



# Sustainable Bioenergy Development in UEMOA Member Countries

The West African Economic and Monetary Union (UEMOA)  
and The Hub for Rural Development in West and Central Africa



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## **Executive Summary: Sustainable Bioenergy Development in UEMOA Member Countries**

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# Executive Summary

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Energy is essential to development. Countries with access to abundant and affordable modern energy have significantly larger gross domestic product (GDP), higher per capita income levels, longer life expectancies, increased literacy rates, and greater educational attainment. Without energy, we cannot improve the productivity of the rural poor—nor achieve the Millennium Development Goals (MDGs).

In September 2007, the UEMOA joined with the Rural Hub of Western and Central Africa in commissioning a report from the United Nations Foundation (UNF), the International Centre for Trade and Sustainable Development (ICTSD), and the Energy and Security Group (ESG) to explore opportunities for bioenergy in the region. ***The goal of this report was to assess the agriculture sector’s potential for bioenergy production and identify constraints in UEMOA member countries, recognizing the equally vital need for food security in the region.***

Globally, 80% of total primary energy supply depends on fossil fuels—coal, gas, and oil. In the poorest countries in Africa, traditional biomass and diesel are often the only alternatives, although some do have access to hydropower. Even in oil-rich African countries most people remain energy poor. Rising costs of fossil fuels compromise the ability of many developing countries to broaden access to energy, even as the use of such fuels worsens global climate change. Developing countries—especially in equatorial zones—are uniquely vulnerable to climate change, which will change weather patterns and disrupt agriculture.

The eight UEMOA countries—Benin, Burkina Faso, Cote d’Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo—possess a rich resource base that can be sustained by a combination of good policies and practices to expand the production of and access to food, fuel, and fiber. Undertaking these strategies to improve agriculture and forest productivity, protect watersheds, and produce bioenergy should also strengthen their ability to adapt to climate change.

Figure 1: The Eight UEMOA Countries



Traditional wood biomass, which comprises 73% of primary energy in the region, must be adapted to create more efficient and cleaner fuels. Poor forestry practices must be reversed as they undermine sustainable forest management and reforestation programs. Waste streams and agricultural residues can add to these biomass resources. Locally grown bioenergy crops, sustainably produced, can also be transformed into modern fuels: expanding energy access, creating more employment opportunities, and generating higher incomes. With the correct policies and choices, the use of bioenergy can also reduce greenhouse gas emissions as energy consumption expands.

### Box 1: Economic and Monetary Union of West Africa (UEMOA) Overview

The West African Economic and Monetary Union (UEMOA) is an organization of eight states established to promote economic integration among countries that share a common currency. UEMOA was created by a Treaty signed at Dakar, Senegal, on January 10, 1994, by the Heads of State and Government of Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, and Togo. On May 2, 1997, Guinea Bissau joined the Union. The UEMOA's objectives include greater economic competitiveness; the convergence of macroeconomic policies and indicators; the creation of a common market; the coordination of sectoral policies; and the harmonization of fiscal policies.

The UEMOA is a customs and monetary union among eight member states of the larger Economic Community of West African States (ECOWAS). The mission of the 15-country ECOWAS (including those of the UEMOA) is to promote economic integration in all fields of economic activity, particularly industry, transport, telecommunications, energy, agriculture, natural resources, commerce, monetary and financial questions, and social and cultural matters.

As work evolved on this report, the already fragile economic outlook in these countries was further influenced by the rapid acceleration of food and fuel prices since January 2008. All but one of the UEMOA member countries (Côte d'Ivoire) is dependent on oil imports for their electricity and transportation needs. Moreover, all eight countries must import staple foods to meet nutritional requirements. Rapidly rising fuel costs and sharp increases in the price of staple crops (e.g., wheat and rice) have led to a deterioration in the balance of payments outlook. Given the synergies between agriculture and bioenergy, global food and energy circumstances have heightened this report's importance and timeliness.

The report concludes that, notwithstanding many challenges that require careful consideration, UEMOA member countries have the natural resources, the land availability, and the demand to improve agriculture productivity and develop bioenergy successfully.

## AGRICULTURE: THE BACKBONE OF THE UEMOA ECONOMIES

Agriculture plays a central role among UEMOA member countries, accounting on average for 36% of GDP in 2004 (ranging from 18% of GDP in Senegal to 61% in Guinea Bissau).

The UEMOA region has significant land, though much of this is infertile and plagued by erosion and degradation. The combination of poverty and population growth (see Box 2) is taking a toll on the region's forests. Overall, the average deforestation rate is 1.25% in UEMOA member countries—more than double the African rate of 0.62% (FAO, 2006).

### Box 2: Agriculture, Poverty, and Population Growth

The UEMOA countries have the highest population growth rates in sub-Saharan Africa (an average annual rate of 3%), the lowest levels of women's literacy, and among the poorest levels of access to family planning and broader reproductive health services. Between 1980 and 2005, the total population in the UEMOA countries doubled from 40 to over 80 million due to some of the highest total fertility rates in the world (five or six children per woman, according the United Nations Population Division) and early childbearing.

Yet, most of the subsistence food crops are produced and marketed by women; men often confine their role to the export crops. For a small-producer revolution to occur, women farmers will need access to land, credit, and inputs. They will need extension services and support. Their functional literacy (closely related to their capacity to effectively access credit and take advantage of extension services) and their economic productivity could be vastly improved if they could determine for themselves when and how often to bear children.

East Asia's economic success is closely correlated with strong social programs, including primary health care, universal education, and access to family planning. These corollary investments reinforced gains in agricultural productivity that resulted from investments in agriculture. This complementary strategy was crucial to East Asia's ability to grow out of the "poverty trap" where annual population growth exceeds the growth in food production.

Forest and other wood resources supply the energy on which 70% of the population depends. The International Energy Agency projects that this reliance on traditional

biomass will continue through 2030; if it does—and population growth remains unchecked, fewer people in UEMOA will have energy access than today.

The forests and grasslands of the UEMOA region represent the largest source of available biomass and provide critical ecosystem services. The data assembled for this report indicates that current use of forest resources is unsustainable. If UEMOA is to move to a modern bioenergy economy, tackling this challenge as a priority is a first step. Without addressing deforestation now, the ability of the states in the region to use other biomass resources to fuel economic growth will be limited.

West Africa's agriculture system combines subsistence farming—revolving around staple food crops of millet, sorghum, cassava, and rice—with an export-oriented sector that produces such crops as cotton, groundnuts, cocoa, coffee, palm, sugarcane, and soy.

The agricultural sector faces many constraints to improving both productivity and production, including a lack of inputs such as fertilizer, irrigation, and equipment. Less than 2% of arable land is irrigated, leaving the remaining production susceptible to weather related shocks. Expanding irrigation has the potential to improve productivity, but such programs must be managed in light of limited water resources.

Low agricultural productivity, rapid population growth, rural poverty, lack of alternative employment in rural areas, limited availability of inputs, and external shocks such as civil strife and environmental degradation are key factors in chronic food insecurity. While gross food production has increased in most member countries, per capita food production lags as population growth outstrips gains in annual production. These trends have worsened as governments and donors reduced support for the agricultural sector and policies focused on export crops to earn foreign exchange. Most recently, insufficient rainfall, flash floods, and import price increases have hit the UEMOA member countries—exacerbating food insecurity.

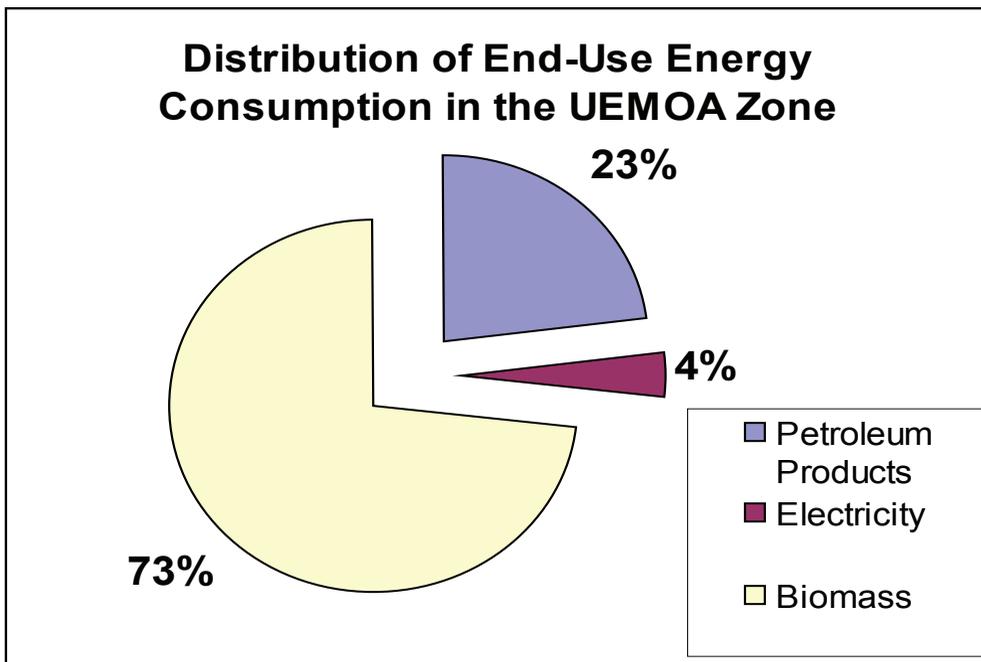
The urgency of increasing agricultural productivity is underscored in the strategic framework to achieve food security by 2015, which the Inter-State Committee to Combat Drought in the Sahel (CILSS) adopted in 2002. Overall productivity increases in existing crops are essential to improving biomass use and management; higher yields per hectare not only yield higher revenues, but also result in overall biomass increases—adding to potential renewable energy resources.

## AGRICULTURE AND ENERGY: CLOSE CONNECTIONS

Energy consumption in the UEMOA member countries is comprised of biomass (73%), oil products (23%), and electricity (4%) (see Figure 1). Wood, charcoal, and agricultural/forestry products constitute the bulk of the biomass resources in these countries today. The UEMOA region’s limited modern energy resources perpetuate chronic poverty and food insecurity.

Energy is essential for improving agricultural productivity. At the subsistence level, collection and use of firewood for heating and cooking consumes tremendous biomass resources and labor. Fuel is needed to operate agricultural machinery (e.g., tractors and harvesters), irrigation pumps, and water pumps. Energy is also needed to process, transport, and store agricultural products. Indirect energy use is necessary for the production and application of fertilizers and pesticides required to boost crop yields. Yet, with few exceptions, current policies place limited priority on widening energy access.

Figure 2: Distribution of End-Use Energy Consumption in the UEMOA Zone



Source: IEA, 2005 and SIE, 2005 (Senegal, Niger, Togo).

Energy consumption will rise in the agricultural sector as existing development plans are implemented. The existing agro-forestry resources (including starches, oilseeds, and woody biomass) can potentially be transformed into significant amounts of modern bioenergy for domestic, regional, and, potentially, international markets. For this vision to be achieved, forest resources must be managed sustainably, agricultural productivity increased and new, more efficient methods of processing and consuming fuels adopted.

Many UEMOA member countries are beginning to pursue bioenergy options, given their domestic resources. If exploited sustainably, these sources could reduce the region's dependence on imported fuel and create new opportunities for local producers. Table 1 highlights some of the existing bioenergy feedstocks for each UEMOA member country. Most UEMOA member countries have recently established biofuels production policies and some already have investor interest in establishing plantations to grow feedstocks—an approach that may not offer the greatest benefits. The combination of pro-biofuels policies, existing and potential feedstock production, available forest resources, and investor interest offers an opportunity to create a regional bioenergy economy that will expand energy access and support development goals.

**Table 1: Potential Bioenergy Feedstocks in UEMOA Member Countries**

	Sugar-cane	Sweet Sorghum	Cassava	Cashew	Jatropha	Palm Oil	Ground-nut	Cotton	Agri. and Forest Residues
Benin	●	●	●	●		●		●	●
Burkina Faso	●				●			●	●
Côte d'Ivoire	●		●			●		●	●
Guinea-Bissau				●	●				●
Mali	●				●		●	●	●
Niger	●				●		●		●
Senegal	●		●		●		●	●	●
Togo		●	●		●			●	●

Source: UEMOA Country Studies (to be published).



### **BIOENERGY OPPORTUNITIES AND CHALLENGES: HELPING IN THE FIGHT AGAINST RURAL POVERTY?**

The development, use, and commercialization of bioenergy offer UEMOA member countries vital economic, social, and environmental opportunities for transforming rural areas. Locally produced and consumed bioenergy has the potential to be a pivotal element in the fight against rural poverty. However, a strong policy framework at the local, national, and regional levels is required to ensure that these benefits are realized, shared equitably, and that negative impacts are minimized. The framework will play a key role in guaranteeing sustainability in the short and long run.

Good policies must focus on the impact of bioenergy development on food security, the preservation of the environment and ecosystems, and the integrity and viability of the agricultural production system. Designing an agriculture strategy in UEMOA countries that incorporates bioenergy production can contribute significantly to:

- ***Accelerating economic development, employment, and income levels and thereby reducing poverty.*** Roughly 70% of the populations in UEMOA member countries depend on agriculture and/or forestry for their livelihoods and many are underemployed. Stimulating bioenergy production and raising overall agriculture productivity will provide jobs in rural areas: from growing or collecting the feedstocks to processing and distributing the bioenergy to final consumers. Bioenergy

production has the potential to improve rural livelihoods as well as boost overall economic growth in UEMOA member countries.

- Enhancing energy access, particularly among the rural poor.** Since less than 7% of the rural populations in the UEMOA have access to electricity, an investment in locally generated power can transform communities. IEA projections indicate that the large majority of the population will continue to rely on biomass, like wood, for the next three decades. At current per capita consumption rates, deforestation will accelerate and per capita access to energy will worsen. Thus, transforming this resource into a sustainable, renewable supply of modern bioenergy is crucial for ensuring access to energy in rural areas while slowing deforestation. Achieving this vision requires establishing local programs that promote biomass management, conservative use, replenishment through reforestation, better use of agro-forestry residues, and development of new crops. Rural communities can supply their own energy needs and consumers can purchase alternative energy at lower rates than imported petroleum—strengthening the local economy. Developing and promoting new, locally produced bioenergy products for cooking is a particular priority as reliance on traditional biomass accelerates deforestation and creates toxic indoor air pollution. Production of new fuels and better stoves can expand economic activities and improve human health and the environment.
- Improving energy security by diversifying the region’s energy mix, reducing demand for petroleum imports, and decreasing the impact of fossil-fuel price uncertainty on current accounts.** The rapid increase in petroleum prices creates an opportunity to switch from petroleum to locally or regionally produced bioenergy and reduce fossil fuel use and phase out fossil fuel subsidies in these economies.



- ***Diversifying and modernizing the agricultural sector to promote more efficient and productive agronomic practices—e.g., multicropping, intercropping, and cascading.*** Increasing the range of economically useful crops and taking advantage of agricultural residues allows small farmers to adapt to market conditions by switching between crops and exploring new niches. Locally produced biofuels could also support mechanization—and small scale irrigation, improving both production and yields. Crop residues can provide a source of fertilizer as well as energy—and small holders will need to balance both uses. Appropriate policies are essential, as are market structures, infrastructure development, credit facilities, and the transfer of technology and knowledge.
- ***Additional benefits include enhancing the role of women, improving health services, relieving pressure on forests and rangeland, and improving the use of waste streams.***

Nonetheless, several barriers that hinder advancement of bioenergy in the region must be addressed.

- ***Food and Fuel.*** Biofuel mandates in the developed world have been linked to rising food prices globally—resulting in demands that biofuel production be stopped. For countries dependent on fuel and food imports, such as those examined in this report, cost increases in both fuel and staple food imports threaten the very survival of the rural poor. Policies over the last two decades have favored export crops over basic food crops, exacerbating declines in per capita food production.

Conversely, policy changes that improve overall agricultural productivity and bring more arable land into sustainable use have the potential to improve food and fuel production. Capturing waste and residues for bioenergy also reduces the conflict between energy and food production.

- ***Water Availability.*** Water availability is essential for food security and sustainable agriculture. Sugarcane and cotton, for example, can create groundwater shortages given their high water demand. Water conserving techniques should be employed when and where production makes sense. Certain food crops, indigenous trees, and bioenergy feedstocks can improve water retention in fragile soils. Water scarcity and limited knowledge of underground aquifers in the

region demand careful study of local conditions when irrigation is expanded. Identifying how to use water, what technologies to deploy, and what to grow will be critical to success.

- **Land Tenure.** Land access will underpin successful agriculture and bioenergy development in the UEMOA. The current land tenure system fails to ensure the security of land ownership. Given the importance of access to land for growing agricultural or forestry-based feedstock, some experts fear that small producers may be forced off their land in favor of large or foreign producers. Protecting the interests of small farmers and balancing the needs of potential investors demand effective, fair land policies. Although beyond this report's scope, the UEMOA must identify "best practices" for land tenure and adopt them if rural development plans are to succeed.
- **Scale of Production.** A risk of bioenergy development is the tendency toward large industrial projects to achieve economies of scale. This approach works against small landholders and producers. Cooperative models merit consideration given their potential contribution to rural development and poverty alleviation—priorities for all the UEMOA member-country governments.
- **Lack of Infrastructure.** More roads, vehicles, equipment, and communications are needed to ensure market access and to expand cultivation in the UEMOA region.
- **Knowledge Base.** The widespread neglect of agriculture by policymakers in developing countries at the global, regional, and national levels since 1980 has created gaps in the knowledge base. Comprehensive, accurate data on land area potential, crop production potential, water availability, and agronomic techniques are essential for decision makers and farmers to improve performance in this sector. The current food price crisis underscores the need to invest in new information systems that will provide more timely data.
- **Research and Development Support.** Bioenergy research is in an embryonic state in West Africa. Research needs to expand to tap traditional knowledge, identify optimal growing conditions, assess environmental impacts, and determine production costs. Such research will pave the way for the introduction of second-generation feedstocks that promise greater productivity. UEMOA member countries have participated in several successful regional research alliances—this

best practice approach should be applied here as implementation proceeds nationally.

- **Climate Change.** West Africa is among the most vulnerable regions to climate change worldwide. A recent study has shown that global climate change impacts will reduce agricultural production in developing countries, led by Africa (see Box 3). Bioenergy offers significant potential for greenhouse gas emission reductions, however there are risks. Some bioenergy applications may actually generate net increases in emissions and these should be avoided. On the other hand, sound investments in bioenergy must contribute to developing resilience to potential climate impacts. Reforestation, afforestation, better forestry management, and watershed maintenance are as critical to this effort as producing new bioenergy crops.

The UEMOA member countries' challenge is to build upon the opportunities and remove the barriers in order to accelerate sustainable bioenergy development in the region.

### Box 3: Climate Change and Agriculture

In 2007, the Intergovernmental Panel on Climate Change released its Fourth Assessment Report, confirming that climate change impacts were accelerating and cautioning that developing countries will be the most vulnerable. In a country-by-country study of the global trends, Dr. William Cline concluded that all agriculture is likely to experience modest global damage and cautioned that assumptions that a "carbon-enriched" atmosphere would improve yields had yet to be proven. For sub-Saharan Africa, average losses due to climate change by 2050 were estimated at 17% of production and losses as high as 28% were possible, if the "fertilization effect" failed to materialize. Africa, in general, is among the worst affected regions in Cline's analysis. Clearly, production losses in this range would have severe implications for food and human security—underscoring the urgent need to adopt policies that can improve the resilience of agriculture to the potential impacts of climate change. These projections underscore the imperative to protect forests and natural watersheds—including grassland areas—as a first defense against climate change impacts—and to sustain and enhance agriculture productivity.

## POLICY AND FINANCE

In general, there are three key market drivers for bioenergy development in the UEMOA region to:

- Stimulate economic and rural development;
- Increase energy security; and
- Address climate change.

Realizing the region's bioenergy potential requires establishing effective policy and regulatory frameworks. To improve the investment climate for bioenergy and enhance collaboration with the private sector and members of civil society policymakers must design policies that support bioenergy markets and ensure predictability.

Bioenergy development will compete with food production unless policies are well designed. To avoid competition among alternative uses of valuable cropland, the state must carefully regulate production and land use. Adopting sustainable forestry practices and reforesting areas that currently produce fuelwood are a vital early step in expanding bioenergy resources and limiting competition with food crops. Policies must promote public understanding of the trade-offs between production of traditional biomass crops and food and strive to minimize competition. Dual-use strategies that promote using agriculture and forest residues for energy or the harvesting and processing of jatropha or other seeds for oil illustrate practices that may expand local options.

UEMOA policy initiatives can benefit from the experiences of other countries that have already established policy and regulatory frameworks to promote bioenergy power generation and fuels (see Box 4). The final combination of policies will inevitably be tailored to local circumstances. To date more than 60 countries worldwide—both industrialized and developing—have enacted policies to support clean energy power generation, including bioenergy. Furthermore, at least 37 countries have established mandates for blending biofuels into transportation fuels.

Policymakers in the UEMOA will need to reflect their own issues and priorities in policy formulation, with a particular emphasis on rural development. In addition to benefiting from the above experiences, activities should include collaborating with existing/future national and regional strategies and plans; focusing on land use planning and forest conservation and management; addressing water governance; identifying the best bioenergy crops; enhancing access to seeds and other critical inputs; and improving transport and infrastructure.

### Box 4: Policy Essentials for Success

Experience to date underscores that policies play a critical role in success or failure when expanding bioenergy use. The best policies provide or promote the following:

- Predictability, consistency, and longevity. Producers, investors, and consumers must have confidence that there will be a market—and a return on investment.
- Public acceptance and support—consumers must see the new products as equivalent to or better than the alternative—and local producers must share in the benefits through policies that protect access to land and ensure inputs are available and affordable.
- Pilot projects that demonstrate how best to produce and process bioenergy and illustrate the economic opportunities for small producers and processors. These programs must build human capacity at the community level to raise agriculture production and productivity and develop business planning skills.
- Commitment of officials at all levels to implement the policies.
- Sustained—and sustainable—demand for products. Producer incentives, risk reduction arrangements, and smart subsidies may all play a role in bioenergy development, but sustaining long-term production and use will be dependent on predictable demand and supply.
- Access to credit. Local banks and micro-credit institutions must be partners in financing production from the start.
- Policy coherence—for bioenergy to become a significant part of modern energy supply in West Africa, national and regional policies must reinforce each other. Common regional policies on feed-in tariffs, diesel and gasoline blending rates, and new standards for cooking fuels will be essential to create predictable markets and expand employment.
- Private and public investment. The private sector needs to provide credit—and possibly equity capital—to these activities. The public sector must provide policy support, information, training, financial risk mitigation, and support applied research. Brazil's agricultural research agency, EMBRAPA, developed new plant varieties and worked with farmers to identify the best crops. Similarly, West Africa's successful regional rice research program offers a model for bioenergy research and development. Joint work on conversion technologies is also important.
- Transparent governance, clear regulations, and limited administrative procedures are vital to contain costs.

Further, the UEMOA will need to address rural development issues in establishing bioenergy policies, including:

- Maximizing rural benefits of biofuels, including promotion of producer ownership.
- Decentralizing energy policies that focus on local production of biofuels aimed at improving economic resilience, particularly in remote areas.
- Promoting access to and transfer of bioenergy technologies.
- Encouraging access to micro-credit funding through soft loans and guarantees.
- Enhancing producer collaboration to achieve economies of scale and enable smaller-scale producers to engage and compete.

Financing for bioenergy projects and programs in the UEMOA member countries, remains a challenge. Agricultural sector financing remains weak in the West Africa subregion. Recent decisions, however, in the UN Climate process have made sustainable forest management a top priority for adaptation and mitigation financing. As access to start-up capital is a major obstacle for entrepreneurs and small producers, these new funds might redress this problem and provide urgently needed resources.

Entities that can collaborate on bioenergy development include UEMOA member country government agencies, local financial institutions, multilateral and bilateral agencies, international organizations, global partnerships, foundations, and the private sector.

## **BLUEPRINT FOR BIOENERGY, AGRICULTURE, AND RURAL DEVELOPMENT IN THE UEMOA — 2009 TO 2011**

As part of this report, a Blueprint for Action in the field of bioenergy has been developed for the period 2009 to 2011. This Blueprint was established by the UEMOA, under the framework of its Biomass Energy Regional Program (BERP), in conjunction with the Rural Hub for West Africa. Key activities are organized into five pillars: capacity building, policy, finance, market development, and technology transfer and research and development (R&D).



### PILLAR 1: CAPACITY BUILDING

For bioenergy markets to develop and deepen, capacity building is required in all areas of project and program design, development, implementation, and operation. This entails a long-term commitment, with activities focusing on individuals, institutions, and systems, and aimed at public, private, and nongovernment organizations. Capacity-building activities include:

- Train policymakers on policies and programs for accelerating adoption of bioenergy by small landholders.
- Integrate bioenergy into national development strategies in agriculture, forest conservation and sustainable use, poverty alleviation, energy, and rural electrification.
- Strengthen enterprises to source, integrate, install, operate, maintain, and service bioenergy systems; provide business training and incubation support.
- Train the finance and banking sectors (senior management/loan officers) on the risks/rewards of financing bioenergy projects, through pilot projects and programs that minimize initial investment risks.
- Provide training and technical assistance on standards for bioenergy development, drawing on international efforts in this area (e.g., the European Union, the Global Bioenergy Partnership, and the Roundtable on Sustainable Biofuels, among others).
- Provide training to governments and the private sector on the CDM and official and voluntary carbon markets.
- Conduct communications and outreach on bioenergy benefits/challenges, including consumer awareness campaigns.

## PILLAR 2: POLICY SUPPORT

Government support, in the form of policy, regulations, and/or incentives, has been instrumental in driving bioenergy markets worldwide. Key policy areas to address in the UEMOA are provided below; these should give due consideration to food security issues (see Box 5):

- Identify and develop pragmatic policy instruments, building upon lessons learned and experience from the UEMOA and other countries/regions. These should emphasize policies that promote local value-added, rural development, gender equity, community forestry, sustainable agriculture, etc.
- Consider establishment of national/regional targets and timetables for bioenergy development, to include issues of small farmers.
- Help establish regulatory frameworks at the national level to accelerate bioenergy development.
- Work with policymakers to link energy and agricultural priorities.
- Establish a lead organization in each national government to coordinate bioenergy activities across the interested ministries (e.g., agriculture, energy, rural development, finance, commerce/trade, and environment).
- Increase coordination and cooperation across Africa (e.g., the New Partnership for Africa's Development (NEPAD), ECOWAS).
- Establish guiding principles for land use development.
- Foster a regional market for sustainable bioenergy, to include cross-border trade.
- Engage the private sector in policy/regulatory development, including producer organizations, SMEs, cooperatives, etc.
- Address water rights.
- Monitor and evaluate the impact and performance of bioenergy activities at the national and regional levels.
- Apply the Bioenergy Evaluation Tool in assessing various bioenergy policies at the national and regional level.

### Box 5: Local and Regional Bioenergy Markets

UEMOA member states can speed this process by adopting new, common standards for modern biomass and bioenergy products—and promoting more efficient technologies. Charcoal, the most common form of biomass apart from firewood, is energy inefficient, creates toxic particulates, and is a potent contributor to greenhouse gases. Developing new, cleaner cooking fuels using sustainable biomass offers the opportunity to create employment in rural communities, raise incomes, and improve health. Combining this initiative with clean-burning, locally produced stoves offers even more benefits. Several pilot projects have focused on using combinations of agro-forest residues and/or animal wastes and have proven the viability of this approach. These programs should be scaled up.

Incorporating some portion of existing bio-oil production into diesel fuel through establishing a blending requirement (e.g., 2–10%) is a standard approach to reducing fossil fuel consumption and creating an additional market for local production. Lower-quality groundnut, palm, and cottonseed oils might be options for this practice. Pilot programs that use jatropha oil—a common hedging shrub with non-edible oilseeds—offer the most promise for village energy use, as the high-quality oil can run generators and small engines with minimal processing. Improving yields per hectare of this perennial plant holds promise for increasing oil production. Senegal is experimenting with mandating that a certain portion of cropland in each village be dedicated to jatropha production for local use.

Ethanol is already produced in the region, primarily from sugarcane. As diesel is the most common fossil fuel in the region, substituting ethanol for other oxygenates—including lead—could create a cleaner fuel and reduce petroleum demand. As Côte d'Ivoire produces and sells much of the refined product in the region and produces bio-oils and ethanol, it could work with its UEMOA partners to: 1) establish blending mandates for diesel and gasoline that would incorporate biofuels into the new formulations; 2) identify the best blending levels for the present—and work to increase them over time; and 3) jointly undertake market studies to determine how additional biofuel supplies could be produced in the region and used in the refining and blending processes.

Currently, all UEMOA countries subsidize petroleum products and electricity. The long-term objective would be to phase out such subsidies and reduce petroleum imports. This objective is achievable, but it demands a strategy and a commitment to use efficiency and conservation in combination with alternative fuels to achieve economic sustainability.

### **PILLAR 3: FINANCE**

Finance and investment are key to the growth and development of bioenergy in UEMOA countries. As the industry expands and develops, the scope and breadth of financing sources and instruments, both locally and internationally, must be increased. More creative leveraging of public and private sector resources will be needed to meet the financing requirements of the bioenergy industry, including from a variety of public and private sector sources. Activities to be conducted include:

- Engage local financial institutions and micro-credit agencies on bioenergy; conduct banker training workshops to increase awareness of bioenergy risks/rewards by investment officers and managers.
- Establish risk mitigation facilities to spur local financing for bioenergy projects, particularly at the small-scale level.
- Foster development of “bankable” project portfolios in bioenergy; offer assistance to entrepreneurs in areas such as R&D, seed capital funding, pre-feasibility and feasibility assistance, reimbursable grants, etc.
- Develop a Bioenergy Regional Fund to provide investment support, in conjunction with the ECOWAS Bank of Investment.
- Conduct donor coordination roundtables to brief current and prospective donors on UEMOA bioenergy activities and secure their participation.
- Explore opportunities for carbon finance at the national/regional levels.
- Engage the private sector in project identification and development and understand its issues/requirements with respect to financing projects in the UEMOA member countries.

### **PILLAR 4: MARKET DEVELOPMENT**

A number of near-term project and program opportunities exist for bioenergy development in UEMOA member countries and should be explored in more detail. Examples are provided on the next page. Pursuit of these efforts however, will require assessment of technical, institutional, financial, environmental, social, and economic considerations, as well as a review of related experience in other countries. The Regional Bioenergy Center proposed in Pillar 5 below is envisioned to serve as a source of information on these topics.



- **Wood, Waste, and Residues.** Forests comprise a major natural resource in UEMOA, covering 44.5 million ha. Due to deforestation and degradation, this resource is under severe pressure. Traditional biomass in West Africa includes fuelwood, wastes from timber processing, agricultural and other forest residues, and animal waste. These products comprise the largest source of primary energy consumption (73%) in the UEMOA area. Modern stoves and low-tech processing systems are key to make this resource sustainable and more efficient.
- **Combined Heat and Power.** CHP, or cogeneration, plants have considerable potential for application throughout UEMOA member countries. As CHP plants are relatively large-scale operations, they require a significant and reliable source of crop residues and sustainable woody biomass. This can be met through plantations, but could also be sourced from rural areas where the CHP facility could serve as a hub for rural electrification schemes.

- **Small-scale Biomass Gasification** is already being demonstrated successfully in several countries and could have applications in the UEMOA.
- **Sugarcane.** Bioethanol production from sugarcane is highly developed worldwide, making bioethanol the main biofuel used today. UEMOA has potential for expansion of production and use of bioethanol in sugarcane-producing countries. Programs can be designed to advance economic and social development, and increase jobs and raise income. Much can be learned from the experiences of other countries such as Brazil; research is needed to determine the best crop varieties given the unique needs, conditions, and resources in the UEMOA.
- **Biomass for Clean Cooking Fuels.** Improved cookstoves and feedstock programs (e.g., biogas, ethanol gel) can potentially free valuable time of women and children in collection of traditional biomass, while reducing health impacts and slowing deforestation. Widespread dissemination of improved cookstoves should be a priority.
- **Sweet Sorghum.** Sweet sorghum is a promising crop offering several benefits. Most notably it provides fuel (ethanol), power, food (grains), and fodder (leaves) and has a variety of rural, industrial, and commercial applications. Sweet sorghum is widely grown in the region.
- **Biomass for Rural Electrification,** to include agricultural processing and electricity generation. Liquid biofuels such as vegetable oils and biodiesel provide opportunities for power production at a relatively small scale and, in particular, for small and medium-size electricity grids at the village and community levels. There are large numbers of oilseed-bearing trees and shrubs available that do not compete with food production or land use and generate fewer environmental impacts. Solid biomass—from sustainable forest programs—can also be used. Effort is needed to organize grassroots organizations for collection, grading, and oil processing.
- **Diesel Displacement.** Adaptation of existing diesel engines to use biofuels has significant potential. Biodiesel lends itself to small-scale agriculture because it can displace diesel in both transport and electricity generation. Examples exist where women's groups, cooperatives, communities, and others have collaborated on biodiesel development for local applications.

### PILLAR 5: TECHNOLOGY TRANSFER AND R&D

Support is required for all aspects of technology research, development, demonstration, deployment, marketing, financing, operation, and maintenance. Further, continued emphasis on accelerating renewable energy R&D is critical to reduce costs, improve performance, and enhance competitiveness with fossil energy sources. Proposed activities include:

- Strengthen local data availability. Access to reliable timely data for bioenergy decision making—including policies, projects, and programs—is a major issue in UEMOA member countries and regionally. An inventory of data services and needs should be conducted and a “prioritized” listing of requirements compiled. The UEMOA member countries should coordinate on this effort with groups like FAO, IFAD, OECD, and others that are also looking at strengthening agricultural data systems in Africa and elsewhere.
- Establish/implement a Regional Bioenergy Center with information on policies, markets, technologies, costs, business models, applications, finance sources, standards and certification, etc. The Center should study traditional biofuels, new crops, including trees, and establish priorities for expanding sustainable use, where and when appropriate.
- Develop tools and toolkits to assist the public and private sector in bioenergy decision making.
- Conduct joint research efforts between local research institutions and industry, aimed at renewable energy applications and collaborative efforts to carry out renewable energy resource assessments.
- Combine efforts with industrialized countries to promote knowledge transfer and the development of appropriate bioenergy technologies for the UEMOA.
- Facilitate South-South collaboration and cooperation on sustainable bioenergy development and forest management.
- Conduct research on current/potential biomass supply and value chains, including forests, in the UEMOA member countries.
- Continue research on local issues related to bioenergy development such as land use, land tenure, soil conditions, socio-economic issues, etc.

## WHERE DO WE GO FROM HERE? MAKING THE TRANSITION TO GREATER PROSPERITY THROUGH BIOENERGY

Today, UEMOA countries face a crisis in three key commodities—food, wood, and fuel—essential to their development and future prosperity. Business as usual practices cannot address the situation. Past experience, innovation, and new practices in bioenergy offer an option for deprived rural communities. In addition, second-generation feedstocks and technologies will greatly expand the potential for broadening energy access and will be a foundation for increasing economic development.

The agricultural and forestry sector of the UEMOA relies on imports for a significant portion of its staples and is experiencing price rises in key import commodities (e.g., wheat and rice). More than one-quarter of the population is facing malnutrition, with women and children the most at risk. In the energy sector, less than 7% of the rural population has electricity access, with the majority reliant on traditional biomass for their heating and cooking needs and suffering from the negative social, economic, health, and environmental consequences.

Past policies and decision making, often shaped by foreign interests and donors, have left countries in this situation. Future policies, however, led by the UEMOA member countries and regional entities, and designed and implemented in partnership with foreign governments and the donor community, can reverse this course.

The experience of other countries, both developed and developing, has shown that effective agriculture and energy policies and programs can propel markets, increase agricultural production and productivity, and energize rural and urban areas. Yet, to be most effective, given the highly interrelated nature of the agricultural and energy sectors in the UEMOA, these policies and programs must be developed and pursued in a collaborative and comprehensive manner. The UEMOA's organizational structure, which combines the agriculture and forestry, energy, and rural development sectors under one entity, is an important model in this regard.

Better management and processing of traditional biomass resources and locally grown bioenergy can increase access to affordable, renewable, modern energy services in rural areas of West Africa while broadening the base for socio-economic development. Bioenergy has the potential to become an engine of growth for oil-import dependent UEMOA member countries, driving rural development, creating jobs, increasing food production, and reducing poverty. It can also help to stimulate

the transformation of traditional farmers into agricultural entrepreneurs. In the UEMOA, with an integrated agriculture and forestry program, food and fuel crops can be a win-win productive relationship that benefits the poorest of the poor.

Beyond poverty alleviation and increased food production, bioenergy can help achieve the MDGs in such areas as health, education, and gender advancement. Bioenergy can ensure the cold chain and support vaccination programs in rural areas with reliable refrigeration; improve children's studying due to electrical lighting; empower women by freeing them from firewood collection and crop processing chores; and improve health with modern biomass stoves. Biofuels advancement can help to reduce rising import bills—which can absorb more than 50% of the countries' export earnings—through substitution provided by locally produced, biogas, bioethanol and biodiesel. Further, use of improved cooking fuels and stoves can help to stem the region's deforestation.

While bioenergy opportunities are significant, the energy–agriculture crisis has brought into focus the daunting challenges facing the region. Home to many of the world's "bottom billion," water is scarce, electricity is dear, crop yields are erratic, and the temptation to migrate is strong.

UEMOA member countries still have the natural resources, the land availability, and the demand to develop bioenergy successfully as part of a broader agriculture and forestry strategy.

Bioenergy from agriculture and forestry-based products and byproducts can provide significant opportunities for diversification, added value, and further development of the agricultural sector in West Africa. Facing up to the challenges requires dedicated government commitment, increased data and knowledge to make sound decisions, enhanced policy and regulatory frameworks, financing facilitation, capacity building, institutional strengthening, technology transfer, and R&D.

UEMOA member countries and the Rural Hub share a common vision for a sustainable bioenergy future and a joint strategy for moving forward in their Blueprint for Action. International collaboration will be essential for implementation and intersectoral engagement will be imperative.

*For sources and bibliography please see the full report.*



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[www.hubrural.org](http://www.hubrural.org)

[www.unfoundation.org](http://www.unfoundation.org)

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