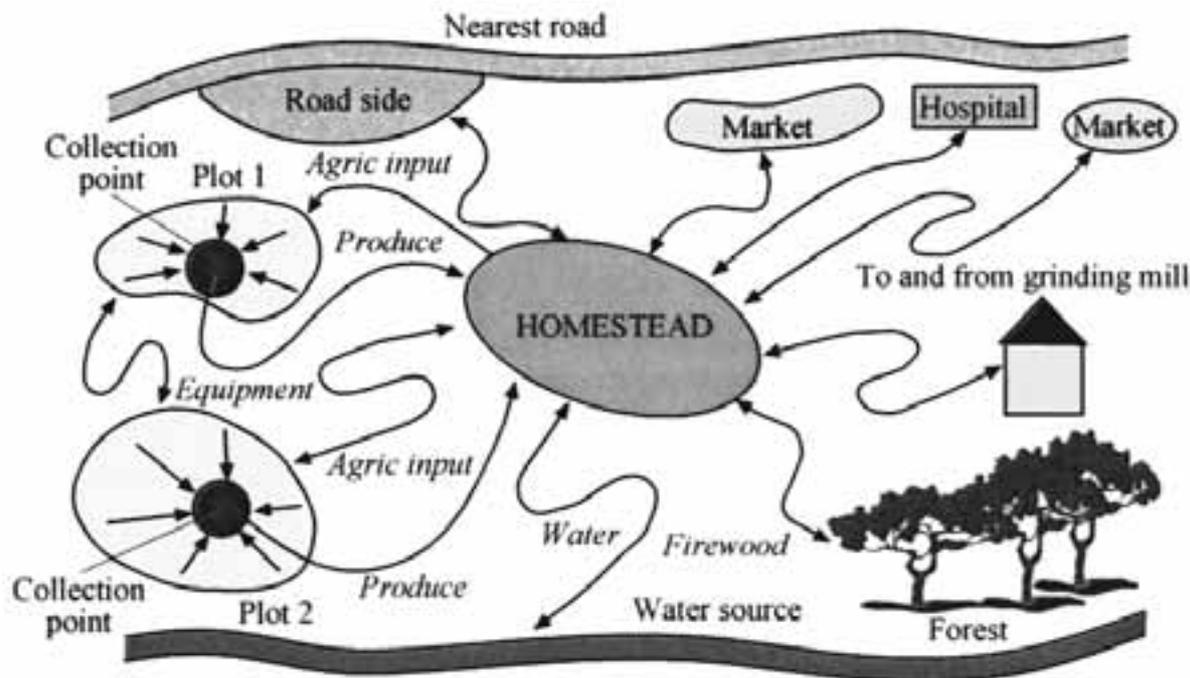


Figure 1: Transport requirements for a typical small householder. Source: *Human Considerations in Crop Post-Harvest Operations*, by Tahseen Jafry.

not taken into account although it is clear that every plant grown requires human effort during land preparation, sowing and crop care, harvesting, and the post-harvest period. Important issues

Efficiency is a human factor

People, or the human capital, are the most valuable resource of any country. Human capital is important and not in great shape in developing countries. If attention is not paid to the human factor in designing projects you risk not getting the most of the limited human capital that exists or, worse still, you can run down human capital still further because of inappropriate interventions that cause fatigue or injuries, or divert attention away from other important tasks. The relationship between people and their working environment – ergonomics – is about developing systems and technology that can accommodate people. Human considerations are particularly important in post-harvest activities where work is often heavy and intensive and where efforts are needed to reduce workload and drudgery and prevent health disorders and accidents caused by inappropriate technology. Figure 1 provides a good example of the amount of effort a smallholder has to make to get his or her crop from the field. It illustrates how an ergonomic approach can be used to identify areas where efficiency can be improved and workloads lightened. In the publication *Human Considerations in Crop Post-Harvest Operations* published by the Crop Post-Harvest Programme (NRI), Tahseen Jafry discusses the factors to take into account when designing interventions to improve post-harvest operations. The author provides project designers with a series of “points to remember” under the headings transport and marketing; processing equipment; workplaces for storing and handling produce; and the working environment itself.

The booklet contains 33 pages and can be obtained from the Crop Post-Harvest Programme, NR International Ltd., Park House, Bradbourne Lane, Aylesford, Kent, ME20 6SN UK. Email: c.wheeler@nriint.co.uk

that should be considered include whether those involved in new initiatives have the labour capacity, energy reserves (adequate diets) and time to complete these tasks satisfactorily. Are children being taken out of school to help with these additional tasks? Could alternative sources of power such as draught animals help and are they available? Could tools that are more suited to the physical capacities of different members of the farm household – men, women and children – make an effective contribution?

Farmers’ production will suffer when human resources are not well used. Whether actions to alleviate poverty have a positive or negative result will depend on achieving a balance between the physical capacities of individual members of farm households and what seem to be economically attractive options.

Jafry (2001) has drawn attention to the way human labour is used in smallholder agriculture, particularly in post-harvest operations. He has developed a “Human Factor Decision Tree” to help find solutions to some of these questions and ensure that human factors are always taken into account in agricultural projects (see box).

When ergonomics is translated in a participatory way, it becomes possible to assess how time, energy and labour are being used within a farm household. A careful consideration of the ergonomic status of the farm household is, therefore, necessary before policy and technological innovations are considered. This will ensure that proposed interventions are appropriate and can be integrated into existing communal practices without endangering the success of the cropping cycle or the quality of farmers’ lives.

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