



Women's access to wood energy during conflict and displacement: lessons from Yei County, South Sudan

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The example of South Sudan, with its millions of displaced people, exposes the pressing need for sustainable supplies of woodfuel and efficient cooking technologies in the wake of emergencies, to ensure not only food security, health and safety but also environmental sustainability.

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Sub-Saharan Africa is particularly affected by acute emergencies and protracted crises, including both natural disasters and violent conflict. The region is also highly dependent on biomass as a source of domestic energy. In 2011, 81 percent of the population in the entire continent of Africa used woodfuel to boil and sterilize water (FAO, 2014a). According to the International Energy Agency (IEA, 2014), 79 percent of the population in sub-Saharan Africa rely on traditional biomass to cover their cooking needs (IEA, 2014). FAO (2014a) estimates that 63.1 percent of the population rely on woodfuel to cover

their cooking needs. Traditional biomass use refers to the use of fuelwood, charcoal, manure and crop residues for cooking (UNEP, 2014a). Biomass is a source of energy for many poor and rural populations, who often use these types of fuels inefficiently in open hearths or simple stoves and in poorly ventilated spaces for the purpose of cooking (UNEP, 2014a). Since women are in most cases responsible for cooking and procuring cooking fuel, they are by

Above: On the road between Nimule and the camp for Internally Displaced Persons (IDPs), women walk long distances for firewood

far the most affected by the detrimental impacts of inefficient fuel use on well-being.

Food is often provided by humanitarian actors as an immediate response to emergencies, but the importance of ensuring affected populations' access both to fuel for cooking and to efficient cooking technologies is often overlooked. Crisis-affected populations will in most cases – unless the food provided is ready to eat – require a source of energy to cook it. The need for cooking energy is especially urgent in emergencies for a number of reasons. When people are displaced and forced to settle in areas that already support host communities or are environmentally fragile, there is a risk of conflict over resources and of environmental degradation. Women and children are often forced to venture out of refugee/Internally Displaced Persons (IDP) camps in search of fuelwood. As a result, they may be exposed to harassment, violence and sexual assault perpetrated by men. The scarcer biomass resources are, the further women will have to walk

to collect fuelwood, thus increasing the likelihood of being attacked. When access to cooking fuel is constrained, there is also a higher risk of women undercooking food (WFP, 2012). In urban areas affected by emergencies, lack of access to fuel has even led some women to resort to the trading of sexual favours in exchange for fuelwood or charcoal (FAO, 2013). The high demand for fuelwood in emergency contexts can lead to environmental degradation in areas that host IDPs when supplies of dead wood are progressively exhausted and live trees are cut in an uncontrolled manner (ProAct, 2012). The environmental impact is often the most visible and lasting impact of informal and formal camps for displaced people (ProAct, 2012).

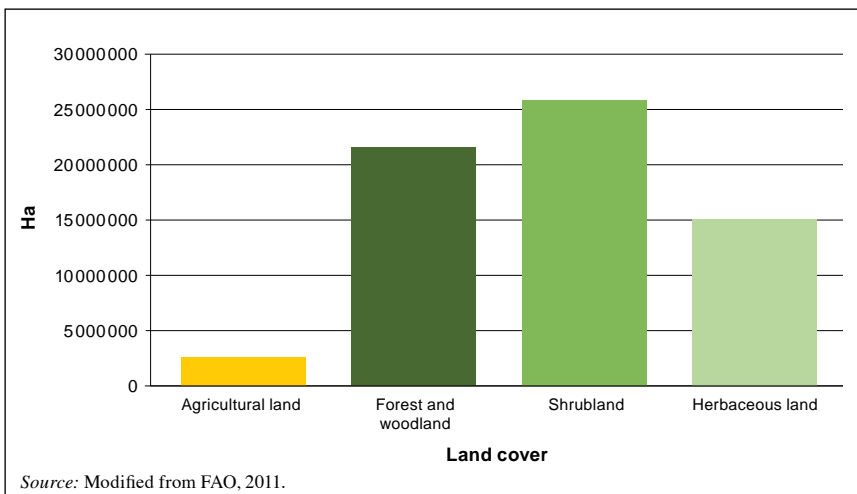
As part of efforts to reduce the environmental impact of an emergency, the provision of a stable and sustainable supply of fuel for cooking can help ensure that forests are not overexploited as a result of the concentration of displaced people and host communities. However, sustainable supplies of fuel are rarely available in conflict settings and would have to be provided by humanitarian actors from zones outside degraded forest areas. Rather

than focusing on fuel supply in acute emergencies characterized by violent conflict, environmental impacts can be addressed by changing the demand for woodfuel. The provision or local production of fuel-efficient stoves (FES) helps reduce the amount of wood and the time needed for cooking, which can allow women more time to engage in productive activities. The use of FES also reduces exposure to indoor air pollution, which constitutes a major health concern in many developing countries. Over 4 million premature deaths every year are attributed to indoor air pollution caused by the inefficient use of solid fuels (WHO, 2014). Finally, both the provision of cooking fuel and efficient cooking technologies help ensure that women do not venture out into unsafe areas in order to collect fuelwood.

The multisectoral challenges outlined above encompass environmental impacts, health, protection issues and livelihoods. Taking all of these into account, a United Nations Inter-Agency Standing Committee Task Force on Safe Access to Firewood and alternative Energy (SAFE TF) was established in 2007: it included UN agency members such as the Office of the United Nations High Commissioner for Refugees (UNHCR), World Food Programme (WFP), United Nations Children's Fund (UNICEF) and FAO. During its existence from 2007 to 2009, SAFE TF produced two guidance tools for field-based actors, including a decision-tree diagram for choosing an appropriate fuel strategy in acute emergencies and protracted crises, and a matrix on the roles and responsibilities of various agencies to ensure successful implementation of the strategy (WFP, 2012; FAO, 2013). Since 2010, the implementation of SAFE projects and activities has gained momentum. WFP – which originally co-chaired SAFE TF with UNHCR, InterAction and the Women's Refugee Commission (WRC) – has implemented SAFE projects in Ethiopia, Haiti, Kenya, Sri Lanka, the Sudan (Darfur) and Uganda (WFP, 2012). UNHCR is currently launching a SAFE global strategy which

Water supply is one of the many challenges for IDP camps. Here, people line up for clean drinking water provided by Oxfam



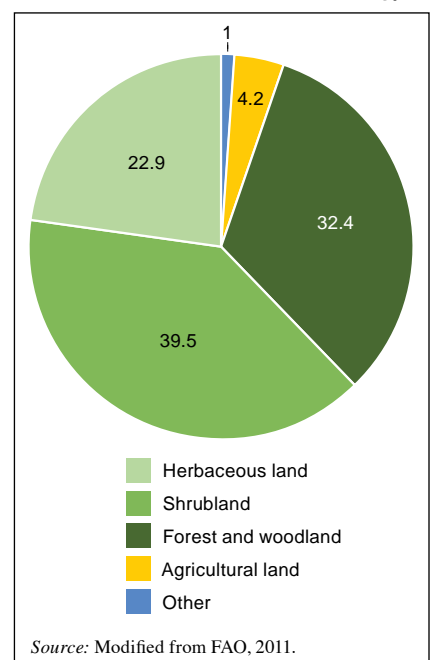


1
Land cover in South Sudan

South Sudan also has extensive and diverse forest and woodland resources that provide food, oils, medicines, timber and fuelwood (USAID, 2007). A study by FAO (2011) has provided an extensive overview of the annual and perennial vegetation found in South Sudan. The study involved a mapping of the country which divided South Sudan into land cover classes. The major classes and the size of the total land area are based on FAO (2005) and are shown in Figure 1.

The percentage of the total land area of South Sudan for each type of land cover is shown in Figure 2. Agricultural land encompasses agriculture in terrestrial and aquatic/regularly flooded land while forest and woodland refers to closed-to-sparse trees in terrestrial and aquatic/regularly flooded land. Shrubland and herbaceous land comprises closed-to-sparse shrubs and closed-to-sparse herbaceous land in terrestrial and aquatic/regularly flooded land, respectively.

2
Percentage of various land cover types



will be rolled out in selected countries from 2014 to 2018, many in sub-Saharan Africa (UNHCR, 2014).

This article examines some of the challenges outlined above in one of the world's youngest nations, the Republic of South Sudan. Having achieved independence and a short-lived peace after being embroiled in two civil wars, South Sudan is now on the brink of an emergency as a result of recent violence, in which the issue of access to energy is emerging as an important driver of both protection risks and environmental impacts. More than ever, there is a strong need to address the environmental and gender implications of the unfolding emergency in the country. The following sections of this paper examine the current linkages between energy needs and forest resources and present a case study of FAO's response.

NATURAL RESOURCES AND THE ENVIRONMENT IN SOUTH SUDAN

The independence of South Sudan, declared on 9 July 2011, was the culmination of a long peace process that started with the signing of the Comprehensive Peace Agreement (CPA) in 2005, bringing an end to the second civil war in Sudan which lasted 22 years (OECD, 2011). More than 2 million people were killed and over 4 million displaced due to the conflict, from the start of fighting in the early 1970s to the signing of the CPA

in 2005 (Haynes, 2007). South Sudan is now one of the youngest and poorest nations in the world. It also differs markedly from the Republic of the Sudan in terms of religion, ethnicity, infrastructure, financial resources, topography and natural resources.

South Sudan covers an area of 640 000 km² and is situated in the Nile catchment area, receiving water from highland areas of the Central African Republic, the Democratic Republic of the Congo (DRC), Ethiopia and Uganda (UNDP, 2012). The elevation of land in the country ranges from 600 to 3 000 m above sea level (AfDB, 2013). While the Sudan consists mainly of deserts, semi-deserts and low-rainfall woodland savannah, most parts of South Sudan have a sub-humid climate (FAO, 2000; AfDB, 2013). The state of Western Equatoria and the highland parts of Eastern Equatoria receive the greatest amount of rainfall, which ranges from 1 200 to 2 200 mm annually, while the lowland areas of Eastern Equatoria, Jonglei, Upper Nile and Bahr el Ghazal receive 700–1 300 mm annually (AfDB, 2013). The south-eastern tip of Eastern Equatoria receives the least rainfall: about 200 mm per year (AfDB, 2013).

South Sudan has vast areas of wetlands and floodplains, such as the Sudd and the Machar Marshes, which constitute significant wildlife havens, especially for migratory waterfowl (UNEP, 2007).

Traditional charcoal making



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As shown in Figure 2, agricultural land constitutes only a little over 4 percent while forest and woodland take up 32.4 percent of the total land area. When adding shrubland, the total area with perennial vegetation cover constitutes an area of over 47 million ha and over 70 percent of the total land area. Earlier studies have estimated that only a small part of this area, 640 211 ha, consists of gazetted forests (USAID, 2007). The figures above indicate that a significant amount of wood-based resources exist that can potentially be used for domestic energy purposes. Over the course of a year, from 2011 to 2012, South Sudan produced 4 383 000 m³ of woodfuel, of which 244 000 m³ was charcoal (FAO, 2014b). While most of this was for domestic consumption, increasing amounts of charcoal are being exported to the Sudan and Uganda, and even reaching markets in the Middle East. According to the United Nations Environment Programme (UNEP, 2014b), other potential uses of forest resources have been considered.

The timber industry has been suggested as an important development opportunity for South Sudan, if managed sustainably and under stable and peaceful conditions. UNEP has estimated that teak plantations (*Tectona grandis*) alone could generate up to US\$50 million per year in export revenue (UNEP, 2014b).

Local communities play an important role in forest management and land use decision-making in South Sudan and almost all forests in the country are community forests (UNEP, 2014b). However, a significant amount of forest cover has been lost throughout the country (UNEP, 2014b). This development is recent. Over the course of both the first and second civil wars in Sudan, the pressure on natural resources was low due to depopulation in many areas and inaccessibility of certain zones due to mines in areas of what is now South Sudan (UNDP, 2012). USAID (2007) reported that there was an increase in vegetation density in Southern Sudan (now South Sudan) over the period of the war from 1982 to 1999.

THE IMPACTS OF VIOLENT CONFLICT AND FAO'S RESPONSE IN SOUTH SUDAN

The situation changed, at least partly, due to the signing of the CPA, after which millions of refugees returned to South Sudan from camps in Ethiopia, Kenya and Uganda (UNDP, 2012). Along with these returnees came an influx of Sudanese refugees. Fighting in the Blue Nile and South Kordofan states in the Sudan led to the flight of about 190 000 people to the Upper Nile and Unity states in South Sudan, where refugee populations far outnumber host populations (UNHCR, 2013). The annual deforestation rate has been estimated at 277 630 ha (UNDP, 2012). The main causes of loss of forest cover have been the clearing of land for cultivation or for roads and settlements and the production of charcoal (UNDP, 2012). Other sources also cite fuelwood extraction, brick production and collection of construction materials as major drivers of forest degradation (UNEP, 2014b). Competition over forest resources has also

led to conflict. Over the last two years, conflict over increasingly sparse forest resources has broken out in Maban County in Upper Nile state, where four refugee camps house 110 895 refugees from the Sudan (DDG, 2013). Women from these refugee camps are particularly vulnerable to assault when collecting fuelwood, and competition for forest resources has resulted in significant deforestation around the camps (DDG, 2013).

In addition to the impact of returnees and refugees, struggles along ethnic lines in South Sudan have recently evolved into a national humanitarian emergency. On the evening of 15 December 2013, fighting erupted in the South Sudan capital of Juba, initially among members of the Presidential Guard (UNMISS, 2014). The Sudan People's Liberation Army (SPLA) was subsequently divided into two factions, the forces in one faction being loyal to the government and President Salva Kiir Mayardit, from the Dinka ethnic group, and rebel forces in the other faction being loyal to former Vice-President Riek Machar, from the Nuer ethnic group. As a result of this split, fighting moved rapidly to various military installations and then into civilian neighbourhoods (UNMISS, 2014). The violence soon took on an ethnic dimension. Both sides have since been accused of human rights violations, including "extra-judicial killings, enforced disappearances, rape and other acts of sexual violence, arbitrary arrests and detention, targeted attacks against civilians not taking part in hostilities, violence aimed at spreading terror among the civilian population, and attacks on hospitals as well as personnel and objects involved in a peacekeeping mission" (UNMISS, 2014).

Fighting has been concentrated in the Jonglei, Unity and Upper Nile states, where state capitals have changed hands several times, in both urban and rural areas (UNMISS, 2014). However, all states are affected to some degree by the violence

and disruption to livelihoods. Overall in the country, about 1 million people are currently internally displaced and 4 million are in need of humanitarian assistance (OCHA, 2014a). Furthermore, in the most conflict-affected states, such as Jonglei, Upper Nile and Unity, the planting season has been disrupted. In addition, in many areas, people are still recovering from the effects of floods in 2013, making them particularly susceptible to food insecurity and malnutrition (OCHA, 2014b).

In response to the violence and subsequent humanitarian emergency, FAO began implementing its Emergency Livelihoods Response Programme (ELRP). This programme supports food security and livelihood responses by distributing emergency livelihood kits, protecting food production and availability in less affected areas, implementing emergency livestock response mechanisms, including the procurement of veterinary drugs and rehabilitation of cold chains, and reducing the environmental impact of improvised settlements for IDPs, including the provision of support for energy needs (FAO, 2014c). Many of FAO's development-oriented projects had been temporarily halted as a result of the violence, but some of these were subsequently incorporated

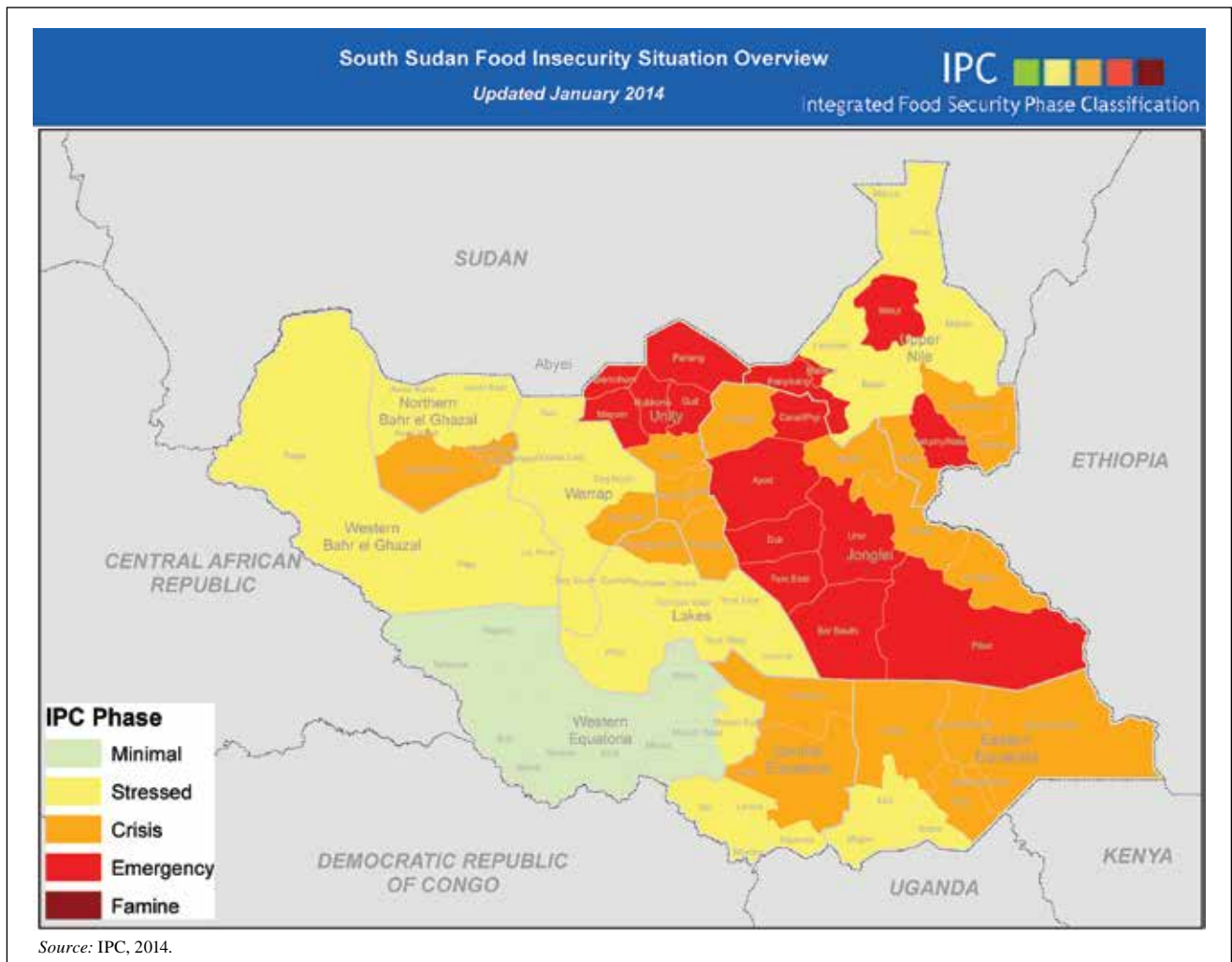
in the ELRP while a few were able to continue. One of the latter, entitled "Integrated Food Security Assistance to Returnees and their Host Communities in South Sudan", addresses the cooking energy needs of vulnerable people, women in particular, in Yei County near the capital, Juba.

Yei County is one of six counties in Central Equatoria. The capital, Yei, is located near the border with the DRC, 156 km southwest of Juba. Around 35 percent of the area of Central Equatoria state consists of forest and woodlands and the total area of perennial vegetation, including shrubland, covers 77 percent of the land area of the state. Agricultural land covers 8.6 percent of the land area, which is over twice the national average (FAO, 2011). Yei is the third largest county in Central Equatoria and covers an area of 669 909 ha of which 14 percent is used for agricultural production, much higher than the national average or the average for the state. Forests and woodlands alone cover 46 percent of the county area, which is much higher than the national average. Total forest area, including shrubland, covers 70 percent of the total area of the county, which is lower than the state average and similar to the national average (FAO, 2011).



Three-stone fire traditionally used in Yei County

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As of January 2014, Yei County was classified as a “stressed” county, according to the Integrated Food Security Phase Classification (IPC), unlike the majority of counties in Jonglei, Unity and Upper Nile which are classified as being in a state of “crisis” and “emergency” (IPC, 2014; see Figure 3 above).¹ Population groups, including IDPs, returnees and host communities in Yei County remain in a precarious situation but are less exposed to violence and food insecurity than the aforementioned states.

¹ The IPC classifies counties in South Sudan according to the severity and magnitude of food insecurity experienced. The categories for food insecurity are “minimal”, “stressed”, “crisis”, “emergency” and “famine”.

More than 94 percent of the communities in the county are dependent on woodfuel as a source of domestic energy (KFTC, 2013). The majority of households in the county collect fuelwood from nearby woodlands and shrubland. However, this pattern of fuelwood collection has been disrupted by the influx of returnees and the expansion of Yei town to rural areas. The overall impact has been a dwindling of forest areas traditionally reserved for the collection of fuelwood and other non-wood forest products. Access to biomass energy is becoming an increasing concern in Yei due to the high concentration of IDPs and refugees from the DRC.

If the issue of the access of women in Yei Country to a secure and efficient source of

energy, especially for cooking purposes, is not addressed, there will be a rapid increase in the risks they face, as they will need to walk longer distances in search of fuel sources. The environmental risk is also significant, and unchecked fuelwood exploitation from nearby woodlands may lead to deforestation and desertification in the mid- to long term. The traditional open fires or three-stone fires (see photo on previous page) used by women in Yei for cooking purposes are not only inefficient in terms of energy use but also unsafe since they generate indoor air pollution and can cause burns and scalds. Hence, addressing

3
*IPC classification of South Sudan
as of January 2014*

energy and woodfuel needs is an urgent priority for the communities in Yei County, which prompted them to request FAO's support in the development of lasting solutions. The communities highlighted access to FES and the establishment of agroforestry as key areas of collaboration with FAO and the Kagelu Forestry Training Center (KFTC), a government institution, on a SAFE project with funding from Japan. The project has targeted the most vulnerable members of the Mugwo, Otogo and Yei Block communities in the county, first and foremost women, as well as elderly, sick and disabled individuals.

Based on the result of a needs assessment carried out by communities in Yei and facilitated by FAO, a total of 20 women from women's organizations have been trained in the construction of FES. Two kinds of FES were selected by the communities: a portable ceramic charcoal stove and a stationary mud/brick stove which uses both fuelwood and charcoal as energy sources (see photos below). The mudstoves are constructed using local materials such as clay soil, bricks and sticks. Working together with the KFTC, community members and FAO constructed a total of 1 500 household stoves. The FES are low-cost and have had a very positive impact

in improvised settlements, IDP camps and with host communities in Yei County. The stoves have reduced the need for fuelwood and the burden and time spent collecting it. Fuelwood collectors in Yei – frequently women and children – are therefore now much less exposed to violence and sexual assault. Beneficiaries have also witnessed nutritional and health benefits since the stoves have reduced the risk of undercooking food to save fuelwood. In addition, those households that depend on purchasing fuelwood or charcoal will reduce their energy expenditures since the stoves are more efficient and use less woodfuel. Furthermore, if the stoves continue to be produced locally, they can provide a source of income for the women's groups that produce them and the skills acquired can be transferred to other women.

The project also addressed the fuel supply side through the establishment of woodlots and agroforestry. Beneficiaries received training to establish tree nurseries and subsequently establish woodlots with multipurpose tree species, used for fuel, shade, fodder, windbreaks and to improve soil fertility. The trees are also a means of restoring the surrounding environment and minimizing the long-term negative impact of large improvised encampments in Yei.

Some of the women who have begun to use the FES have already shared their experiences on a local radio programme, Radio Miraya's Monday Moi:

What I have seen is that it takes less fuelwood and sometimes smoke is not coming directly into your eyes and it cooks faster since you put the source in one side and the food in the other. Also, children will not get burnt when using the stove.

CONCLUSION AND RECOMMENDATIONS

There is a great need to recognize the importance of fuel for cooking, heating and other immediate needs in the context of humanitarian settings. Access to cooking fuel has implications for a range of sectors that influence livelihoods, the well-being of people, environmental sustainability and the overall resilience of crisis-affected populations to shocks. Because of the strong links between energy access and food security, livelihoods, environment,

Stoves which are now used by FAO beneficiaries in Yei County. On the left, the Rocket Lorena stove which uses both charcoal and fuelwood (smoke is directed outside the kitchen wall). On the right, the shielded-fire portable stove





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Tree nursery in Yei County

nutrition and health, emergency fuel response activities should be considered as life-saving interventions and have a firm place in emergency response procedures. These include the Multi-cluster Initial Rapid Assessment (MIRA), Post Disaster Needs Assessments (PDNA) and the Office for the Coordination of Humanitarian Affairs (OCHA) emergency cluster system itself, either as a cluster in its own right or in a cross-cutting role.

Successful energy interventions should ideally address both fuel supply and fuel demand, as the case study from Yei County shows. It has been possible to address longer-term issues in Yei, such as the sustained supply of woodfuel, because the county is relatively calm compared

to counties in other states. These types of interventions will also be very important in post-crisis and rehabilitation phases to ensure that communities are resilient in the face of future shocks.

It should be recognized that fuel supply activities may not always be possible in acute emergency settings where more phased approaches may be needed. In acute emergencies, where the displacement of people poses a risk to food security and environmental sustainability, a relevant starting point is the provision of fuel-efficient, durable and portable cookstoves for both displaced people and host communities. These can be deployed as an integral part of emergency kits for affected populations, while fuel can even be sourced from other areas, if feasible, in anticipation of

a more comprehensive fuel strategy after initial emergency response efforts.

Given that energy needs in humanitarian settings are associated with a range of sectors, it is very important that responses are well coordinated and that they draw upon the comparative advantages of various UN agencies and organizations. Hence, it is crucial that the members of the SAFE Steering Committee establish solid lines of communication and ensure coordination on the ground. This can be achieved through joint SAFE programming.

Providing context-specific and well-coordinated support that addresses the fuel supply and fuel technology needs of crisis-affected populations can help to provide stability and progress towards rehabilitation, recovery and resilience. ♦



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Effects of the current crisis and war in South Sudan on access to forest foods in Greater Akobo

A. Thulstrup and W.J. Henry

Balanites aegyptiaca can play a critical role in food security, but the gathering of its fruits and leaves has been disrupted by the conflict.

Fruiting branches of the desert date, *Balanites aegyptiaca*



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For their food and livelihoods, the Lou Nuer people of South Sudan rely mainly on cattle-rearing and crops like sorghum, maize, pumpkins and other vegetables, which are cultivated mainly in the rainy season. These and other livelihood activities depend on people's access to land and associated natural resources such as soils, water, forests/woodlands, wetland, wildlife and fisheries. Land is not only a means of earning a livelihood but is also a source of wealth, tribal belonging and conflicts.

Traditionally, the Lou Nuer people treasure the forests/woodlands for the products they provide for both livestock and human consumption. The food gathered from these areas is mainly in the form of seeds, leaves, nuts and fruits. These forest foods are not only important in terms of their dietary value; their availability in times of food scarcity, especially during the dry season when there is inadequate rainfall to support crop production, makes them essential.

One particular tree treasured among the Lou Nuer is the *Balanites aegyptiaca*, which

is used for food both by humans and livestock and is critical in moments of scarcity. *B. aegyptiaca* is a fruit-bearing tree found in the Sudano-Sahelian region of Africa, in the Middle East and in South Asia. The Lou Nuer people call it *thou* and consume mainly the pulp of its fruits as snacks and the leaves as vegetables. The kernels are boiled and eaten directly or used for extracting oils. In addition to its value as a source of food, *B. aegyptiaca* has high medicinal value. In particular, the fruits, the kernels and the leaves have many medicinal uses. Being an evergreen tree in the dry Sudano-Sahelian region, *B. aegyptiaca* is also valued for its shade, particularly for animals in the dry season, when most other trees shed their leaves. The tree is often retained in farmers' fields as recognition of its intercropping potential. The tree also has strong spiritual value for some communities in the Sahelian region. It is considered a symbol of blessing for newly married couples or women after the birth of a baby.

The various edible parts of *B. aegyptiaca* are collected at different times of year. Leaves are usually collected from November to January while the fruit is collected from February to April. These are periods where there is no rainfall and crop production comes to a halt. However, this normal pattern of gathering wild food has been greatly affected by the eight months of conflict in South Sudan. Traditionally, collection of edible parts from the *B. aegyptiaca* starts with trees located close to the homestead, after which collection continues to nearby woodlands which are often 2–4 km away. However, this unimpeded access to extensive land territory for pastures, water and forest food has been affected by the current insecurity as a result of the ongoing war.

The people in the area are in zones controlled by the rebels and have therefore been denied access to services and markets in the capital, Juba. The limited mobility of the community has resulted in depletion of nearby tree stands of *B. aegyptiaca*. As a result, the traditional gathering of its fruits and leaves – the community's main coping mechanism – has been critically compromised. ◆

Conflict and forest resources in Darfur

A. Oshiek



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There is growing concern in the Sudan about the impact of the Darfur conflict on natural resources, particularly forest resources.

The conflict in Darfur has resulted in the massive loss of human lives and assets. Already in 2008, the UN estimated (UNICEF, 2008) that between 200 000 and 300 000 people had died since the start of the conflict in 2003.

The protracted conflict has disturbed livelihoods and resulted in severe food insecurity in some areas. Outbreaks of violence have forced millions of people to flee from their homes and land, thereby becoming Internally Displaced Persons (IDPs) in camps. Some 2.5 million people are currently displaced as a consequence of the conflict, out of a total population of between 7 and 8 million.

IDPs and their hosting communities face limited livelihood options and often rely on

unsustainable coping strategies, such as the unmanaged cutting of trees and shrubs for fuelwood and charcoal production.

THE INTER-RELATIONSHIP BETWEEN CONFLICT AND NATURAL RESOURCES

Natural resources in Darfur prior to the conflict were flourishing and plentiful. Central and Southern Darfur were rich in forest products and valuable timbers such as mahogany (*Khaya senegalensis*). The Jebel Marra massif area has a special climate and soil characteristics which make it suitable for the production of several soft

Above: Trained IDP women making a mud fuel-efficient stove in Zanzam IDP camp, North Darfur

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wood species, including *Cupressus* and *Pinus*. These resources have been severely affected by over-exploitation and drought, and further aggravated by the conflict.

Traditional governance in Darfur has become increasingly weak. The tribal leadership had legal authority under the Native Administration system until 1971, when the system was abolished. In 1986, it was renewed but its role remained dependent on broader political and religious dynamics. Profound changes, such as the redrawing of state boundaries and breaking up of tribal homelands, have altered the tribal-political map, and inconsistent and weak tribal administrations have undermined traditional environmental management (Bromwich, 2008).

Indeed, environmental degradation may be a contributing cause of conflict, as highlighted by the UN University for Peace Conference on “Environmental degradation as a cause of conflict in Darfur”, held in Khartoum in December 2004. The conference noted that an increase in population density intensifies cropping and grazing, which can entail a deterioration in yields and carrying capacities. In turn, larger areas are needed to support the same yields and herds, while demands and herds are increasing. Herders and farmers are therefore in competition for access to resources, which may lead to conflict.

DEFORESTATION

The United Nations Environment Programme (UNEP)'s *Sudan post-conflict environmental assessment* (UNEP, 2007) has estimated that deforestation in Darfur is in excess of 1% per annum.

Several conflict-related factors have contributed to the removal of trees in Darfur. According to the Forests National Corporation, the three states of Darfur permitted the United Nations Mission in Darfur (UNAMID) forces to clear trees, establish camps, evict forest staff and occupy premises in some forest reserves, as well as hindering legal procedures against these acts. War and displaced populations in the states of Darfur have inflicted severe

damages on 23 forest reserves and extensive areas of *Faidherbia albida* forests in the regions of Jebel Marra. The worsening security situations and tribal conflicts have also facilitated the forests' deterioration process and the unauthorized trafficking of forest products.

In particular, the conflict and subsequent human displacement have led to a high energy demand. Darfur is characterized by a high urbanization rate, and the former urban/rural ratio of 20:80 has now been reversed. This, in turn, has created a huge demand for building materials, particularly red clay bricks, which are made in inefficient wood-fired kilns, exacerbating pressure on dwindling forest resources. Other reasons for the growth in energy needs relate to the sale of fuelwood and charcoal, social preferences for certain types of fuel and a growing population.

Environmental degradation often occurs in areas that host IDPs, as supplies of dead wood are progressively exhausted and live trees cut in an uncontrolled manner. Deforestation is often the most visible, serious and lasting impact of informal and formal camps for IDPs.

Furthermore, when IDPs finally return to their original domains they could be expected to use trees to rebuild and repair homes and properties; provide energy (for houses, restaurants and schools); support industry (brick-making, tobacco curing); and fence off agricultural holdings, livestock pens and backyard gardens.

DEMAND FOR WOODY BIOMASS

FAO (2011) conducted a Woodfuel Integrated Supply/Demand Overview Mapping (WISDOM) assessment and provided detailed information on woody biomass supply and demand. The total stock of woody biomass in Darfur states was estimated at 99.8 million m³, or 58.8 million oven-dry tonnes. The estimated mean annual increment, according to the medium productivity variant, was estimated at 7.9 million m³, or 4.6 million oven-dry tonnes. The physically accessible annual production was estimated

at 7.4 million m³, or 4.3 million oven-dry tonnes.

According to the analysis, the total annual consumption of woody biomass in 2011, according to the business-as-usual (BAU) consumption variant, all uses included, was estimated at 6.3 million m³, or 3.7 million oven-dry tonnes. With 93 percent of total woody biomass use, the household sector was by far the most important demand sector. This value was higher in rural areas (98 percent) and lower in urban areas (77 percent), where industrial uses are concentrated. Eighty-six percent of household consumption went to cooking and the rest to construction, maintenance and furniture. The cooking share was lower in rural areas (83 percent) and higher in urban areas (95 percent).

The building wave subsequent to the influx of the international community, which boosted brick production to extreme levels, has also had a long-lasting impact. The WISDOM study estimated an annual fuelwood consumption of over 118 000 m³ for this purpose, which is lower than the peak but still almost five times higher than the pre-war situation.

Annual consumption by the institutional, commercial and industrial sectors (bricks included) was estimated at 453 000 m³.

FUEL-EFFICIENT STOVES

Considerable attention has focused on domestic energy in Darfur, particularly since the start of conflict when the visible impacts of deforestation became prominent around major towns such as Nyala, which have attracted large numbers of IDPs.

Household energy use in Darfur is characterized by a continuing high dependence on fuelwood, most of which is unsustainably harvested and burnt on inefficient stoves, and humanitarian assistance packages typically do not include energy sources for cooking. IDP households face considerable pressure and challenges to satisfy their cooking energy needs and women run the risk of insecurity when collecting firewood; not to mention health risks associated with smoke from open

cooking fires, which affect women and children in particular.

As displaced people spend significant amounts of time, money and labour securing sufficient fuel to meet their cooking needs, and can often not afford petroleum products, the dissemination of fuel-efficient stoves (FES) is one of the ways to reduce the consumption of fuelwood. It has had good results in IDP camps, although it remains marginal in rural and urban areas. It is estimated that a widespread and intensive stove programme in rural and urban areas ("FES" consumption variant) could reduce total consumption of firewood by up to 1.2 million m³ (from 6.3 to 5.1 million m³, or from 3.7 to 3 million oven-dry tonnes).

FAO'S ROLE IN FOREST CONSERVATION AND ENERGY SAVING IN DISASTER AREAS IN DARFUR

Since the beginning of the conflict, FAO and other UN agencies, international non-governmental organizations (INGOs) and

non-governmental organizations (NGOs) have exerted considerable efforts to support conflict-affected communities in Darfur. FAO, in partnership with UNEP, has formulated and implemented many projects to contribute to reforestation and energy-saving, including the Darfur Timber and Energy Project, which was implemented successfully from January 2009 to December 2010. This project provided the original analysis of the wood energy situation in Darfur (FAO, 2010a). The 2011 update was carried out in the framework of the Sudan Institutional Capacity Programme: Food Security Information for Action (SIFSIA N) funded by multiple donors, including the European Commission.

The Timber and Energy project also succeeded in mobilizing governmental institutions and local communities to produce and distribute 815 590 seedlings to over 150 000 IDPs, and to host community and returnees' households in the three states of Darfur, as well as 760 community forest farmers. In addition, 16 community

forests/woodlots and committees were set up in North and West Darfur. Five training of trainers (TOT) sessions were conducted for 371 committee members, extension agents and local leaders on tree seedling production, husbandry and protection, nursery management and seed broadcasting. Women represented 40 percent of those involved in training on community forests and tree planting.

Special attention was given to FES, with 342 women trained as trainers in both the manufacturing and use of the mud-type FES. These women further trained another 50 611 women and 72 900 FES were produced and distributed to households in the three states of Darfur. These stoves use 30–60 percent of the quantity of fuelwood traditionally consumed by the widely-used three-stone fire (FAO, 2014). The final report of the Timber and Energy project estimated that each household consumed 12 medium-sized trees per year, i.e. that at least four medium-sized trees are saved annually by each household that uses an improved stove.



Community leaders (women and men) and teachers following a session on the importance of FES given by the Forest National Corporation (FNC)



*IDP woman from Morni Locality
taking her stove home*

FES can attenuate the negative impact of forest removal to meet the needs of the war-affected, IDPs and other vulnerable communities. In addition to their role in energy saving, these stoves also have an important gender dimension. Women and girls have the primary responsibility of cooking and collecting fuelwood for household use, frequently in insecure conditions, and in conflict situations are particularly vulnerable to gender-based violence while carrying out this task. In addition, women can earn an income from the production of FES.

To date, FAO continues to implement a number of other projects aiming at improving environmental protection and sustainable natural resource management (NRM) in Darfur through community

awareness raising, training on FES production and tree planting.

Overall, FAO is taking an integrated multisectoral approach to peace-building through improving food security and nutrition, livelihoods, environmental protection and sustainable NRM, for example through promoting dialogue between conflicting pastoral and farming communities and enhancing livelihoods and NRM in North and West Darfur. The impact of these initiatives is complementary to that of the FES and other NRM activities. This approach is at the heart of FAO's Strategic Framework Country Plan of Action for 2015-2019, of which Pillar 3 focuses on NRM and livelihoods, food security and nutrition response, protection and recovery.

CONCLUSION

Conflict has multiple short- and long-term impacts on development, the environment and human well-being. The displacement of people is a major social and economic cost of conflict, during but also after the end of conflict. The conflict in Darfur has seriously exacerbated the processes of environmental degradation which have contributed to the destabilization of subsistence livelihoods in the area. The environmental drivers of conflict have been aggravated as a result. Resource scarcity is one of the contributing drivers, besides the wider political and economic marginalization.

A World Bank study (IRIN, 2005) has shown that it is not only humanitarian, but also far cheaper, to help returnees rebuild their lives rather than to abandon them to a situation that may result in impoverishment, instability and a renewal of conflicts. The repatriation and settlement of refugees and IDPs needs to be tackled from various angles, with a vision that aspires to sustain and consolidate peace while encompassing rehabilitation of the degraded environment.

There is a clear need for sustained collaboration between all actors at the local, national, regional and international levels in repatriation, rehabilitation and reconstruction processes. Unless there is a coordinated, genuine partnership between the Government of Sudan, local authorities and NGOs to ensure consistency across socioeconomic and environmental policies, it will be impossible to generate sustainable livelihoods for IDPs. ◆



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