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ICT Update

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A community power centre brings business and ICTs to farmers in **Kenya**

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ICT Update

ICT Update issue 46, December 2008. *ICT Update* is a bimonthly printed bulletin with an accompanying web magazine (http://ictupdate.cta.int) and email newsletter. Each issue of *ICT Update* focuses on a specific theme relevant to ICTs for agricultural and rural development in African, Caribbean and Pacific (ACP) countries, and includes feature articles and annotated links to related web resources and projects.
The next issue will be available in February and will cover the theme of market information systems. Suggestions for contributions to this issue can be sent to ictupdate@cta.int

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Developing rural energy

The need for electricity is a recurring theme in ICT Update. A mobile phone is useless if it cannot be recharged, and an expensive satellite system will not connect to the internet if it does not have a power supply. But people living in the rural areas of many ACP countries still cannot make use of communication technology because their towns and villages are not connected to the main electricity grid. Energy companies and governments complain that they don't have the money to invest in an electricity supply for rural areas where the population density is low and where they will get little return for their investment. However, it is those areas – the main centres of food production – that need a dependable power supply the most.

Recent advances in renewable energy technology, however, mean that rural communities no longer have to wait for a connection to the grid. They can set up stand-alone utilities to serve anywhere from a few hundred to several thousand households. The village of Kibae in north-eastern Kenya is an excellent example of how rural communities can develop an electricity supply independent of the main power grid. Working with the country's Ministry of Energy, the people of Kibae have set up a community power centre (CPC) as part of the United Nations Industrial Development Organization's (UNIDO) rural energy initiative.

The CPC uses solar and hydro energy to power an industrial centre in the village where farmers process agricultural products without having to transport them to the main urban centres. Kibae farmers use the electricity to produce fruit juice and mill maize to make flour. These new products provide extra income for the small-scale farmers in the area and help to cover the maintenance costs of the power supply service.

This electricity also powers a new community centre, which provides internet access and satellite television to the village. A mobile phone recharging service ensures that farmers can stay in touch with buyers and get current market information.

Solar power also provides income generating opportunities to people in rural areas of Zambia, Malawi and Tanzania. Since it was established in 2006, the organization SolarAid has trained hundreds of entrepreneurs to build and sell solar power generating equipment. The products range from small solar panels that can power a radio, removing the need for the ongoing expense of environmentally damaging batteries, to systems big enough to power schools, businesses and community centres.

According to the Renewable Status Report of 2007, renewable energy sources from solar and wind power have been growing at a rate of 50–60% per year for the past ten years. It is the fastest growing technology sector in the world. Another growing market, and one that is especially important to agriculture but is often controversial, is the production of bioenergy.

The development of renewable energy sources is the fastest growing technology sector in the world

Earlier in 2008, many analysts blamed the increase in food prices on the increasing amount of land now used to produce bioenergy rather than traditional crops. However, research by the International Centre for Trade and Sustainable Development (ICTSD) has shown that non-food plants can be grown in areas where the land is not suitable for other crops, and their material or oil used in biomass generators. Hardy, drought–resistant species, such as jatropha, could provide an alternate crop for farmers, give an extra source of income and help to regenerate the land in desert and semi-arid regions.

A few ACP countries, including Senegal and Mali, are investing in projects to research the long-term potential of bioenergy. With a local supply of renewable energy, these countries could reduce their reliance on expensive oil imports and start to invest in electrification projects as rural areas become an important energy supply source. ■

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Energy production priorities

Although estimates vary greatly, from as few as five to as much as 100 years, the fact remains that fossil fuel resources are finite and will steadily decline before they run out sometime in the near future. However, that does not mean there is not enough energy available on the planet to meet our growing demands. There are many ways to meet our demand for energy using renewable sources such as the sun, wind and water. One important step forward would be to make some major behavioural changes in order reduce our everyday reliance on electricity.

The African continent is especially suited to harnessing power from the sun as it receives so much solar radiation throughout most of the year. Wind power, depending on the location, could also provide large amounts of energy, while only about 5% of Africa's hydropower generating potential has so far been exploited. But only a few nations have taken concrete steps to invest in renewable energy technologies or develop clear energy policies.

There have been a few initiatives, but these were often set up to meet donor demands as much as local concerns. There are also several organizations promoting projects to provide light from renewable sources, and while these are extremely useful, I feel the main priority for any new energy system has to be focused on the agricultural sector.

At the moment, because so few rural areas have sufficient energy supplies, almost all the food grown by farmers is processed in urban areas. By shifting priorities to supply electricity to farming communities it should be possible to increase overall productivity, raise incomes in rural areas and take the pressure off the already overcrowded urban centres.

It is encouraging to see that in recent years increasing attention has been given to the development of bioenergy systems. There are already several projects in countries around the Sahel looking into growing species such as jatropha. Farmers can grow the plant to regenerate degraded land on which they can later grow food crops, but jatropha also has the added benefit that its oil can be used as a fuel [see page 10].

It is important that these plants are primarily used to recover land for future crop production, rather than as an energy source. We have to avoid the possibility that an increase in the production of these non-edible plants could lead to a shortage of food supplies.

Growing grids

The cost of renewable energy technology has fallen considerably in recent years, making energy projects much more affordable and easier to maintain. The cost is likely to come down even further but it will take some innovation and an injection of new ideas into our old systems and institutions to bring reliable electricity supplies to rural communities.

From my own experience, I remember thinking that it would be virtually impossible to develop biogas technology in West Africa. Cattle herders there do not confine their livestock to small areas, which would make it easy to collect the dung for biogas production. Then I visited a project in Bangalore, where some people pay for their electricity by taking cow dung to the biogas electricity generation facility. Energy supply companies will have to think beyond their current practices, such as handing out monthly bills to people who have no monthly income.

The obvious advantage of expanding electricity services to rural areas is that more farmers will then have access to communications technologies – to use the internet and mobile phones, listen to radio and watch TV programmes. ICTs can help to increase productivity and raise revenue for the people living in farming communities, especially if more energy projects give priority to supplying electricity to those areas.

I am confident that electricity supplies to rural areas will improve rapidly and dramatically in the coming years, but we have to think big, and we have to move fast to develop new energy policies. The problem is that time is not on our side, so that the ideas we put on paper now have to be implemented as soon as possible. In the past, many major energy supply projects have taken more than 30 or 40 years to put into action – think of the large hydropower schemes especially.

The way forward would be to create small facilities in rural areas. Such stand-alone supply systems can be developed in two or three years. Once these decentralized facilities become established and stabilized they can then be linked to bigger networks, with countries working together to build regional networks. By progressing in this way, we would give priority to providing electricity supplies to rural areas, and develop systems that are adapted to local resources and which meet the community's needs. ■

CHARLES STURGE / ALAMY

Feature

Power to the community

Using hydro and solar energy, a village in Kenya now boasts the first hybrid zero emission power supply in the country. The community power centre provides a stable electricity supply and brings internet and mobile phone access to local farmers.

The village of Kibae is located 150 km north of Nairobi, on the slopes of Mount Kenya. The fertile land here allows the small-scale farmers in the area to grow a wide range of fruit and vegetables, mostly bananas, plus tea and coffee. But, like most people in rural Kenya, those living around Kibae have no access to electricity from the main grid (the Kenyan government estimates that 63% of the rural population does not have access to the grid).

In 2004, the community decided to use another of its local natural resources, a 12 metre high waterfall, to produce electricity. They constructed a building to house the generator next to a nearby stream, and a weir to control the flow of water, and then approached the Ministry of Energy to see if they could supply a hydro turbine unit. The Ministry contacted the local offices of the United Nations Industrial Development Organization (UNIDO) and, together with the community, they came up with a plan to solve Kibae's energy problem.

UNIDO, a UN agency that specializes in developing production processes that do not harm the environment or place a burden on limited energy resources, had recently started work on a community power centre (CPC) project. The centres, also known as energy kiosks, supply electricity from renewable sources ensuring that they emit no, or very little, gases that could harm the environment. It is also important that the CPC provides a variety of income-generating opportunities for the community.

In many rural areas of Kenya the population density is low and communities are widely scattered, making it uneconomical for energy companies to extend the electricity grid to supply these areas. UNIDO's idea is that community power centres – essentially decentralized (off-grid) facilities – could make use of technologies that generate electricity from renewable resources, and play an important role in helping rural community members to develop small businesses. A reliable source of power, for example, means that farmers can process their agricultural produce, and thus have a wider range of goods to sell on local markets. With the extra income, producers can invest in other local services, such as the mobile phone and internet facilities provided by other community members, giving a much-needed boost to the local economy.

The type of energy sources used and the services the centre delivers depends on a number of factors, including the location, the number of people in the area, the types of services required, and the energy demands of the community. But a typical CPC serves 400 households, or about 2000 people, and earns its money from the sale of energy and the services it can offer as a result of having a steady supply of electricity.

The types of activities a CPC supports, and can earn money from, include providing ICT services such as computer training, internet access and telephone kiosks, while another part of the centre might offer light industrial processing such as flour milling, metal welding, carpentry workshops, hair clipping, beauty salons and cold storage facilities. As the centre becomes more established within the community it can also become a local trading centre offering mobile banking and market information services for farmers and buyers.

Combining energy

In Kibae, the new community power centre has two sources of energy. Water from the nearby stream and its waterfall drives two small hydro turbines to produce 2 kilowatts of energy, and a solar unit generates 500 watts, giving a total of 2.5 kW of electricity for the community. Both systems charge a bank of batteries from where the supply is converted from direct current (DC) to alternating current (AC) by an inverter device. The inverter then provides a stable 240 volts of electricity on which most electrical equipment can operate.

All of the energy-generating equipment is housed in a single building, known as the power house. From there it goes to two main points in the village, the industrial centre and the community centre. Small businesses in the industrial centre use the electricity to mill maize, to heat incubators in a small poultry hatchery, to produce juice from locally grown fruit, and even to make liquid soap. These products provide extra income for farmers and other community members, who are then able to pay for the electricity from their profits.

In the first month alone, the proceeds from the sale of juice, flour and soap produced in the centre amounted to more than KSh 11,000 (US$ 140), well beyond initial expectations and significantly above the projected amount needed to maintain investment in the electricity supply system.

The third part of the project, the community centre, also provides opportunities for local entrepreneurs to start up their own businesses. The centre in Kibae serves many households that are not connected directly to the electricity grid, and use car batteries to run small household appliances. There are also approximately 200 mobile phones in

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UNIDO

The community power centre at Kibae

use in the community. All of these batteries have to be charged regularly, so some local entrepreneurs are renting space in the centre and offering recharging services. The businesses pay only for the electricity they use based on readings taken from meters at each business premises.

It costs KSh 10 (US$ 0.13) to recharge a mobile phone, and since most phones need recharging twice a week, the businesses take in around KSh 16,000 (US$ 200) per month. Other community members have invested in computers and are providing training courses and internet services. Farmers can use the centre to access market information and to search for methods to improve crop production. The centre also has a satellite TV and DVD viewing facility where people can pay to watch popular sports events, or organizations can hire to show information videos.

Light matters

Another major income generator, and an important objective of the UNIDO project, is the supply of alternative light sources. At the moment, most people in Kibae use kerosene lamps for lighting. A typical household has three kerosene lamps – one for the kitchen, one for the sitting room and the other for the room where the children study. An average family will use the lamps for fours hours each evening, burning approximately half a litre of kerosene per day. This adds up to more than KSh 1200 (US$ 15) per month, not including the initial cost of the lamp or replacement wicks. But the lamps are also a fire hazard and the fumes from burning kerosene lead to air pollution in the home, and have been linked with a variety of respiratory and ophthalmic problems.

LED (light-emitting diode) lamps, on the other hand, remove the pollution and fire risks, and provide better quality, steady light rather than the flickering light of a kerosene lamp. There is also no need to keep on buying kerosene as the LED lamps operate on a battery, but this has to be recharged every week or so, if used every evening. It costs KSh 20 (US$ 0.25) for a single charge, which amounts to KSh 240 (US$ 3) per month for a family with three lamps. This is significantly less than the amount they paid for kerosene each month (see table).

Although the LED lamps work out cheaper, resulting in a saving of more than KSh 11,000 (US$ 140) per year, the initial purchase price of KSh 4500 (US$ 57.50) is often beyond the means of many families. Instead, local businesses offer the lamps at KSh 500 (US$ 6.40) each and give families the chance to pay the rest in instalments of KSh 300 (US$ 3.80) per lamp over a period of eight months. During this time the household saves enough on kerosene to pay the monthly instalments. The local primary school is also distributing LED lamps to children to take home for a week so that their families can try them out first.

Model business

The community power centre at Kibae runs on hydro and solar energy, but the energy kiosk model can be adapted to use whatever source of energy is

Related links

Lighting up Kenya blog
A blog covering UNIDO's activities to bring sustainable renewable energy and productive activities to Kenyan rural communities.
➜ **http://lightingupkenya.org**

UNIDO website
➜ **www.unido.org**

UNIDO Kenya Website
➜ **www.unido.org/office/kenya**

LAMP	COST OF PURCHASE	COST OF CONSUMABLES (WICK OR BATTERY) PER YEAR	COST OF FUEL OR RECHARGE PER YEAR	TOTAL COST
RECHARGEABLE LED (3 LAMPS)	4,500	1080	2,880	7,860
KEROSENE HURRICANE LAMP (3 LAMPS)	1500	240	14,400	16,140
KEROSENE TIN LAMP (3 LAMPS)	150	200	18,720	19,070

Table: Comparison of overall costs of kerosene lamps and LED lamps. All amounts in KSh

available. Power for the centre could come from a single renewable source or, as in the case of Kibae, from a combination of sources, in a hybrid system.

Wind turbines, for example, might be more appropriate for villages that do not have a perennial stream or waterfall nearby. Other alternatives could be to use photovoltaic (solar) systems on their own, or biomass generators that burn waste material from crops such as maize, sugar cane and sorghum. Biomass generators can also use livestock waste gathered from around the village. Another option is to use vegetable oil for fuel (also known as straight vegetable oil or SVO), which could also be produced from locally grown crops.

Marketable

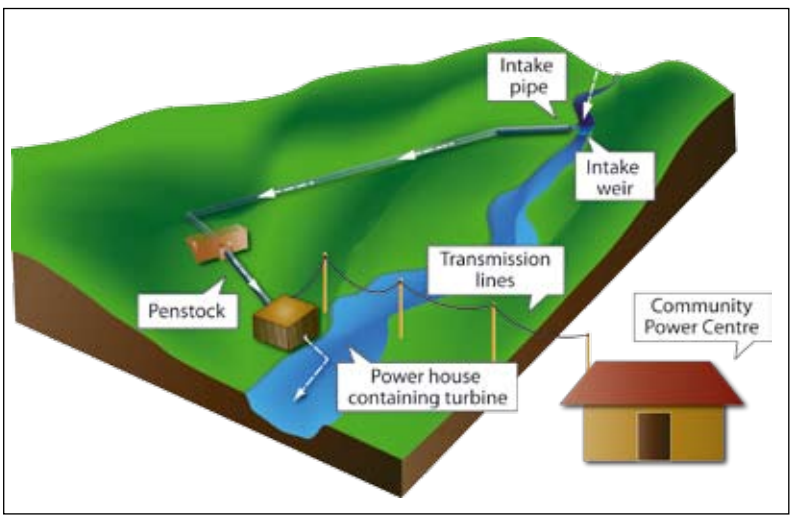
A CPC can also run on grid electricity if there is access to the grid in the area. Such an arrangement might seem unnecessary, but UNIDO has found that in rural areas that are served by the main grid, only about 20% of households can afford a connection and to make regular payments for the service. The community power centre, however, makes its services available to everyone in the community who only pay for the electricity they use, without the need for minimum monthly payments. From its various activities and services the CPC should make enough money to cover running costs, repairs and make a profit. This is the only way the CPC model can be viable and replicable throughout Kenya and convince other countries to replicate the initiative.

The cost of setting up a CPC ranges from US$ 5000 –100,000 depending on the size of the centre and the type of electricity generating technology it uses. A typical centre would serve a population of 2000, but this could be easily scaled down to serve a few hundred or expanded to supply several thousand people.

In the case of the community centre at Kibae, providing recharging services, computer and internet access and processing agricultural produce generate more than KSh 90,000 per month (US$ 1150). The facility, therefore, brings in enough money to ensure its continued operation and offers extra income generation opportunities for farmers and local businesses. A stable and reliable electricity supply also means that the community has access to communication technology – small growers can use access agricultural information via the internet and can contact buyers and transport companies using mobile phones.

Mobile phone facilities in Kibae will increase further in future, with new businesses selling airtime and mobile banking services to people who do not own their own mobile phone. The centre will also expand to serve a further 200 households, and more businesses will open in the community centre to provide photocopying and printing services, and even a beauty salon.

The community power centre at Kibae, along with the other facilities supported by UNIDO's rural energy initiative, have proven to be successful and viable projects capable of supplying reliable and cost-effective electricity to areas off the main grid. In fact, the organization is so convinced by the success of these projects, and their ability to be replicated in other areas around the world, that it is now looking for communities with no alternative electricity supply to submit proposals for similar initiatives. By expanding the scheme, UNIDO hopes to bring affordable renewable energy supplies to rural communities in many more ACP countries. ■



INPETTO

An illustration showing the electricity supply to the community power centre in Kibae

Growing energy on the farm

Unwanted plant species have taken over huge areas of Namibian farmland. Rather than being a problem, the encroaching bush is now seen as a potential source of energy for a small-scale power station.

Case study

The uncontrolled growth of certain bush species has led to a sharp decline in land productivity in Namibia over the last 50 years. The spread of unwanted shrubs onto land used for grazing livestock has prevented the growth of useful grass and plant species and has reduced the volume of water flowing into underground aquifers, a vital resource in the arid and semi-arid regions of the country. Bush encroachment, as it is known, has contributed to the loss of huge areas of grazing land in both communal and commercial farming areas, and to a subsequent drop in the number of livestock, from 2.5 million in 1958 to only 800,000 in 2001.

Against this background, the Desert Research Foundation of Namibia (DRFN), in collaboration with the Namibian Agricultural Union (NAU) and the Namibia National Farmers' Union (NNFU), has started a project that will use the invading bush species to generate electricity. The intention is to establish a 0.5 MW generator that will turn the unwanted plant material into combustible gases for use in a gas-fired power station. The generator, Namibia's first biomass independent power producer (IPP), will then feed electricity into the national grid.

The project, known as CBEND (combating bush encroachment for Namibia's development), is currently in the early stages, with researchers conducting tests and feasibility studies to show that the concept really works. So far, the results have been encouraging and it looks like Namibia's bush encroachment problem could become a new economic opportunity for the agricultural sector. It could also create much-needed jobs in rural areas where the unemployment rate often exceeds 50%.

Although the project team has not yet decided on an exact site for the biomass plant, it is likely to be built in one of the areas already badly affected by invader bush species, as this will reduce the costs of transporting the harvested material. The team is currently considering the area around the towns of Tsumeb, Grootfontein and Otavi, in the north of the country, where many farms have been seriously affected. Several power lines already pass through this part of the country, which would make it easy to feed electricity from the power station into the national grid.

IMAGE SOURCE / ANP

Constant supply

Farmers in this area are already cutting back the invading bush on a small scale to burn and sell as charcoal, giving them an important extra source of income. The project team hopes to involve these farmers, and to provide training courses explaining how they can develop their businesses around the power station. The project will also compile information on how to manage the extra farmland that will become available when the unwanted bush vegetation is removed.

The new opportunities will see commercial and communal farmers, and others from the rural communities, become 'energy farmers'. The CBEND team hopes that those involved in the scheme will start up their own small enterprises to supply biomass to this first power station. As they develop their harvesting and supply methods, these new businesses could go on to demonstrate that there are enough resources to supply more small-scale power plants in rural areas.

The farmers will work in harvesting teams to dig out the unwanted vegetation. The amount of biomass that can be harvested per hectare will depend on the method applied. Farmers can remove it mechanically, using earth-moving equipment, but this may also remove useful plant species. Alternatively, they could do it manually using axes and chainsaws, which may be more species and size specific, but would be more labour intensive and time consuming.

The idea, however, is not to eradicate all of the invader bush species but to thin it out. The farmers have to leave enough behind so that the plants can grow back and continue to produce enough material for the generator. Initial studies have shown that one hectare of bush can generate between 0.5 MW and 2.5 MW of electricity, which is roughly the amount used by one household in a year. The aim is to clear 1.5 million hectares of bush each year adding a significant quantity of extra energy to the national supply system. Technology built into the power station will ensure that it will produce virtually no carbon dioxide.

The CBEND project is a potentially huge vehicle for land rehabilitation and income diversification in rural Namibia. The scheme has already attracted considerable attention from commercial companies that are interested in replicating the system elsewhere. The project team hopes that bush-to-electricity power stations, and the accompanying technological and agricultural expertise, will not only provide a renewable energy supply, but will also become a Namibian export product in the not too distant future. ■

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ANDY BODYCOMBE SOLARAID

Generating power and money

The introduction of solar power systems to rural communities in East Africa is providing new business opportunities, as well as affordable and safe electricity supplies.

Case study

Johari lives in the Iringa region of Tanzania. She used to work as a manual labourer, breaking rocks and selling the stones for building material. But now, after a short training course, Johari is assembling and selling small solar panels that can be used to power radios and recharge batteries for lamps and mobile phones.

Johari is one of several hundred people already trained by SolarAid, a charity set up in 2006 to fight climate change and global poverty. The organization is currently focusing its efforts in Kenya, Malawi and Tanzania, and promotes economic development by encouraging entrepreneurs to set up their own businesses building and selling solar products. The businesses provide new sources of income for the trainees, who can supply solar equipment at affordable prices, giving even the poorest people access to clean, renewable energy.

The market for inexpensive solar power is considerable. Using Tanzania as an example, only 2% of rural communities are served by the main electricity grid, forcing those without to burn kerosene, diesel and candles for light in the evening. All of these sources emit carbon dioxide, cause accidental fires and, in the case of kerosene and diesel, can lead to respiratory disease. Many people also rely on cheap but poor quality disposable batteries for their radios, which they have to replace regularly. The used batteries are rarely disposed of safely, and are often left to decompose on the ground, poisoning the land and posing a danger to livestock and small children.

The good news is that solar power is a viable and realistic energy alternative. In much of Africa there is plenty of free sunlight year-round that can be converted to electricity. There are, however, three significant obstacles preventing greater access to solar power:

- financial barriers – solar power is traditionally seen as too expensive for the majority of people;
- access to the market – it is difficult for many solar companies, often based in large towns, to reach

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SolarAid Vocational Training Centre in Nkhata Bay Malawi lit up by solar lamps.

customers living in rural areas, and of course for potential customers to contact them;
- education and awareness – many people do not understand how solar power works, what it can do, or how to choose a system and maintain it. Many systems fail due to poor maintenance, misuse and incorrect sizing, affecting consumer confidence and the reputation of solar power.

SolarAid is tackling the above problems through what it calls microsolar and macrosolar projects.

Microsolar

Microsolar projects provide opportunities for enterprising people to set up businesses selling solar power equipment. These entrepreneurs market low-cost solar systems tailor-made to meet the local demand for affordable electricity. The projects provide business management, technical and marketing training to enable individuals and community groups to establish and operate successful businesses. For instance, part of the income generated by the project participants is reinvested to ensure the long-term continuation of their businesses.

Microsolar projects attempt to overcome financial barriers through the promotion of small solar panels and products that, because of their size, are less expensive than the more usual, larger solar systems. Of course their small size also means that microsolar products only generate small amounts of power (typically less than 2 watts), but even 0.3 watts of power is enough to play a radio all day long for years on end, or to power long-life or energy-efficient LED (light-emitting diode) light bulbs. Rural communities benefit by being able to recharge their mobile phones using a reliable and low-cost energy source. Farmers are then able to communicate with buyers to find the best prices for their produce, giving them increased access to new markets and removing the need to deal with local middlemen.

Microsolar products are also small enough that travelling salesmen can easily transport them to rural areas that are not connected to the grid, and display them in village markets where there is a high demand for solar products. Households that start using microsolar products no longer need to buy as much kerosene or as many batteries, and can use the money for other necessities.

Macrosolar

Macrosolar projects are designed to enable institutions in rural areas not connected to the electricity grid, including schools, clinics and community centres, to benefit from electricity-generating solar installations (typically 100–500 watts). All the projects are designed to improve community services and generate an income by including a business component such as a phone recharging service.

In Mumbwa district in Zambia, for example, one solar installation provides lighting for a community centre, which houses a small library and an area where local women's groups meet in the evening to make clothes. The centre also uses the system to earn money by recharging mobile phone batteries. A vocational training centre in Malawi, meanwhile, it also using its solar system to provide lighting and power for a television. The centre generates extra income by charging community members who want to watch sports events on TV or video.

While the ways in which each system is used may vary considerably, the themes common to all of these projects are community use and income generation. If a system cannot generate funds, it is likely that it will fall into disrepair. SolarAid works to ensure that every system installed includes a component that can be used to generate an income, and will enable the community to save part of the proceeds and reinvest it in the system.

The larger solar power systems are often too expensive for many individuals or communities to purchase outright, but SolarAid does not provide them for free. Around the world, too many solar projects have failed as a result of poor planning and the lack of local participation, as community members feel they have no vested interest in the system. To avoid this, SolarAid provides users with details of how much the components cost, how long they are likely to last and, based on this, works out the minimum income targets that the community needs to meet per month and per year.

Investment

SolarAid's projects give low-income rural communities access to an electricity supply that serves local needs and can generate an income by selling solar-powered services. To apply for a system, community members first need to put together a sound business plan detailing the benefits for end users, how the system will be used to generate an income, and how it will be managed. They have to commit themselves both financially and physically, meaning that they also have to contribute through some form of work, such as helping to install the system or teaching other community members about solar power. End users also have to attend training courses prior to installation. This helps to ensure that the users know how to operate the system correctly and how to monitor it and carry out repairs should part of it fail.

SolarAid is currently carrying out research into using solar systems to power water pumps in Malawi that can be used to irrigate farmland. Irrigation has been shown elsewhere to dramatically increase crop yield which in turn can lead to increased incomes for the farmers. They are also developing a pilot project in Tanzania with NoPc, an organization working to bring the internet to schools in rural areas.

SolarAid sees its microsolar and macrosolar projects as just the beginning of its work in Africa and elsewhere. Countries with high levels of solar insolation (radiation from the sun) all year-round can certainly look to solar power not only as an off-grid solution, but also as power source that can contribute towards the expansion of the main electricity grid.

Ultimately, SolarAid wants to help governments understand the benefits of solar energy so that they are more likely to adopt solar solutions in the future rather than relying on carbon-emitting fossil fuels. ■

Johari demonstrates a solar powered product

Fuelling productivity

For many ACP countries, increasing agricultural productivity also requires more energy from expensive fuel sources. But several projects in West Africa show that bioenergy could help solve the problem.

Case study

Energy is an essential component of agricultural production. It is necessary for running agricultural machinery, such as tractors and harvesters, and for operating irrigation systems and pumps using electricity, diesel or other fuel sources. Energy is also required in the processing and conserving of agricultural products, and for the transportation and storage of goods.

In the current context of fluctuating oil prices, however, the oil importing bills of several African countries amount to 50% of export earnings, and many nations are struggling to meet their current energy demands. At the same time, expanding access to energy in rural Africa is a critical part of modernization and future agricultural development, making energy supply both a problem and a part of the solution. The energy crisis that these countries face is not only a problem in itself, but it also presents a hurdle in addressing food security in Africa.

But although the agricultural sector is emerging as a significant energy consumer, it is also as a potential source of energy generation. The production of energy from agriculture is at the centre of the present boom in bioenergy. Indeed, most biofuels produced today originate from the agricultural sector.

There are a wide range of crops produced in Africa that are source of bioenergy. Sugarcane, sugar beet, maize, sorghum and cassava are all suitable for ethanol production, while peanuts, jatropha and palm oil can be used to produce biodiesel. Agricultural and forestry products also have great potential. According to estimates published by the Copernicus Institute, Africa has the potential to produce about 317 exajoules of bioenergy on surplus agricultural land by 2050. That is roughly equivalent to 142 million barrels of oil per day. And this is the amount that can be produced under optimal conditions, meaning without causing environmental damage or undermining food supplies for growing populations.

JOERG BOETHLING / LINEAIR

Integration

Tapping into this potential could help decrease the dependency on imported oil for many countries, and contribute to meeting the energy demands of the agricultural sector and rural electrification. There is, however, a challenge to using food crops for energy. Many food importing African countries are already experiencing food supply problems, partly as a result of using of cereals, such as maize, soya and wheat, to produce biofuels in other parts of the world. But the real potential may lie in making use of non-food crops such as jatropha, or the vast agricultural and forest reserves, to generate energy.

Jatropha curcas, also known as the Barbados nut or pourghère, is currently receiving a lot of attention. Traditionally used to make protective hedges or mark out agricultural land, jatropha, is widely available throughout Africa. It can grow on very poor soil and is extremely drought-resistant, making it ideally suited to conditions in several parts of Africa, including the dry regions in the west. In fact, there are already programmes operating in Mali and Senegal that focus on the development of jatropha as a modern form of bioenergy.

In Senegal, a national biofuels programme that began in 2006 seeks to plant more than 300,000 hectares of jatropha, at a rate of 1,000 ha per rural community. This would produce over 3 million tonnes of seeds per year by 2012, resulting in more than one thousand million litres of refined jatropha oil that could be used as biodiesel. In Mali, too, several experiments that have been conducted over the past few years have revealed the possibility of using jatropha oil for agricultural production and rural electrification, while also availing of this plant's positive environmental and social impacts.

There are now several initiatives that generate bioenergy from agriculture and then use it to meet the energy requirements of agricultural production. Some projects, for example, use bioenergy to drive water pumping systems for irrigation, to provide lighting or run generators to supply electricity for anything from refrigeration to machinery for grinding and processing cereals.

If bioenergy could be developed in ways that do not undermine the already fragile agricultural system, but rather carefully integrate energy and food crops, then it could help to meet the energy challenge of increasing agricultural productivity. To achieve this, African countries would need to formulate clear strategies and policies that take into account the various socio-economic and environmental implications of integrating energy and food production. Taking these factors into consideration will be just one important aspect in the range of actions needed to ensure a sustainable development of agriculture in Africa. ■

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Save energy with ICT equipment

For organizations and individuals with access to a relatively reliable energy source it is still advisable to reduce electricity consumption. Computers, printers and even mobile phones consume a significant percentage of the electricity used in homes and offices. Efficient use of such appliances can lead to significant savings in fuel bills, or make a generator or battery system last that little bit longer. Turn off computers, monitors, printers and photocopiers when you are not using them, for example.

Computers

If you must leave your computer on, use the power management feature built in to your operating system. For Windows users, click 'start', 'control panel', 'performance'. Select 'maintenance', then 'power options' (in XP Pro: control panel, power options). For Mac users, go to 'system preferences' and select 'energy saver'.

Configure your monitor to turn off after 20 minutes of inactivity, your hard drive to turn off after 30 minutes of inactivity, and your desktop computer or laptop to go into a standby or sleep mode after 90 minutes of inactivity.

Laptops are more energy efficient than desktops. A typical desktop computer consumes around 150 watts of energy per hour, although some can use more than twice that amount. A laptop uses only 30 watts. Most of the major computer manufacturers are now producing models that use even less power. Many people think that shutting down a computer is bad for the hard drive. This was the case with older computers (before 2000), but for some years now manufacturers have been designing hardware to better cope with being repeatedly switched on and off.

Most computers can now deal with being rebooted more than 40,000 times in their lifespan, which is significantly more than you are ever likely to do even if you have the computer for 10 years. In fact, switching off your computer overnight reduces heat stress and wear on the system and can actually extend the life of your computer.

The energy required to start up a computer is the equivalent of about three minutes' use of the machine. Even if your computer takes a long time to start up you should still try to save energy by switching it off in the evening.

Monitors

Monitors can account for more than two-thirds of your computer's total energy use. You should turn off your monitor when you leave your desk for more than a few minutes. This applies equally to the old style cathode ray tube (CRT) monitors and the newer, large flat screen liquid crystal display (LCD) monitors.
Note that screen savers are not energy savers. Screen savers only help to save the monitor's pixels from burning out, but so will turning off the monitor.

Printers

Printers are often left running for long periods of time, even overnight, but are used for only a few minutes each day. The result is a lot of wasted energy, with laser printers consuming the most. Many printers now come with 'sleep mode' features that can cut energy use by up to half.

Chargers

Unplug battery chargers for laptops, mobile phones and digital cameras when the devices are fully charged or not in use. Many chargers continue to use energy even when not connected to a device. If the charger feels warm to touch, then it is still using energy. ■

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Related resources

Vista energy saving features
Energy saving advice for users of Windows Vista operating system
➜ www.worldstart.com/tips/tips.php/4638

Big Green Switch
Tips on energy saving, green energy, waste reduction, recycling and green monitoring. Includes a calculator to work out your 'carbon footprint'.
➜ www.biggreenswitch.co.uk

Guide to Green Living
Reducing you computer's energy use.
➜ http://guidetogreenliving.blogspot.com/2006/05/tips-to-reducing-your-computers-energy.html

Energy saving tips
More ideas for saving energy at home, in the office and in the car.
➜ www.blackle.com/tips

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Rural renewable energy

Why do so many rural communities in ACP countries still have such poor, or even no, electricity supplies?
➜ It costs more than US$ 10,000 per km to bring electricity cables to rural villages. In developed countries most people live in cities, so the tax revenues raised from the 90% of the population living in urban areas cover the cost of delivering electricity to the 10% living in rural areas. In most developing countries it is the other way around. The 25% of the population who live in cities do not generate enough tax revenue to electrify the rural areas where the other 75% live. A further problem is that many ACP countries do not have enough power in their grids to distribute energy to rural areas.

Is the prospect of a stable source of grid electricity still a long way off for many rural areas?
➜ Many ACP countries have made progress with rural electrification. In South Africa, for example, the national electrification rate went from 35% to 75% in 10 years, due to a concerted and well funded government initiative launched by President Nelson Mandela. Asian nations have also made progress. However, the poorest countries have trouble keeping electrification on a par with population growth rates.
There is some hope, though. For basic lighting and communication there are inexpensive solutions that do not require connection to the grid. LED lighting is one example. The International Finance Corporation (IFC) Lighting Africa project is promoting such low-cost technologies. Governments need to redefine rural electrification and help poor people gain access to these technologies, in the same way mobile phone companies helped bypass the need for fixed telephone landlines.

Many people find renewable energy sources – wind, water and solar, for example – difficult and expensive to install. Are there cheaper and easier alternatives?
➜ In many developing countries, renewables have a bad reputation. This is often due to poor planning or installing the wrong size of system. If people are not properly trained to use and maintain a technology, whether it is a car or a solar lighting system, it will fail. However, renewables do work and they are often the lowest-cost solution for people living in areas outside the reach of grid electricity. In off-grid areas, the primary alternatives to renewables are generators, lead-acid batteries and fuels such as kerosene. In some situations generators will be the best solution, while in others centrally recharged lead-acid batteries are preferred. In Kenya, for example, lead-acid batteries are the main source of electricity for more than a million people, and can be carried back and forth to grid charging stations. But renewable energy supplies are often the best choice where loads are small and where fuel delivery is expensive.

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How will rural communities benefit from reliable electricity supplies to power computers and phones?
➜ The primary benefit of communication services in rural areas is access to markets and cash income. Mobile phones provide connections with family members, businesses and banking services. Other benefits of phone and computer access include education, entertainment, news, health and even agricultural services. Rural people quickly make themselves aware of the ways that technology can improve their lives.

Could growing biofuels crops provide farmers in ACP countries with extra income?
➜ Biofuels are rapidly gaining in importance as petroleum prices rise. They will undoubtedly be part of the solution to future energy supply. Biofuels will be a cash crop, like many others. However, ACP farmers should be protected by their governments against fluctuations in prices that will undoubtedly occur. Small farmers who planting their entire farm with biofuel crops are putting their future at risk, in the same way coffee and tea farmers do in years when the prices of those crops crash.

The increasing use of land to grow biofuel crops has been blamed for rising food prices and food scarcity in some areas. Is this likely to be a real long-term problem?
➜ This is a complicated problem, and it really depends on the crop and the location. The use of maize to produce ethanol has been blamed for price rises for that crop in the US, for example. Still, in my view, there needs to be some accommodation of biofuel crops and I think the problem has been overblown.
If people were so worried about the use of land for biofuels perhaps they should also pay attention to 'wasted' fertile land that is used for growing sugar, tea, cocoa and coffee. Fuels for transport and luxury sweets and beverages are increasingly in conflict with the world's food requirements. ■