



Food and Agriculture
Organization of the
United Nations



Running out of time

The reduction of women's work burden in
agricultural production

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Flavia Grassi, Josefine Landberg and Sophia Huyer

**Food and Agriculture Organization of the United Nations
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Abbreviations and acronyms

| | |
|-------|---|
| BRAC | Bangladesh Rural Advancement Committee |
| FAO | Food and Agriculture Organization of the United Nations |
| GSMA | Groupe Special Mobile Association |
| IASC | Inter-Agency Standing Committee |
| ICT | Information and communication technology |
| IFAD | International Fund for Agricultural Development |
| ILO | International Labour Organization |
| JFFLS | Junior Farmer Field and Life School |
| NWFP | Non-wood forest product |
| PAHO | Pan-American Health Association |
| SAFE | Safe Access to Fuel and Energy |
| SEWA | Self Employed Women's Association |
| SHS | Solar home system |
| UNIDO | United Nations Industrial Development Organization |
| WFP | World Food Programme |
| WUA | Water users association |

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Executive Summary

Rural women in developing countries play an active role in small-scale agriculture, currently accounting for 43 percent of the global agricultural labour force (FAO, 2011b). Women support their households by producing more than half of all food worldwide, despite increasing competition over the natural resource base, which is being depleted by climate change and unsustainable practices.

Smallholder women's access to resources is very diversified and context-related. However, research indicates that in comparison with men, women bear a disproportionate work burden which leads to time poverty. Women have limited access to solutions in the form of labour-saving technologies, services and infrastructure, and in many regions they also face mobility constraints.

This paper illustrates the role of smallholder women farmers, fishers, forest dwellers and/or livestock keepers, and analyses the factors that lead to time poverty as well as their implications. The paper discusses women's triple work burden in the productive, reproductive and social spheres, and highlights how this can affect their communities' food security and prosperity, with potential impacts on their well-being and health. The fact that rural women spend more time in order to produce less has broad implications for their family and productive life and weighs on the choices they are able to make, including the choice to dedicate more time to leisure.

Based on a literature review, the authors illustrate labour-saving technologies, practices and services that are currently available, and explore the type and nature of constraints faced by women in terms of accessing and adopting solutions. A section of the paper is devoted to technologies and services which have been tested as successful: the text draws on a number of examples that have contributed to relieving women's work burden in agriculture, with a focus on water and energy provision as well as access to infrastructure and information and communication technology (ICT). Collective access to and management of technology and collective services provision appears to be a good entry point for the reduction of women's work burden.

Recommendations are presented at the research, policy and project level. In order to address women's low technology and service adoption rate, the paper proposes a development approach that encourages more dialogue among key players at the national level, and also focuses on fostering dialogue and transformation of gender relations at the household level.

Section 1

Introduction

Family farms represent up to 80 percent of all farm holdings in developing countries (FAO, 2014a). The majority of these are small or medium-size farms ranging from 1 to a maximum of 5 hectares.¹ Most of them rely primarily on family members for labour and management, and produce essentially for their own consumption, with some surplus for the market. Women make an important contribution to family-run economic activities and represent an average of 43 percent of the agricultural workforce worldwide (FAO, 2011b).

Among smallholders (small-scale farmers, pastoralists, forest keepers and fishers), men and women have diverse and often complementary roles related to household food provision. Women play an essential role in food and nutrition security through their responsibilities in provision and preparation of food consumed in the home. However, research indicates that in comparison with men, they often bear a disproportionate work burden (see Table 1 for an example of time distribution within a day).

Rural women's long working hours correlate to a triple work burden in the productive, reproductive and social spheres, and in contrast to men their work is mostly unpaid and unrecognized. This work overload restricts women's well-being and their engagement in activities of value, including remunerative activities. Surveys from 45 developing countries show that women and children bear the primary responsibility for water collection in the vast majority of households (76 percent). This is time not spent working at an income-generating job, caring for family members, or attending school (WHO/UNICEF, 2010).

Over the last decades, attempts have been made to assess women's time use in agriculture using data collected through household surveys, but this information is often very patchy and difficult to aggregate at the country level. In addition, several internationally comparable indices such as the Women's Empowerment in Agriculture Index measure women's time burden as an indicator of empowerment. Unfortunately, this index is presently only available for a mere 16 country cases.

Since the 1980s, research and investment has focused on promoting and introducing technology, services and infrastructure solutions to reduce the care and productive work burden of rural women. When specifically tailored to women's needs these technologies can be effective, but there are important hurdles to their adoption, as explored in this paper.

1 FAO's State of Food and Agriculture 2014 states that in low- and lower middle-income countries, more than 95 percent of all farms are smaller than 5 hectares.

The number of women farmers feeding their households, communities, countries, and regions is increasingly on the rise (Caselli-Michael, 2014). Yet, women's access to and control over resources and work burden is still not adequately addressed, despite ample evidence that better access for women tends to lead to higher agricultural yields and food and nutrition security (FAO, 2011b).

This paper argues that there are no “quick fixes”, such as the mere introduction and diffusion of technology with labour-saving potential. The issues surrounding the lack of access to and adoption of technology are context-specific and complex. Social norms and behaviour need to be targeted for change to take place and for greater equality to be achieved between men and women in relation to time availability and choice.

Yet, labour-saving technologies and related services can contribute to freeing up women's time and improve their quality of life, enabling them to engage in activities of their own choice, whether for the home or remunerative nature.

Table 1: The distribution of daily hours across different activities by sex: Mozambique, Nampula Province

| Type of activity | Average time spent (hours/day) | |
|--------------------------------------|--------------------------------|--------------|
| | Men | Women |
| 1. Child care | 0.07 | 0.39 |
| 2. Caring for elderly/sick | 0.02 | 0.48 |
| 3. Care work (1+2) | 0.10 | 0.88 |
| 4. Household chores | 0.14 | 3.39 |
| 5. Food processing | 0.13 | 1.8 |
| 6. Fetching water | 0 | 0.72 |
| 7. Fetching fuelwood | 0.04 | 0.47 |
| 8. Shopping | 0.38 | 0.21 |
| 9. Construction/repair | 0.65 | 0.05 |
| 10. Voluntary work | 0.07 | 0.09 |
| 11. Domestic work (4–10) | 1.42 | 6.74 |
| 12. Work inside the household (3+11) | 1.52 | 7.61 |
| 13. Farm sector | 2.58 | 3.02 |
| 14. Paid employment | 0.61 | 0.57 |
| 15. Self-employment | 1.72 | 0.50 |
| 16. Work outside the house (13–15) | 4.90 | 4.08 |
| 17. Rest | 0.64 | 2.02 |
| 18. Personal care | 0.76 | 0.73 |
| 19. Other | 0.76 | 0.25 |
| 20. Leisure (17–19) | 7.92 | 2.99 |
| 21. Total Work Time (12+16) | 6.42 | 11.70 |

Source: Arora, 2014.

The paper brings together available evidence on the work burden of women in agriculture and rural economies. It provides (i) an overview of the division of labour in agriculture; (ii) a discussion of the current approaches to reducing women's work burden through improved access to technologies and services, with a focus on agriculture, energy, water, and transport infrastructure; and (iii) conclusions and recommendations for research, policy action, and programme implementation.

Rural women's daily activities revolve around a mixture of tasks pertaining to domestic and productive work. Thus, time-saving in one sphere can directly affect time availability in the other, and vice versa. Labour-saving technologies and services developed to reduce the domestic work burden (in support of water and fuelwood collection, cooking and care) have received more attention and are already well covered (IFAD, 2014). The focus of this paper, rather, is on labour-saving technologies, practices and services that can support women's agricultural production (whether paid or unpaid), including post-harvest activities linked to food processing. Areas addressed to improve the productive workload include improved production technologies; extension, management and information services; and access to training, credit and inputs, among others.

Section 2 describes men and women's different roles within the gender division of labour in the agricultural sector in order to then explore, in Section 3, how different labour dynamics affect women's work burden and result in time poverty. Section 4 introduces labour-saving technologies and services. It elaborates on their importance, identifying key barriers faced by women in terms of access and adoption, and illustrating research findings by key sectors (agriculture, energy, water, and transport and infrastructure). Section 5 identifies key issues and recommended actions to reduce women's work burden. Section 6 presents a conceptual model illustrating the main actors involved in the introduction of labour-saving agriculture-related technology and service delivery. It proposes an approach focusing on gender transformation at the household level.

Section 2

Context: the gender division of labour in agriculture

In 1989, Moser pointed out that “gender roles are shaped by ideological, religious, ethnic, economic and cultural factors and are a key determinant of the distribution of responsibilities and resources between men and women” (Moser, 1989; FAO, 2011b).

The division of labour in agriculture often follows traditional patterns with specific tasks assigned to women and men. However, this division is dynamic, and “roles” are constantly shaped and negotiated. There are variations by region and farming system, and changes occur over time with changing conditions (seasons, markets, and climate). Women are often affected by changes occurring in men’s lives: seasonal changes in tasks and relations may lead to labour peaks; men’s migration or off-farm employment opportunities can result in women taking over male responsibilities for agricultural production and marketing, household purchases, and social and community duties. New circumstances can, therefore, affect the traditional division of labour and make new roles acceptable. Often, however, when the crisis has abated or the male migrants have returned, the previous “status quo” is re-established.

In most developing countries, women work longer hours than men when both paid and unpaid work is taken into consideration. But much of their work consists of laborious and repetitive domestic tasks that are less visible, unpaid, and severely restrictive of their time and mobility to undertake productive tasks and enjoy spare time (FAO/IFAD/ILO, 2010). In addition to their domestic tasks, women are overrepresented in low productivity subsistence farming.

While the gender division of labour varies from context to context, some commonalities have been identified when looking at women’s labour. The literature refers to women’s triple work burden consisting of and relating to the reproductive, productive and social sphere. Women are primarily responsible for reproductive activities such as child bearing and rearing; household maintenance, including cooking and fetching water and fuelwood; and caring for elderly and sick family members. They also engage in productive activities that include family subsistence farming as well as income generation through wage labour and entrepreneurship (market and non-market productive activities). Women also play a major role in social and community-building activities such as funerals, weddings, and administrative support to schools.

Through their different activities and roles, men and women have often developed different expertise and knowledge about the local environment, its plant and animal species, and their products and uses (FAO, 1996). Women farmers are largely responsible for the selection, improvement, and adaptation of plant varieties, and often have a more highly specialized knowledge of wild plants used for food, fodder and medicine than men. Women are often concerned with how multiple plant use can add to household income (Eyzaguirre, 2006). They manage home gardens, often used as a refuge for underutilized plant species (Eyzaguirre and Linares, 2004). When new technologies and processes are introduced and offered mostly to men, sufficient attention is not being paid to how this may have a negative impact on women's specialized knowledge and use of local biodiversity.

The gender division of labour within agriculture and its subsectors of crop farming, fisheries, livestock and forestry is relevant not only because there are time burden issues related to the tasks women perform in each sector, but also because of the overall burden forcing them to balance these tasks simultaneously and in conjunction with reproductive tasks. The next section provides an overview of the different tasks commonly assigned to women and men within agriculture and its subsectors.

2.1 Farming

Agriculture is the main source of rural employment for both women and men in sub-Saharan Africa, South Asia and Southeast Asia (FAO, 2011b). In sub-Saharan Africa and Eastern Asia, close to 50 percent of the region's economically active women are engaged in the agricultural sector. In North Africa, women's participation is close to 43 percent; in Latin America, just over 20 percent (FAO, 2011b). Recent studies have observed a trend towards the "feminization of agricultural labour", referring to the rising share of women in the agricultural labour force as a result of migration and additional opportunities available to men (Abdelali-Martini and Dey de Pryck, 2014).

There are also particular agricultural employment patterns that emerge by region (FAO/IFAD/ILO, 2010):

In Latin America, rural women are typically self-employed in both agricultural and non-agricultural activities, while men primarily work in agriculture, either self-employed or as wage earners.

In the Middle East and North Africa, rural women are more likely to be self-employed farmers, while men are more likely to find employment in non-agricultural activities.

In Sub Saharan Africa, rural women are as likely to be self-employed as men, and mostly work in the agricultural sector.

In South Asia and East Asia agriculture remains the main employment source for both women and men. In South Asia, however, women's percentage of self-employment in agriculture is low compared with men's, while in East Asia self-employment rates are very high and similar to men's.

Despite these regional varieties, some commonalities seem to emerge:

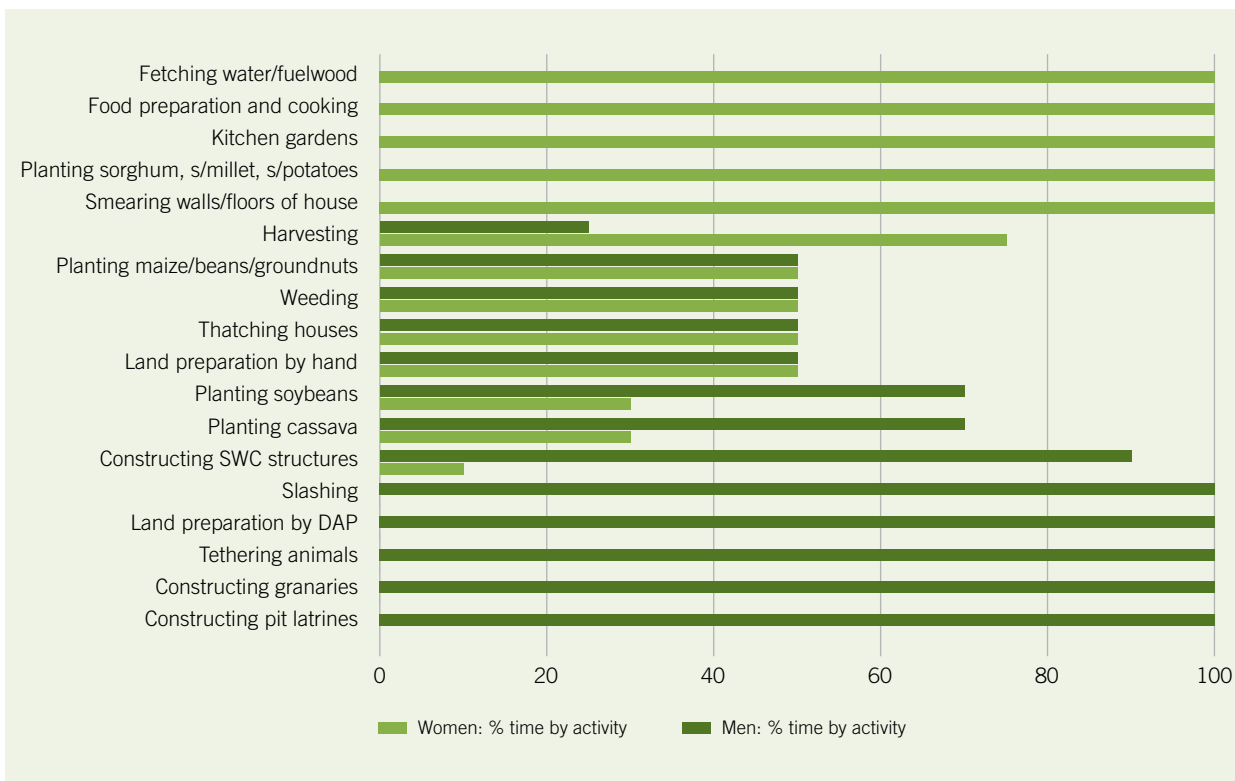
- (i) In most regions, rural women are more likely than men to be self-employed and working in agriculture.

- (ii) Women's activities tend to be time- and labour-intensive.
- (iii) Women's agriculture-related activities tend to be tied to the provision of household needs, e.g. cultivating vegetables and taking care of homestead gardens.

At the farm level, both men and women participate in the production cycle. However, some general patterns emerge, such as differences in the types of tasks, access to inputs and crops, and the level and areas of decision-making, as well as resulting benefits within the supply chain. Figure 1 illustrates the division of labour in Western Kenya, showing how women take care of specific crops while men cultivate others. Often men are in charge of cash crops, which benefit from a higher income, while women typically farm subsistence crops for house consumption, such as fruits and vegetables.

Even though the division of roles is not always clear cut, as part of farming men are commonly responsible for chores such as land clearing, ploughing, and harvesting, while women are in charge of seed selection and management, weeding, planting, and postharvest processing. Often men have easier access to animal draught power and mechanization for ploughing and clearing of land, while women's work tends to be more manual, tedious and labour-intensive.

Figure 1: Gender division of labour in Nandafubwa, Busia District, Kenya



SWC: soil and water conservation structures such as *fanja juu*, trash lines, cutoff drains, diversion dishes and boundary bunds.

Source: Bishop-Sambrook, 2003:22 (data source: community estimates during fieldwork).

2.2 Fisheries and aquaculture

Fish provide a vital source of protein as well as cash income for many families in the developing world. Of all those engaged in fishing and fish farming, most are in the South and the majority are small-scale, artisanal fishers. The highest numbers of fishers and aquaculture workers are in Asia (85 percent of the world total), followed by Africa (7 percent); Europe, South America, and North and Central America (about 2 percent each); and Oceania (0.2 percent) (ICSF, 2015).

Case studies suggest that women may comprise up to 30 percent of all those employed in fisheries worldwide, including primary and secondary activities (FAO, 2012b). They provide labour before, during and after the catch in both artisanal and commercial fisheries, and often act as small-scale entrepreneurs in household-level cottage industries where appropriate technologies can bring many benefits (FAO, 2012; Sackey Tetteh, 2007). Many aquaculture (fish or shellfish farming) activities are considered appropriate for rural women because they can be carried out with minimal investment, are located close to homesteads, and can be integrated into existing food production systems (FAO and WorldFish Center, 2008; World Bank, FAO and IFAD, 2009).

Men and women have different roles depending on local norms regarding resource access and control, mobility, type of technology involved, the extent of commercialization in the sector, and the product involved. Despite their role in the fish value chain, women's contributions are rarely seen as "productive". Rather, they have low social value and are normally seen as an extension of the "domestic" space (ICSF, 2015).

In most regions women are less involved in offshore and long-distance capture fishing. More commonly, in coastal artisanal fishing communities women manage the smaller boats and canoes that go out fishing. They are often responsible for skilled and time-consuming onshore tasks such as net making and mending, fry collection, feed preparation, feeding of stock, and processing of fish from cages, pens and ponds, but their most significant role is in processing and marketing catches. FAO reports that women's engagement in processing and coordination of the selling of fish catch worldwide is as high as 90 percent. This includes sun drying, salting, smoking, and preparing fish and fish-derived foods such as fish paste and cakes. At the village level these tasks can be very time consuming, as reported for a fishing village in Africa where women were observed spending an average of 9 hours per day on fish smoking (Momsen and Kinnaird, 1993).

2.3 Livestock

Livestock constitutes a major asset for many rural households and is a primary livelihood resource for many low-income rural communities (FAO, 2012a). In such contexts, women provide much of the labour for livestock tasks. Despite ample available research on this subject, women's role in livestock production tends to be undervalued by policy-makers.

Rural women represent about two-thirds of low-income livestock keepers. They most likely own small stock (goats, sheep, pigs and poultry) and engage in dairy processing and marketing of milk and milk products, while men tend to own large stock (cattle, camels, horses) and “special” or new breeds (EADD, 2008).

Women are mostly in charge of daily care for their household's livestock. Their tasks consist of harvesting fodder and fetching water for the animals, caring for sick animals, and cleaning animal sheds. These daily tasks are time consuming, and more efficient livestock management is hampered by a variety of factors. Access to water poses a problem, as water facilities are frequently not within the house or on village premises; therefore women have to walk long distances to gather sufficient water for livestock needs. They are rarely trained in animal health, hence they lack veterinary skills to efficiently detect and respond to animal diseases, which can also affect human health. They also have restricted access to time- and cost- effective practices and technologies in animal husbandry, and lack knowledge of innovative and more efficient livestock management practices.

Traditionally, women are in a weak decision-making position regarding the household's purchase of livestock and the use of income deriving from it, including that which they directly manage. Their work burden relating to livestock management is therefore not taken into consideration. In the United Republic of Tanzania, for example, women cannot sell or slaughter their animals without consulting their husbands (although they can make their own decisions on buying livestock). Moreover, women's livestock ownership and management tends to take place in the informal sector, where they use proceeds for barter or sale in local markets (Dieye2005; Tipilda and Kristjanson, 2008).

Two growing concerns for the livestock sector are land degradation and climate change, which increase women's work burden. For example, in the pastoral communities of the arid and sub-arid lands of Eastern Africa, women are walking longer distances to collect not only water and fuelwood, but also fodder for the animals. Recurring droughts have also led to increased raiding and livestock-related conflicts (Pavanello, 2009).

2.4 Forestry

In communities that rely on forests for their livelihood, women play an active and important role in forest management. Within the sector, women usually engage in formal and informal forestry through watershed management, tree improvement, and forest protection and conservation. In addition, they frequently gather fuelwood and non-wood forest products (NWFPs) for food, medicine and fodder.

In many countries, women in forest-dependent communities engage in nursery activities as well as patrolling and monitoring forests. They make up a sizable proportion of the labour force in plantations, wood cutting and processing, although they are not highly visible in the sector and their wages and working conditions tend to be disadvantaged in comparison with men (World Bank, FAO and IFAD, 2009). Women also practice traditional agroforestry, but grow fewer tree crops owing to their lack of land rights and tenure security, which discourages long-term planning (Place, 1994).

Compared with men, women in forest-dependent communities rely disproportionately on NWFPs for income and nutrition. This is due, in part, to their poor access to productive resources such as land. Given the large variety of forestry landscapes, NWFPs include a significant number of products such as exotic fruits, honey,² wild animals (meat and fur), fodder, medicinal plants, fuelwood, nuts, seeds, berries, and mushrooms. More than 80 percent of the population in the Lao People's Democratic Republic, for example, supplements its diet through daily consumption of wild foods. NWFP trade constitutes an important component of local livelihoods, with women representing approximately half of the traders. For some households in Mozambique, for example, cash from unprocessed NWFPs constitutes 30 percent of the household income (FAO, 2003).

After harvesting forest products, women have to carry back heavy loads of wood to the household. With forest degradation, the distances to access NWFPs and fuelwood become even greater, taking away precious time from other activities.

Some solutions were identified in the Shinyanga region of the United Republic of Tanzania where native trees were planted by communities close to villages, reducing the time required for collecting domestic fuelwood, food and water by 80 percent. As a result, women had more time for other pursuits and activities including education, income generation and social responsibilities. Another solution is the use of improved cooking technology, such as stoves, which can reduce the quantities of fuelwood needed in the household as well as the frequency of collection (Barrow and Mlenge, 2003).

2 While wild honey harvesting is usually a male activity, there are many successful women beekeepers (keeping hives close to homes as opposed to collecting from the forest). Women may process the honey (remove it from honeycombs, make beer, etc.) or sell it at the market.

Section 3

Women's work burden and time poverty

Women's work burden is often characterized by repetitive, tedious and cumbersome activities that are time consuming and unavoidable. This is why the term "time poverty" appeared in the literature on poverty (Vickery, 1977). In a World Bank working paper, Blackden and Wodon (2006) recognize that time poverty is a critical gender dimension of poverty in sub-Saharan Africa. Looking at time-use data within the household economy, the literature identifies that "what particularly characterizes women's roles in contrast to those of men's, is that they must carry out their roles simultaneously, not sequentially. This is evident not only in the extent of women's work burden and their very long working hours, but also in the harsh choices and trade-offs that women inevitably have to make because of the simultaneous competing claims on their time" (Blackden and Wodon, 2006: 16). The authors also note that "in the case of households that have poor incomes, fewer assets and less available labour, time poverty may become a particularly important problem" (ibid.).

Besides the gender division of labour, there is a wide range of factors that affects time poverty and gender-differentiated time-use patterns: household composition (age and gender composition of household members) and life cycle; seasonal and farm system; ease of access to water and fuel; existence of infrastructure; and distance to main economic and social services such as schools, health centres, financial institutions, and markets. Although these factors influence time poverty and time-use patterns, social and cultural norms play an important role both in defining and sustaining rigidity in the gender division of labour (Blackden and Wodon, 2006: 2).

Time poverty has important implications in terms of women's overall potential and actual contribution to society: it affects the family's food and nutrition security, and also the ability to build up assets. The time women spend looking after their families, working in home gardens and businesses, and producing food for their households greatly inhibits their ability to expand production for the market (Ellis, Manuel and Blackden, 2006; World Bank, FAO and IFAD, 2009). Finally, time poverty has implications for the health of the entire household and, most importantly, it affects women's own stress and well-being.

When their work burden is reduced, women use the freed time in a variety of ways. As stated in one alternative energy project in rural Nepal, "the saved time was not always visible as women were always occupied with additional work such as working in

kitchen gardens, collecting more fuelwood to store and weaving mattresses” (Mahat, 2005). Evidence has not been collected systematically, but research has shown that women take on a wide range of activities including additional care work (of children, the elderly, and the sick); wage labour; entrepreneurship to increase household income; community and social activities; awareness-raising and community mobilization activities; leisure; and education. They may also increase their political participation. In Viet Nam, for example, when time spent on hand weeding was reduced, more time was allocated to child care, income-generating activities and community activities (Paris and Chi, 2005; Fernando and Porter, 2002).

Concerning the value of leisure time to women in various developing country regions at different socio-economic levels, a recent survey by the Groupe Speciale Mobile Association (GSMA) mWomen Programme³ found that only a small proportion of the 300 million women respondents consider “more free time” a major life priority; however, they do value the leisure time available to them. Priority leisure activities include relaxed face-to-face interaction with family and social networks either through church, community activities, or at home. Time not used to meet the family’s immediate needs is used for “pleasurable” activities, such as mending clothes, basketweaving and candle making. Leisure here is defined as a “period free of time-consuming duties or responsibilities”. Seventy-two percent of women reported having at least half an hour of free time each day – although the definition of free time varies. In Egypt, time spent in social interaction is not considered free time by women, while in Uttar Pradesh, India, free time is considered leisure so long as women can sit or remain stationary, even if they are mending clothes (GSMA mWomen Programme, 2012).

Research over the last few decades has found that the introduction of technologies and infrastructures can address women’s work burden by reducing some of the time they spend on laborious activities. A study on time use and infrastructure in the United Republic of Tanzania estimates that improving infrastructure for water collection, fuel collection and food preparation (e.g. grain-milling facilities) could reduce the burden for women by over 9 billion hours of unpaid work per year – equivalent to 5.5 million full-time jobs. For men, the time saved on the same type of chores corresponds to 450 000 full-time jobs⁴ (Fontana and Natali, 2008). In terms of household dynamics, access to technology and appropriate services can increase women’s intrahousehold bargaining power and allow them to negotiate exchanges. In western Ghana, for example, women exchanged free time for labour in their husband’s fields in order to access and/or gain ownership of land (Jha, Hojjati and Vosti, 1991).

Equally relevant is the range of information, training, and agriculture-related knowledge provided by various service delivery systems (government, private sector and Non-governmental Organizations) to increase farmers’ ability to improve productivity and efficiency. These services can empower women by providing them with support and knowledge for decision-making and participation in local institutions. The service delivery, carried out by extension agents or livestock officers, may take the form of individual field visits, technical advice at organized meetings, visits to demonstration plots and model farms, and farmer field schools (Peterman, Behrman and Quisumbing, 2010) and/or Junior Farmer Field and Life Schools (JFFLS). Alternatively, extension

3 GSMA Development Fund and Cherie Blair Foundation Programme on Mobile Technology for Women.

4 The authors admit that the data listed is based on strong assumptions. It is, however, interesting to note the magnitude of full-time jobs calculated as a result of strong investments in infrastructure, water and fuel-related technologies.

services can also be delivered through community groups, community-based organizations, producer associations, and dairy cooperatives (Manfre *et al.*, 2013). What is delivered to smallholders is fairly well documented and explored in the literature; however, who delivers it and how (range of modalities and support provided) have been much less analysed, yet are still very important.

Experience has demonstrated that technological innovations have to be developed taking into consideration both time and gender issues, as approaches that fail to do so may end up increasing women's time poverty and work burden – thus producing direct or indirect benefits in one area while increasing work in others. For example, “improved” hybrid maize required more time and effort to pound than the variety grown previously (Jha, Hojjati and Vosti, 1991). A livestock irrigation project to increase crop residue and available drinking water for animals resulted in greater income, increased market activities, and more milk consumed by children. However, reduced grazing practices required women and girls to spend more time feeding the animals. Several households decided to implement the even more labour-intensive practice of stall feeding. Women ended up taking on greater roles as labourers and family workers, so the net result of the project was to increase women's work (IFAD, 2007). This is where participatory and culturally responsive approaches are essential to developing inclusive strategies.

As mentioned in the introduction, limited consolidated data are available on women and men's differential time use, and there are no clear standards that can allow for reliable international comparison. Small-scale surveys do exist, but they are not representative, and most are out of date. Moreover, women themselves may give conflicting information on time use. Blackden and Wodon note that “women often do not consider domestic and personal care activities as work, and hence, do not report it. The omission of such activities may in turn cause a downward bias in the measurement of intensity of women's work. Time-use surveys need to be designed to capture individuals' work intensity and the trade-offs they face. As there are strong seasonal variations in workload, it is important to undertake these surveys at different points in time in order to capture the impact of seasonality” (Blackden and Wodon, 2006: 25).

Section 4

Labour-saving technologies and services

For several decades, development practitioners have explored water, energy and farm-related technologies and practices that can contribute to reducing the burden of rural living, in particular for rural households and communities under labour stress. The FAO TECA website gives a general definition of smallholder technologies as “practices or techniques, tools or equipment, know-how and skills, or combinations of the aforementioned elements”. Ragasa (2012) complements the FAO generic technology definition with a focus on productivity, efficiency and labour-saving “that are used to enhance productivity, reduce production and processing costs, and save on scarce resources or inputs, such as labour or energy”. Bishop-Sambrook defines labour-saving agricultural technologies as “tools and equipment which reduce the drudgery and/or improve the efficiency of performing various farming or household activities” (Bishop-Sambrook, 2003).

The perspective of FAO’s Rural Infrastructure and Agro-Industries Division is that “many labour-saving technologies and practices (LSTPs) have been developed and are already in the public domain, for example, draught animals save time tilling land or relieve the burden of carrying heavy loads; conservation agriculture reduces the time spent on tillage and weeding; roof water harvesting reduces the need to carry water home; and mills save time and energy pounding maize”. Information about technologies and their usage is collected in FAO’s TECA website (<http://teca.fao.org/>); 30 of the technologies are classified as labour saving. This data, however, does not allow for exploring which of these solutions are particularly adapted to women, and which are easily adopted by them. Nor does it explicitly account for time saved. The barriers to women’s technology and service adoption are discussed later in this paper.

For ease of reference, Table 2 was developed to illustrate household and agricultural tasks typically carried out by rural women in low-income countries, and their corresponding technologies and services with labour-saving potential. Other UN agencies are also currently focusing on the topic of women’s work burden. IFAD is testing technologies through its own projects, and additional evidence on innovations that support rural female smallholder farmers has been collected through the Share Fair for Rural Women’s Technologies, organized in 2014 by UN Women, IFAD, FAO and WFP.

Table 2: List of selected technologies, services and practices with labour-saving potential for women

| | Task/activity | Existing practice | Technologies, services and practices with labour-saving potential |
|--------------------|---------------------------------------|---|---|
| HOUSEHOLD TASKS | Water collection | Walking to fetch water from potentially unsafe water source | - Improved household water sources (protected dug/shallow well and pump – protected spring – tube well/borehole & pump – public tap/standpipe – roof rainwater harvesting – piped water into house, plot or yard – simple water filters) |
| | Fuelwood collection | Wood collected from communally owned resources | - Woodlots - Agroforestry practices - Improved fallow |
| | Cooking | Cooking on traditional open fires using traditional biomass or charcoal as fuel | - Fuel-efficient stoves, using traditional biomass or modern biofuels - Solar cooking - Small-scale low-cost power supplies, using diesel or renewable energy sources |
| | Care work | Looking after family while simultaneously undertaking essential domestic and productive tasks | - Rehabilitation/construction of care centre infrastructure - Support to local stakeholders to set up and run care services |
| AGRICULTURAL TASKS | Land preparation and cultivation | Manual land preparation, digging and weeding with simple tools and following traditional labour-intensive practices; often relying on local seeds | - Improved hoes for land preparation, planting and weeding - Tillage implements (steel mould-board plough – ripper tine – harrows and cultivators – ridgers and bed makers – levelling planks or blades) - Weed wipes and knapsack sprayers; fertilizer micro-dosers - Draught animal planers (DAPs) and weeders - Micro-irrigation (drip and sprinkler-based) for vegetable growers - Integrated pest management practices - Conservation agriculture (reduced tillage – semi-permanent planting basins – ridge, tined strip or zero tillage) |
| | Harvesting | Simple manual tools (knives and sickles) which are often heavy and/or worn out | - Improved hand tools for harvesting cereals (scythes – reaping hooks) - Motorized single-axle mowers and reapers for harvesting cereals - Draught animal-powered groundnut lifter |
| | Post-harvest (processing and storage) | Manual shelling, cleaning, drying and processing of crops; poor storage facilities and food packaging | - Small-scale low-cost power supplies - Draught animal-powered and motorized crop processing - Strippers and shellers (manual or motorized) - Threshers (manual or motorized) - Motorized cleaning/processing of grains and pulses - Crop processing (screw or hydraulic presses – cassava grinders) - Coffee hullers - Motorized rice hulling (rubber-roller huller – disc huller – polishers) - Motorized oil extraction - Solar drying & milling equipment (polyethylene covers) - Fish processing oven for fish drying, smoking and storing - Storage infrastructure and packaging materials (airtight storage bins) |
| | Transportation | Travel on foot; carrying loads on body | - Intermediate means of transport (donkey or other pack animals, wheelbarrow, cart, bicycle [with trailer] – small-scale motorized transport: single-axle tractors or motorized tricycles – yokes and collar harnesses for draught animals – Hippo water roller) - Affordable and safe public transport system - Improved paths and feeder roads |
| | Marketing | Limited utilization of ICT in acquiring market information | - Prepaid cards and mobile phone plans for weather forecasts, market price information, etc. |

Source: FAO.

4.1 Barriers in access to and adoption of labour-saving technologies and services

Research and case studies on labour-saving technology adoption by smallholders have noted that there are constraints (gender roles, social hierarchies, incentives) that affect the engagement of different social users and groups when articulating their demand and needs; there is also limited capacity to access technology and services, and limited information and complementary inputs to use these technologies.

Women's technology adoption rate is particularly low. Ragasa's literature research and synthesis of 35 case studies (2012) concludes that low adoption is mostly due to women's limited access to complementary inputs and services. Peterman, Behrman and Quisumbing (2010) further explain that it is the "accessibility of inputs, not propensity to use inputs" that constitutes a major bottleneck for many women farmers.

Technology adoption can also be affected by fear of employment loss or preference. In the Syrian Arab Republic, for example, women were not in favour of the introduction of mechanization for lentil harvesting, as they feared they would lose their income-generating jobs to men (Abdelali-Martini and Dey de Pryck, 2014). In other cases, women appreciate the opportunity for social time afforded by certain activities (collecting water at a river, for example, may allow them to share opinions with other women).

Barriers in women's access to and adoption of labour-saving technologies

The following section lists some of the most common barriers in access to and adoption of improved labour-saving technology that have emerged in literature.

Education: Rural women's low education and literacy levels affect their capacity to make informed choices. The differentiated access to complementary inputs (such as education) explains the difference in adoption decisions (Ragasa, 2012). Recent literature notes the importance of empowering women through participatory technology development that seeks to incorporate their perspective so that they are able to help themselves (Carr and Hartl, 2010).

Men and technology: Worldwide, technologies are often considered to be within the purview of men (Cecchini and Scott, 2003; Ashby *et al.*, 2009). Gender norms about men's control of technology, information, and knowledge limit women's opportunities to learn, use and benefit from technologies (Karlsson, 2007; Molony, 2005).

Household dynamics: Men tend not to see the need to invest in technologies when women household members can do the work for free (Feder, Just and Zilberman, 1982; Knox, Meinzen-Dick and Hazell, 1999). They also tend to manage other family members' usage of technology, and often appropriate women's technologies either because they attribute a social importance to their usage, or because they recognize that there is an income-generating potential. Interestingly enough, this problem has been overcome in an Oxfam International project in Cambodia, which distributed pink cell phones to make them less attractive to men and ensure that the phone would remain in the hands of women (Oxfam, 2012).

Time availability: The heavy burden of unpaid household responsibilities often leads to “time poverty” – the absence of discretionary time that women can dedicate to personal interests, paid labour, education, or other endeavours. Among those endeavours is learning skills that would allow them to adopt new technologies to improve their productivity or start a small business (Shelton and John, 1996; Karlsson and McDade, 2001; Hafkin and Taggart, 2001).

Physical challenges: Most existing agricultural tools and equipment tend to be designed for men's physiques, with the result that they are often too heavy or too high for women to handle comfortably (Carr and Hartl, 2010). In many communities, women also make use of old and worn out hand tools that are easily found, but ultimately less efficient.

Social norms: There is a wide range of social norms that inhibits women from accessing and adopting technology. Certain technologies or practices may not be considered suitable for them. For example, the use of long-handled hoes by women is not considered appropriate in West Africa (IFAD, 1998). With specific reference to transport, restrictions on mobility and on associating with non-family members pose barriers to women's adoption of new technologies. Among some ethnic groups in Burkina Faso, women are prohibited from riding bicycles (Fernando and Porter, 2002). Security is also a major concern for women users of public transport, as they are especially vulnerable to violence or sexual abuse (UNCTAD, 2011).

Financial and institutional constraints: Women tend to lack the financial resources to use, rent or purchase established and new technologies (Zainudeen *et al.*, 2008). The inability to borrow leads to a vicious circle: women cannot develop their skills, which prevents them from earning higher incomes, so they cannot afford the technologies that might boost them to the next rung on the economic ladder. Access to cash or credit is also restrictive for women's small businesses. Dissemination strategies that rely on individual entrepreneurs often put women and poor farmers at a disadvantage. For example, mills, graters and oil expellers are important labour-reducing technologies: rural mills can cut the required time for pounding or grating from hours to minutes. They are widely distributed, but while some are owned by community organizations or women's groups, most belong to individual male entrepreneurs, restricting access for poor producers who cannot afford to buy the services (World Bank, FAO and IFAD, 2009).

Barriers in women's access to and utilization of extension services

Technology adoption is often constrained or cut short by lack of access to inputs and services such as credit, fertilizer and information. Even if women have equal access to extension services, a lack of complementary knowledge or necessary inputs will restrict their ability to take full advantage of introduced technologies or techniques (Doss and Morris, 2001). The services available to women and their ability to use them are affected by social norms, cultural practices, lack of education, and lack of recognition of their triple role (see example in Box 1).

BOX 1 Barriers to donkey power

Lighter crop cultivation implements that can be attached to donkeys are an option for women, as there are no taboos concerning their work with donkeys, unlike with oxen. A donkey-drawn cultivator can reduce weeding time from 2–4 weeks to 2–4 days per acre.

Often, however, women lack the cash to purchase equipment, and men see no need for it when the work can be done manually by their wives at no cost. In addition, animal-draught technologies are seen as men's domain, so women do not have access to training (IFAD, 1998). Therefore, even when donkeys and equipment are distributed to women through development projects, other constraints may emerge. For example, in one project in Uganda, women lost their donkeys because they were unable to buy drugs to keep the animals healthy.

Source: (GRTI, 2006)

There is a vast literature on the use and availability of services to women. Women tend to make less use than men of extension services (Meinzen-Dick *et al.*, 2010). In 2010, the World Bank found that extension agents only serve 2 to 20 percent of women farmers in Ghana, India, and Ethiopia, for instance. Common barriers include the following:

Representation and Empowerment: Women continue to be heavily underrepresented as extension agents and in many cultures women may not interact in public with men who are not members of their family. Male workers may not recognize or understand the work that women engage in, or may not be able to communicate effectively with them. Women have been underserved by traditional extension owing to their child care responsibilities and the scarcity of their free time (World Bank & IFPRI, 2010). In turn, female farmers may not feel comfortable asking questions to male extension agents. Women may feel inhibited to speak freely in groups with men (Moore *et al.*, 2001; Manfre *et al.*, 2013; Meinzen-Dick *et al.*, 2010; UNESCO, 2010; Huyer, 2012).

Mobility: Women often cannot travel long distances to attend extension sessions owing to time, cost and child care responsibilities, as well as restrictions due to cultural norms.

Visibility: Women's productive work is invisible and not targeted by extension services. The advice provided is therefore not tailored to their needs. Women are often not even considered as farmers and are therefore not approached by male extension agents. Extension and assistance is given to men even for tasks and crops managed by women, in the assumption that the information will be shared.

Education: Women's illiteracy or lower educational levels inhibit their understanding and use of information and services.

Information: Lack of access to ICT or mobile phones restricts women's ability to find and access information. Information on improved technologies may not be widely disseminated, or the sales and maintenance structure may not be in place. Information is focused on a few areas that may not benefit all smallholders to the same extent, and complementary services may not be provided to implement the information.

4.2 Technology and services: findings by sector

Because women's time poverty is often poorly understood and not recognized as a cause of rural poverty, few policies and programmes include interventions that support women producers with labour-saving technologies and practices. Consequently, related research and investments are also far from sufficient. Nonetheless, tested technologies exist which have been found to effectively reduce women's work burden and time poverty.

Agriculture

Women are much less likely to use purchased inputs such as fertilizers and improved seeds or to make use of mechanical tools and equipment. In many countries, women are only half as likely as men to use fertilizers (FAO, 2011b). Appropriate farm tools, improved crops, integrated pest management techniques, conservation agriculture, biological nitrogen fixation, and other context-specific technologies should be targeted for development and for enhanced access by women.

Listed below are some contributions (not a comprehensive list) in agricultural technology inputs that are relevant to reducing women's work burden, and where related services such as entrepreneurial training and participation can show results. The list also includes examples of specific approaches and services that have facilitated technology adoption and/or are supported by technology (see Box 2):

- The introduction of low-input, low-risk, early-maturing and disease-resistant crop varieties can reduce women's work burden. Sunflower production, for instance, is not labour-intensive: sunflowers require little weeding and they mature early (Bishop-Sambrook, 2003). Disease-resistant crops can help farmers adapt to climate change and reduce the need for pesticides (Lybbert and Sumner, 2010). Some vegetables, such as beans, are adapted to drought conditions at a very basic cellular level, and require little water.
- Certain agricultural practices, such as conservation agriculture and cultivation of vegetable crops close to home using household waste and water, also decrease the agricultural labour burden (Bishop-Sambrook et al., 2004). Maintenance of keyhole gardens is easy and low cost, and requires few inputs and less work; the gardens are built in difficult places such as rocky areas, shallow arid/compacted soils, and near the entrance of dwellings (to facilitate their watering with household waste water). Similarly, improved livestock practices can also alleviate the work burden, such as integrating fodder production with crops, or improving housing for animals to reduce losses from drought or livestock diseases. Another potential time-saving practice is the usage of aquaponics, a food production system based on a technology that combines farming fish with growing plants in water, in an integrated and symbiotic environment. It is particularly useful for families with limited space or lack of land, as it allows food to be produced at home on rooftops or in backyards. The use of aquaponics in an FAO project in Gaza, where women often have limited mobility, allowed these women to produce food at home. Although it risks perpetuating gender norms around

women's work taking place within the boundaries of the home (in contrast to employment, which allows women more mobility), aquaponics can provide short-term improvement in terms of women partaking in productive activities.

- Improved tools have been tested to contribute to reducing women's work burden and health hazards. Operations like seed preparation, digging, weeding, harvesting, and separation of pods are often done manually or with traditional tools. Lighter and improved hoes, seed treatment drums, serrated sickles, weeders, and planters are among some of the tools that have been tested to reduce women's work burden.
- Harvesting and post-harvest processing and storage are activities where women need increased knowledge of techniques and access to specific technologies to improve product quality and quantity. This knowledge can help them to reduce food losses, save time, and enhance their earning capacity. For example, in West Africa women growers of perishable vegetables often harvest at the wrong time of the day (late in the morning after domestic work is completed), when the quality of vegetables is lower (FAO/IFAD/ILO, 2010; Fernando and Porter, 2002). Specific agroprocessing technologies for silk processing, fish smoking, grinding, and briquette production can provide rural women with additional income and save them production time and resources. One example is the FTT-Thiaroye fish processing technique introduced by FAO in West Africa (discussed below in the section on energy). Micheline Dion, small-scale fisher and cooperative leader, notes that it has allowed women fish processors to improve their product and to become more competitive in regional and subregional markets (FAO, 2014d).

The FAO-initiated farmer field schools (which started in 1989) are a good example of accessible services in the agricultural sector. They are widely used and generally perceived to be an effective outreach strategy. Impact studies, however, indicate that the results for female farmers are mixed. Local level effects are positive for women in many instances, with higher rates of technology adoption and substantial increases in income for male and female participants – 61 percent in some cases. However, the effects do not extend beyond the local level, and farmers are not passing on their knowledge to other farmers. Questions about the gender equality results include the tendency of men to dominate discussions even when in the minority, and the enrolment of women from dominant classes who are not farmers (Davis *et al.*, 2010; Braun *et al.*, 2006).

In 2003, FAO also introduced the Junior Farmer Field and Life School (JFFLS) programme, designed to enable young women and men (ages 12–17) to enhance their agricultural and entrepreneurship skills. Little evidence seems to have been collected regarding technology adoption by girls in particular, but equal participation of girls and boys is sometimes hard to achieve, as reported in a Mozambique case study where “the local socio-economic context has been a restraining factor on the integration of gender-related issues in the programme. In particular, it has been difficult to achieve equal participation by boys and girls. Dropouts of girls have been experienced as a result of early marriages and of the withdrawal of girls from the programme in order to contribute to household-related tasks” (Djeddah, Mavanga and Hendrickx, 2005).

Another important service is the provision of information and communication technology (ICT) to improve access to markets and supply chain management and to disseminate information about productive inputs and services. In view of existing limitations in reaching farmers in the developing world, ICT is recognized as a central component of agricultural outreach and information provision. Nevertheless, the gender digital divide in terms of ownership, control and independent access to computers (and even mobile phones) is still wide. The same resource restrictions that inhibit women's access to technology in general also affect women in terms of ICT.

Even in the case of mobile phones, which tend to be more accessible to women because of their cost and flexibility, women are still disadvantaged in terms of ownership. In sub-Saharan Africa a woman is 23 percent less likely to own a mobile phone than a man (Blumenstock and Eagle, 2012; Zainudeen et al., 2008). Included in this category are local radios that can help in disseminating information on animal and plant diseases, and also help in organizing women's groups.

Box 2 FAO-DIMITRA Listeners' Clubs

The FAO-Dimitra Clubs contribute to women's empowerment and a transformation of gender roles in rural areas in sub-Saharan Africa. Dimitra Clubs are groups of rural women and men that meet regularly to discuss their daily challenges and solve problems using their own means. They are equipped with wind-up solar-powered radio sets (sometimes paired with mobile phones that operate in a fleet) that facilitate their access to information and enable them to communicate with other clubs, community radio stations, and other rural actors.

As a result of the dynamics created by the Dimitra clubs, changes in rural men and women's behaviours and practices have been observed at the individual, household and community levels. A wide range of positive outcomes have been achieved, in particular for women. For example, women speak up in public, make their voice heard, and are more confident to engage in leadership roles and new income-generating activities. In Niger, women's access to land has improved in several localities thanks to the Clubs and to discussions and support from religious and community leaders. The issues of work burden and gender roles are often discussed within the clubs, leading to positive changes in task sharing between women and men. For example, in some villages in Niger, women can now rent carts to transport water containers that are very heavy. Also, in different villages of the Democratic Republic of Congo where the Dimitra Clubs were created, the household budget decisions are no longer exclusively managed by men. In several villages, the husbands take a share in childcare and household activities, including taking children to school and even pounding the cassava, a time-consuming activity that is typically carried by women.

Source: FAO, Social Protection Division

ICT use can decrease women's time burden directly:

- It allows direct communication with clients, middle men, markets and suppliers, decreasing time needed for travel. In Ghana, onion wholesalers known as "Market Queens" use mobile phones to coordinate supply among themselves and to reduce transportation costs (Overa, 2006), saving time and increasing income.
- Entrepreneurs in East Africa find that mobiles and computers help them combine business with domestic work, allowing them to work at home while running their enterprises.
- Access to e-governance services increases efficiency and decreases time required to interact with government, apply for licenses, learn about regulations and procedures. (See, e.g., Nath, 2006 on India).
- Mobile-phone based financial transactions provide access to financial services for those without a bank account, and save time by reducing travel to financial institutions (see T.S, 2013 on Kenya). Moreover, different payment schemes and options (such as pay as you go) have been developed and provide flexibility for lower-income households. Mobile-based transactions can also reduce safety risks linked to women travelling with cash when returning from long distance markets.
- ICT is a particularly flexible and time-saving resource as it can allow women to access agricultural and productive information from home (Huyer, 2012). Mobile phones can give access to weather forecasts and help farmers to make decisions on when to sow (Lybbert and Sumner, 2010). As farmers deal with changes in climate and more variability in weather, local memory becomes a less reliable guide. ICT could be used to design early warning systems (accessible to rural women) for transmitting information on livestock disease outbreaks or locusts.

Collective action and cooperatives can enable women (as well as men) to take advantage of technologies and services. For example, collective ownership of grinding mills can make these technologies accessible to women and poor producers, as in the Bangladesh Rural Advancement Committee (BRAC) initiative, which provides loans to women's groups in order to purchase mills (Ahmad and Jenkins, 1989).

In India, women's self-help groups are active in many aspects of agricultural and enterprise development. The Self Employed Women's Association (SEWA) provides a wide range of support for entrepreneurship, financing, and information services to small-scale women traders (see Elbehri and Lee, 2011). It manages a simple market price information system that sends daily text messages to members informing them of current and future prices in nearby markets. Members post the prices in the local language on a public board centrally located in the community. SEWA also supports the establishment of "tool libraries" in villages, whereby groups of women pool resources to buy tools that are rented at a fixed low rate, such as hand hoes, ploughs and oxcarts. The income from tool rental is used to buy additional tools so that the library gradually expands; or, if no further tools are required, profits are shared among the members. Other tools that can be stocked include energy technologies (solar lanterns, solar panels and biogas generators) and water quality test kits. This kind of library provides access to tools and equipment that farmers would have difficulty accessing otherwise (FAO, 2013). As well as the increased productivity and income that is generated, the time saved in travel and manual labour reduces women's time poverty.

Energy

It is estimated that 1.4 billion people (over 20 percent of the global population) lack access to electricity, with 85 percent of this group living in rural areas (IEA, 2010). In sub-Saharan Africa, only 22.6 percent of the population has access to electricity; in South Asia, the figure is 40 percent (Thomas, Rajepakse and Gunasekara, 2007). Without access to efficient and affordable energy sources, opportunities for economic and social advancement are extremely limited. This “energy poverty nexus” is particularly harmful to women.

Energy is a critical input for women's productive and reproductive work. In addition to the environmental, health and cost implications, inefficient sources of energy are major causes of time poverty for women and girls. The negative effects of unreliable, inefficient and time-consuming energy sources on women's productive work have not been adequately acknowledged. An example of an initiative launched to address energy-linked constraints is the SAFE⁵ initiative, which facilitates safe access to fuel and energy in humanitarian settings.

Informal sector enterprises in this category include food processing and preparation. For example, in some districts of Bangladesh, rice parboiling uses up to 15–20 percent of available fuelwood (UNDP, 2000). In Thailand and Viet Nam, agrobased industries use primarily fuelwood and other biofuels for crop drying, tobacco curing, and preparation of animal feeds (Poletico, 2002). The development and introduction of improved kilns in fish smoking, such as the Chorkor oven in the 1970s and more recently the FAO-Thiaroye fish processing technique (FTT-Thiaroye) for enhancing fuel(wood) efficiency, was a great improvement for small-scale post-harvest fisheries, which are dominated by women. Besides the effect of lowering operating costs (when wood is purchased), the improvements reduce the drudgery for women processors in terms of exposure to heat and smoke. The new FTT-Thiaroye technique in particular also offers the possibility of using agrowaste (maize or millet cob, coconut husks or shells, etc.) as fuel in lieu of wood.

Other home-based energy-intensive production activities include beer brewing, palm oil processing, soap making, basket weaving, cane work, and spinning and textile production. These “cottage industries” provide an important source of income for women while they carry out their domestic chores. Another important energy requirement is mechanical power for agriculture, food processing, water piping and irrigation. In addition to reducing the time women expend on these industries, improvements in energy increase their productive capacity through lighting, refrigeration (reducing risks for perishable products), communications, and community services (Lambrou and Piana, 2006).

Despite the controversy of biofuel crops displacing food crops and threatening food security, the energy potential of biofuel makes it a promising solution for households in need of electricity, which can reduce women's daily workload. The affordability and availability of biofuels make them accessible. They also contribute to the mitigation of climate change impacts through the use of renewable, carbon-neutral energy in place of greenhouse gas-producing fossil fuel (Jurgens, Best and Lipper, 2004).

5 SAFE (Safe Access to Fuel and Energy) was established by the Inter-Agency Standing Committee (IASC). It is made up of FAO and 24 other humanitarian agencies and NGOs.

An important example of a useful service to women in the energy sector is training on solar energy. This has the dual advantage of introducing an efficient and affordable technology to ease women's work burden (by freeing up time normally used in accessing energy sources) and increasing women's incomes if they are trained in developing, managing and deploying the technology. For example, the Barefoot College in India trains rural women as solar engineers to build, install and maintain solar panels in villages that have no other energy systems (Lal, 2008). And in Bangladesh, the Grameen technology centres are training women as solar technicians in an initiative to scale up solar home systems (SHS) across the country. Technicians will be responsible for maintenance, and could potentially become energy entrepreneurs themselves.

Water and irrigation

Given water scarcity and the increasingly erratic or infrequent rains in many regions, labour-saving technologies related to more efficient use of water are important for women and girls. In sub-Saharan Africa, the majority of poor farmers – especially women – lack access to irrigation infrastructure (Gill *et al.*, 2012). Men tend to be the main decision-makers on irrigation for agriculture and are responsible for the technology-intensive tasks, while women tend to be unpaid family labourers engaged in the more labour-intensive tasks (Upadhyay, 2003).

Irrigation projects, when developed and implemented taking into account the needs and concerns of both women and men, can provide an efficient source of water for vegetable production, reduce the number of hours women spend in fetching water for production and domestic tasks, and make it easier for animals to be watered. This can benefit not only women, but their whole household and the community as well.

A project in Nepal aimed to improve women's production and time use by introducing an alternative to manual irrigation for their vegetable gardens. Women provided 88 percent of the labour for the gardens. The introduction of micro-irrigation produced a range of positive effects on women's workload, household food and nutrition intake, and perceptions of gender. Time spent in irrigating the vegetable fields was reduced by 50 percent. Increased production levels meant greater availability of vegetables for the community and increased incomes for women (which gave them an enhanced social status and the means to buy cows for household dairy production). As a result of this, women were increasingly consulted by men in decision-making. The project also involved the establishment of women's self-help groups, as well as vegetable collection centres for easier transportation of vegetables to the market (Upadhyay, 2005). Further research, however, is still needed. The International Labour Organization (ILO) and UN Women are currently coordinating research on the unpaid work of women in water supply through three country studies (to be presented at the World Water Week in 2016).

Drip irrigation can have a variety of benefits for conservation and production, with related socio-economic and gender effects. In Nepal, for example, women participated more actively in vegetable production when drip irrigation technology was introduced, increasing food availability for their households (Upadhyay, Samad and Giordano, 2005).

Access to services for women in the water sector is also particularly important. Multi-use, multi-user and multi-purpose water systems can serve a wider range of community water needs, including but not restricted to agriculture, fishing, livestock watering, small business, kitchen gardening, and domestic tasks. Offering options and flexibility in water provision can increase production per unit of water used, make it available for a range of interrelated tasks, and at the same time reduce women's work burden.

There are programmes that specifically address the needs of women for water and sanitation services (such as the 2011 programme of the ILO, UN-HABITAT, UNIDO, UNV and PAHO on governance of the water and sanitation sector in Ecuador), but these are not yet a common practice. Water use systems which are implemented without adequately consulting women will likely have negative effects for them, increasing the existing inequality and adding to their work burden. In the 1990s and 2000s, women's access to land and water often declined as a result of irrigation projects. This was due to the fact that while women benefitted indirectly from increased household incomes, they lost direct control over their own land and financial resources (IFAD, 2007). In Cameroon, a World Bank project introduced irrigated rice crops without taking into account women's cultivation of sorghum, a staple crop, and redistributed their land on the assumption that they would provide labour on their husbands' land. The project neglected to consult the women first, and when they refused to provide this labour, the project failed (IFAD, 2007).

A strategy to avoid these pitfalls is to ensure women's participation in water users associations (WUAs), which offer a form of cooperative governance. In general, women tend not to participate sufficiently in these associations, and often do not hold decision-making positions in them. Membership in WUAs is often vested in land ownership, leaving women at a disadvantage with respect to their husbands. In some cases, membership of WUAs is made up of those (most commonly men) who contributed labour during the construction of irrigation systems or in operation and maintenance activities (Meinzen-Dick *et al.*, 2011). Women's lack of participation may also result from social perceptions that irrigation is a man's job because it requires physical labour and machinery. Women may also be hesitant to join organizations dominated by men, may lack information about water use initiatives, and may not have the time or the staff needed to take action. In addition, WUAs may be unaware of the gender dimensions of water use and management.

Transport and infrastructure

Feeder and main roads can greatly reduce women's time burden and expand their work opportunities, especially when combined with accessible and affordable modes of transportation. Where public transport is available, women tend to use it. Improved roads and road networks provide social, economic and environmental benefits: they foster agricultural marketing and enable rural farmers to take advantage of other opportunities to increase their incomes. Improved road networks can encourage the public and private sector to invest in transport and socio-economic development. Importantly, improved transport increases women's mobility and decreases their

isolation, with positive effects on their social, economic and political status (IFRTD, 2010; Bhandari, Kato and Hayashi, 2009). When direct market access is difficult for small producers and particularly for women, sometimes cooperatives and producers organizations can facilitate access through the provision of transportation, cold storage facilities, processing facilities, communications, and information (FAO/IFAD/ILO, 2010).

Gender and socio-economic analysis is required to ensure that interventions do not inadvertently increase the labour and/or resources required, or undermine work valued by women. For example, the use of donkey carts for fuelwood collection in South Africa in fact resulted in women being required to travel farther to find wood, because their husbands appropriated the carts to collect and sell wood found closer to home (Fernando and Porter, 2002; Venter, Mashiri and Buiten, 2007).

A gender approach to transport planning can address and resolve some of these concerns so that transport systems are implemented that meet women's practical needs and reduce their time poverty. Some positive models for overcoming these barriers include using a consultative approach that incorporates a range of supporting or complementary activities and services. With this approach, an IFAD project to construct roads contributed to market access in southern Zambia. A consultative process with farmers to develop preferred routes and ensure women's participation produced 700 km of gravel road that halved distance-related operating costs for farmers and others, doubled the number of traders, improved food security generated employment (25 percent of which was for women), and improved the safety of children going to school (Andreski, 2009). Similarly, with the modernization of irrigation schemes, gender-friendly infrastructure can be introduced, such as simple small bridges that enable women's access to the market.

In another example, the construction of feeder roads in North Darfur, the Sudan, improved food security and women's livelihoods mainly because the implementing agency, Oxfam International, integrated transport provision with services. Improved access enabled staff, women's organizations and local authorities to reach the villages, which received immunization and other health services. A drug service was set up, wells and hand pumps were provided, and schools rebuilt. Women benefitted through the introduction of literacy classes; training in food processing; skills upgrading for small enterprises; timely distribution of food aid during droughts; and, most importantly, through their increased participation in village committees and the Rural Council. Because the roads reduced travel time, women were allowed to attend meetings and return home on the same day (Fernando and Porter, 2002). This combination of mobility with literacy, training, skills building, and participation in local decision-making not only addresses transport, time and production needs, but also increases the confidence, skills and status of women.

Section 5

Conclusion and recommendations

In order to build on the opportunities presented in this paper and to tackle the constraints that have emerged as relevant for women in agriculture and rural development, different actors have been identified as relevant at the national and international level to support the reduction of women's work burden and to support their access to labour-saving technologies and services. Key actions have been identified as relevant for research institutions (both in terms of technology development and social analysis), government (for the creation of a more conducive policy environment), and service providers (extension and associative groups). Capacity development actions are identified as a cross-cutting theme.

Research

- Little is known and recorded about the social dimensions of technology access and adoption, even though these are important to reach a deeper understanding of social as well as individual preferences and perceptions. *Research needs to take into account the social value of technology in order to understand men and women's willingness to adopt certain technologies over others. Context-specific and gender-specific priorities and restrictions also need to be taken into account.*
- Data on rural women and men's time use is not available for systematic assessment, nor is it given due attention. *Standardized, sex-disaggregated data on time use needs to be collected and analysed to inform policy-making and project/programme design. To measure work burden, specific indicators and methodologies and tools (surveys, censuses) should be developed and tested.*
- Research into information and communication technology (ICT) still presents unexplored potential for agriculture (see climate-related and market price information, and also mobile financial transactions), both in terms of the technology itself and what it can be applied to. *This could be a priority area of intervention for traditional research organizations (CGIAR and national institutions) as well as private sector innovators to support rural development.*

- Agricultural labour-saving technologies have often been developed with a focus on men's work and needs, and have overlooked or neglected women-led production processes (such as post-harvest processing) and activities associated specifically with women's work (such as home gardens). There is insufficient technology adapted for women that takes into account the nature of their work, their time use, their physique, and the social and cultural context they live in. *Therefore, research needs to (i) identify technologies adapted for women and for women-specific priorities; (ii) understand when women's labour peaks occur, what type of labour-saving technologies they need, and how these can contribute to reducing work burden; and (iii) determine how these technologies can be introduced and what measures and support are needed for their adoption.*
- The role of the private sector in spreading technologies into rural areas needs to be further researched. An understanding of the comprehensive framework of national players (public as well as private service delivery systems) can help governments and project managers cooperate with the private sector to regulate and generate appropriate incentive structures for the benefit of the rural poor. *Research at the country level needs to inform interventions to ensure that technology is introduced by those best situated to do so, and that capacity development is offered to relevant service providers and adapted to local needs.*
- Specific high-value products, such as essential oils and medicinal plants, are produced by women and constitute part of their traditional knowledge. *Research in technologies which can support agroprocessing should be carried out to minimize time use and maximize the income potential for women entrepreneurs.*
- For a number of reasons linked to intrahousehold and community power imbalances, men often influence women's access to and adoption of technologies and their utilization of related services. *Further research on the underlying gender-based social dynamics which influence technology adoption is needed to avoid project failure and to ensure that women can benefit from resources made available to them.*
- Despite some evidence on new activities that women carry out when they have more free time, what women would like to do with their time is seemingly unexplored. *Women's voices need to be brought out (livelihood analysis, well-being approach), and further research is needed to identify how to structurally address some of the social inhibitors faced by women.*

Policy

- Policy at the national and international level does not sufficiently integrate gender dimensions; rather, it tends to relegate them to areas traditionally associated with women, such as social protection, child care, and health. *More specifically, women's time use, technology, resource and support needs are not being effectively addressed in the sectors reviewed (energy, water, transport), and therefore the policies developed are partially gender blind.*

- Sector-specific policies tend to be segregated and treated in isolation so that the synergies in favour of women's contribution to agriculture do not emerge, for example through the usage of resources such as technologies, energy and water. *In order to address women's work burden, a more integrated approach is required to ensure that policies relating to the energy, water and agricultural sector specifically address key access and adoption issues.*
- Mobility is a fundamental contributor to women's empowerment, as it is required in order to access resources, social networks and knowledge. In areas where women have limited mobility, they will be absent from value chains. *Within the transport sector, increased mobility through accessible, safe and affordable transport can improve women's market access, support safe cross-border trade, and enable them to access services.*
- ICT has a lot of potential for women farmers as both a service and a technology. *Policy-makers should incorporate ICT within their agricultural sector policies and explore all options of development and dissemination for the benefit of farmers in general, and women in particular.*

Programmes and projects

- Labour and time are factors that aren't sufficiently addressed in project/programme design, implementation and monitoring frameworks, such that efforts and initiatives risk having negative impacts on women. *Gender analysis should specifically address labour and time constraints to guide, when appropriate, activities and support services targeted at women.*
- Smallholder farmers' traditional agricultural activities, skills and specialized knowledge are not necessarily recognized, particularly those of women. *Project design should take into account that when introducing new practices/inputs, there is a strong risk of losing valuable knowledge for sustainable and resilient agriculture.*
- Smallholder farmers, particularly women, tend to be excluded from higher value and more lucrative domestic and international markets, owing to lack of transportation, cold storage facilities, processing facilities, communications and information. *Working with cooperatives and producer organizations may be a way of facilitating access to these markets for small-scale producers.*
- Men are often "gatekeepers" to women's access to technology. *Therefore, for a project to be successful it is important to reach a good understanding, through gender analysis, of the channels through which innovative solutions are introduced in order to identify and address possible risks at the project design stage.*
- Men are not sufficiently targeted in project design as relevant to the gender dimension and part of the solution to women's work burden. This refers both to men's greater time availability in relation to women and to their role in women's access to and adoption of technology. *Gender strategies that work with men as well as women can sensitize project beneficiaries to the concerns and needs of*

both. The Dimitra Clubs in the Democratic Republic of the Congo included gender awareness-raising sessions in their approach. As a result, male participants began to understand the need to reduce women's work burden through participation in child care and agricultural tasks previously considered the realm of women only (see Dimitra Project, 2013). In addition, incentives should be explored to prevent men from appropriating women's technology.

- Extension services are often inadequate (in quality and availability) and gender blind. *Projects need to expand their outreach to service delivery partners beyond government, and assure gender awareness through capacity development.*
- The indicators in project/programme monitoring frameworks do not collect and analyse the gender information needed, thus contributing to the invisibility of women's time burden. *Gender differences in adoption rates of technologies, labour, time use, income, and productivity need to be measured, along with outcomes and impacts to see the results of women's participation on farming improvements, efficiency, livelihoods and well-being.*

Capacity development and information sharing

- The knowledge and awareness of gender and women's work burden in the agricultural sector is weak among all development partners. *Policy-makers, project implementers, government counterparts, extension delivery services, and beneficiaries need to be aware of the benefit of implementing gender approaches and appropriately addressing women's needs in regards to technology. This can be achieved through advocacy and targeted capacity development on gender equality.*
- Women's agricultural work is largely invisible, and women have less of a voice than men concerning their needs and wants. *Training and capacity development of female farmers is required to promote their leadership and negotiation skills, support voicing of their concerns, and enhance their technical skills.*
- It is commonly understood that capacity development is delivered predominantly by the public sector. However, it is important to keep in mind that there is a wide range of service delivery agents from both the public and private sectors (extension services, farmers' organizations, NGOs, and community associations). *The different roles and capacities of all these stakeholders need to be acknowledged when identifying the most suitable delivery agent.*
- When introducing technology there are a number of issues and weaknesses related to extensions services. *Attention needs to be paid to i) increasing representation of female extension workers (who might have more insight and facility when speaking with women farmers); ii) specific targeting of women farmers; iii) increasing knowledge of the technologies through better instruction and communication; and iv) improving and extending outreach. In order to achieve this, the actors within the whole service delivery system need to be better identified, and capacity development needs to be extended to them.*

Section 6

Proposed approach

This paper mapped the agricultural sectors of relevance for the reduction of women's work burden, highlighted some of the barriers to their access to and adoption of technology and service utilization, and reviewed some solutions adopted so far. It attempted to illustrate and frame the gender issues and social context and dynamics within which rural men and women live and operate, in order to highlight the complex understanding required by all those concerned when introducing technologies with a potential for labour- and time-saving.

A conceptual model (Figure 2) was developed to illustrate the national context for agriculture-related technology introduction and service delivery to reduce women's work burden. It addresses the need for a transformation of gender relations at the household level such that women are able to voice the time burden they face as part of their triple role, thus enabling their husbands and community to support them. The model designates the household as the central unit and links it to the community and policy levels. Key sectors (research and services) composed of different stakeholders (public/private/NGOs) are identified to illustrate interlinkages and the dynamics affecting services and technology introduction and adoption.

The household is presented as a unit of reference, and three circles, linked by a timeline, represent the transformation in the household's relations which would facilitate women's technology adoption for work burden reduction:

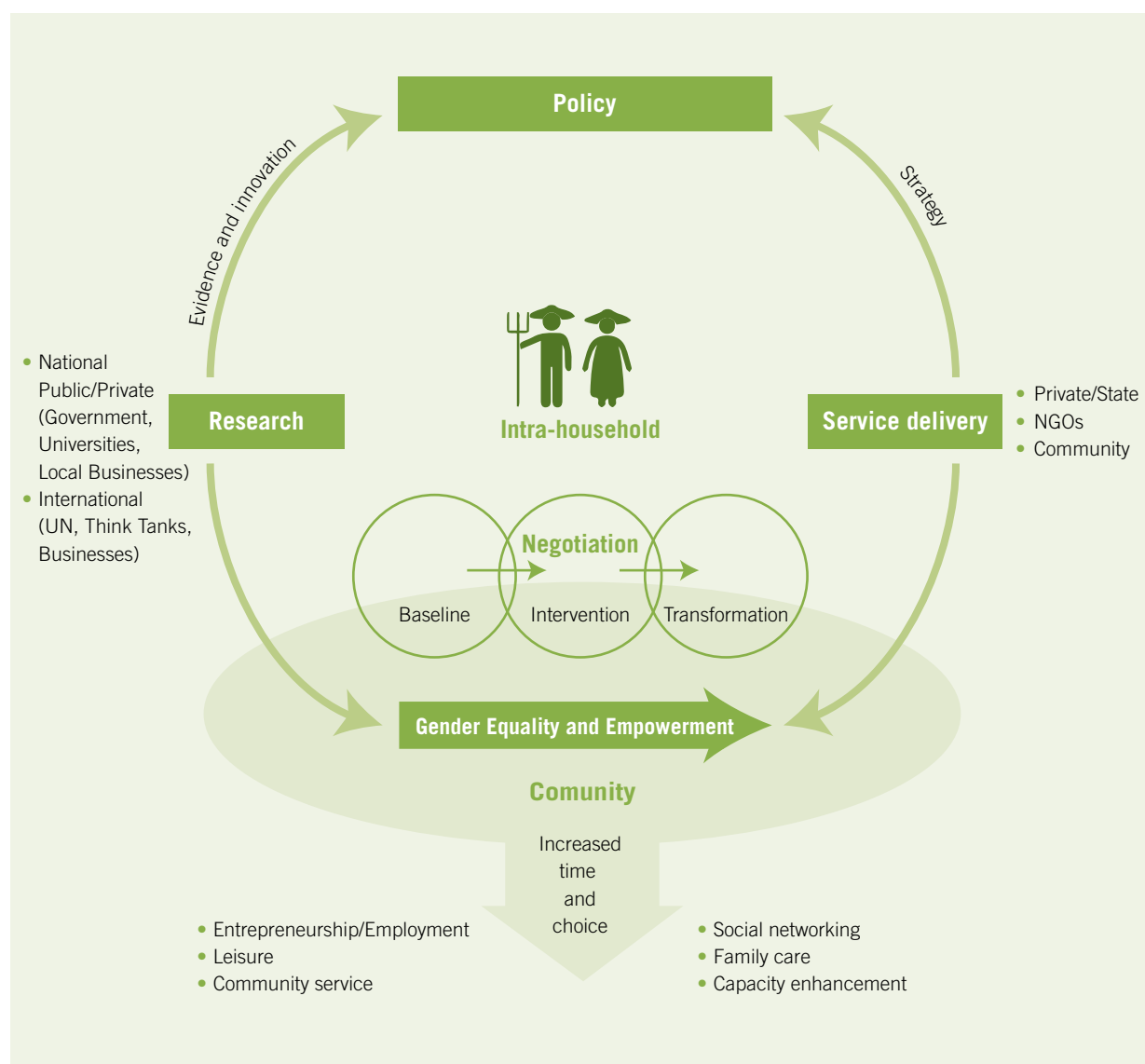
The first circle represents the baseline and reflects the household (HH) before a technology is introduced. Researchers and development workers need to establish a dialogue with communities, and ultimately with individual households, to ascertain what women and men's needs and requirements are. Through participatory engagement, the household can provide feedback on its members' time availability and resource requirements. It needs to be supported to identify its members' labour constraints.

The second circle refers to the phase during which a technology and its related services are introduced. This is when household members negotiate among each other for acceptance or rejection of a technology, deciding on who uses it and for what purpose. Appropriate services need to be defined and made available to different household members; women in particular need to be relieved of some of their tasks to be able to make full use of services available.

The third circle depicts the possible outcome of technology and service adoption at the household level. In this final stage, a facilitated dialogue process on the intrahousehold division of labour and relative time constraints needs to have taken place. The outcome of this process should be an environment where joint decisions are taken (bargaining of time and sharing of duties within the household) resulting in task distribution, more balanced time availability, cooperation, and sharing.

This model highlights the important nexus between household dynamics and technology introduction and adoption. It is in synergy with IFAD's household approach and can guide development partners and FAO on activities, tools and methodologies to apply at the household level. The outcome of increased technology adoption is additional free time and the choice to decide how to spend it.

Figure 2: Conceptual model to reduce women's work burden in agriculture



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Based on a broad literature review, this publication discusses rural women's time poverty in agriculture, elaborates on its possible causes and implications and provides insight into the various types of constraints that affect the adoption of solutions for reducing work burden.

This paper raises questions about the adequacy of women's access to technologies, services and infrastructure and about the control women have over their time, given their major contributions to agriculture.

It also looks into the available labour-saving technologies, practices and services that can support women to better address the demands derived from the domestic and productive spheres and improve their well-being. The reader is presented with an overview of successfully-tested technologies, services and resource management practices in the context of water, energy, information and communication.

The findings elaborated in this paper feed a set of recommendations provided for policy makers and development partners. A gender-transformative approach at community and household level is suggested as a way forward to promote women's increased control over the allocation of their time.

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