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Updated information on this workshop is available at <http://www.bioenergy-lamnet.org>, <http://bioenergia.oikos.unam.mx> and <http://www.anes.org>.

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WORKING GROUP 4: BIOMASS RESOURCES

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FOOD SECURITY, BIOENERGY AND RURAL DEVELOPMENT IN THE DEVELOPING WORLD

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ABSTRACT

Major adjustments are needed in agricultural, environmental and macroeconomic policy, at both national and international levels, in developed as well as developing countries, to create the conditions for sustainable agriculture and rural development (SARD). The major objective of SARD is to increase food production in a sustainable way and enhance food security. This will involve education initiatives, utilization of economic incentives and the development of appropriate and new technologies, thus ensuring stable supplies of nutritionally adequate food, access to those supplies by vulnerable groups, and production for markets; employment and income generation to alleviate poverty; and natural resource management and environmental protection. 14.3. The priority must be on maintaining and improving the capacity of the higher potential agricultural lands to support an expanding population. However, conserving and rehabilitating the natural resources on lower potential lands in order to maintain sustainable man/land ratios is also necessary. The main tools of SARD are policy and agrarian reform, participation, income diversification, land conservation and improved management of inputs. The success of SARD will depend largely on the support and participation of rural people, national Governments, the private sector and international cooperation, including technical and scientific cooperation. (Agenda 21, Chapter 14, 14.2)

RURAL UNDERDEVELOPMENT AND BIOENERGY

Energy use in most countries is unsustainable in the short and long terms, from both natural resource and environmental points of view. In rural areas throughout the developing world, the situation is more critical. The main - and often only - sources of energy for household use and food production are diminishing supplies of woodfuels, along with biomass residues and human and animal power. Dependence on these traditional energy sources is associated with poverty, health risks and human drudgery.

In global terms, woodfuels represent about 7% of the world's total primary energy consumption, most of which (76%) are used in developing countries, where about 77% of the world's population live. The rest (approximately 5400 PJ) are used in developed countries, where they represent only 2% of total energy consumption. (WEC, 1999-2003)

This contribution rises to 14% in developed countries if other biofuels are considered, however, thus reaching a broadly similar share to other conventional energy sources, such as coal, gas and electricity. (IEA, 1997). In the developing countries, wood energy represents 15% of total primary energy consumption, although this figure conceals important differences at the sub-regional and national levels. For example, there are 34 countries where woodfuels provide more than 70% of the energy needs and the dependence of 13 countries is 90% or more. (WEC, 1999-2003)

In developed countries, wood energy contributions also vary considerably from country to country. In Europe, for instance, countries like UK, Belgium and Germany make relatively little use of woodfuels, while in countries such as Finland, Sweden and Austria, forest energy provides up to 17% of their demand. France is the largest user in the EU in absolute, but not in relative terms. It should also be noted that in many countries, especially those of the former USSR, there is virtually no information on wood energy. (WEC, 1999-2003)

Of the approximately three-quarters of the total woodfuel consumption accounted for by developing countries, about 44% is concentrated in Asian countries, and this is a fair indication of the important role played by trees and forests in meeting the energy needs of this region. (WEC, 1999-2003)

Developing countries must be assisted to meet their energy requirements in agriculture, forestry and fisheries, as a means of achieving sustainable development. They will have to accomplish a transition from the present energy supply of mainly fuelwood and other biomass fuels and animal and human power to a more diversified resource base, increasingly utilizing renewable energies and a more modern use of biomass, to attaining sustainable livelihoods and improving the living conditions of rural populations.

POVERTY AND BIOENERGY

Poverty levels had been increasing constantly in the last years. The effects of globalisation and increasing economic integration have led to the rich getting richer and the poor getting poorer in the last 20 years. UN statistics provide evidence of the widening gap between rich and poor: In nine years, the income ratio between the top 20% and the bottom 20% has increased from 60:1 to 74:1. Eighty countries have less revenue than they did a decade ago.

The assets of the 200 richest people exceed the combined income of 41% of the world's total population. The assets of the top three billionaires are more than the combined GNP of all least developed countries and their 600 million people or their income is more than the GDP combined of the 48 less developed countries in the world. (WB, 2000/2001)

The overall consumption of the richest fifth of the world's people is 16 times that of the poorest fifth. About 840 million people are malnourished. Nearly 340 million women are not expected to survive to age 40. Nearly 160 million children are malnourished. More than 250 million children are working as child labourers. (Human Development Report 1999)

Of the world's 6 billion people, 2.8 billion live on less than \$2 a day, and 1.2 billion on less than \$1 a day. (Global Poverty Report, 2001). Meanwhile the 25% of the world population received the 75% of the global generated income. (WB, 2000/2001)

Economic growth is projected as the road to overcome global poverty. With economic growth of \$100 the rich 20% of the world population pocket \$83 and the poorest 20% get \$1.40. Global economic growth is therefore a highly inefficient way to help the global poor. (Achaean, 2000)

Wealth extraction causes poverty, and poverty causes hunger.

Statistics on the inability of people in developing countries to satisfy basic human needs corroborate the enormous scale of poverty and highlight its breadth and complexity. For example: (HDR, 1999, 2000,2001).

From the 4 600 millions of people living in the Third World:

- 968 millions lack access to safe water; and
- 2 400 millions lack access to sanitation (HDR, 1999, 2000,2001).
- 2000 millions do not have access to less expensive basic medicines like penicillin.

In comparison with industrialised countries:

- infant and child mortality rates in developing countries are more than five times higher;
- the maternal mortality rate is 440/thousand alive
- the proportion of births attended by trained health personnel is 56% and only 29% in the poorest countries.

Sustainable Energy is fundamental to the great challenges facing the world at the beginning of the 21st century: how to eliminate the obscene levels of poverty without further polluting the planet or worsening climate change

Two billion people have no access to electricity and up to three billion depend on bio-mass (wood, charcoal and dung) to meet their household energy needs. The UN Commission on Sustainable Development has called access to Sustainable energy a "prerequisite" for halving poverty by 2015.

Energy is the lifeblood of human society and economics. It cooks the food society eats. It heats the buildings humans' use for work and daily life. It powers the industries. And for a majority of the world's people, turning on a light switch is something that rarely, if ever, requires conscious thought.

There for is so amazing the figure that points out that over two billion people in the developing world today have no modern energy services. Eighty per cent of people in sub-Saharan Africa have no electricity.

The world's greatest child killer, acute respiratory infection will not be tackled without dealing with smoke from cooking fires in the home. Children will not study at night without light in their homes.

Gender disparities have continued. Poverty has a woman's face. Of the approximately 1.3 billion people living in poverty, 70% are women. Increasing poverty among women has been linked to their unequal situation in the labor market, their unequal treatment under social welfare systems, their lack of access to health and education services, and their lack of status and power in the family. (See Annex I)

The undervaluation of women is reflected in the undervaluation of their work and in the absence of recognition of the contribution that they make. On average women work longer hours than men in nearly every country. Moreover, women support 53% of the total burden of work in developing countries, and 51%, in industrialized countries.

Around a half of the total work time of both men and women is spent in economic activities in the market or in the subsistence sector. The other half normally is devoted to unpaid household or community activities. In industrialized countries men's total work time is spent roughly two-thirds on paid activities and one-third on unpaid activities.

But for women, the situation is the opposite. In developing countries, more than three-quarters of men's work is in market activities. As a result men receive a much larger share of cash income and recognition for their economic contributions. Conversely, most of women's work remains unpaid in non-marketed or subsistence activities and is thus unrecognized and undervalued. If unpaid activities were treated as market transactions at prevailing wages, global output would increase by US\$16 trillion. This represents a 70% increase in the officially estimated global output of US\$23 trillion. US\$11 trillion of this increase would correspond to the non-magnetized, "invisible" contribution of women.¹ (HDR, 1995)

¹ See Chapter 4 of the Human Development Report (HDR, 1995) "Valuing women's work".

Women are the major users of traditional and biomass energy resources for household and income-earning activities, and they also play major roles in the use of modern energy by households:

Biomass fuels account for 80% of all household fuel consumption in developing countries, mostly for cooking, which is done primarily by women. Women have practical interests and applied expertise in the burning properties of different fuels, fire and heat management, fuel-saving techniques, and the advantages and disadvantages of different fuels and stoves.

Given women's crucial roles in and contributions to food security, any efforts to reduce food insecurity worldwide must take into consideration the factors and constraints affecting women's ability to carry out these roles and make these contributions, with a view to removing the constraints and enhancing women's capacities.

Access to resources is essential to improving agricultural productivity of both men and women farmers and to promote sustainable development. Because women play crucial roles in agricultural production, improving productivity will depend to a great extent on ensuring that women farmers, as well as men farmers, have sufficient access to production inputs and support services. While both men and women smallholders lack sufficient access to agricultural resources, women generally have much less access to resources than men.

The causes of this are rooted, to a great extent, in: gender-blind development policies and research; discriminatory legislation, traditions and attitudes; and lack of access to decision-making. Worldwide, women have insufficient access to land, membership in rural organizations, credit, agricultural inputs and technology, training and extension, and marketing services.

Access to basic, clean energy services is essential for sustainable development and poverty eradication, and provides major benefits in the areas of health, literacy and equity. The Millennium Development Goal of halving poverty will not be achieved without energy to increase production and income, create jobs and reduce drudgery.

POVERTY, FOOD SECURITY AND BIOENERGY

One of the most dramatic aspects of the food security problem is the extent of famine, hunger and starvation. While some progress has been made in averting famine, especially in China, Asia, these horrifying conditions persist throughout the world. Their occurrence is commonly attributed to drought and other natural disasters, but war, civil unrest and political and economic instability have far greater importance. In the 1990s and the beginning of the actual decade, hunger and malnutrition resulting from civil strife were and are serious problems in many parts of the world including Europe (particularly former Yugoslavia), Asia (for example, Afghanistan), the Near East (Iraq) and most extensively Africa.

Tragically, wars often affect not only the countries in turmoil but also those that provide hospitality to the refugees who flee their homes in terror. Their arrival more than doubled the population of the resource-poor region, which welcomed them as best it could. The influx placed overwhelming pressure on local resources and necessitated a major international effort to prevent an increase in nutrition and health problems among the local people as well as to contain these problems among the refugees.

As well as producing supplies of food and fibre, agriculture also affects other aspects of quality of life. Agriculture can support the vitality of rural communities through maintaining family farming, rural employment, cultural heritage and sustainable development. It also can make positive contributions to biological diversity, recreation and tourism, soil and water systems, bioenergy, landscape, food quality and safety, and the welfare of animals - but none of these outcomes are automatic, they often require policy mechanisms to facilitate them.

The term multifunctionality reflects these diverse elements although the relative importance of the various functions of agriculture differs between localities, regions, countries and groups of countries.

The basic fact that agriculture serves multiple functions is widely recognised. As early as 1992, world governments at the Rio Earth Summit recognised the: "*multifunctional aspect of agriculture, particularly with regard to food security and sustainable development*". (Agenda 21, Chapter 14).

In March 1998 the OECD stated: "*Beyond its primary function of producing food and fibre, agricultural activity can also shape the landscape, provide environmental benefits such as land conservation, the sustainable management of renewable natural resources and the preservation of biodiversity, and contribute to the socio-economic viability of many rural areas.... Agriculture is multifunctional when it has one or several functions in addition to its primary role of producing food and fibre.*" (OECD Declaration of Agricultural Ministers Committee).

A key function of agriculture is to ensure secure and stable supplies of food. Yet, food insecurity is still a major problem, particularly in the developing world.

Today more than 800 million people throughout the world still lack sufficient food to meet their basic nutritional needs. Progress is weak, given the scale of the challenges. For example, achieving the food security targets of the World Food Summit requires a four- to sevenfold increase in commercial energy. This will, obviously, not happen under a "business as usual" approach.

The world already grows more than enough food to feed everyone. About a billion people now don't have enough food to meet basic daily needs, but that's not because there's not enough food. There's more food per capita now than there's ever been before -- enough to make everyone fat. There's enough to provide at least 4.3 pounds of food per person a day: two and a half pounds of grain, beans and nuts, about a pound of fruits and vegetables, and nearly another pound of meat, milk and eggs.

People starve because they're victims of an inequitable economic system, not because they're victims of scarcity and overpopulation.

It's a myth that most of the food is grown in the rich countries. The US, for instance, is the world's biggest food importer. US exports of corn and other grains for human food to reduce malnutrition and starvation are another myth. Most US grain exports go to feed livestock, not humans. Much of it is also used as feedstock for industry. (See Annex II-III) (Food or Fuel, 2002)

The capacity exists to produce sufficient food for all people in the world. (Annex V) This requires, however, an increase in food production, particularly in low-income, food-deficit countries. According to the World Food Summit Draft Plan of Action, "*production increases need to be achieved while ensuring both productive capacity, sustainable management of natural resources and protection of the environment*" (UN, 1999). Sufficient food production alone will not guarantee food security, however, unless action is also taken to ensure access to food by all people.

Economic liberalization and privatisation are major features of Structural Adjustment Policies (SAPs), which aim at the rationalization of fiscal and monetary policies and the creation of a macro-economic environment favourable to economic growth. SAPs focus on the reduction of public spending and price supports, liberalization of markets, reduction and elimination of agricultural and food subsidies and the elimination of marketing and transportation controls. These measures are likely to have a negative impact on small and poor farmers. Cuts in social services and the increase in food prices adversely affect the more vulnerable parts of the population, particularly women and children, and place a disproportionate burden of work on women who must make up for the services that have been cut.

Paradoxically, the rural people who produce the world's food also make up the majority of the world's poor and are among those most vulnerable to food insecurity.

Approximately 70 percent of the world's poor are women. The trends towards economic and trade liberalization and privatisation which are intended to boost agricultural production and the economy may well result in increasing food insecurity.

A range of different policies attending agriculture, energy and trade developments - which could vary depending on levels of development - should therefore be crucial for implement by governments to pursue real food security objectives. For example, the possibility of being able to exempt life-forms from patenting if this conflicts with the maintenance of traditional farming practices that are important for food security (such as saving seed from one season to the next).

Future food security will mainly depend on the interrelationships between political and socio-economic stability, technological progress, agricultural policies and prices, growth of per capita and national incomes, poverty reduction, women's education, trade and climate variability

Policies on the ownership of land, and regulations to control its use have important implications for biomass conversion to energy. Legislation regarding property rights - both of land and of produce, such as biomass from forests - is generally weak in the developing world, especially in Africa, and is considered an important barrier to the healthy development of sustainable bioenergy production and use.

Planners and policy makers need to be able to link energy requirements with specific objectives of agricultural and rural development, such as food security, agro-industry development, and sustainable farming practices. This requires specific studies and data indicating the energy intensiveness of different farming techniques for important food and other crops.

Agricultural productivity is closely associated with direct and indirect energy inputs, and policies are required to consolidate this relationship for the benefit of farmers. Agricultural development plans in most African countries are designed and implemented with little or no regard to this association, thus missing opportunities to enhance production in both quantitative and qualitative terms. Energy development plans rarely take into consideration the present and future energy needs of agriculture, and most rural electrification programmes are mainly directed to households.

Energy price policies seldom regard the economic conditions of rural populations. If rural development is to be achieved, energy inputs must be made available, and this might require special efforts from the society as a whole - e.g. subsidizing energy inputs in order to maintain the expected low costs and high quality of agricultural produce, as generally demanded by urban populations.

Policies promoting social equity between rural and urban populations and between men and women, particularly in rural areas, are generally non-existent, leading to migration, injustice and social instability. In energy terms, what is needed is a reduction in human drudgery (e.g. water and fuel collection) and better services. Facilitating energy and other inputs required by agriculture represents greater recognition, in both economic and social terms, of the vital role played by Africa's rural people in feeding society.

In order to promote food security strategies with the necessary energy inputs, policies and methodologies should consider the critical linkages between agricultural production, agricultural-based industries (food, beverage, tobacco, and textiles), distribution and commercialisation, and the rest of the economy. Agricultural growth is the most important contributor to manufacturing and service activity in the Third World, not only stimulating agro-industries, but the rest of the economy as well. In this context, energy from biomass is an added benefit.

The design and implementation of almost all sustainable agriculture and rural development field activities will require some form and amount of energy input. In many cases, this energy input is not considered, leading to unsatisfactory solutions from both the environmental and energy efficiency standpoints. It is necessary to "energize" agricultural practices.

Low-input farming techniques, such as integrated pest management, low-tillage cultivation, use of residues, green manures, and other organic fertilizers, may play an important role in sustainable agricultural development. There are several local success stories and new initiatives in low-input, high-yield agriculture. However, the energy implications of these techniques have yet to be systematically documented. More research is needed to enable clear comparisons with well-established high-input methods.

Unfortunately, most sectoral plans are carried out in isolation from other sectors. Integration is particularly important when developing policies and plans for energy in agriculture, due to the close interlinkages. To a great extent, this problem arises as a result of the lack of priority given by the energy sector to rural areas in general, to the lack of a "lobbying" capacity among farmers, and to the lack of mandate and of technical expertise on energy in the agricultural.

A key form of intervention in the bid to increase rural people's access to energy is financing. Many renewable technologies best suited to provide energy services to remote rural areas use traditional fuel, but have a prohibitive initial capital cost. At the same time, many developing country governments are actively promoting the replacement of woodfuel by subsidising other energy sources.

However, the success of such fuel substitution programmes basically depends on two factors largely beyond government control: economic growth and the corresponding increase in personal incomes that would permit consumers to switch fuels. The substitution process in many countries is hampered by high import costs resulting from the inefficient procurement of small quantities and the increase for prices in the privatised sectors.

POVERTY, BIOENERGY AND CLIMATE CHANGE

Climate change, may affect the physical availability of food production by shifts in temperature and rainfall; people's access to food by lowering their incomes from coastal fishing because of rising sea levels; or lowering a country's foreign exchange earnings by the destruction of its export crops because of the rising frequency and intensity of tropical cyclones.

It is generally accepted that climate change is the result of human activity including industrial output, car exhaust, and deforestation. These types of activities increase the concentrations of carbon dioxide, methane, nitrous oxide and other greenhouse gases (GHGs) in the atmosphere (IPCC, 2001).

If the current trend in carbon emissions continues, temperatures will rise by about 1 degree C by the year 2030 and by 2 degree C by the next century. This increase, however, will probably have different impacts in different regions. Agricultural impacts, for example, will be more adverse in tropical areas than in temperate areas. Developed countries will largely benefit since cereal productivity is projected to rise in Canada, northern Europe and parts of Russia.

In contrast, many of today's poorest developing countries are likely to be negatively affected in the next 50 – 100 years, with a reduction in the extent and potential productivity of cropland. Most severely affected will be sub-Saharan Africa due to its inability to adequately adapt through necessary resources or through greater food imports

Some groups are particularly vulnerable to climate change: low-income groups in drought-prone areas with poor infrastructure and market distribution systems; low to medium-income groups in flood-prone areas who may lose stored food or assets; farmers who may have their land damaged or submerged by a rise in sea-level; and fishers who may lose their catch to shifted water currents or through flooded spawning areas

At the same time, the world faces another great challenge: the prospect of a climatic catastrophe if present trends of fossil fuel consumption continue. Heat-trapping gases such as carbon dioxide and methane that keep more of the sun's warming energy in the earth's atmosphere cause climate change. (Annex IV)

And this is primarily caused by the industrialized world's fossil fuel consumption, although developing country emissions are rising quickly. Per capita emissions of developed country citizens are far higher than those of people living in developing countries: the average American produced 20 tones of CO₂, compared to an Indian average of less than one tone.

The Intergovernmental Panel on Climate Change projects a substantial global temperature rise and sea level increase, and more extreme weather events such as floods, hurricanes, drought and heat waves. Those most vulnerable to these changes live in the developing world.

Developing countries will feel these impacts most acutely, even though they also have the least responsibility for climate change. A range of effects consistent with climate change has primarily triggered the current famine in Southern Africa. Extreme weather events are growing stronger and more frequent, as recent years have shown abundantly in events ranging from the Orissa Cyclone in India and floods in Mozambique to Hurricane Mitch in Central America. Most tellingly of all, the people of Tuvalu a tiny small island state in the South Pacific have started negotiations with New Zealand for the evacuation of their entire population. Rising sea levels are Stalinizing the country's low-lying cropland and making it unusable. Tuvalu is a sign of how things can develop.

There is a huge potential for renewable energy to provide clean, appropriate and efficient energy to the world's poorest. Millions can be lifted out of poverty without costing the earth, with the help of clean sustainable energy

The role of renewable energy sources and of bioenergy, in particular, in carbon sequestration and substitution is increasingly of interest in the context of the Climate Change Convention. The international institutions like FAO should strengthen their assistance to countries in strengthening their institutional and human capacities to implement rural energy programmes and in the implementation of bioenergy programmes within the framework of the Kyoto Protocol.

Agriculture is itself responsible for about a third of greenhouse-gas emissions. Activities such as ploughing land and shifting ('slash and burn') cultivation for agricultural expansion release CO₂ into the air. Much of the 40% of human caused methane comes from the decomposition of organic matter in flooded rice paddies. About 25% of world methane emissions come from livestock. In addition, agriculture is responsible for 80 percent of the human-made nitrous-oxide emissions through breakdown of fertilizer and that of manure and urine from livestock. However, agriculture's GHG emissions can be largely reduced, and much can be done to lessen their effect on production and on the livelihoods of farmers, especially in developing countries. (FAO, 2003).

It seems so unfair that agricultural activities, responsible for generating food would compete with the environmental pollution created by industrial processes. The eternal debate among development and survival. The developed countries should also understand the real impact of their emissions into the atmosphere and finally implement the international agreements already signed for that purpose.

It is clear, that farmers in the developing world will have to receive assistance in adopting coping mechanisms that withstand climate variability through activities such as the use of drought-resistant or salt-resistant crop varieties, the more efficient use of water resources, and improved pest management. Changes in cultivation patterns can include the reduction of fertilizer use, the better management of rice production, the improvement of livestock diets and the better management of their manure. In addition, national governments have an important role to play in enforcing land use policies which discourage slash and burn expansion and extensive (rather than *intensive*) livestock rearing, as well as raising the opportunities for rural employment. (FAO, 2003)

Carbon sequestration can also be a means through which agriculture can make a positive contribution towards mitigation, and will be of growing economic and environmental importance in the context of the Kyoto Protocol. It is estimated that for the next 20 to 30 years, cropland contribution to carbon sequestration lies within the range of 450 – 610 million tones of carbon per year. By applying improved land management practices (better soil fertility and water management, erosion control, reversion of cropland in industrial countries to permanent managed forests, pastures or ecosystems, biomass cropping, conservation tillage, etc.), the role of agriculture as a major carbon sink and as a compensating mechanism for agriculture's contribution to GHGs can be greatly enhanced. (FAO, 2003)

Agriculture can also play a role in reducing the burning of fossil fuels. It is said that up to 20 percent of fossil fuel consumption could be replaced in the short term by using biomass fuel. In Brazil 6 million cars are running partly on alcohol derived from sugar cane. China already has 10 million dung digesters, which provide a clean cooking fuel and an organic fertilizer. Fast-growing grasses, oilseeds and agricultural residues offer great potential as energy alternatives. It is important to note that these bioenergy initiatives also have a positive impact on rural socio-economic development. But for the implementation of these and other clean technologies, the developing countries will have to attain real access to the technologies sources.

PERSPECTIVES FOR THE FUTURE

The "energizing" of the food production chain - both quantitatively and qualitatively - based on diversified sources and a better use of commercial energy is one key to achieving food security and improving the living conditions of rural populations. However, breaking the current energy bottleneck must also be sustainable - environmentally sound, socially acceptable and economically viable.

The challenge is also an opportunity. By using the potential offered by renewable energy sources, agro-ecotechnologies, and innovative institutional and financial arrangements, rural areas could "leapfrog" to more sustainable energy systems and food security. These rural areas could become examples to other sectors of society, both in developing and industrialized countries.

There is, however, a danger. The energy sector is undergoing a rapid shift toward high-energy efficiency, renewable energy sources, lower intensity industry and energy recycling. It is supposed that agriculture will also have to move towards greater sustainability thanks to techniques such as organic farming, improved water and soil management, integrated pest management, mechanization and biotechnology.

The challenge in the medium term is to harness these changes for the benefit of the rural poor. If not, there is a real risk that rural populations will be excluded from the shift to sustainability, and left to face either chaos in rural areas or massive emigration to urban centres. And then agriculture will never accomplish the major carbon sink role agriculture is supposed to play.

The basic needs of the two billion poor people who lack access to modern energy services should be covered in a way that does not further damage the environment. This aim demands to identify two key challenges for energy planners and policy makers:

Challenge number 1: Energy for cooking and food security.

The first energy priority of poor people is how to meet their household energy needs. Poor people spend up to a third of their income on energy, mostly to cook food. Around three billion people in the developing world use biomass, such as wood, dung, charcoal and agricultural residues, for cooking and, in cold regions, heating.

Due to poverty and a lack of appropriate alternatives, many will continue to rely on biomass as their primary energy source for cooking in the foreseeable future. There is urgent need to establish and maintain a sustainable supply of wood and charcoal to people on a very low income. This action demands widespread and sustainable reforestation programmes, which directly involve communities.

Women, in particular, devote a considerable amount of time to collecting, processing and using traditional fuel for cooking, often spending up to three hours per day and walking up to ten kilometers to gather 35 kg of firewood time which could be spent on child care, education or income generation. Reducing the amount of firewood or dung used through simple affordable technology, such as more efficient stoves, is vital.

Every year 1.8 million people die of illness related to smoke for cooking fires. Smoke is a major factor contributing to acute respiratory infection, the greatest single cause of under-five- year-old deaths. Simple, low-cost solutions to deadly indoor air pollution can be available, including chimney stoves, smoke hoods, switching to cleaner fuels and improved ventilation

Challenge 2: Getting electricity to the rural poor

A major challenge will be to provide electricity to the rural poor. Electricity is needed to power small industry and enterprise, run health clinics and light schools. Without it rural poverty will never be eradicated.

The conventional approach to electrification tends to marginalize rural communities who are located far away from the grid. As rural population densities are generally low, the cost of energy supply is high compared with densely populated areas. Electricity companies, either public or private, have almost no incentive to provide services to these areas.

The present alternatives for decentralized rural electrification are either through diesel or renewable energy sources. Renewable energy has distinct advantages over diesel as it has much lower running costs, uses local energy sources, does not run out, is much cleaner and does not contribute to global warming.

Where centralized approaches have failed to reach the poorest communities, there is a need for a new approach based on small-scale sustainable energy options.

Decentralized energy options can:

- make efficient use of local energy resources e.g. hydro, solar, biomass, wind.
- can avoid the negative environmental and social impacts of large-scale projects, and remove dependency on costly supplies of fossil fuels or grid power
- make use of and develop indigenous manufacturing and technical capability
- harness the energies and resources of the community
- be controlled by local communities and their organizations, enabling them to identify their own needs.

Although Agenda 21 has no specific energy Chapter, energy issues are raised throughout the document, in the context of topics such as protection of the atmosphere, consumption patterns, environment, sustainable agriculture and rural development.

Many countries are moving toward renewable energy in rural areas. At national level, some financial schemes are finding their way into national and international policies and strategies, in response to declining government intervention and the reduction of subsidies, cost-reflecting pricing of energy carriers. New neoliberal 'policies liberalized energy markets, energy services leasing systems and cooperative arrangements, not always benefit the rural poor. In almost all the cases, the increase of prices severely affects the already poor services. Privatisation not always produces efficient services.

At the international level, the ratification by 159 countries of the Framework Convention on Climate Change creates opportunities for new energy programmes leading to higher levels of sustainability. Nevertheless, International financing through the Global Environment Fund and others, directed specifically to a net reduction of greenhouse gas emissions, has to increase substantially to really pursue the goal of sustainability.

ENERGY DEVELOPMENTS AND INSTITUTIONS

FAO's energy activities emphasize the need to develop and promote technologies and strategies for the utilization of renewable sources of energy adapted to the socio-economic needs of rural populations.

FAO's technical assistance activities recognize that agriculture, forestry and fisheries have a double role and potential as energy consumers and as energy producers in the form of renewable bioenergy. An integrated approach for the assessment, planning and implementation of energy and sustainable rural development is taken in its technical assistance activities.

All steps in the food chain require energy and a systematic approach is taken to its "energization". Renewable energy applications, such as photovoltaic systems, are promoted specially in relation to enhanced agricultural productivity and other income generation activities. Networking is promoted, such as the Latin American and Caribbean Working Group on Rural Energization for Sustainable Development, the Regional Wood Energy Development Programme in Asia or the Sustainable Rural Environment and Energy Network for the Whole European Region.

ENERGY SYSTEMS AND APPROACHES

Special emphasis is placed on bioenergy that plays a key role in the present energy scenario in rural areas and has a high potential as a modern energy carrier. Wood energy data and projections are a major component of FAO's energy activities. FAO has gathered information on the dynamics of woodfuel flows and has been providing multi-disciplinary approaches and technical expertise in the field of bioenergy.

Attention is placed to the energy function of the sugar industry, as one of the diversification strategies of that sector and to the production of low cost transport fuels to contribute to urban food security.

FAO has also promoted awareness and better use of work animal technology. It has also implemented field projects aimed at: a) increasing the supply of biofuel (through multipurpose tree plantations and sorghum species, agroforestry FAO schemes, community forestry, utilization of agricultural residues); b) reduce the woodfuel consumption and increase energy efficiency (improved stoves and charcoal making techniques); c) promote renewable energy applications (to enhance agricultural productivity and for rural services such as electricity); d) improve market and trade mechanisms; e) foster gender equality; f) address health problems and g) promote bioenergy for combined heat and power.

It has conducted activities on energy planning and training at the, regional and national levels such as the Regional Wood-Energy Development Programme for Asia, the assessment of the future energy requirements of agriculture in African countries and the organization of energy planning and training at the, regional and national levels such as the Regional Wood-Energy Development Programme for Asia, the assessment of the future energy requirements of agriculture in African countries and the organization of energy planning and training at the, regional and national levels such as the Regional Wood-Energy Development Programme for Asia, the assessment of the future energy requirements of agriculture in African countries and the organization of National Consultative Meetings on Energy for Rural Development.

A significant number of projects have been implemented in fields such as wood energy, bioenergy, biogas, and solar drying, illumination and water lifting. Agricultural engineering solutions to promote fuel saving cropping systems (conservation tillage, zero tillage), human and work animal energy, efficient energy and water use in irrigation, and energy efficient fishing vessels are other areas of attention. In the crop specific area, technology transfer of new drought and saline tolerant sweet sorghums for alcohol production are pursued.

The particular characteristics of the energy and environment linkages in rural areas are assessed; animal and agro and agro-industrial residues, their valorisation and the protection of local environmental quality are also topics of attention and network support. Outstanding challenges are the development and implementation of rural energy policies and programmes with concerted action of all interested parties: farmers, local and national governments, the private, finance and d international institutions. Remaining an urgent and critical matter is the physical and economic accessibility to sustainable forms of energy by the poorest rural and peri-urban populations for income generation and subsistence activities.

CONCLUSIONS

STRATEGIES FOR SUSTAINABLE DEVELOPMENT

Strategies for sustainable development through planned energy inputs must rely on a convergence between national development policies and goals and locally perceived and identified priorities. Critical issues concern:

General framework

- Energy must be seen as an integral part of overall developmental goals and other sectoral development plans and strategies
- Policies should correct the "energy deficit" in rural areas, where consumption is below subsistence level and barely cover cooking, heating and illumination needs
- The food security/energy nexus must be assessed to identify the best technological and economic strategies for meeting energy needs in food production. Sustainability will depend on integration of food security and energy policies.
- Specific policies and programmes should be targeted to rural women, children and other groups responsible for collection and use of energy, mainly fuelwood

Access to Technology

- Although rural areas have the right to use all energy sources, policies should facilitate the transition to renewable resources, such as bioenergy, solar and wind energy - they are reliable, locally available, adaptable to small and medium scale energy requirements, and environmentally friendly
- Upgrading the efficient use of biomass energy resources - including agricultural residues and energy plantations - offers job opportunities, environmental benefits and enhanced rural infrastructure
- New energy programmes for sustainable rural development should be based on sound planning and preparation of human and technical resources.

Institutionalised Support

- The potential benefits of privatization should not overcome the important role that the government intervention should have in establishing priorities and adopting policies that can benefit the rural poor. Government action is still needed to redistribution of resources, create relevant legislation, regulations, overall policy guidance
- Rural energy usually has to be supported by institutional backing. All concerned sectors - technical ministries, NGOs, public and private industry and financial institutions - should be mobilized around a common policy framework and strategy
- National energy plans should converge with locally defined priorities - local farmers' and women's organizations and local authorities should participate fully in identifying, developing and implementing rural energy plans and programmes

Sources for Financement.

- There is a major problem concerning reductions of government support for the rural energy transition.
- Small scale investment is also needed for renewable energy schemes in rural areas - this calls for innovative approaches such as microfinancing, cooperative systems, end-service payment, equipment leasing and flexible loans
- Governments could not remove to conventional energy sources - benefiting the poorest sectors. Additionally new subsidies should be introduced to develop non-conventional energy sources.

This paper has look at the basic nexus among poverty, food security and bioenergy in the developing world. The paper calls for comprehensive and well-articulated framework to identify obstacles goals, strategies, policies and programmes that can help to reduce poverty using the energy sector as a focal point. The paper has assesses briefly the link between food security and bioenergy and its impact on poverty and called for specific strategies to be employed targeting the energy transition from the actual consumption model to a more sustainable and developed one.

Annex I

Gender disparities

- Women's participation in the labor force has risen by only four % points, from 36% to 40%, despite a 60-70% increase in female adult literacy and school enrolment between 1970 and 1990.
- Women have access to a disproportionately small share of credit from formal banking institutions. In Latin America and the Caribbean, women constitute only 7-11% of the beneficiaries of credit programmes; in Africa only about 10% of small-scale credit is accessed by women.
- Women in general receive much lower average wages than men. In part this is because many women work in the informal sector or in inherently low-paying jobs, but also because women are often paid less than men for equal work. The average female wage is only three-fourths of the male wage in the non-agricultural sector.
- In developing countries, women still constitute less than a seventh of administrative and managerial positions. Globally, women occupy only 10% of all parliamentary seats and only 6% of cabinet positions. In 55 countries, there are either no women in parliament or fewer than 5%.
- Throughout the world women face unequal treatment under the law, and often face violence and abuse as both girls and women.

Source: Energy after Rio. Prospects and Challenges. Chapter 2.
Energy and Major Global Issues. 1997.

Annex II

1. The US and the other industrialised countries are the world's major food importers, importing 71% of the total value of food items in world trade (Handbook of International Trade and Development Statistics 1994 (New York and Geneva: United Nations Conference on Trade and Development, 1995), table 3.2).
2. The US imports about \$1.5 billion worth of beef a year (Food and Agriculture Organisation, FAO Trade Yearbook 1995, vol. 49 (Rome: FAO, 1996), 160, table 12).
3. The US imports 54% more in farm commodities than it exports (FAO Trade Yearbook 1995, table 6), much of it from countries where the majority lack a healthy diet. The US is in fact the biggest food importer the world has ever seen.

Sources: The Myth of Scarcity

<http://www.foodfirst.org/pubs/backgrdrs/1998/w98v5n1.html>

12 Myths About Hunger

<http://www.foodfirst.org/pubs/backgrdrs/1998/s98v5n3.html>

From Food or Fuel, 2002

Annex III US exports.

- For every one-ton of US corn exported in 1996 to one of the 25 countries with the world's most serious malnutrition problems (Category 5 countries, with at least 35 percent of the population undernourished), 260 tons were exported to a wealthy Organization for Economic Cooperation and Development (OECD) country.
- 20 percent of the total US corn crop is exported; two-thirds of these exports go directly to the 28 industrial OECD countries, where it is mostly used for feeding animals.
- 76 percent of the corn used in the US is used for animal feed.
- Less than three-tenths of one percent of total US corn exports went to the poor Category 5 countries in 1996.
- Less than three percent of total US corn exports in 1996 went to the 24 Category 4 countries (where undernourishment affects at least 20 percent of the population).
- More US corn goes to make alcoholic beverages in the US than is exported to feed the hungry in the world's 25 most undernourished countries combined.
- About one-third of the total US soybean crop is exported; 70 percent of US soybean exports went to 28 industrial OECD countries in 1996.
- No soybeans were exported to Category 5 countries in 1996, while 17.8 million metric tons went to OECD countries.
- In 1998, a year of record-low soybean prices, the 25 most undernourished countries received less than 0.027 percent of total US soybean exports.

Sources: "Feeding the World?"

<http://www.iatp.org/foodsec/library/admin/uploadedfiles/>

[Feeding the World The Upper Mississippi River .htm](#)

"The U.S. Department of Agriculture estimates that more than a billion bushels of corn went unused last year [2000]." -- University of Wisconsin

<http://www.news.wisc.edu/view.html?get=6810>

from Food or Fuel, 2002

Annex IV Cars figures

- 70 million motor vehicles were on the world's roads in 1950.
- 630 million motor vehicles were on the world's roads in 1994.
- 1 billion motor vehicles are expected to be on the world's roads by 2025, if the current growth rate continues.
- 50 million new cars roll off the assembly line each year -- 137,000 a day.
- 27 tons of waste are produced in the manufacture of the average new car.
- 11 million cars are junked annually in the US.
- The average car emits 12,000 pounds of carbon dioxide each year.
- Underinflated tires can waste 5% of a car's fuel.
- 2 billion gallons of gasoline could be saved annually if 65 million car owners kept their tires properly inflated.
- 85% of auto fuel is consumed just to overcome inertia and start the wheels turning.
- SUVs (Sports Utility Vehicles) and light trucks generate 2.5 times more emissions than the standard cars.
- 33,000 natural gas vehicles were in use in the US in 1993.
- 75,000 natural gas vehicles were in use in the US in 1998.
-

By Josh Sevin

Sources: World Resources Institute; Environmental Working Group; 50 Simple Things You Can Do to Save the Earth; Amicus Journal; L.A. Times; U.S. Department of Transportation; Earth Communications Office; Amicus Journal; Wall Street Journal, From Food or Fuel, 2002

Annex V

The World Declaration on Nutrition produced by the FAO and World Health Organization (WHO) International Conference on Nutrition (ICN) held in Rome in December 1992 reviewed the current nutrition situation in the world and set the stage for markedly reducing these unacceptable conditions of humankind. Reaching the ICN goal is possible. Most of the work will need to be done in the developing countries by their own people. However, cooperative work across nations and across disciplines is also essential.

The ICN declaration goes on to state:

1. ... We recognize that globally there is enough food for all and that inequitable access is the main problem. Bearing in mind the right to an adequate standard of living, including food, contained in the Universal Declaration of Human Rights, we pledge to act in solidarity to ensure that freedom from hunger becomes a reality. We also declare our firm commitment to work together to ensure sustained nutritional well-being for all people in a peaceful, just and environmentally safe world

2. Despite appreciable worldwide improvements in life expectancy, adult literacy and nutritional status, we all view with the deepest concern the unacceptable fact that about 780 million people in developing countries - 20 percent of their combined population - still do not have access to enough food to meet their basic daily needs for nutritional well-being.

3. We are especially distressed by the high prevalence and increasing numbers of malnourished children under five years of age in parts of Africa, Asia and Latin America and the Caribbean. Moreover, more than 2 000 million people, mostly women and children, are deficient in one or more micronutrients; babies continue to be born mentally retarded as a result of iodine deficiency; children go blind and die of vitamin A deficiency; and enormous numbers of women and children are adversely affected by iron deficiency. Hundreds of millions of people also suffer from communicable and non-communicable diseases caused by contaminated food and water. At the same time, chronic non-communicable diseases related to excessive or unbalanced dietary intakes often lead to premature deaths in both developed and developing countries.

Sources: UN. The World Declaration on Nutrition. International Conference on Nutrition (ICN). 1992,

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