



Reducing Rural Poverty through Increased Access to Energy Services

A Review of the Multifunctional
Platform Project in Mali



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United Nations Development Programme

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A Review of the Multifunctional Platform Project in Mali



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Foreword

In working with the government of Mali on the multifunctional platform, UNDP has sought to promote an integrated, multidimensional approach to reducing rural poverty. Rural women who benefited from the platforms experienced a significant reduction in the burden associated with typical household tasks as well as savings in the time devoted to these activities, which have allowed them to engage in income-generating opportunities and improve their overall socio-economic position. In addition to these direct impacts on women, the impact study undertaken in 2001 showed that the multifunctional platforms also lead to improvements in water quality (which is no longer drawn from wells); the delivery of services by local health facilities; school attendance by girls; and job creation for rural blacksmiths, carpenters, and mechanics, all of which contribute to reducing poverty in rural areas.

Although it is not a solution to all problems, the multifunctional platform is a viable solution to reducing rural energy poverty given that the electricity grid is not expected to reach most rural communities within the next twenty years. While the Mali programme will require further support to improve the current approach and to ensure its sustainability, the demonstrated impacts of the multifunctional platform approach on poverty reduction and sustainable development have encouraged other countries in the West African region to want to develop similar programmes. Delegations from several countries (Burkina Faso, Burundi, Côte d'Ivoire, Ghana, Guinea, Senegal, and Togo) have visited Mali to learn from the multifunctional platform experience.

A regional programme is being initiated based on the Mali multifunctional platform approach to support the achievement of the Millennium Development Goals by 2015 in several sub-Saharan Africa countries. This assessment report provides a timely opportunity to consider improvements in the current approach and provide constructive inputs for the regional programme.

Together, I hope we can work to overcome the challenges of rural energy poverty.

Jocelline Bazile-Finley
Resident Representative
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The discussions in the report benefited significantly from an expert meeting held in Bamako, Mali, in December 2001 to review the draft report. UNDP is highly grateful to the participants in the meeting. We would particularly like to thank Youba Sokona, who shared his ideas and observations with us, and Alain Nickels and Georgios Anestis from UNIDO for their advice and co-sponsoring the meeting. Rosemarie Philips' contribution to the final text editing was greatly appreciated. We are highly appreciative to Communicances, Inc., for designing the report and its distinctive layout.

Special thanks are also due to Laurent Coche for his leadership in managing the entire review process, including co-ordination of the field studies from which this report emanated. Minoru Takada provided excellent guidance in the conceptual design of the field studies and substantive comments that shaped the contents of the report. UNDP would also like to thank Ines Havet for her contributions during the editorial and review process.

We are deeply indebted to Kalfa Sanogo who, as UNDP focal point for the multifunctional platform project in Mali, provided full support for the production of this report. Encouragement from Giuseppina Mazza, former UNDP Deputy Resident Representative in Mali, was also much appreciated. The entire efforts were co-ordinated under the overall supervision of Jocelline Bazile-Finley, UNDP Resident Representative in Mali, whose constant support was essential for completing this report.



Acronyms

ADEME	Agence de l'Environnement et de la Maîtrise de l'Energie
CAC	Cellule Appui Conseil
CERP	Centre d'Expansion Rurale Polyvalent
CNC	Cellule Nationale de Coordination / National Coordination
CNESOLER	Centre Nationale de l'Energie Solaire et l'Energie Renouvelable
CP	Centre Pilote de Conakry / Pilot Technical Center in Conakry
EDF-ACCESS	Electricité de France - Programme ACCESS
FCFA	Franc Communauté Francophone d'Afrique
GNP	Gross National Product
HDI	Human Development Index
hp	Horsepower
IFAD	International Fund for Agricultural Development
Kg	Kilogram
PAIB	Programme d'Appui aux Initiatives de Base pour la Lutte Contre la Pauvreté
PCSD	Programme Cadre du Secteur Privé
PPP	Purchasing Power Parity
RMS	Results Management System
RBM	Results Based Management System
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organisation



OVERVIEW

The relationship between energy services and development outcomes is complex and influenced by many factors: social, economic, and environmental conditions and capacity at individual, institutional, local, and national levels. An improved understanding about the factors shaping the relationship between energy services and development outcomes can significantly contribute to the design of better policies and programmes. Yet, to date, few attempts have been made to codify relevant field-level data and experiences.

This report reviews experiences of the multifunctional platform project in Mali and documents how modern energy services affect people's lives in terms of income, education, and rural women's status and health. In addition to showing on-the-ground evidence, this report presents analytical insights into key factors affecting the relationship between energy services and development outcomes. The analysis derived from field studies conducted between mid-2001 and early 2002 that evaluated data and documents available through the project management unit in Mali.

This study also assesses the relevance of the multifunctional platform concept to larger national/regional development policies and frameworks on energy for poverty reduction in Africa.

Rural Energy Challenges: A Key for Development in Sub-Saharan Africa

Energy services are indispensable for human survival and development. They play a critical role across the whole spectrum of development activities and are a powerful engine for social and economic growth. Indeed, increased access to reliable, affordable energy services can totally change the way the poor and women organise their time and lives, and be a strong means for them to combat social and economic threats that hamper the achievement of human security at the individual level. Government policies can play a critical role in providing increased access to energy services as well as incentives to investors to build delivery systems that make such services more widely available.

Currently, of the three billion people living in rural areas in developing countries, nearly two billion still have neither access to nor ability to pay for modern energy carriers such as electricity and/or liquid or gaseous fuels. The problem is particularly acute in sub-Saharan Africa, which includes 30 of the 49 least-developed countries. In these countries, per capita commercial energy use has remained static

since 1980. Although over 800 million people in developing countries as a whole benefited from rural electrification schemes during the period 1970-1990, only 20 million gained access in sub-Saharan Africa. Currently, significantly less than 10 percent of sub-Saharan Africa's rural population has access to modern energy carriers.

Limited access to modern energy carriers and the services they provide has a disproportionate effect on the poor, especially poor women in rural areas. It is most often women who must expend large amounts of time and physical effort to supply fuel for their household and productive needs, using their own labour to carry heavy loads over increasingly long distances, at great risk to their own and their children's health and safety. Women in rural sub-Saharan Africa are at the bottom rung of the so-called "energy ladder", which associates users of progressively cleaner, more efficient fuels with corresponding higher levels of income. Inadequate access to modern energy is both a determinant and a manifestation of poverty and inequitable gender relations.

The global community firmly recognises the centrality of energy services for achieving all Millennium Development Goals (MDGs). At the ninth session of the Commission for Sustainable Development (CSD-9), held in 2001, it was concluded: *"To implement the goal accepted by the international community to halve the proportion of people living on less than US\$ 1 per day by 2015, access to affordable energy services is a prerequisite"*. Building on the outcome of the CSD-9, the World Summit on Sustainable Development (WSSD) reaffirmed the criticality of energy services – in particular, increased access to reliable, affordable energy services – as the fundamental facilitator of poverty reduction.

Responding to the challenges African countries face, the New Partnership for Africa's Development (NEPAD) aims to increase energy access over the next twenty years from 10 percent to 35 percent of Africa's population, i.e., an increase in access to energy from 60 million people to 300 million. This goal is based on a clear recognition that energy services are critical in meeting most NEPAD development goals. In order to harness energy services as an engine for rural development and poverty reduction, however, the current energy situation in rural areas in sub-Saharan Africa, which exaggerates inequalities between the sexes and between the haves and the have-nots, has to be fully addressed. Table 1 summarises some of the many ways energy services can contribute to achieving the MDG goals and associated targets.

Table 1. Contributions of Energy Services to Achieving MDGs

The Multifunctional Platform Approach: Creating Opportunities for Economic Growth and Empowerment of the Poor

MDG Goals and Targets	Contributions of energy services to achieving Goals and Targets
<p>Goal 1: Eradicate extreme poverty and hunger</p> <p>Target 1: Halve between 1990 and 2015, the proportion of people whose income is less than \$1 a day</p> <p>Target 2: Halve between 1990 and 2015, the proportion of people who suffer from hunger</p>	<ul style="list-style-type: none"> ❑ Increased and diversified income for women through greater productivity in agro-processing using affordable, reliable energy services, and more time and energy to engage in income-generating activities ❑ Increased and diversified income for men through the above and through greater productivity with direct use of affordable and reliable energy services ❑ Increased and more diversified food production through the reallocation of human time and energy saved by women and girls in many tasks associated with daily food preparation ❑ Income to purchase food in food-deficit areas
<p>Goal 2: Achieve universal primary education</p> <p>Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling</p>	<ul style="list-style-type: none"> ❑ Increased school attendance as a result of affordable, reliable energy services replacing child labour ❑ Women's increased income helps to cover schooling costs (linked to Goal 1 as well)
<p>Goal 3: Promote gender equality and empower women</p> <p>Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005 and at all levels of education, no later than 2015</p>	<ul style="list-style-type: none"> ❑ Reduced labour, especially for girls, who benefit directly from the mechanisation of girl-specific tasks ❑ Relatively higher educational performance and attendance for girls as a result of less time spent on unpaid labour, making it more likely that they transition to secondary education ❑ As owners and managers of modern energy-based enterprises, women have greater leverage than previously in both community and household decision making ❑ More time for rest; physical and mental recuperation are essential for learning activities
<p>Goal 5: Improve maternal health</p> <p>Target 6: To reduce by three-quarters, between 1990-2015, the rate of maternal mortality</p>	<ul style="list-style-type: none"> ❑ Better energy services can improve access to better health, medical services ❑ Better energy services can help reduce workloads, thus contributing to improved health ❑ Modern energy services can replace the inefficient use of traditional biomass fuels, which cause indoor air pollution, a measurable cause of premature death (<i>WHO reports about 2 million annual premature deaths attributable to indoor air pollution, mainly due to incomplete combustion of fuels</i>)
<p>Goal 7: Ensure environmental sustainability</p> <p>Target 10: Halve by 2015, the proportion of people without sustainable access to safe drinking water</p>	<ul style="list-style-type: none"> ❑ Cleaner energy services can encourage better management of natural resources, including better water quality

Widening access to modern energy services can be a catalyst for sustainable human development. However, increased income is necessary to be able to afford needed energy services and release women's time and energy. This increased income is not possible without spending further time and human energy, already at very high levels. Such is the energy-poverty trap that women in sub-Saharan Africa, in particular, are struggling to get out of. The key response must be to combine mutually reinforcing strategies to reduce both income and energy poverty.

To respond to the energy-poverty challenge, the Government of Mali, with support from the United Nations Development Programme (UNDP) and the United Nations Industrial Development Organisation (UNIDO), has been implementing the multifunctional platform project since mid-1990. The project seeks to reduce rural poverty in general and that of rural women in particular, while creating income-generating opportunities through provision of affordable energy services. As of June 2001, a total of 149 platforms were operational in Mali¹, where the project intends to install platforms in 450 villages serving about 10 percent of the rural population by the end of 2004. The project has also expanded to other West African countries: Burkina Faso, Ghana, Guinea, and Senegal.

The multifunctional platform has a simple diesel engine that can power a variety of tools, such as a cereal mill, husker, and/or battery charger. The engine can also generate electricity for lighting and refrigeration and to pump water. The advantages of the engine are its simplicity and multiple uses. With its many functions, it can be used for a variety of services that can generate incomes for the group operating the platform. Because it is a very simple machine, its installation and maintenance can be handled by local artisans and spare parts are readily available across West Africa.

Installation of a platform is demand-driven. A duly registered women's association has to request it,

with the active support of the village community. But before a platform is installed, a social, economic, and technical feasibility study is undertaken by local project partners. The feasibility study provides the women's association as well as the whole community with information to make an informed purchasing decision, identifies potential partners, and establishes base line indicators against which platform results as well as development impacts at the village level can be monitored. After initial literacy training, the association elects a women's management committee, whose members are then trained in managerial and entrepreneurial skills to ensure the technical and economic viability of the platform.

At an estimated cost of US\$ 4,500 for engine, rice de-huller, stone mill, and housing for the platform as well as for feasibility studies, literacy training, and introductory business training for women operators, the platform is comparatively cheap to buy, install, maintain, and replace. Between 40 and 60 percent of the cost is financed by the women's association, often with financial support from the rest of the community; a one-time subsidy of approximately US\$ 2,500 is provided by the project. This amount fully subsidises the cost of feasibility studies, literacy training, and business training for women operators (about US\$ 1,000) and partially subsidises (40-60 percent) the cost of equipment and installation (US\$ 1,500). The project informs beneficiaries of existing financial and management-support facilities and facilitates access to credit in order to finance the platform. Depreciation and variable costs (operations, maintenance, salaries, etc.) are borne entirely by the women's management committee.

Impacts of the Multifunctional Platform Operation

The impacts of the multifunctional platform were reviewed using the conceptual framework of Villavicencio (2002) to determine its contribution to the sustainability of rural livelihoods. The findings

Multifunctional platform mounted with food processing devices.



¹ The number is at the time of a field study conducted in mid-2001. As of the end of 2003, over 300 platforms are operational in Mali.

suggest that the project has had great success in stimulating expansion of multifunctional platform-based rural energy enterprises and an astonishing level of positive impact on the lives of rural people:

- **Rapid expansion of access to energy services by the poor.**

The number of requests in Mali for multifunctional platforms is growing at an exponential rate, reflecting widespread awareness and appreciation of the positive impacts a platform can have on community and individual lives. In mid-2001, there were 149 platforms operation in Mali and the number is expected to reach 450 by end 2004, covering about 10 percent of Mali's rural population. Each platform is estimated to serve an average of about 800 clients per month, most of them women. Hence, in Mali, as of mid-2001, some 120,000 clients (per month) enjoy services that multifunctional platforms provide.

- **Income generation.**

Almost all platforms were successful in operating on a cash-positive and self-sustaining basis. Village case studies clearly indicate that the platform has positive cash flows from the first day after installation (see the example in Figure 2). Moreover, the

annual income per woman increases when the freed time is used for income-generating activities and when the multifunctional platform is used for productive activities such as rice de-hulling or shea nut grinding. In addition, the multifunctional platform provides employment (and new income opportunities) for women operating the multifunctional platform.

- **Freeing-up women's time.**

One of the most important impacts that the multifunctional platform has brought to women is the time to rest. For example, the aggregate time saved per women over a week in the processing of cereals amounts to an 8-hour working day. On ave-

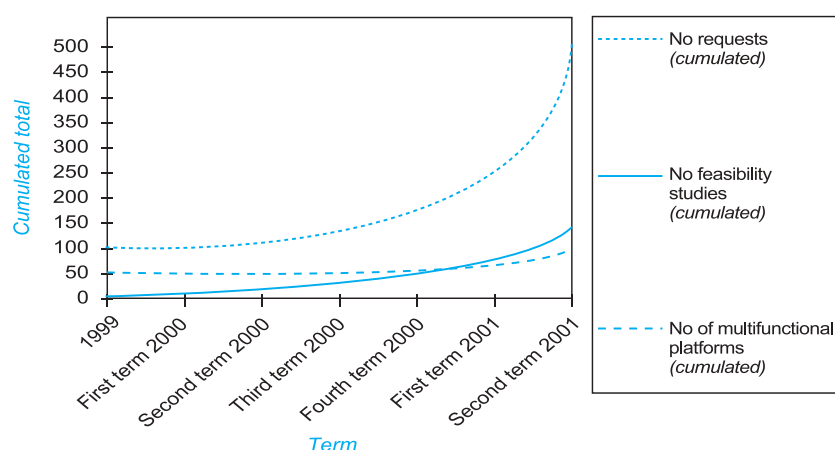
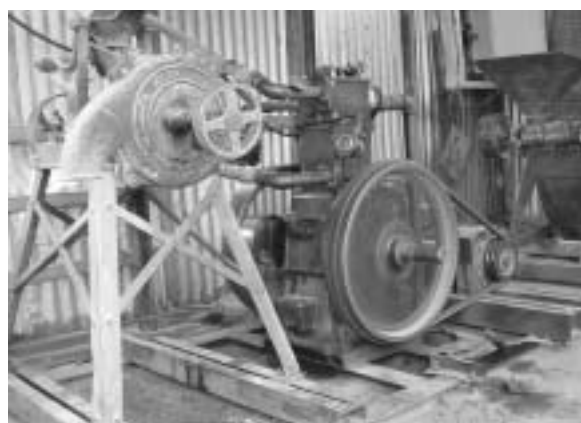
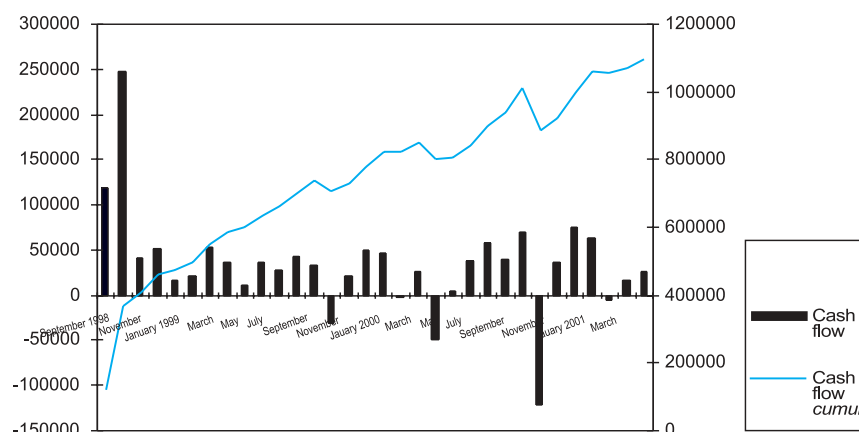


Figure 1
Cumulative multifunctional platform requests, feasibility studies, and installed multifunctional platforms, Mali, 1999 - June 2001.

Figure 2
Monthly cash flow and cumulated cash flow, FCFA, Balanfina.



rage, a multifunctional platform has freed 2 to 6 hours daily per woman depending on the services of the platform. The time saved can be interpreted in two ways: less time per task and/or less arduous tasks enabling other activities to be done. The equipment allows women more choices in determining the uses of time and energy that they desire and are willing to pay for.

Moreover, the “invisible” time and energy spent on repetitive work is made visible for all group members, as women re-organise their allocation of time and gain social as well as economic recognition for the work they do.

- **Increased access to education by girls.**

Girls handle domestic chores (cereal grinding) generally from the age of eight and even earlier for water carrying. Platforms have provided alternative means for the villagers to handle the tasks that would otherwise be handled by the girls and thus have released them from burdensome tasks. The results have been an increased level of girls’ attendance in primary school and improved school performance. The positive impacts on girls’ education are among the most visible, appreciated, and profound impacts the multifunctional platforms have produced thus far.

- **Financial sustainability.**

Multifunctional platforms help to reduce seasonal liquidity problems and mitigate adverse shocks (e.g., natural, economic, or political disasters) in rural communities by improving health among community members, generating additional non-farm

income during the dry season, raising the total net income of households, and empowering women to participate in economic decision making. Despite seasonal needs and low ability to pay for the services, all multifunctional platforms for which data were available have positive cash flows. However, the extent to which individual platforms achieved financial sustainability still varies widely. Figure 3 provides an example of a monthly balance sheet.

Key Challenges of Scaling-Up

Results of the multifunctional platform initiative in Mali demonstrate concrete linkages between the number of modern energy services a platform delivers and a range of interlinked poverty and development outcomes. Lessons thus far have shown that multifunctional-platform-based energy enterprises can significantly help eradicate root causes of human insecurity such as income poverty and gender inequality.

The multifunctional platform approach in terms of content and process offers real scope for expanding access to needed energy services for the poor and enhancing development prospects. It presents effective ways to achieve NEPAD objectives and Millennium Development Goals based on a bottom-up approach originating from the communities themselves.

In scaling up the multifunctional platform project, a number of constraints need to be overcome and opportunities exploited if multifunctional platforms are to contribute significantly to sustainable development.

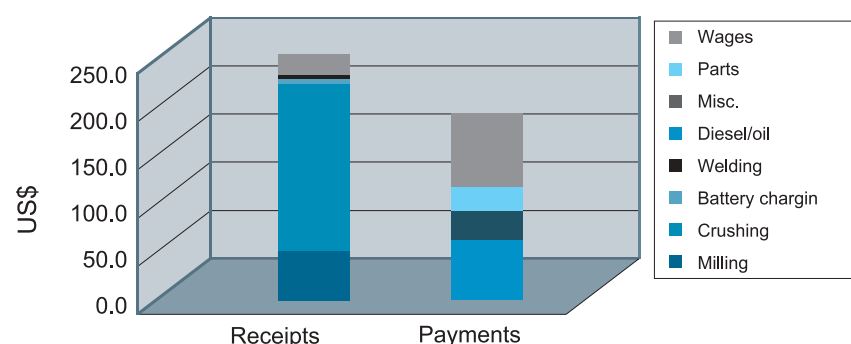


Figure 3
Balance sheet of the multifunctional platform operation at Kondogola, Mali, October 2000.

Source: Multifunctional Project Management Team in Mali.

- **Improving policy co-ordination.**

Although there is considerable knowledge and awareness of the platforms in Mali, there is little evidence that the concept is being integrated explicitly into national energy, industrial, or other sectoral development plans. How a focus on provision of energy services for the rural poor can be an effective point of entry for cross-sectoral policy co-ordination is poorly understood. For example, national poverty reduction strategies do not address time and human energy poverty. Enhanced data analysis is needed to help monitor the project's achievements in terms of changes in income, schooling, the way women spend time, etc. Case studies should be set up to analyse how the energy freed by the platform is spent and to create an indicator of human energy; this analysis should be done in collaboration with Mali's National Direction of Statistics and Information. Enhanced data analysis and use will not only contribute to monitoring multifunctional platform outcomes, but also support integration of rural energy concerns into national strategies on gender equity and health promotion.

- **Developing an institutional framework.**

There is no available institutional framework for analysing the multifunctional platform's cross-sectoral approach. Often, there is no clear policy or institutional framework for decentralised energy supply for rural areas. A significant challenge is identifying and working with appropriate legal and institutional mechanisms to build the capacity to scale up and replicate the platform approach. Building competence and capability to mainstream the platform approach into existing public and private institutions at meso and macro levels in ways that are sustainable also poses a significant challenge.

- **Diversifying opportunities for income generation.**

If the multifunctional platform's potential to break the energy-poverty trap is to be met, it will need to stimulate significant income-generating capabilities. But local markets, serving poor customers, have limited scope for revenue growth. Diversification of productive activities combined with better marketing of products produced in the village to consumers within and outside the village is an under-exploited opportunity to increase local value-added and generate economic growth. The multifunctional platform project must remain flexible in its implementation approach and technology selections to meet new rural needs.

- **Diversifying energy sources.**

The multifunctional platform's use of diesel is an obstacle to acceptance within environmental management and sectoral programmes that favour renewable energy technologies. At the same time, at least one platform has demonstrated that the engine can run using locally available biomass, the *jatropha curcas shrub*, whose nuts can be converted into liquid fuel. The potential for wider use of *jatropha* as well as other biomass resources should be examined, along with their income-generating and environmental regeneration potential.

- **Creating markets.**

The platform approach favours private sector development based on an effective marketing strategy. This, in turn, implies being able to achieve a high volume in a given area. However, local rural industrial markets are narrow and the rural technical skill pool is very weak. The approach should focus on developing market clusters, including measures to increase public-private partnerships.

- **Enabling access to financial instruments.**

Responsibility for easing transaction and information costs of many small loans to widen access to credit still rests with national financial institutions. There are no intermediaries at present with knowledge and know how in managing energy loan programmes at the local level. In order to facilitate access at the community level to financial instruments such as micro credit, the capacity of both the users (community) and the suppliers (financial institutions and other venture businesses) needs to be reinforced.

- **Building individual and institutional capacities.**

The multifunctional platform project has shown that rural women, given appropriate training, are fully capable of managing business operations. Yet the project has also identified a number of major knowledge and capacity gaps in national institutions that would be needed for scaling up rural energy initiatives. It is therefore necessary that the project devote more attention to training selected government and nongovernmental organisations not just in conducting feasibility studies, but in managing the whole process. This includes working with financial institutions to make loans accessible, monitoring and evaluating the platform's impact, and co-ordinating policy dialogues and advocacy.

1. INTRODUCTION

1.1 What is the Multifunctional Platform?

The multifunctional platform consists of a source of mechanical and electrical energy, provided by a diesel engine of 8 to 12 horse power (hp), that is mounted on a chassis and to which a variety of end-use equipment can be added. The configuration of equipment modules – such as grinding mills, battery chargers, electric water pumps, vegetable or nut oil presses, welding machines, carpentry tools, and mini electricity grids for lighting – is flexible and can be adapted to the specific needs of each village. Technically, it provides decentralised energy services to rural populations. However, the platform concept as implemented in the current project is much broader than merely the technology.

Some 50 to 80 percent of the population in Africa live in rural areas where the level of infrastructure is very low and women are trapped in a daily grind of searching for energy as well as producing, transporting, and processing food for their husbands and children. This report examines the multifunctional platform's potential as a tool for liberating women's energy and serving as a dynamic catalyst for sustainable development and rural transformation in Africa.

1.2 Objectives of the Review

The main objectives addressed in this report are to review and document experience to-date of multifunctional platform initiatives. First, multifunctional platform initiatives are assessed in terms of their performance and how well they have succeeded in meeting and advancing development objectives. The assessment includes impacts at micro, meso, and macro levels; implementation strategies and tools; and potential replicability. Second, the relevance of the platform concept to larger national/regional development policies and frameworks on energy for poverty reduction in the context of Africa is assessed. This includes the platform's potential to accelerate provision of affordable and needed energy services and to advance poverty reduction objectives.

1.3 Methodology

The review team, composed of Abeeku Brew-Hammond (team leader) and Anna Crole-Rees, began with a desk review of available documents on the multifunctional platform project, followed by a field review in Mali and in Burkina Faso from September 5 to 19, 2001.

The review methodology consisted of the following:

- Desk reviews of available documents for countries with multifunctional platform projects (Mali, Burkina Faso, Côte d'Ivoire, Guinea, and Senegal).

- Interviews with project beneficiaries, as well as with public and private sector partners, in Mali and Burkina Faso. The mission team used a simple set of guidelines for the interviews, which were conducted either individually or in groups.

- Case studies of three villages in Mali with multifunctional platforms. Two of the villages, Balanfina and Sampara, were visited. The mission conducted group interviews in each village with the community as a whole and then separately with the women and the men (Appendix A). Data from these villages were also collected from the project database to allow for some quantitative analysis. It was not possible to visit the third village, Maurolo, but data for this village were collected and analysed because of the relevance of this multifunctional platform for biofuels use, since it is the only one in the UNDP project to operate solely on jatropha oil.

Project personnel encountered several constraints during the mission, primarily because of time limitations:

- Experience in three out of the five countries participating in the current regional project had to be assessed mainly from secondary data (project/mission reports).

- In the two countries visited, none of the local partners involved in the technical and socio-economic activities (artisans, nongovernmental organisations, etc.) could be met.

1.4 Structure of the Report

This report is structured as follows:

- Chapter 2 discusses the origins of the multifunctional platform project and the platforms implemented as of June 2001. The Mali project is described, as well as the role and purpose of the subsequent regional project.

- Chapter 3 reviews and documents experience to date of the platform initiatives in meeting and advancing development objectives in Mali and other West African countries. It first briefly describes a conceptual framework and then uses this framework to assess benefits and impacts of multifunctional projects in rural areas within the framework of on-going projects.

- Chapter 4 reviews policies within the region in the sectors relevant to the platform concept. It then discusses the potential contribution of the concept to sustainable development and rural transformation in the region. Finally, it highlights the key issues to be taken into account in the formulation of an expanded regional multifunctional project in sub-Saharan Africa.

- Chapter 5 offers a brief conclusion.

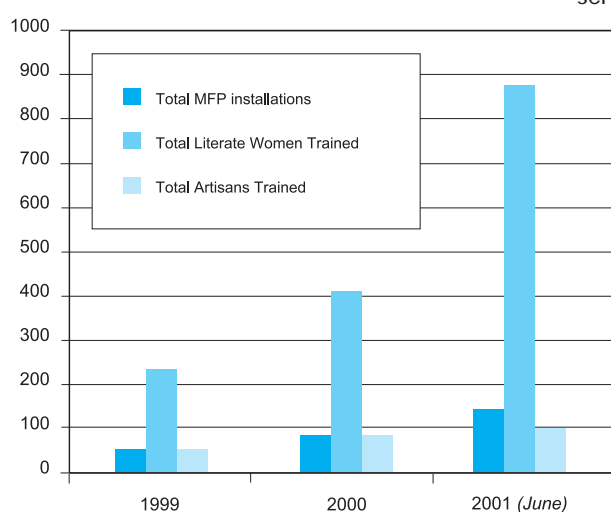
2. OVERVIEW OF PLATFORM INITIATIVES

2.1 Origins of the Multifunctional Platform Concept

Efforts to adapt the conventional grain-milling machine to the local environment and respond to the challenges of the time may be traced back to a project started in Mali in the late 1980s by the German development agency GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit). The project sought to use vegetable oil derived from *jatropha*¹ seeds as an alternative to diesel fuel in the engines that powered the milling machines. The project was terminated in 1996 when cost comparisons between *jatropha* oil and diesel fuel showed *jatropha* to be more expensive than diesel.

The idea of a multifunctional platform as we know it today was first put forward in a regional project developed jointly by the United Nations Industrial Development Organization (UNIDO) and the International Fund for Agricultural Development (IFAD)². The project was implemented in two West African countries, Mali and Burkina Faso, from 1993 to 1995; it was aimed at reducing time spent on the repetitive and energy-intensive domestic non-reproductive tasks allocated to women, such as grinding, de-hulling, and water fetching. Experience showed that existing grinding mills in the traditional private sector were costly and their services not adapted to women's need.

The project was designed to target women as prime beneficiaries; female ownership and management were made conditions of the project. The project was based in Sikasso, a town located in the southern part of Mali not far from the Burkina Faso border. The multifunctional platforms installed in this project used diesel. Four platforms were installed in Mali, and six in Burkina Faso.



Source: Project data.

¹ *Jatropha* is known in French as *Pourghere*.

² The Chief Technical Adviser for this UNIDO/IFAD project was Mr. Roman Imboden, a Swiss national, who is credited with the first elaboration of the multifunctional platform concept.

³ Data provided by Mali Project, Sevare.

⁴ The UNDP Mali Project Manager is Mr. Yaya Sidibe.

2.2 Platform Initiatives in Mali

In 1996, UNDP and the Government of Mali began providing support to existing platforms and set out to install diesel-fuelled multifunctional platforms across Mali. The project base was moved from Sikasso to Sevare, a more central location in Mali, and two international consultants were brought in to assist in the technical and socio-economic aspects. A participatory evaluation exercise was undertaken in 1998 to assess the strengths and weaknesses of the platform operations and to reassess the project's objectives and strategy.

In 1999, the project was transferred to the Government and became a nationally executed project, located within the Department of Industry and Commerce. By the end of the year, a total of 48 multifunctional platforms had been installed in Mali³. One of the platforms used only *jatropha* oil and was believed to continue to do so at the time of the review. By end 1999, 240 women had been successfully trained in functional literacy programmes organised by the project as part of the platform development process and 47 male artisans based in rural areas had been trained in mechanical and electrical installation, maintenance, welding, etc. (Figure 1.1).

Following the participatory evaluation exercise, a new UNDP/Government of Mali project (MLI/99/001) started in 1999 and is scheduled to end in 2003⁴. This project recognises the multifunctional platform's potential as an engine of development and poverty reduction for the rural community as a whole. Its primary aim is to reduce poverty in rural areas in general and that of rural women in particular, while creating income-generating opportunities through the provision of affordable energy services.

Figure 1.1
Multifunctional platform installations and women and artisans trained, Mali, 1999-2001

Thus the project seeks to improve living conditions in villages through direct and induced effects of multifunctional platforms, notably the time savings, energy production, and associated income generation, plus the provision of lighting and potable water, which have immediate consequences for health and education. The project is aiming to install a total of 450 multifunctional platforms by 2004, out of which 150 are expected to feed into water and electricity networks.

From the beginning of the year 2000 to mid-2001, the Mali project installed close to one hundred new platforms and trained hundreds of additional women and dozens of rural artisans. It is estimated that, as of June 2001, a total of 149 multifunctional platforms had been installed in Mali and that 862 women had been trained in functional literacy and 98 artisans had been trained in various technical and income-generation activities associated with the platforms (Figure 1.1).

2.3 Initiatives at Sub-Regional Level

As stated, the multifunctional platform concept was first launched within the framework of a UNIDO/IFAD sub-regional project implemented in Mali and Burkina Faso around the mid-1990s. The current sub-regional project (RAF/099/013) started in October 1999 under the auspices of UNDP. The project is based on the experience gained in the on-going UNDP-funded Mali project, as well as the experience in Burkina Faso, and it covers five countries: Burkina Faso⁵, Côte d'Ivoire, Guinea, Mali, and Senegal.

The main aim of the UNDP sub-regional project is to develop technical capacity in the participating countries for initiating, operating, managing, and replicating multifunctional platform projects. In addition to expanding the Mali project to four additional countries, the goal is to develop a database of methodological, technical, financial, economic, and social information. The database will a) ensure the transfer of knowledge and competencies, b) disseminate information on the various national projects, and c) increase understanding and awareness of the MFP concept and approach and its potential to reduce rural poverty.

The sub-regional project, funded primarily by UNDP, has additional funding from UNIDO, IFAD, the French Agency for Environment and Energy Management (ADEME), SHELL Foundation, Electricité de France - Programme ACCESS, Afriques Initiatives, and the French Ministry of Foreign Affairs. The project has indeed launched platform projects in four countries, with eight pilot platforms installed in Guinea and one each in Burkina Faso, Côte d'Ivoire, and Senegal. A database management system has also been developed and several fora have been organised to facilitate the transfer of knowledge and exchange of experiences.

Nevertheless, as discussed in chapter 3, much more work needs to be done in the four additional countries. Many other African countries have also expressed interest in having multifunctional platform projects, necessitating a careful review of the achievements to date and elaboration of specific strategies, as detailed in chapters 4 and 5.



⁵ The UNDP/IFAD multifunctional platform project in Burkina Faso was interrupted in 1995, and started again in 2000 with support from the regional project, which was originally designed to include Chad instead of Burkina Faso. The switch was made because of strong interest shown by Burkina Faso and because of political problems in Chad that made it difficult for the project to continue in that country.

3. ACHIEVEMENTS TO DATE

3.1 The Multifunctional Platform Concept

The multifunctional platform concept aims at enabling rural communities – and women in particular – to get out of the energy-poverty trap and have affordable and sustainable modern energy services (Burn et al., 2001).

The multifunctional platform has a simple diesel engine that can power different tools, such as a cereal mill, husker, and/or battery charger. The engine can also generate electricity for lighting and to pump water.

Development and installation of a multifunctional-platform-based energy enterprise generally occurs through the following eight-step process.



Multifunctional platform mounted with food processing devices.

1. Assessing demand and selecting a women's group.

To maintain an explicit focus on rural women, the project only responds to firm requests for a platform from rural and duly registered entities such as a village women's association.

2. Conducting participatory pre-feasibility and feasibility assessments.

Before a platform is installed, participatory social, economic, and technical feasibility studies are undertaken. These assessments/self-evaluations are undertaken in two phases. First, a relatively short assessment is undertaken to determine whether the basic conditions for multifunctional platform to perform are present. Once the first assessment confirms the potential for a self-sustaining multifunctional-platform-based energy enterprise in the village, a full participatory assessment is conducted to confirm social and economic viability. This assessment covers a wide spectrum of issues, such as economic status, women's time use, social and gender balances, technology choices to meet the existing and potential market needs, etc. This extensive assessment enables the platform's purchasers and the potential clients of the multifunc-

tional platform to decide based on informed choices and clearly identified partners; it also establishes a social and economic baseline against which results can be tracked. From the initiation of the first assessment to the final decision by the community itself, the process may take anywhere from a few weeks to three months depending on local conditions.

3. Configuring the multifunctional platform to fit the community's needs.

The clients of the end-use equipment and the purchasers themselves determine the type and level of energy services they are willing and able to pay for, based on the outcomes of the feasibility assessments. The configuration of tools installed is thus village-specific. Between 40 and 60 percent of the cost is financed by the beneficiaries themselves; a one-time subsidy to cover the rest is provided by the project. All depreciation and variable costs (operations, maintenance, management, salaries, etc.) are borne entirely by the women's management committee out of the business profits from the platform. Thus the feasibility assessments, which provide a business plan, are configured to be very precise to facilitate the villages' decisions. The project informs villages of existing financial and management-support facilities and facilitates access to credit.



Community energy and development priority setting in a village in Mali.

4. Establishing women's ownership and management.

Once the feasibility studies have confirmed the full viability of a platform operation in the village, the women's association, which has submitted the request and already mobilised funds to acquire the platform, establishes management mechanisms to ensure ownership and smooth implementation. The association elects management committee members who will oversee platform operations, schedule the work, distribute benefits arising out of the platform operation, and develop a mechanism to address any potential confrontations that may arise.

5. Building women's capacity to operate the multifunctional platform.

Members of women's associations are trained in managerial and entrepreneurial skills to ensure the technical and economic viability of the platform. This is a critical component of the platform approach – ensuring that the business is led by and works for the women who operate it.



Agricultural products grinding has a lot of demand in villages in Mali.

6. Implementing a business approach.

Once a platform with the selected equipment is installed and women's association members have gained the necessary knowledge and confidence to manage the platform, a market-based business approach is adopted. The women's association develops a business strategy for its multifunctional-platform-based rural energy enterprise (pricing of services, etc.), with advice from project staff on an as-needed basis.

7. Building the capacity of local artisans.

The project identifies, networks, and strengthens the capacity of existing mechanics and artisans to service platforms. All technical operations required by the platform – including purchasing, installation, repair, and maintenance – are handled by the private sector.

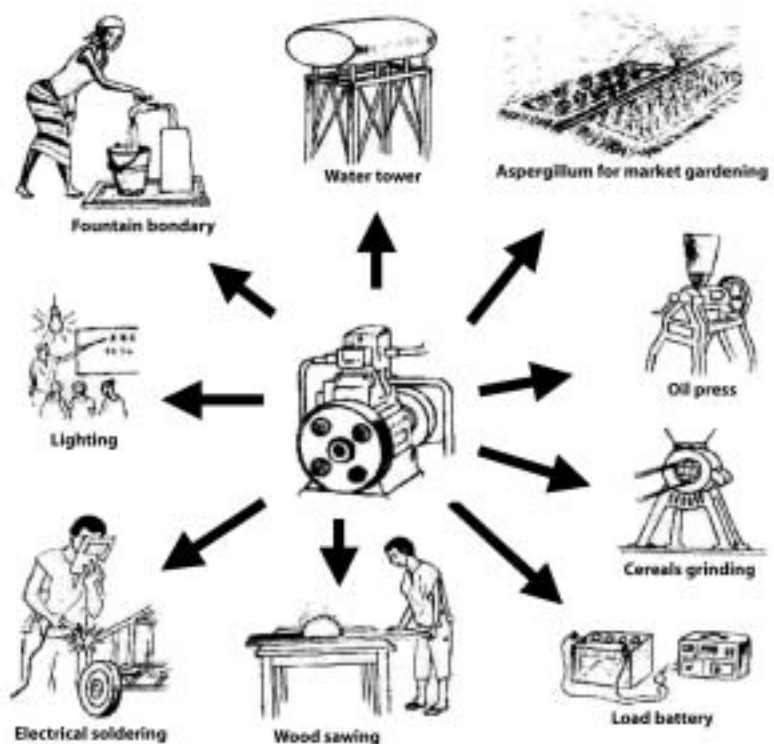


Local artisans installing a generator on a platform.

8. Monitoring and evaluation.

Several tools have been developed to assist major stakeholders in monitoring the multifunctional platform and its socio-economic impact at the household and community level. Such tools make it possible to track economic and social development in the village. Transparent collection of data makes it possible to pinpoint both deficiencies (e.g., discrepancies between cash on hand and cumulated cash) and successes (e.g., the cumulated cash flow).

Multiple applications a multifunctional platform can provide.



3.2 The Conceptual Framework

Reviewing the achievements to date of the multifunctional platform concept is a complex task involving examination of the activities and impacts of, and the benefits to, various end-user groups and stakeholders at the micro, meso, and macro levels. The review begins at the micro level, not only because end-users are the prime target, but also because it facilitates better understanding of the needs at project level.

At the micro and meso levels, the review's conceptual framework relies heavily on the conceptual framework developed by Villavicencio (2002) and the project's concept paper (Burn et al., 2001). Villavicencio combines concepts from different approaches ⁶ and develops criteria to assess the contribution of a new technology to the various dimensions of rural development, namely, to the sustainability of rural livelihoods and to the viability of the technology within the rural context. Table 3.1 summarises the criteria developed by Villavicencio and adopted in this report.

Two elements have been added to Villavicencio's framework to analyse the multifunctional platform. First, gender aspects are included to allow for heterogeneity in the rural population; differences among men, among women, as well as between women and men are all part of the analysis. Second, issues related to the implementation of multifunctional platforms are included.

Implementation methodologies are reviewed based on interviews and available documents. The opportunities for biomass-derived fuels are discussed separately.

3.3 Impacts and Benefits

3.3.1 Sustainability of the Multifunctional Platform

Affordability

The affordability criterion assesses the capacity of the end-users to pay for acquisition of the multifunctional platform on the one hand and ongoing services on the other hand.

Installing a basic multifunctional platform, with an engine, rice de-huller, stone mill, battery charger, and housing, including the feasibility study and training for the women, has an average cost in Mali of 2,800,000 FCFA (Franc Communauté Francophone d'Afrique), equivalent to about seventeen times the yearly GNP per capita ⁷. The cost of a water network and/or an electricity network is much higher and varies widely according to its specific local characteristics.

Instead of looking for an entity within the community requesting the multifunctional platform that can afford to pay for it, the strategy is to make ownership by a women's association a condition of the project. This might decrease affordability, since

Table 3.1 Sustainability Criteria

	Sustainability Criteria	
Orienteur (sustainability dimension)	Sustainability of the affecting system <i>(viability of the technology in the rural context)</i>	Sustainability of the affecting system <i>(contribution of the technology to sustainable rural livelihoods)</i>
Existence	Affordability	Sustainability and urgency
Effectiveness	Efficiency	Effectiveness and efficacy
Freedom of action	Freedom from risk of obsolescence	Resilience
Adaptivity	Flexibility	Diversification
Coexistence	Technological capacity	Environmental protection

Source: Based on Villavicencio, 2002.

⁶ Villavicencio (2002) makes use of the following frameworks : the Sustainable Rural Livelihoods, the Co-Evolutionary Technological Change, and the Systems Orientation approaches.

⁷ The FCFA'S value in recent years has fluctuated between 500 and 700 FCFA per US\$. Based on the median value over time, 2,800,000 FCFA is approximately US\$ 4.500.

women tend to have less access to income and resources than men (see, for example, De Groot and Coulibaly, 1996), as well as less bargaining power.

Several measures have been taken to increase affordability. First, the project provides grants of about US\$ 1,500⁸ for the basic module and installation, which represents around 40 to 60 percent of the total basic equipment cost⁹, provided that the ownership condition has been fulfilled. The size of the grant for a particular village is determined after taking into consideration the cost of the basic module and the village's ability to mobilise its resources (economic, physical, and social). Villages vary in size and in social, technical, and economic potential¹⁰.

Second, the up-front cost is often lowered with the help of other members of the community, for example, a men's association from the village or, in some cases, a village member who has emigrated. In Sampara, for example, the women's association paid 38 percent of the 2,430,000 FCFA, the men 12 percent, and the project the remaining 49 percent (see Appendix A).

Third, specific arrangements can be made. For example, in one village (Maurolo), due to the particular low resource level of the women, the project suggested a payment in-kind, namely 10 tonnes of *jatropha* seeds. This was possible due to the project's and the villagers' willingness to test the use of biomass-derived fuels in the pilot phase (Coche, personal communication).

Fourth, the project is developing a website to enable potential benefactors anywhere in the world to target particular villages, an entire platform, or any combination of end-use equipment.

Fifth, existing collective and/or private infrastructure, such as a small house, a mill, etc., can reduce the investment cost since it can be combined with the multifunctional platform.

Finally, the use of credit institutions is currently under consideration. The feasibility study can be used as a business plan, but this approach nevertheless faces several challenges, including the need to find collateral accepted by formal institutions. Currently, cotton produced by men is used as collateral to obtain credit for agricultural inputs and

equipment in cotton-producing areas. Among local informal credit institutions, with limited financial resources, the amount of credit required to set up a multifunctional platform might be a significant constraint to their lending.

The project characteristics that increase affordability are the requirement that it be demand driven and the feasibility study. Both ensure the community's willingness to accept the multifunctional platform concept and its ability to afford the initial investment, the services, and the need for ongoing sustainable management in the long term.

Currently, the rate of multifunctional platform "affordability" for all of Mali is 96 percent, that is, according to project data, 96 percent of requests for the implementation of a multifunctional platform have met the affordability criteria. This "affordability rate" might become lower with time and growing demands. First, the geographical expansion of the multifunctional platform to regions with fewer resources, such as in the north of Mali, might limit affordability or increase the amount of time needed to save the required financial contribution. Geographical variations within Mali and within the region could not be analysed. Second, if the project contribution is reduced, this, too, might affect affordability in the future.

Prices of the services are set to ensure the financial sustainability of the multifunctional platforms as well as maximum affordability for local end-users. Prices are similar to those of the traditional cereal mills. Prices for milling and de-hulling are between 20 and 50 FCFA/unit, the unit being a tomato tin or similar container. Other prices are the following:

- 9 to 16 FCFA/kg for milling
- 10 to 22 FCFA/kg for de-hulling
- 22 FCFA/kg for shea nut grinding
- 4 to 8 FCFA/litre for water
- 1,500 FCFA/hour for energy (water, electricity, and soldering)
- 500 FCFA/battery for battery charging.

The participatory evaluation in 1998 estimated for six village case studies that 40 percent of the women used the platforms for milling (Burn, 1998). This corresponds to one woman from each household. In Anakaga, all households had access to pumped water (Crole-Rees and Burn, 2001).

⁸ Note that the cost for feasibility studies, literacy training, and introductory business training for women operators, which amount s to about US\$ 1,000, is additional and is borne entirely by the project.

⁹ The choice of equipment is flexible and demand driven. The basic platform equipment includes engine, mill, de-husker, and housing for the platform, and costs about US\$ 3,000. In many villages, people opt for additional equipment, such as a generator and battery charger, pushing the total equipment cost up to US\$ 4,500. In these cases, the subsidy from the project goes up proportionally, i.e., up to US\$ 2,500.

¹⁰ For example, the average population size of 38 villages was 1,249 inhabitants (with a range of 100 to 4,000). Agricultural potential (crops, yield levels) varies according to soil fertility and agro-climatic characteristics. Differences in cultural values also impact the ability of villages to mobilise resources.

According to the data from the three case studies analysed in this review, namely Sampara, Balanfina, and Maurolo, the multifunctional platforms average 698 client visits per month. The same data suggest high variation among villages and by season. Maurolo, a small village with 18 households, indicates 446 client visits per month on average for 14 months, with a minimum of 317 and a maximum of 699 in the twelve-month period May 2000 to April 2001. Balanfina, a larger village with around 1,300 inhabitants, shows an average of 558 client visits per month (with a range of 130 to 1,091 client visits per month) in the same period. Figure 3.1 shows both the average number of client visits and expenditures per visit in Balanfina. It suggests that use of the multifunctional platform services, as well as the amount spent, varies by season. The number of client visits is lower during the dry season and higher during the rainy season while expenditure per visit shows an opposite pattern. While expenditures spent per client average 296 FCFA per visit, clients spend less than 100 FCFA per visit during the rainy season¹¹ and more than 300 FCFA during the dry season. This clearly indicates the need to distinguish between need and affordability. Milling needs are much higher during the harvest season, when external workers helping in the harvest have to be fed, men and women's time is scarce, and energy needs are higher. During this season, there is also less need for non-agricultural services.

Virtually all (99 percent) of the clients are women (not including clients of the water and electricity networks, whose numbers currently are not registered). Women use the multifunctional platforms on a twice-daily or daily basis while men, one percent of total clients, use multifunctional platform services less often. There are several reasons for this. First, not all multifunctional platforms have equipment

for battery charging, welding, sawing, etc., that is "directly" usable by men. Second, the need for these services is not on a daily basis. Blacksmiths mainly use welding equipment during the dry season. Batteries, generally owned by men, are charged once a month on average. This again shows the importance of evaluating both need and affordability for each type of service and for various groups in the community.

The available data and studies suggest that multifunctional platform services are used by 33 percent (Sampara) and 80 percent (Maurolo) of households for milling services and by 100 percent of households for water in Anakaga. There is a need to further analyse the factors affecting affordability, such as season, gender, household wealth and resources, the relationship between energy and poverty, etc.

Efficiency

The efficiency criterion measures the cost of the energy service provided by the multifunctional platforms. According to Villavicencio (2002), one way of analysing the efficiency of the technology as a means of supplying mechanical and electrical energy is comparing its price to the price of conventional means of energy supply. For milling and de-hulling, prices are comparable to those at traditional mills, according to villagers interviewed and project data, making the multifunctional platform efficient for these services. Because energy and water services are rare in rural areas, prices are difficult to compare.

Freedom from risk of obsolescence

This criterion looks at how well the multifunctional platform is insulated from the risk of becoming rapidly obsolete. The small water-cooled, Indian-



made Lister diesel engine was developed many decades ago, and in the medium term no further developments are likely to improve the engine's efficiency. The air-cooled diesel engine, an alternative, requires special skill and facilities for repairs (Jonsson et al., 1994). The risk that the multifunctional platform will soon be obsolete is low. Furthermore, alternatives such as electricity are not likely in the medium term in some areas and in the long term in others.

Flexibility

The flexibility criterion looks into the suppleness of the multifunctional platform to satisfy both current and expanding energy needs. On many dimensions, the platform can be said to be very flexible, with considerable potential to accommodate increased need¹².

First, the multifunctional platform concept allows several pieces of equipment to be combined according to the needs of various population groups. Currently, there are 81 "basic modules", 52 platforms with de-hullers, and 22 with water and/or electricity (DSEI, 2001).

Second, the number of operating hours is flexible. This is relevant as needs may vary according to region, time of day, and season. For example, water pumping and cereal grinding are primarily needed early in the morning and at the end of the afternoon. Several multifunctional platforms were observed to operate from 8 to 9 or 10 o'clock in the morning and from 4 to 6 in the evening. Figure 3.1 shows the variation in platform use by season. Figure 3.2 shows the variation in the number of operating hours per month in three case study villages (although some variation may be attributable to equipment breakdown).

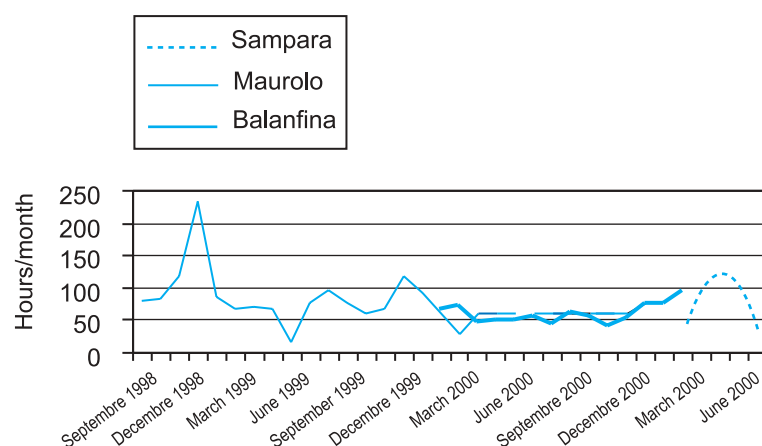
Third, the operational capacities are currently not exhausted in these villages. The average use is 96 hours/month in Sampara, 77 in Balanfina, and 59 in Maurolo. This corresponds to an average of 2 to 3 hours per day, leaving some margin for expanded platform use. Furthermore, capacities can be expanded by performing two to three functions simultaneously, such as battery charging and milling.

Fourth, energy from the multifunctional platform can be used in a variety of additional ways by adding more functions to the platform. Some of these additional possibilities are already available as prototypes or concepts in one or two villages. For instance, electricity from the battery could be used to run video systems. The addition of an electric generator makes it possible to provide irrigation, sawing, and refrigeration services. The Mali project includes several concepts that are still to be developed: mill thresher, ventilator for dryers, and spinning machine (Crole-Rees, 1998).

Fifth, the use of more powerful engines (10 to 12 hp) has been tested and implemented successfully in some villages where increased power was needed. There are other engines on the market, mostly 16 and 20 hp Chinese models using similar technology, that could be adapted to the multifunctional platform, but these engines had not been tested as of June 2001. One option that has been successfully tested is a device to couple two engines together on the same platform, thus doubling the power produced.

Technological capability

The technological capability criterion assesses the availability of human and organisational resources to install, operate, and manage the multifunctional platform.



Source: Project data.

Figure 3.2
Multifunctional platform operating hours per month in three villages, September 1998 - June 2001.

¹² Some aspects of this question overlap with the suitability and urgency criterion examined below.

The small Indian-made Lister diesel engine and similar ones manufactured in other parts of the world, particularly China, are widely available throughout rural Africa and they are often used by private millers for grinding grain (Burn and Coche, 2001). These engines had been imported and commercialised (installed, repaired, and managed) long before the multifunctional platform was introduced.

Although these engines have had some problems (e.g., poor-quality engines and lack of availability of spare parts), these problems are not platform-specific. The Mali project is working with producers in Asia to solve the problem of low-quality engines.

The strategy of the project is to train existing repairers and/or mechanics to install and repair the multifunctional platform. This has the two-fold benefit of providing cost savings for the project and, more importantly, enabling mechanics to be more fully occupied, to diversify their income sources, and to enhance the quality of their services. As of June 2001, seventeen mechanics had been trained as fitters and forty-four as repairers (DSEI, 2001). With a total of 149 platforms, this means that each mechanic was in charge of maintaining approximately three multifunctional platforms. Several reports (Ferrari, 1999, 2000, 2001) suggest that training is an iterative process and that socio-economic aspects should not be underestimated.

The project utilises the same strategy with respect to specific equipment such as wood saws and welding machines. As of mid-2001, 27 men had been coached to become welders. In Balanfina, the review team was able to observe the use of welding equipment to make high-quality chairs and carts next to the multifunctional platform. The local community claimed that the quality of work had increased since the welding equipment had been added to the platform.

A key strategy of the project is to assign ownership and management to women's groups. This does not involve merely assessing existing management resources and choosing the best available, but rather "creating" the needed capacities. According to traditional criteria, most community members might be assessed as not capable of managing the multifunctional platform. Most cannot read or count in the national language (French in Mali) and/or in local languages. Yet as of June 2001, some 862 women had been trained (DSEI, 2001), namely, six women per installed platform on average. The training includes basic accounting, functional reading and writing in their local language, and filling out the monitoring tools, the "management sheets":

Most training at the platform level is being done by external manpower. As of June 2001, 121 trainers

had been coached by the project to teach women (and men) to read and write and to teach the future female millers.

3.3.2 Sustainability of Rural Livelihoods

Suitability and urgency

The suitability and urgency criterion assesses the multifunctional platform's ability to meet the immediate requirements of rural people. Energy technologies in rural areas must be able to relieve the stresses generated by the patterns of energy consumption; these stresses undermine the livelihood resources base and constrain livelihood strategies, hence constraining the welfare of the local population (Villavicencio, 2002).

At present, most of the energy expended in rural areas is human energy, primarily that of women engaged in small-scale agriculture or livestock production as well as in basic subsistence activities (Burn and Coche, 2001). According to Jonsson et al. (1994), the biggest challenge is to find a way to reduce time allocated to domestic activities and their burden and to offer women opportunities to benefit from new technologies.

The most urgent problem confronting women in rural communities is physical exhaustion (Burn, 1998). Women spend many hours and considerable energy procuring food and caring for their families even though the number of working hours per day is already higher for women than men (World Bank, 1999, and Table 3.2). One of the most important short-term consequences is that rural families forego evening meals in some areas and/or seasons (Burn, 1998); this reduces the energy potential of the family members for the next day, with possible negative consequences in agricultural production, school attendance, school outcome, health, etc. Other consequences are:

- employment of children for domestic activities such as water fetching, grinding, and meals preparation, hence reducing school attendance,
- social tension within the household as meals might be served late, and
- lack of time and energy for income-generating activities, training, etc.

Results of feasibility studies show that potential clients' two most important desired and expected outcomes from new energy services are rest and income generation. Women's willingness to pay for rest is a clear indication of the urgent need for relief from physical exhaustion. It is a compelling indicator of the depth and severity of their energy poverty (Burn et al., 2001).

The cause of women's exhaustion is structural. Women are responsible for the daily food security and nutritional well being of their families (Johnson, 1997). This requires food production and processing and/or earning income to purchase food. In addition, women have a range of family maintenance and reproductive tasks, including fuel-wood collection, water procurement, sanitation, child bearing, child care, and food preparation (Johnson, 1997). Depending on geographical zones, seasons, and resources available, these so-called non-productive activities can take from 30 to 80 percent of women's time (Tables 3.2 and 3.3). These tasks are energy-intensive, although precise data on energy expenditure organised by the nature of activities are lacking.

Women generally have less access to income and resources. Furthermore, research has been seriously biased in favour of technology for agricultural and productive activities. Technologies for reproductive activities have been far less researched. The introduction of a multifunctional platform makes radical short- and long-term changes possible. It gives women access and ownership to technology and resources while maintaining their social role and responsibility for the food security and nutritional well being of their families. Access to platform services frees up both time and energy, reducing daily time spent on chores by 2 to 6 hours (Box 3.1), depending on the services of the platform (with or without water pump).

Table 3.2 Daily Activities of Women and Men in Madjoari, Burkina Faso, hours and percentages

	Women		Men	
	Rainy season	Dry season	Rainy season	Dry season
Total time	17 hours 30 min	16 hours 30 min	16 hours	17 hours 30 min
Milling, grinding and dehulling	3 hours (17%)	2 hours (12%)	-	-
Other domestic activities (water, wood, meals preparation, etc)	7 hours 30 min (43%)	4 hours (12%)	-	-
Agricultural work on household collective field	4 hours (23%)	-	10 hours 50 min (68%)	-
Agricultural work on private field	30 min (3%)	-	-	-
Training in reading and writing	-	6 hours 30 min (40%)	-	-
Livestock reading	-	-	45 min (5%)	2 hours 20 min (14%)
Housing, construction	-	-	-	7 hours 40 min (45%)
Petty trade	-	2 hours (12%)	-	-
Rest and leisure	2 hours 30 min (14%)	2 hours (12%)	4 hours 25 min (28%)	7 hours (41%)

Source: PAICB/LCB, 2001a.

Table 3.3 Womens Daily Activity in Sampara, Mali, percentages

	Dry season	Rainy season
Total Time Worked	6:00 to 23:00	6:00 to 21:00
Water fetching	6%	7%
Preparation of meals and washing-up	35%	16%
Cereals grinding and de-hulling	15%	30%
Meals	6%	13%
Coton spinning	20%	10%
Private (washing, praying)	5%	4%
Entertainment	13%	0%

Source: Sahel Consult, 2000.

Measuring Platform Efficiency

An alternative method of analysing the efficiency of the technology is to compare it to the cost of human energy and time that it replaces. For cereals grinding and de-hulling, three cases can occur:

- There were no mills and/or de-hulling available nearby. Women ground cereals at home before the introduction of the multifunctional platform. In this case, the multifunctional platform replaces this human energy and time minus time and energy to bring the cereals to the multifunctional platform.
- Women used a mill in a village nearby. The introduction of the multifunctional platform in the village replaces time and energy to transport the cereals to and from the mill in the nearby village.
- Women used facilities within the village.

Data on time and energy saved by mechanical milling and de-hulling is sparse. In Guinea, a study indicated that rice de-hulling machines took twenty minutes for a task for which each woman previously needed half a day (AFSC, 1987. Quoted by Malmberg Calvo, 1994).

The participatory evaluation estimated that women in charge of cooking needed two to four hours per day for grinding (Burn, 1998). Diagana (2001) observed that women needed 1.13 hours to grind 3.5 kg cereals per day without external mechanical energy. Hence, use of the multifunctional platform's services allows savings of 8 hours per week per woman. For each 10 kg of shea nut, using multifunctional platform services saves 5 hours of tedious work.

Transport for domestic purposes, namely water and wood fetching and going to a mill, was estimated to be 3 to 4 hours/day/household and 120 to 240 kg/km/household/day (Malmberg Calvo, 1994). According to these data, the introduction of the multifunctional platform with a mill and a pump could reduce this transport time by about 1.5 to 2.5 hours/day/household¹³ and the transportation energy burden by 65 to 40 kg/km/household/day.

Source: AFSC, 1987, in Malmberg Calvo, 1994.

In the short term, introduction of the multifunctional platform makes the "invisible" time and energy spent on repetitive and tedious work visible for all group members as women re-organise their allocation of time. Social and economic recognition of

women's work rises and so, too, does women's empowerment. Hence, the multifunctional platform fulfils the suitability and urgency criterion by releasing women's time and energy for rest and income generation. The facts that within one year, 149 multifunctional platforms were installed in Mali, that each multifunctional platform has between 500 and 1,000 clients, and that clients (mostly women) are willing to pay between 77 and 296 FCFA per visit are indicative of the need and its urgency.

Effectiveness and efficacy

This criterion assesses whether the system is effective in the long term (and not merely efficient) in its efforts to secure scarce resources and its influences on its environment (Villavicencio, 2001). The basic question is whether the strategy developed for the multifunctional platform concept is efficacious for reaching the project objective of enabling rural communities – and women in particular – to get out of the energy-poverty trap and have affordable and sustainable modern energy services, with women both using and controlling the energy supply. Do the strategy's main elements – that it be demand driven, begin with a participatory feasibility study, be women-owned, be decentralised, and strengthen resources – contribute to that objective?

The condition that it is demand driven and responds to requests from women's associations means that interested rural communities already have acquired information about multifunctional platforms (their benefits, how they work, and conditions attached to participation in the project) and that they have mobilised themselves to fulfil some of these conditions before they even approach the project about acquiring a platform. Since no publicity is being done to promote the project, rural communities are clearly learning about it by seeing multifunctional platforms and their impacts in other villages.

Participatory feasibility studies allow communities to make an informed choice, based on the assessment of the community's financial, economic, social, technical, and human capacities.

Women's ownership and management in this project has lower initial costs than generally thought in the long term and the installation of the multifunctional platform reduces those costs even further¹⁴. As Burn and Coche (2001) write, "since it is solely women who perform grinding, hulling, and

¹³ Generally there is a rotation for these activities among the wives. In several villages in Mali, rotations are weekly.

¹⁴ Multifunctional platforms have often not been included in project designs because they were considered too costly. They were considered to have high initial costs and to require too much time and energy in persuading men in general and village elders in particular and in training and organising women. However, the project has shown that these costs are in fact lower than thought and that the installation of a multifunctional platform in a community reduces them.

water collection”, the village elders can more easily be persuaded that the equipment has to be under women’s control, thus using the existing social division of labour to the project’s advantage.

Moreover, once the platform is installed, even as a basic module, it is much easier for women to attend training, since they are now freed from their tedious grinding time and energy and have 2 to 10 hours daily to allocate to other activities than manual grinding and water pumping. Various examples of men’s positive arguments for the multifunctional platform are given in Appendix A. Impacts on women can be considered as sustainable as now “women would not marry into a village where there is no platform” (a female client). In order to ensure that these benefits are maintained and that the men in a village do not take over the platform, the project monitors it for at least two years after installation.

The project has ensured that the approach remains *decentralised* by setting up four regional advisory units that co-ordinate all the support activities in their areas.

The whole concept is based on the *mobilisation and strengthening of resources* at each level of the multifunctional platform’s supply chain. Engine importers, who have been importing the same engine for decades now, have been invited to travel to India in order to increase their ability to assess quality and to create trade relationships. The platform is manufactured by local artisans, with locally available parts, and local artisans handle its ongoing functioning and repair. Local repair is important not only for regular maintenance visits, but also for local capacity building and trust building between repairers and their clients. Training in bookkeeping is under consideration. The operators are all from the community acquiring the platform and, except for a few millers, are all women. The potential clients – indeed the whole community – of any particular platform participate in the feasibility study. Women are mostly members of the women’s association owning the multifunctional platform and may attend training in literacy.

One of the key innovations of this strategy is that all members of the community acquiring a multifunctional platform are involved in the process. Moreover, all the elements of the concept are linked and re-enforce themselves. For example, participatory feasibility studies re-enforce the existing process of resource mobilisation and strengthening at community level. These inter-linkages contribute to securing scarce resources. Constant upgrading of the various working methodologies (feasibility studies, etc.), regular training of the

various actors in the supply chain, close relationships established through the decentralised approach, minimum of two years of monitoring, all these elements help to promote long-term impacts of the multifunctional platform.

Resilience

The resilience criterion assesses the multifunctional platform’s contribution to rural communities’ ability to cope with and recover from shocks and temporary stresses. It has several dimensions.

One important dimension is whether, under current project conditions, acquisition of a multifunctional platform creates a debt burden for communities or others. The feasibility study ensures that when loans are provided, repayment can be made without threatening the multifunctional platform’s financial viability.

A second dimension is whether introduction of a multifunctional platform helps community members deal with seasonal stresses and shocks. It does so in several ways. In the short term, it alleviates the time bottleneck in the rainy season, when agricultural workload is highest, by making it possible for women to spend more time in the field during this critical period¹⁵ without threatening food production or the cooking and serving of meals. This is important because approximately 95 percent of rural household income in southern Mali comes from agriculture (De Groote, 1994, and Crole-Rees, 2002). During less critical periods, the multifunctional platform may also contribute to income generation, hence increasing communities’ capacity to cope with shocks.

Cash flow and net income in general are highly seasonal. It is acknowledged that many households suffer from a “cereal gap” (translated from French: *période de soudure*) by the end of the dry season, before the next harvest. The existence of the multifunctional platform and its various services can help alleviate this seasonal stress by diversifying and/or increasing non-farm income. For example, in some villages in the Dogon area, more water is being sold for the animal herds passing by. Women can increase their production of de-hulled rice and shea nut butter, and so on. Non-farm income not only has a positive impact on total net income but also helps in coping with temporary shocks (see Reardon et al., 1992, for Burkina; and Crole-Rees, 2002, for Mali).

Women’s income, in cash and in kind, generally is used for households’ basic needs and children’s nutrition (Von Brown et al., 1994, and World Bank, 1999). The improvement in health gained from

¹⁵ Planting time is an important factor in determining yield levels. Delay in planting may reduce yield potential.

women's income is a positive factor for coping with stresses and shocks. Additionally, when women earn their own income, a number of social benefits – including increased capacity to negotiate and to manage conflict – result.

Diversification

The diversification criterion measures the ability of a multifunctional platform to expand people's options and choices and to decrease their dependence on agricultural activities. The introduction of a multifunctional platform in a community has impacts on several groups within the community: women, men, children, entrepreneurs, traders, shopkeepers, etc.

By using the services of the multifunctional platform, women are able to reduce the time spent on some domestic activities by 30 to 50 percent and thus are able to re-allocate their time and energy to other activities, with positive impacts for the community as a whole. One important impact is that daughters are relieved from helping with domestic tasks – and are thus able to return to or begin school. Women who had been trained by the project to read, count, and manage perceive the benefit of increased learning and in turn encourage their daughters to attend school (Box 3.2).

"We prefer to pump water than to take our daughters away from school."
-- Members of the Water Management Committee in Sampara

The new allocation of time also has several social impacts. The working capacity of household members and health in general depends on women's subsistence activities. The ability to serve more varied, higher-quality meals on a regular basis and at a regular time is a positive factor for health, work and school capacities, and interpersonal relationships. *Frutigi* is the word for improvement in marriage relationships that has been used by an older person to describe the introduction of the multifunctional platform in his village. Burn (1998) gives many such examples.

Impacts on men vary according to their activities. For example, time bottlenecks can be alleviated for smiths repairing tools and machinery in the period just before planting time. Building construction and renovation are made easier and more rapid with available running water.

Better health and more time available for agricultural and non-agricultural activities might have positive impacts on total household net income through bigger fields, higher yields, increased production, etc. These aspects could not be analysed due to lack of data.

The platform allows additional income-generating activities for women in general and for the women actively involved in the management of the multifunctional platform in particular. Estimates based on the available data in one village, Sampara, indicate average increased earnings of 100 FCFA/hour for each operator ¹⁶ of the multifunctional platform. In the three case studies, each operator received the equivalent of a salary of 6,000 to 10,000 FCFA/month (Appendix A) ¹⁷. Box 3.3 shows the potential for increased productivity from the multifunctional platforms.

Increased Productivity from the Multifunctional Platform

In the village of Noumoula, women compared hand production of shea butter with butter production using the multifunctional platform. They estimated that using the multifunctional platform increased daily production from 3 kg to 10 kg. The increased productivity results from time liberated by the mill and increased production through mechanical pressing (Diourté and Diallo, 1999).

This finding was confirmed by another study that observed that production of shea butter with the multifunctional platform reduces work time from 8 hours to 4.5 hours per 10 kg of raw shea nuts and increases the yield from 35 percent to 45 percent (Diagana, 2001).

The multifunctional platform functions as a "profit-centre", generating benefits for individuals and communities. Crole-Rees (1998b) observed that for the ten platforms with available data, cash flow (before amortisation) was positive and averaged 350,000 FCFA (a range of 80,000 to 780,550) after twelve months of activity. The three case studies undertaken by the review indicate that multifunctional platforms generate immediate positive cash flows (Figure 3.3). However, income opportunities differ according to the village and its specific characteristics.

The positive income from a multifunctional platform can be an important factor in development. For example, Diagana (2001) observed an increase

¹⁶ The contribution might be overestimated as it is calculated based on engine hours. The number of hours women spend working on the platform (in preparation, for example) might be higher.

¹⁷ The official Malian minimum wage for a full-time job is 22,000 FCFA per month.

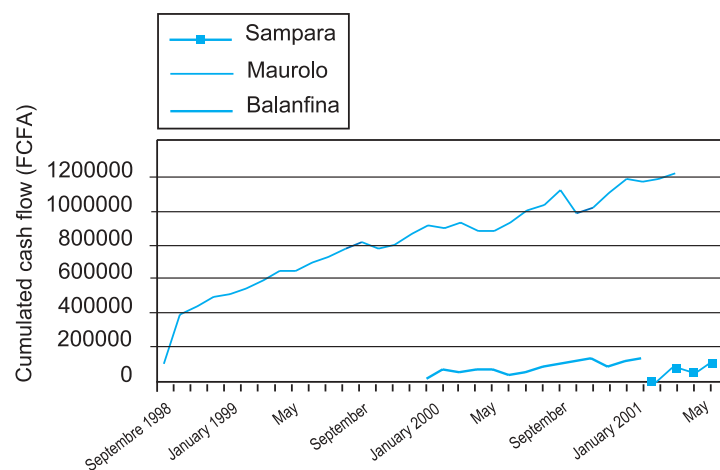


Figure 3.3 Cumulated cash flows for Sampara, Balanfina, and Maurolo

Source: DSEI, 2001

in use of financial institutions. A shopkeeper in Sampara indicated to the review team that he is now selling fuel that was not previously available in the village to both the multifunctional platform and motorbike owners. Evidence of these changes and of how income from the multifunctional platform is being used and its impacts on the local economy should be further documented.

Environmental protection

The environmental protection criterion looks at how well a technology contributes to environmental sustainability. In the case of the multifunctional platform, the use of diesel is an obstacle to acceptance within environmental management and sectoral programmes that favour renewable energy technologies (Burn et al., 2001). In the Mali project, one multifunctional platform currently operates with vegetable oil from the jatropha bush. According to the agro-climatic conditions, this plant can easily grow in three of the four areas where the Mali project operates. The opportunities to use vegetable oil are reviewed more closely in section 3.5. However, the environmental costs of diesel and other fuels should be considered in conjunction with the economic and social gains resulting from introduction of multifunctional platforms, particularly in income-poor and energy-poor areas. Each multifunctional platform directly benefits around 800 individuals a month and reduces tedious and repetitive domestic work that is not directly "productive" (domestic activities) by 1,500 to 2,000 hours per month using an average of 70 to 80 litres of fuel. The benefit from multiple multifunctional platforms outweighs any environmental costs (Box 3.4).

Valuing Environmental and Social Aspects

With the current mean use of the multifunctional platform in Mali, 450 multifunctional platforms would use 45,000 litres of fuel per month, which would cost around 12 million FCFA/month. The domestic time that can be freed with these 450 multifunctional platforms amounts to over 1 million hours of tedious work. Valued at rural current wages, it corresponds to over 60 million FCFA/month.

3.3.3 Contribution to Macro-Development Frameworks and Policies

Each month, around 800 clients buy services at each of the current 149 multifunctional platforms, not including the clients for drinking water and electricity. Assuming that women can save two hours per day by using these services and that 99 percent of the clients are women, it can be estimated that currently almost 3 millions hours per year are being made available to women. These hours can be used for resting, enhancing the number and quality of family meals, educating the children, obtaining training, working on the collective crop field, generating additional income, etc.

This is only one example of the impact that multifunctional platforms are having at the national level. The same kind of estimation could be made for other benefits, such as increased monetisation of the economy, increased petty trade and other non-farm income, etc. These estimates may be impressive, but more importantly, they show the need for re-allocation of local, regional, and national budgets. For example, the introduction of multi-

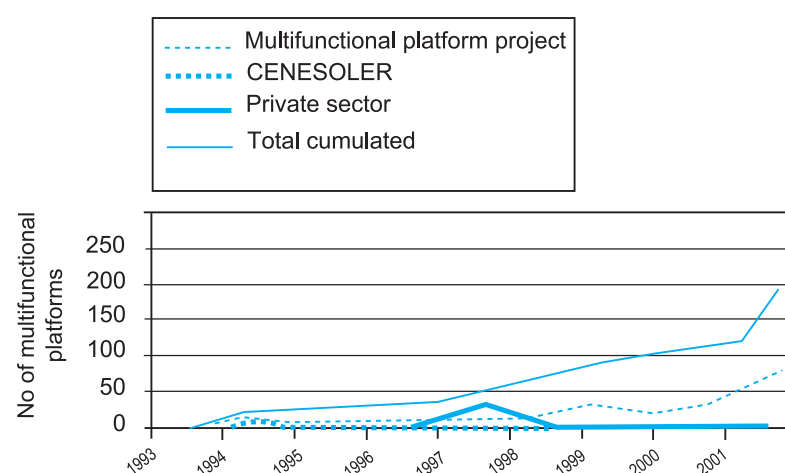
functional platforms contributes to a higher level of schooling for girls and/or better concentration in class. This has to be taken into account when planning resources in education. The results of the participatory evaluation hinted at the need to include direct and indirect impacts in the feasibility study in order to facilitate estimation of the multifunctional platform's costs and benefits (Burn, 1998). At the same time, new planning will be needed to respond to new demand for increased classes, school materials, a new health strategy, etc. To our knowledge, these actions have not taken place in Mali, nor are they perceived as necessary adjustments to the introduction of multifunctional platforms.

The sparse data available indicate that the multifunctional platform increases non-farm income at household and local levels, which in turn helps to reduce income inequalities in communities. According to a study in Mali (Crole-Rees, 2002), non-farm income reduces inequalities, although only slightly since non-farm income comprises only a small share of total net household income. Introduction of multifunctional platforms in more rural communities can thus help reduce income inequality in rural areas.

As of June 2001, some 61 mechanics had been trained by the project. Although it is assumed that they have more work as a result, more diversified activities, and eventually will have more income, no empirical evidence could be found to support this assumption.

There are several positive signs that multifunctional platforms are becoming mainstream. In the Sikasso area, 19 platforms were installed without any subsidies from the project. In these cases, the villages directly contacted private artisans who had been trained by the project, and procured and installed the multifunctional platforms on a commercial basis. These multifunctional platforms are not monitored by the project and no information has been gathered. It is hence not possible to know whether this replication limits itself to the platform tool or whether it includes the whole concept, including how the platform is managed and how the benefits are allocated. Since 1994, six to eight platforms have been installed by the public sector solar energy research institution CNESOLER. A review is under way by the Mali Folkcentre with support from UNEP's Sustainable Energy Advisory Facility, but its results were not available at the time of this study. Figure 3.4 shows the number of installed multifunctional platforms in Mali by funding source.

Figure 3.4 Number of installed platforms in Mali, by funding source, 1993 - June 2001



Source: DSEI, 2001



The multifunctional platform as currently implemented by the project has a high added value for the end-users, particularly women. The components of this added value are:

- The product is new and thus enjoys novelty status.
- It is exclusive to rural areas, and de facto to women.
- Services provided before and after sale of the platform – feasibility study, training, monitoring – are free of charge.
- Because both the equipment and the services are monitored by the project, quality is guaranteed, at least in the short term. In the long term, quality is guaranteed through training.

Because management training and feasibility studies are free of charge, potential “competitors” might have serious difficulty competing with the project to help rural communities, particularly women, acquire a multifunctional platform. The length of time that rural communities are willing to wait in order to acquire a multifunctional platform is an indicator of the level of benefits and gains community groups perceive the platform as providing.

Despite the advantages, a number of factors act as bottlenecks against mainstreaming the multifunctional platform concept:

- The rightly argued insistence on ownership by women might be perceived as a constraint. There are several counter-arguments. First, women alone perform grinding, de-hulling, and water collection. The equipment therefore has to be their property and under their control (Burn and Coche, 2001). Second, the project subsidy is a very attractive feature. Without this help, the social resistance of other groups might not be contained in the short term, even though the social and economic impacts and benefits are increasingly recognised by local communities and others. There is need for more impact studies of the costs and benefits of this strategy, particularly the requirement of women's ownership.

- The initial cost of the multifunctional platform in Mali might prevent rural entrepreneurs from installing additional platforms, knowing that formal credit facilities are sparse for entrepreneurs as well as for traditional rural associations (both women's and men's), except for village associations. Figure 3.5 shows the initial costs to be around US\$ 4,500 or 2,800,000, including basic equipment (engine, mill, de-husker, and housing for the platform), feasibility studies, and training for women operators. The cost of a traditional mill is lower.

- The rates of return for traditional mills and/or pumps are well known, while those for multifunctional platforms are not.

- The complexity of the multifunctional platform might impede its mainstreaming. On the seller side, logistical (transport of equipment, for example), financial, and organisational requirements are high. Risks might be perceived as high for the sellers as well as for the buyers because of the multifunctional platform's high cost and the risk of default of payment by the buyers. Furthermore, technical partners have to be willing to invest time to learn about the concept and to develop technical and social capacity to manage it.

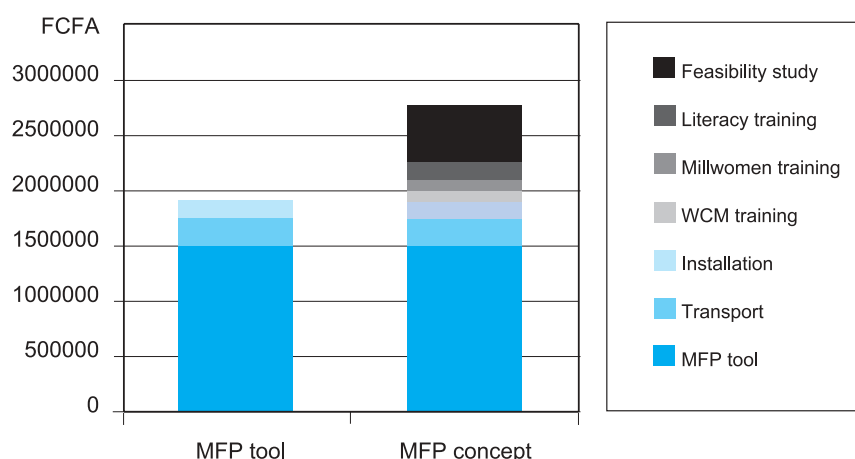
- The full impacts of the multifunctional platform such as better health, freed time, timely meals and additional income for women and men might not be comprehended or, more importantly, appreciated since they do not directly benefit the potential private investor.

- A private seller may not be able to “compete” as long as the project is active in one area, as he may not be able to offer similar allowances.

- Finally, the project's overall objectives are larger than those of private sellers. The project's main objective is to allow the reduction of time and energy spent on reproductive tasks in all rural areas, while the private seller is mainly looking for the payment guarantee. This might reduce geographical expansion of the multifunctional platform. Furthermore, the project is constantly looking to improve both the concept and its implementation. Thus there are barriers of access for private sector



Figure 3.5 Installation costs of the multifunctional platform tool and concept, FCFA



Note: MFP = multifunctional platform.
Source: Data from PAICB, 2001.

partners to further disseminate the multifunctional platform concept without the kind of external funding that the current project provides.

- For the multifunctional platform manufacturers:
 - High organisational and logistics requirements
 - High liquidity requirements
- For the repairers:
 - New product (preventive maintenance)
 - Cost of the new product perceived as very high
 - High organisational requirement: regular visits
- For the consultancy firms:
 - Product (feasibility study, monitoring, etc.) and its benefits not well known
 - High acquisition cost for the new product
 - High "selling" cost of the product
- For the women:
 - Lack of information about the product
 - Low negotiating power
 - Low liquidity
 - Lack of credit facilities
 - Low empowerment

The multifunctional platform's contribution to policy formulation at the national level is not yet visible. There is no evidence of concrete actions at the national level, except for keen interest in Mali and in Burkina Faso. Several constraints deserve mention:

- The process from awareness to action is long and slow at all levels of decision making.
- The multifunctional platform project generally does not generate direct publicity or have high visibility.

□ Documentary evidence of the impacts of multifunctional platforms at local and national levels is sparse even though potential gains and benefits have been clearly described (see particularly Burn, 1999, 2001a, 2001b).

□ The only somewhat large-scale experience so far is the Mali project, which may now have reached a "critical mass" that could give the concept some visibility. The multifunctional platform is currently used in fewer than 2 percent of rural Mali villages.

□ Lack of communication and occasional competition among government ministries has not augured well for clear national leadership in promoting the multifunctional platform concept.

□ The project needs to formulate active information and co-operation strategies with and for decision makers, at local, national, and at regional levels. The project rightly only responds to firm demand at micro level. However, this strategy might not be suitable for involving decision makers and other stakeholders in spreading the concept.

□ There is a need for more emphasis on relationship with all stakeholders (current and potential), end-users, and decision makers, in order to increase their awareness of the multifunctional platform's potential and the need to reallocate resources to facilitate the multifunctional platform's expected results.

□ The decentralisation process is on going, and local, decentralised governments are not fully operational yet, hence reducing their potential as project partners.

3.4 Implementation Methodologies and Strategies

3.4.1 Project Tools

The various tools developed by the project aim to:

- ensure beneficiaries' participation as well as transparency at each step: feasibility assessment, implementation, and monitoring;
- assess the feasibility of installing and running a multifunctional platform in a specific rural community in a sustainable way;
- monitor results of the project as a whole as well as for the various stakeholders;
- guarantee durable relationships between rural communities and their partners; and
- ensure efficient use of project resources.

The feasibility study

The demand by a rural community for a multifunctional platform is followed by a pre-study, mainly to ensure the firmness of the demand, to inform the villagers about procedures, and to confirm technical opportunities, particularly for water pumping. When the findings from this initial study are positive, a participatory feasibility study is undertaken.

The key element of the feasibility study is the use of participatory tools and methods. A team of four facilitators works within the requesting community for four days. The feasibility study yields greatly increased knowledge about the community and the conditions in which people live. The resulting information serves as a base line for setting concrete objectives at community level and for monitoring in case the project proceeds. Ideally, it serves as a business plan to be presented to credit institutions. Since 1998, the feasibility study has been developed through an iterative process, taking into account the multifunctional platform's economic, social, and technical aspects as well as its impacts.

Whenever the feasibility study shows negative financial results, further analysis is done to determine ways of making a multifunctional platform profitable. Possibilities include:

- Combining it with existing equipment. For example, if a village has water pumps, the multifunctional platform's energy could be used to operate the pumps and the redundant engine could then be sold.
- Adjusting the price. In some villages, some clients might be willing to pay higher prices.
- Looking for new complementary income-generating activities. The multifunctional platform reduces grinding time by two to four hours per women. Assuming that the first need is for rest, some of the time gained might still be used for an additional income-generating activity that increases the number of times the clients use the platform's services and/or makes the services affordable for others, thus helping to make the multifunctional platform profitable.

These comments illustrate the complexity of a feasibility study, apart from the fact that it is participatory. Another aspect of this complexity is the choice of weighting allocated to various aspects of sustainability, namely, the social, economic, technical, and environmental. Yet another is the opportunity given to the community to respond to a refusal by re-assessing its objectives, needs, and resources. The success of this "re-assessment" highly depends on the social characteristics of the local community and the support given to the community. Hence, in case of a negative result, a plan of action should be made with the help of the project. Technical aspects should also not be underestimated during this phase. For example, Peyres (2001) reports of technical insufficiencies in a feasibility study involving a new "technology," the optimised micro-grid. Technical problems might threaten the sustainability of the multifunctional platform and therefore should be properly addressed in all feasibility studies. Box 3.5 summarises one feasibility study whose outcome was negative.



Income and Gender

A feasibility study in a village in the Bougouni area concluded that a multifunctional platform was not viable in the village.

Total population: 664

Available services at the village: private mill (cereals and shea nut), water pump, manual mill for shea nut

Main income sources for men: cotton, gold

Main income sources for women: gold (Women of a village in the Bougouni area allocate 70 to 85 percent of their time to gold, which can pay from 500 to 10,000 FCFA/day)

The decision taken was to postpone installing a multifunctional platform for the following reasons:

- Mill services of good quality were already available in the village.
- Opportunities for women to increase their income through the multifunctional platform were considered lower than the actual income they already earned from gold (guaranteed outlet)
- The multifunctional platform was determined to have low financial returns.
- A water pump was already available in the village.
- The village was deemed to lack social cohesion. (CAC-Bougouni, 2000).

This result raises several issues:

- The financial and social results of the multifunctional platform should have been compared to the current financial and social costs and benefits (two separate engines for the pump and the mill).
- Currently the pump is managed by a committee composed of men. Both the mill and the manual mill for shea nut are privately owned. The gender aspect might have been under-weighted: women ownership and management, access to energy for poorer women, etc., might have made installation of a multifunctional platform worthwhile.
- The postponement proposed by the feasibility study does not seem to have been followed by a plan of action.

The feasibility study occurs at a specific time. Whenever the result is positive, several weeks, even months will pass until the multifunctional platform is implemented. Social, economic, and technical conditions might change at the local level due to policy changes (for example, trade measures) or other reasons (climatic shock, another project beginning activity, etc.). There is a need for a sensitivity analysis, or some other measure, to test the various hypotheses made in the feasibility study.

Experience to date shows that internalisation by the project staff of the feasibility study is an iterative process (Burn, 2001) and hence takes time and continuous training. One workshop and one guide might not suffice to grasp the relationship between the theoretical and the practical aspects on the one hand (Burn, 2001a) and the complexities of rural development and the gains and risks associated with introduction of a multifunctional platform on the other. One symptom of this problem is that feasibility studies may look very similar except for the data. There is thus a risk of mechanically filling out the report. The fact that external stakeholders are responsible for the feasibility study but are not involved in follow-up activities in specific villages increases this risk.

The feasibility studies are mainly directed at installation of the multifunctional platform. Demands for additional equipment will be processed in the same way.

Participants in the feasibility studies (and feasibility study training sessions) include various village groups (women, men, youngsters, elders, etc.), project staff, and consultants. Potential installers and repairers, for example, do not participate. Furthermore, there is no "formal" feasibility study for installers, repairers, and advisory units.

The Project Management Manual (*le Manuel de Gestion*)

The project management manual aims at supporting project staff in their tasks. It was developed by the sub-regional project together with the Mali project. It provides all available information based on the Mali project: its origin, objectives, role of the stakeholders, tools, etc. It consists of individual information sheets assembled in a file that allows easy transportation and updating. The information is divided into three sections:

- A description of the regional multifunctional platform project.
- Information about the multifunctional platform concept: the technical description, the role of each actor, prices, monitoring, etc. This section consists mainly of the fiches techniques developed in 1998 that describe various aspects of the multifunctional concept and tool.
- A description of the Results Management System software developed to support the project staff in their management by objective.

The main strength of the manual is that it assembles all basic information on the project in a single, easy-to-access place. However, at the time of the review, the July 2001 version of the manual still needed some minor changes and updates. Longer term, it needed to be reviewed to determine what additional tools should be included to make it useful in other countries. The project was also reviewing options for sharing information among country teams; these options included a committee of country team representatives and the ability to download new information via the intra-net.

Management sheets

Management sheets are the basic tool used by the multifunctional platform operators at the village level to provide information on engine data, clients, income, etc., to project management.

The Results Management System

The Results Management System (RMS) is software developed by Focus International, a private consulting firm based in Bamako, to analyse the results of projects rather than management of specific activities. It was first developed for project management at the national level and then expanded to include data on multifunctional platforms.

The RMS provides various advantages:

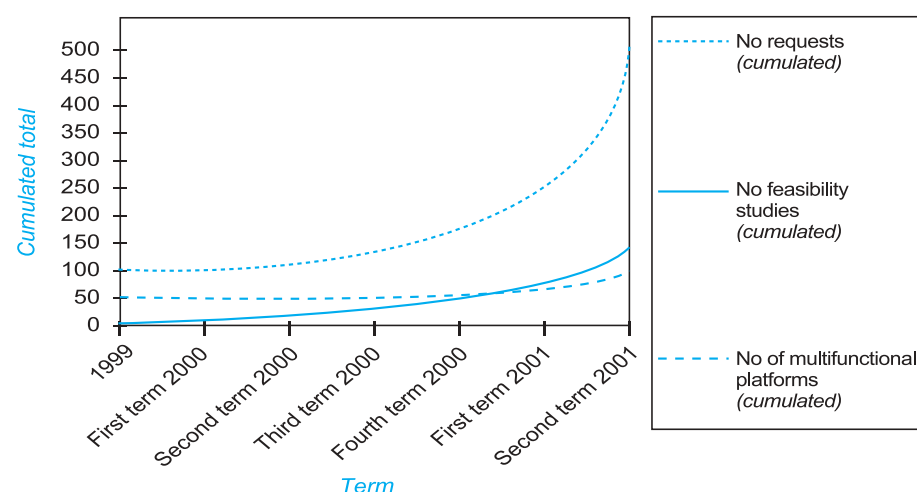
- It provides a single format for all project levels, advisory units as well as national and sub-regional co-ordination centres.
- It reduces the need for report writing by local staff.
- It facilitates easy transfer of information between advisory units and national and sub-regional centres.

The construction of the RMS was a long and iterative process. The current (eighth) version is under-used, and measures should be taken to optimise its potential.

3.4.2 Project Cycle

Feasibility study

The feasibility study represents a substantial but necessary investment of time and resources to minimise the risk that equipment will be misused, underused, or inappropriate (Burn and Coche, 2001). Figure 3.6 shows the cumulative number of requests received by the project from the end of 1999 to June 2001, including almost exponential growth in demand since the end of 2000. As of June 2001, the project had received 452 requests – equivalent to the total number of budgeted platforms for the Mali project – without explicit publicity from the project.



Source: National Coordination Unit, Sévaré, 2001.

Figure 3.6 Cumulative multifunctional platform requests, feasibility studies, and installed multifunctional platforms, Mali, 1999 - June 2001

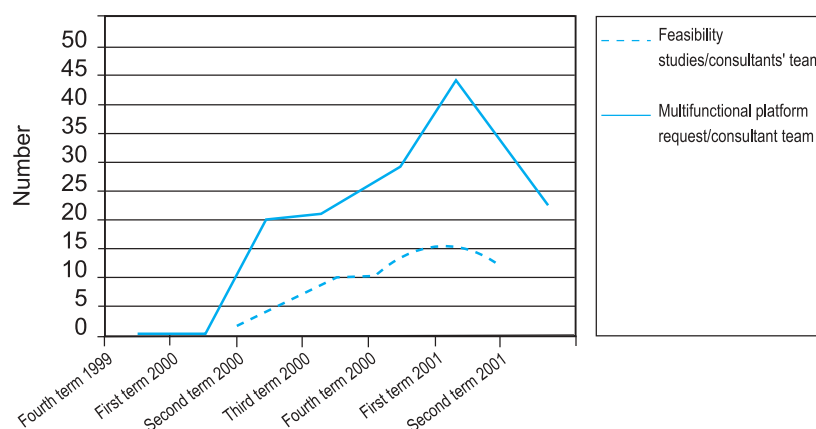
The duration between when a platform is requested and when a feasibility study is conducted varies widely, but can be quite long. In Sampara, for example, the time from first request to project implementation was approximately a year; in Diossan, it was a year and a half. This raises the question of how to respond to the rapid growth in demand, in terms of human resources and financial flow, to avoid an increase in the amount of time that passes from request/feasibility study and the implementation of a platform? Only 4 percent of the feasibility studies conducted as of June 2001 had negative results. How are the next requests going to be treated? What criteria are going to be used to select which requesting villages will receive a platform?

The feasibility studies are undertaken by a team of four people, from different consultancy firms, who have been trained by the project (as a team) in collaboration with the requesting community. Figure 3.7 shows the number of feasibility studies undertaken by each team, as well as the number of requests for multifunctional platforms relative to the number of trained consultant teams as of June 2001. The first team of consultants was trained in the second half of 2000, after which each team

conducted an average of eleven feasibility studies per half quarter. Field time is organised to take four days. Assuming one day for preparation and three to four days to produce the report, one feasibility study takes eight to nine days. Assuming 22 working days per month, the results suggest that each of these teams are working full time on feasibility studies and doing a lot of overtime. According to these numbers, the maximum number of feasibility studies per team of consultants should be approximately eight per quarter.

The feasibility study also addresses the number of multifunctional platforms that can be maintained and repaired with the number of available trained personnel. On average, each trained repairer is responsible for the maintenance of two to three multifunctional platforms (Figure 3.8). Further analysis is needed to advise repairers (and manufacturers) on the optimal number of additional multifunctional platforms they can monitor (construct) per year while keeping their current customers. There are more multifunctional platforms per manufacturer than per repairer. This makes it possible to compare multifunctional platforms from the same manufacturer, across repairers.

Figure 3.7 Number of multifunctional platform requests and number of feasibility studies per consultant team, December 1999 to June 2001



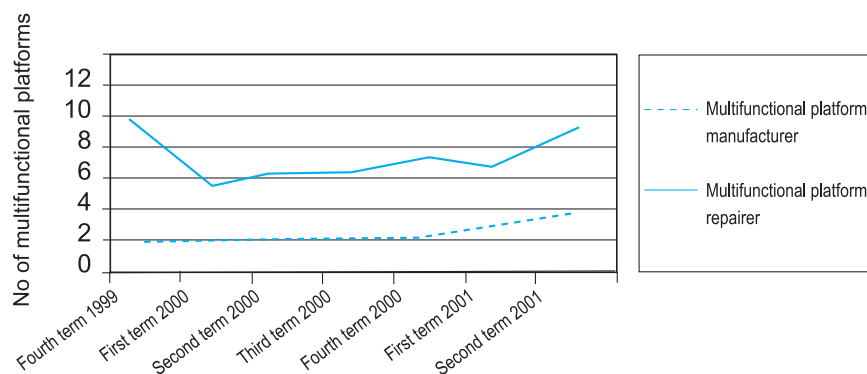


Figure 3.8 Number of multifunctional platforms per manufacturer and repairer

The importance of well-prepared participatory feasibility studies and of the monitoring process is shown in Box 3.6, which relates a conflict that was highlighted during the visit of the review team in one of the villages, Balanfina.

Water and Energy Costs in Balanfina

The price of energy in Balanfina was set at 1,500 FCFA/hour. This is the price at which the Women's Management Committee was prepared to provide energy to the Water Committee.

The Water Committee faces financial problems. With a water tank of 20 cubic metres and a pump of 1.5 cubic metres, the energy cost for a full tank is currently 7,500 FCFA/tank. Water is sold at around 0.5 FCFA per litre. According to the Water Committee, total income reaches between 6,000 FCFA and 10,000 FCFA per tank. In addition to the cost of energy, the Committee has to pay the "controllers" at the distribution points. This cost varies according to the number of clients. Consequently, the Water Committee regularly faces liquidity problems.

The Water Committee argues that energy cost could be lowered through multifunctionality. The pump, for example, can be used while cereals are being ground.

Both committees also argue that prices were set by the project. Even though the Water Committee could not provide an indication of "salary" costs (no management sheet was available), it is clear that the problems might continue as amortisation costs still have to be added.

Based on the discussion in the village, the following can be concluded:

- No formal participatory feasibility study had been done for the water tank (Annexe A), leading to financial losses and lack of transparency in the water management.
- Social or, in this case, gender aspects were probably weighted much higher than financial aspects.
- Women's empowerment has been raised. They are not ready to risk reducing the financial sustainability of their multifunctional platform.



Monitoring

As mentioned before, several tools have been developed to assist major stakeholders in the management and monitoring of the platform and its impact at both household and community levels. It appears that the use of these tools could be improved. As noted, several tools are being filled out in a repetitive and mechanical way (Burn, 2001a), without yielding information specific to the local situation. Similarly, the process of data collection and transmission could be improved if the necessary human resources are available.

No examples of the kind of analysis provided by this review (see also Appendix A) could be found for the village or other levels. Figure 3.9 illustrates the kind of analysis that could easily be conducted at the village level using the same data and notice board that each management committee already works with. Such information could increase interest and involvement in regular platform meetings among members of the women's associations. Moreover, visual presentations are easier to understand, particularly in societies with "oral" traditions. They also allow real transparency of data and make it possible to pinpoint both deficiencies (for example, discrepancies between cash on hand and cumulated cash) and success (Figure 3.9 shows cumulated cash in Balanfina as well as monthly cash flow). Finally, increasing the use of existing data may increase empowerment of women.

The examples provided here are only some of the ways in which currently available data could be further used and analysed.

Existing monitoring tools seem to be focused on the platform itself. Tools for monitoring the repairers, manufacturers, the "artisans" (clients of the multifunctional platform), the water committee, new income from multifunctional platform services, freed time and energy, successes and bottlenecks in the additional trade of non-agricultural items, and so on were not discussed during the review.

The review team is also not aware of the results of ongoing processes at the community level. The management committee is to organise a yearly General Assembly including all women's association members (not only the operators of the multifunctional platform) and community members. These meetings should occur twice in each village with a multifunctional platform during the monitoring

period¹⁸ and address questions such as: Have objectives been reached? How does the multifunctional platform's functioning relate to the feasibility study recommendations? If not, what are the constraints? These General Assembly meetings, and monitoring in general, should be used to further improve the project experience.

Exit

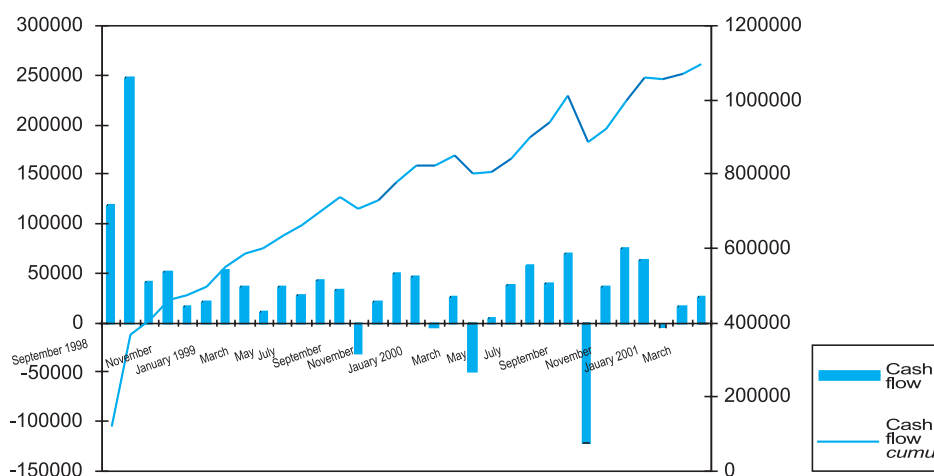
According to the available documents and interviewed persons, the project should withdraw approximately two years after the platform installation. The second yearly General Assembly in each village is set up to take this decision, provided that the management committee and the village experienced several phases and reached specific indicators (DSEI, 2001).

The Mali project is expected to end by 2004. An exit strategy is required not only at the village level but at the national level as well. It is foreseen that:

- The advisory units will disappear or evolve into private providers of services such as feasibility studies, monitoring, advising, etc.
- There will be sufficient manufacturers and repairers able to repair and install current and future platforms.

As of June 2001, there was no formal experience of the project withdrawing from villages. The only experiences, which have not been monitored, are the several multifunctional platforms that were left on their own because of project re-orientation or lack of finance (in Burkina and in Guinea). According to our sources, it seems that most of these projects were still running as of June 2001 but how well they were doing is not known.

Figure 3.9 Monthly cash flow and cumulated cash flow, FCFA, Balanfina



Source: Project data.

¹⁸ The current project foresees a two-year monitoring programme for each multifunctional platform.

Although these were not discussed during the review process, several issues require consideration:

- Who will develop and be responsible for adding equipment and functions to existing platforms, as foreseen in the project? To whom can platform owners turn for information or to purchase equipment?
- One “set” of committee members per village has been trained by the project. How should the turnover of human resources occur at the platform level? How can the risk of a decline in the quality of services and equipment be avoided after the project withdraws?
- Will the women still be able to have access to the technology and own it? What are the consequences if platform ownership is taken over by men? Is ownership by men acceptable to the various participating governments?
- If the use of jatropha (or other vegetable fuels) in the test sites has positive results, who will introduce the new technology?

3.5 Opportunities for Biomass-Derived Fuels

The multifunctional platform's Indian-made Lister engine can run on vegetable oil as well as on diesel. Technical trials between 1993 and 1996 showed not only that the engine can be run with a local vegetable oil, but also that there were no signs of power reduction between the two kinds of fuel.

Jatropha curcas is a shrub, originally from South America, which grows easily in different parts of Africa and is resistant to drought. The shrub is well known locally and is used to create living hedges against wind erosion, to protect vegetable gardens, and to pen in livestock. Most parts of the shrub, depending on the variety, can be used: the leaves as vegetables and for medicinal purposes, latex for medical use, the whole fruit as a combustible material, the seeds as pesticides. The most important by-products are oil and cake. The oil can be used as a medicine, fuel, and the base for a much-appreciated soap. The cake can be used as organic matter against erosion and declining soil fertility.

Beginning in 1987, research to evaluate jatropha oil as a fuel was conducted in Mali with support from GTZ and UNDP. Although the tests were technically successful, an audit concluded that jatropha use was not financially sustainable, and the jatropha GTZ project was stopped. No further research was

conducted on the issue until the Mali Folkcentre expressed renewed interest in 2000. Ibrahim Togola of the Mali Folkcentre makes the following arguments for a re-assessment of jatropha use (personal communication):

- The Folkcentre has adapted a Soundara press from Asia, which is much cheaper than presses used previously (1 million FCFA versus 3 million).
- The previous analysis did not include the added value from soapmaking and other uses.
- Jatropha seed price is lower than a few years ago (45 to 50 FCFA compared with 200 FCFA) ¹⁹.

The multifunctional platform project at national as well as sub-regional level aims to encourage the use of jatropha oil as fuel. By 2004, 15 percent of the Mali platforms are to be run on jatropha oil. Experience to date is ambiguous. In Mali, a platform in Maurolo is said to run exclusively on jatropha oil, but could not be visited due to time constraints ²⁰. The CNESOLER platforms, which are said to run on jatropha oil, were assessed in 2001, but the results were not available at the time of the review.

The following factors favour the use of locally produced jatropha oil in multifunctional platforms:

- The processing of the jatropha fruits adds value to local resources.
- Planting jatropha creates a barrier against wind and soil erosion through the living hedges.
- The jatropha bush is a low-input product that can be grown on low-fertility soils.
- The production of jatropha oil for fuel reduces cash outflow from the village (fuel and soap from outside can be substituted with jatropha oil and soap).
- The production of jatropha oil creates opportunities for income-generating activities such as soap-making with sediment and oil.
- The cake by-product provides an organic fertiliser for crops. The press cake offers more nitrogen and dry matter than that provided by conventional mineral fertilisers (GTZ, no date).
- The use of jatropha oil as fuel is carbon dioxide neutral: jatropha oil releases no more carbon dioxide when burned than is invested in its growth.

¹⁹ According to the project management manual (2001), prices (dated 1998) are different depending on the use of seeds: 120 to 200 FCFA/kg as seeds and 60 FCFA/kg for oil making. At the time, a project from the Compagnie Malienne de Développement des Textiles (CMDT) aiming at increasing living hedges bought seeds from households, hence discouraging the use of seeds for other uses. That project has now ended.

²⁰ The data show fuel expenditure without distinguishing between jatropha oil and other fuel consumption, so no analysis has been done.

The factors that may constrain use of jatropha oil in multifunctional platforms are the following:

- The quantities required. Three to four kg of jatropha seeds are required to produce one litre of oil. This corresponds to the yield from 3 to 4 linear metres of jatropha bush. The Balanfina platform, for example, needed 610 litres of fuel in one year (May 2000 to April 2001). Assuming that the consumption of jatropha oil is similar to fuel, the required quantity of jatropha seeds is between 2 and 2.5 tonnes, that is, 2 to 2.5 km of living hedges.

- Time required for collection and preparation of oil. Jatropha fruits are mainly collected and transported by women and children. Fruits have to be shelled. The seeds have to be stored and then pressed. No data could be found on the time required for these activities that would need to be added to women's already constrained time and energy budgets.²¹

- Potential for gender conflict. According to the traditional social division of labour, men are responsible for planting hedges. They, of course, are mainly interested in the production-securing aspects of protective hedges. Women are allowed to collect and use the nuts for making soap, thus meeting their responsibility to provide for family hygiene while tapping an additional source of income. The use of jatropha as a source of oil for fuel production opens up new economic potential for the plant. As the monetary significance of the plant expands, the men show waxing interest in such matters as who is to enjoy rights of ownership and use of the nuts. Accordingly, they become more disposed to plant jatropha, potentially leading to social conflict along gender lines over access to and use of such a promising economic resource (GTZ, no date).

- Potential conflict over land ownership. Most local land laws do not recognise individual ownership rights. The village authorities retain the right to allot the village's land to certain individuals for certain lengths of time. Frequently, however, trees are planted on arable land as an expression of a permanent claim to possession or beneficial enjoyment that is then formally recognised through documentation. If jatropha is promoted for hedge cultivation, ownership conflicts may result (GTZ, no date).

There is need for further analysis of the feasibility of jatropha oil use as fuel. The following aspects should be included in any analysis:

- Conditions required to stock jatropha seeds in different zones (humidity, containers, period, etc.) to yield oil of good quality.

- Time required for collection, transport, and prepa-

ration (shelling, pressing, etc.) as well as the consequences on time allocation for different groups in the community.

- Market analysis (prices and outlet opportunities) for jatropha soap and cake in various zones.

- Comparative cost/benefit analysis for traditional fuel and jatropha oil.

- Information about jatropha varieties whose fruits are not toxic.

- Ways to reduce the cost of oil (by increased yield, intensification of processing, and/or new ways of adding value).

These issues should be analysed for specific situations. Furthermore, the use of other biomass resources should not be overlooked for various agro-climatic zones. Perennial crops that are of interest are: oil palm (*Elaeis guineensis*), babassu palm (*Orbignya speciosa*), coconut palm (*Cocos nucifera*), karite tree (*Butryospermum parkii*), castor oil plant (*Ricinus communis*), neem tree (*Azadirachata indica*), iron wood or argan tree (*Argania sideroxylon*), and cardoon (*Cynara cardunculus*). The use of oil from cottonseed and soybean should also be examined.

3.6 Lessons Learned and Challenges

3.6.1 Lessons Learned

Important lessons can be learned both about the multifunctional platform concept and about its specific implementation in this project.

The multifunctional platform concept

1. The acquisition of a multifunctional platform at community level is affordable; 96 percent of the requesting communities in Mali could afford a multifunctional platform under current conditions.

2. The affordability of the services is determined by several factors: the season, the area, households' wealth, women's time budget, etc.

3. Between 30 and 80 percent of women use the services of multifunctional platforms, and 100 percent of households are willing to pay for safe drinking water wherever a water network is installed.

4. About 99 percent of clients are women. They buy milling, de-hulling, and/or water services once or twice a day for domestic purposes. Other services are more seasonal and for commercial purposes. Men's use of multifunctional platform services is less frequent: welding during the dry season, battery charging about once a month, etc.

²¹ Henning et al. (1997) observed that shelling and grinding one kg of jatropha seeds take four hours.

5. The multifunctional platform shows flexibility in its use. Despite seasonal needs and low ability to pay for the services, all multifunctional platforms for which data were available have positive cash flows (before amortisation). The availability of power and equipment can easily be extended to cover higher and/or specific needs for domestic and income-generating activities for men as well as for women. The risk of the multifunctional platform becoming obsolete is low.

6. The most frequently used services of multifunctional platforms are cereals milling and de-hulling, substituting mechanical energy for human energy. The relatively few specific data on energy requirements for domestic and income-generating activities indicate that the platform eliminates a high proportion of women's tedious, repetitive, daily, and energy-intensive work.

7. Introduction of a multifunctional platform and its services allows for income diversification at household and local levels.

8. The fact that end-users are mostly illiterate does not constrain the introduction and expansion of multifunctional platforms, owned and managed by women, provided preliminary investments are made in training. The success of the multifunctional platform suggests a new, innovative, and powerful technology path, namely first providing basic training and then introducing a complex concept rather than focusing on finding an "appropriate" technology for illiterate populations.

9. The introduction of modern energy through the multifunctional platform concept breaks a structural cause of gender inequality, namely access and ownership of technology. The social obligations of women towards their families are not being modified as a result of this ownership.

10. The way the platform is currently implemented makes women's non-paid tedious and repetitive work visible and even transforms it. By making various groups in the community aware of the role and the importance of subsistence activities provided by women, the implementation process promotes men's acceptance of control and management of the energy supply by women and allows women to mobilise men's financial and social support. At the same time, it creates the conditions for women to negotiate more equitable terms of co-operation over time (Burn et al., 2001).

11. The multifunctional platform has the potential to reduce the frequent and repetitive tasks associated with post-harvest food preparation, such as fetching water, grinding grain, and pressing for cooking oil. It does not reduce other tasks related to agricultural production and the gathering of food, fuel, and other resources.

12. The multifunctional platform meets an urgent need by women for increased rest, which – along with income generation – is the most frequently mentioned expectation women have for the introduction of platforms.

13. Introduction of a multifunctional platform can help reduce seasonal liquidity problems and mitigate adverse shocks (e.g., natural, economic, or political disasters) in rural communities by improving health among community members, generating additional non-farm income during the dry season, raising the total net income of households, and empowering women to participate in economic decision making.

14. The multifunctional platform contributes to reducing income and energy inequality and poverty in rural areas.

15. Requesting villages are of various sizes and have varying social, technical, and economic potential. However, they have common features such as lack of access to energy and high proportions of time and energy spent by women on daily domestic activities that are not directly productive.

16. Where women's associations that adopt multifunctional platforms are pre-existing, they frequently are enterprises with economic and social objectives. The multifunctional platform contributes to fulfilling these associations' objectives and increases women's empowerment.

The project

1. At every phase of the project, the social and technical aspects cannot be separated from the financial aspects.

2. The project is introducing innovative strategies and tools, such as the participatory feasibility study, despite their higher requirement in time and resources. These tools have proved to be powerful in terms of decision making, data collection, and their impacts on project staff as well as community members.

3. The "grid of competence level" developed by Burn (2001), adapted for use in the feasibility study, could also be used for the management sheets filled out at the village level and the *fiches techniques* that describe the project. Furthermore, it has been recognised that the participatory feasibility study developed for the multifunctional platform project could be a powerful tool in other projects as well.

4. The dissemination of information in rural communities about the multifunctional platform is through basic technology, namely inter-village visits, whether organised by the project or not.

expected outcome from installation of a platform requires a facilitator with strong theoretical knowledge, down to earth experience, and good interpersonal skills.

6. Village communities as well as countries have benefited from sharing experience.

7. The platform must be multifunctional right from the start, incorporating equipment for its various uses and providing for simultaneous use of the engine.

8. The multifunctional platform concept must be clearly and understandably described for each project level.

9. The project has strong links with the private sector that help increase entrepreneurship in rural areas. Women's associations, male and female clients, technicians, repairers, etc., all learn to diversify and intensify their activities and thus increase both their professionalism and their income.

3.6.2 Challenges

As the project approaches its end in 2004, it faces some important challenges.

1. Capacity to respond to the growing demand.

As the Mali project demonstrates, demand grows exponentially – an element that must be taken into account in planning new projects at national and local levels.

In the meantime, growing demand for new platforms raises several issues for the Mali project. How will it match its resources to the growing demand? Will it undertake action to avoid increasing the time communities must wait for a response after requesting a platform? What will the project do when its quota (based on existing resources) is reached but demand remains unmet? These issues must also be addressed at the regional level (number of countries to be included in the project, for example).

2. Balancing the need for a clear strategy with the need to remain flexible.

Maintaining the balance between these competing pressures requires a high level of competence by project staff, at each level.

To be successful, the project needs a strategy with clear project boundaries and key non-negotiable elements such as female ownership and management, participatory tools at every level, etc. The expected results from introduction of a multifunctional platform cannot be solely monitored and promoted by the project staff, since the impacts are multi-disciplinary, complex, and occurring at various levels. For example, there might be need to analyse market opportunities for increased shea

butter production to advise producers on specific packaging needs. The boundaries of the role and responsibilities of the project staff within the larger context of rural development have to be clearly defined.

However, the project must also be able to remain flexible. Requesting communities are heterogeneous in terms of availability of and access to resources, mobilisation capacity, traditions, income opportunities, etc. This heterogeneity leads to different needs, abilities, and willingness to pay for services, as well as various paces of appropriation, transformation, and development.

3. Reaching the poor.

Some communities are not able to purchase a multifunctional platform and/or make it sustainable under current conditions, even with the project's support. Figure 3.10 shows a theoretical distribution of villages in the current project by available resources. The A area indicates communities that have enough resources to acquire and manage a platform (or other energy-supplying tools) without external help. In the B zone, communities need some form of support from the project (training, credit, etc.) in order to acquire and manage a platform in a sustainable way. Communities in the C area do not have sufficient resources to acquire and/or run a platform sustainably, i.e., they are the poorest communities. The challenge is to either lower the cost of acquiring and managing a platform so that more communities fall into the A category or to provide additional resources that enable more communities to acquire a platform with some project assistance (the B area) by:

- Finding ways to increase the multifunctionality of the multifunctional platform and reduce running costs with additional equipment. Several opportunities have been identified that will respond to current needs (for example, vaccine refrigerators) and increase income opportunities.
- Establishing a limit beyond which communities cannot receive financial resources from the project but must instead acquire the multifunctional platform at market value with little or no project assistance, as in the A area, for example.
- Seeking partnerships with financial institutions. The feasibility study can be used as a business plan to present to financial institutions for credit to invest in a multifunctional platform. These requests to financial institutions might face several challenges. Women's associations generally do not have legal recognition, a potential constraint when dealing with formal institutions such as banks. Similarly, collateral is needed that banks will recognise. After the multifunctional platform is installed, both women and men, with more choices, time, and energy, will need access to additional credit to support new income-generating activities.

4. Maximising rural transformation after installation of a multifunctional platform.

To maximise potential gains after installation of a multifunctional platform, the following are needed:

- Effective use of available tools. Mainly due to time and resources constraints, several project tools tend to be used and transmitted rather mechanically. The project database is under-used at village, advisory, and national levels. The project faces the challenge of transforming these processes so that the tools developed are used as real strategic instruments at all levels in order to promote support for the concept and the project, pinpoint problems, increase management capacities at village level, etc.
- A clear statement of objectives at the village/community level, arrived at in a participatory way and regularly adjusted according to results and/or external events.
- A clear information strategy. The increasing number of requests and the increasing number of actors involved in the project, at each level, require a firm information strategy at both the national and the regional level. The quality and the use of the information have to be enhanced. Information should flow equally in both directions, upstream and downstream.

5. Ensuring long-term sustainability.

Exit strategies have not yet been applied at either the local or the national level, but as the project draws to a close, this issue must be addressed.

6. Strengthening political awareness, commitment, and co-ordination at both national and community levels.

Mali has no clear policy or institutional framework for promoting decentralised energy supply for rural areas (Burn et al., 2001). However, communes (called districts in other countries) can move in this direction by allocating part of their budgets to supporting local multifunctional platform initiatives.

The argument in favour of decentralisation in general and for energy in particular is public participation for a public good. Decentralisation's progress varies across countries; Mali, for example, is far more advanced in moving toward decentralised government than Burkina Faso. To move toward greater awareness of the advantages of decentralised energy policy in general and wider dissemination of multifunctional platforms in all rural areas, more illustrations are needed of the positive gains resulting from such platforms, i.e., more impact studies. The introduction of a multifunctional platform within a community induces radical/complex social and economic changes that have long-term impacts. When the multifunctional platform project reaches a critical mass, these changes will be perceived at a more regional level and may prompt rural communities and national policy makers to re-allocate resources towards provision of decentralised energy as well as towards new initiatives such as increasing schooling opportunities.

Enhanced data analysis of existing platforms will help to strengthen political awareness and commitment at all levels. Enhanced data analysis will also help to monitor the project's achievements in terms of the activities described in section 3.1, such as building entrepreneurial and management capacity to own and manage an energy enterprise and to operate end-use equipment for the energy end-uses desired. Burn (2001) rightly argues that two kinds of studies have to be initiated. The first involves a sample of multifunctional platforms to monitor financial profitability. The second should be conducted on a micro-meso-macro basis, namely, linking progress at household, platform, and community levels. Case studies should also be set up to analyse the freed energy and to create an indicator of human energy; this should be done in collaboration with Mali's National Direction of Statistics and Information. Enhanced data analysis will not only contribute to monitoring the desired outcome of the multifunctional platform, namely enabling rural communities to get out of the energy-poverty trap, but also support gender equity and health promotion.

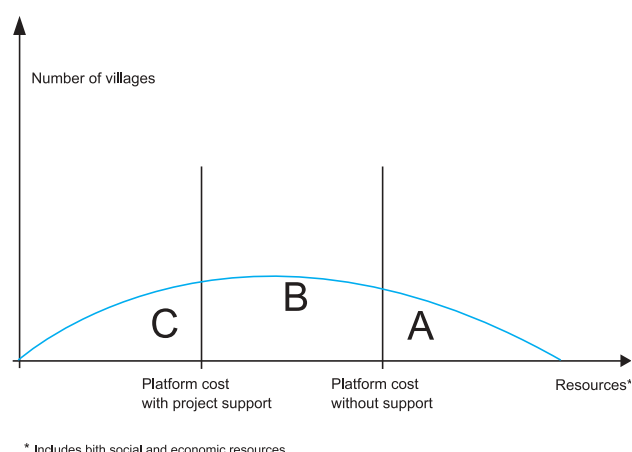


Figure 3.10 Market for multifunctional platforms

4. STRATEGIES FOR FUTURE INITIATIVES IN AFRICA

In many sub-Saharan African countries, poverty reduction is the highest development priority (see Appendix B for a discussion of this issue with respect to Mali, Burkina Faso, and Ghana). Gender imperatives are also clearly identified as key to reducing poverty and accelerating national development. What this suggests is that the policy environment is favourable for implementing the multi-functional platform concept – making it possible to tackle the challenge of getting rural women out of the energy-poverty trap – in a large number of countries across the region. This chapter discusses the rationale for, and the potential focus of, a multi-functional platform initiative on a regional scale across sub-Saharan Africa.

4.1 Development Challenge ²²

Women in the rural areas of sub-Saharan Africa are at the bottom rung of the “energy ladder” for cooking, which associates users of progressively cleaner, more efficient fuels with correspondingly higher levels of income. Rural women rely on traditional biomass – in the form of wood, plant residues, and dung – as sources of thermal energy for cooking. Traditional biomass is at the bottom of the ladder for cooking, with charcoal, then kerosene, and finally liquified petroleum gas and electricity following progressively towards the top.

Rural women are also at the bottom rung of the energy ladder. They have little access to mechanised energy for either food preparation (peeling, pounding, grinding, mashing, etc.) or for use in the extraction, transportation, and distribution of foodstuffs. These women depend entirely on their own human energy and are normally without any other resources such as animal power, or mechanical or electrical devices, for such activities. Even where animal power and/or mechanical equipment are available, gender norms, power relations, and divisions of labour tend to exclude women from use, and certainly ownership and control, of these assets.

This energy situation for women has tremendous survival and development implications since the tasks associated with food preparation are critical to the prevailing socio-economic systems. The main economic activity in rural areas is agriculture, and small-scale farmers – men and women – make up about three-quarters of the rural population. Agricultural production is therefore the main source of rural livelihood and income, and it is primarily based on human and animal energy (muscle power), which requires the biological conversion and storage of food into useful energy. Food intake, crucial for the daily production of human energy for agricultural labour, in turn depends on proces-

sing and preparing the food harvested or gathered. The frequent, repetitive tasks associated with post-harvest food preparation, such as fetching water, collecting firewood, grinding grain, pressing cooking oil, and processing other ingredients are women's responsibilities and obligations. These are in addition to women's other labour inputs in agricultural production and in gathering the “wild” resources used in food preparation, oil and soap-making, and other household provisioning needs.

Dependence on such traditional energy systems leads to multiple social and economic costs, which are overwhelmingly borne by poor women. Linked to the lower energy efficiency of fuelwood combustion (15 percent efficiency for firewood cooking stoves compared to kerosene at 50 percent and gas at 65 percent) are the higher emissions of sulphur, carbon dioxide, and particulates, pollutants resulting from incomplete combustion. The occupational hazards for women – and for their young children – from exposure to indoor air pollution, smoke, and particulates when cooking are the negative health impacts: burns, acute respiratory infections, lung disease, internal disorders, and eye problems. Load carrying of fuel and other materials, for example in palm oil processing, takes a health toll in terms of injury, miscarriages, and fatigue.

Poor women pay a disproportionate price for energy services not only because of the inefficiency and associated health costs. Long hours are spent collecting water and firewood for both food preparation and agricultural processing, as well as the multiple other tasks that sustain rural livelihoods. The arduous and time-consuming nature of women's activities has significant opportunity costs in terms of agricultural production and other productive and income-generating uses of time and energy, as well as time and energy for child care, health, education, rest, social and cultural activities, recreation, and personal maintenance. As traditional fuelwood sources and water get increasingly scarce, the costs become more severe, including time and energy spent in activities to generate cash to buy firewood that is no longer possible to collect individually.

Widening access to modern energy services can be a catalyst for sustainable human development, given these patterns of energy use. However, increased income is necessary to be able to afford to climb to higher rungs of the energy ladder and release human energy and time for sustainable development purposes. Unfortunately, rural women have found it impossible to generate this increased income without increasing their already high expenditures of time and human energy. Such is the energy-poverty trap that women in sub-Saharan Africa are struggling to get out of.

²² This section has been adapted slightly from the UNDP Concept Paper prepared for this review mission (Burn et al., 2001).

The challenge is how to enable poor women, and men as well, to get out of the energy-poverty trap and have affordable and sustainable modern energy services. The main lesson from many energy and broader development projects around the world is that for energy services to be affordable by poor women (and men), the energy has to be for end-uses that are directly productive and income generating²³. Thus it is the chain of conversion from energy to income that can facilitate the transition over time to cleaner and more efficient fuels, and thereby generate opportunities for reducing poverty and enhancing the quality of life in rural areas of sub-Saharan Africa.

4.2 Potential Contribution of the Multifunctional Platform Concept

4.2.1 Liberating Poor Women's Energy and Time

The multifunctional platform concept is designed to help poor rural women by releasing their human energy and time for sustainable development purposes. By providing a modern source of energy for food preparation and the extraction, transportation, and distribution of foodstuffs as well as traditional biomass fuels, the multifunctional platform helps rural women of Africa to progress up the energy ladder for motive power. The savings in human energy and time then enable rural women to turn their attention to more gainful activities for themselves and their families. The achievements in Mali provide ample evidence of the multifunctional platform's capability in this regard. Replicating these achievements throughout Mali and in other sub-Saharan African countries can help change the socio-economic landscape of rural Africa quite significantly.

First, some of the barriers associated with high rates of illiteracy in rural areas, and even higher rates among rural women and girls, can be overcome with wide-scale implementation of the multifunctional platform concept. The integration of literacy programmes in the village multifunctional platform process is one dimension. The release of young girls from time-consuming chores and thus enabling them to go to school is another. The provision of electricity for lighting and, possibly, television is yet another dimension of how the multifunctional platform can help increase literacy rates in the rural areas and improve access by the poor to basic education.

Second, the multifunctional platform can increase access by the poor to potable water and thus improve health. Many village multifunctional platforms in Mali include potable water supply networks in the package of services provided. Some

multifunctional platforms with electric generators also provide basic lighting and vaccine refrigeration services to rural clinics and village health posts.

The multifunctional platform concept has direct relevance to the development policies and frameworks of sub-Saharan African countries. It has the potential to make major contributions in accelerating the provision of affordable and needed energy services and in advancing poverty reduction goals. Widespread implementation of the concept should help in no small measure the realisation of UNDP's commitment to the goal of halving the world's poverty rate by 2015 – an internationally agreed goal set by the Millennium Summit at the United Nations in September 2000.

4.2.2 Expanding Opportunities for Growth

An important component of rural transformation is enterprise development in the rural areas – a major objective of poverty reduction programmes throughout the region. Furthermore, as already noted, for energy services to be affordable by poor women (and men), they have to be for end uses that are directly productive and income generating. Enterprise development is therefore of critical importance to successful implementation of the multifunctional platform concept, as shown in Mali, where a number of enterprises have emerged around the multifunctional platforms. Petty trade has both increased and diversified. Welding of metal chairs, donkey carts, farming implements, etc., is a new business in many places that have acquired multifunctional platforms. Entrepreneurs purchasing electricity from the multifunctional platforms provide battery charging services for home (lighting/ entertainment) and other applications.

Although some progress has been made in Mali in oil production and related industries like soapmaking, more could be achieved if vegetable oils like jatropha replace diesel fuel on a wide scale. Replacing diesel with vegetable oils, together with the provision of electricity for lighting and other rural energy services like vaccine refrigeration, makes the multifunctional platform very relevant to policy objectives for the energy sector. In Mali, for instance, plans are under way to develop rural electrification projects for 500 villages between 2001 and 2007, and a programme to increase the share of renewable energy to 3 percent of national energy by 2007 is under consideration. Increased use of renewable energy (in this case, using biofuels to replace diesel) could also serve an income-generating purpose and allow more money to stay in rural communities.

²³ See, for instance, Farinelli et al (1999) and Barnett (2000).

Rural telephony is practically non-existent in many countries of sub-Saharan Africa. The non-availability of electricity is one reason for this anachronistic situation. Electricity generation by the multifunctional platforms therefore opens up possibilities for establishing rural telecentres – a potentially important step towards the eventual introduction of the Internet and other information technology services. The impacts on rural commercial activities, education, and health could be far-reaching.

There are several international initiatives to introduce the Internet into rural areas of sub-Saharan Africa. One such initiative, promoted by the U.S.-based not-for-profit organisation Greenstar, uses solar-powered communication systems. Electricity from multifunctional platforms could help reduce the capital costs considerably and make it possible for more rural areas to be reached through such initiatives.

4.2.3 Strengthening Pro-Poor Local and National Policy Frameworks

The multifunctional platform concept as currently defined and implemented in West Africa (particularly Mali) shows great potential for bringing together a wide range of actors at the micro and macro levels for the purposes of influencing policy frameworks in favour of poverty reduction. At the micro (village) level, the insistence on women's ownership and the supporting role played by men in most cases are resulting in the mobilisation of whole communities (both women and men) for local development. In many villages, the men and the local authorities have contributed towards the initial payment by the women's groups. This and the multifunctional platform's positive impacts are giving rise to a co-operative spirit among the key actors, which in turn should lead to better decision making with respect to development activity.

At the national level, the multifunctional platform concept is bringing together key policy makers and implementers with respect to poverty reduction. Government ministries and departments already involved in implementing multifunctional platform projects have the potential (and, indeed, the imperative) to bring on board other ministries and departments whose activities have a bearing on poverty reduction. Their interactions among themselves and with donor agencies and nongovernmental organisations point to the emergence of pro-poor consortia that can act in individual countries to influence poverty reduction policy frameworks. These frameworks can draw on the experiences of multifunctional platform initiatives at the micro level and cut across many different sectors (energy, industry, women's affairs, etc.)

Many sub-Saharan African countries acting in concert with key multilateral and bilateral development agencies are putting in place poverty reduction strategies with emphasis on gender, enterprise development, and improved access to financial services as well as education and health (Appendix B). The multifunctional platform concept has demonstrated its potential to have wide-ranging impacts on existing and evolving poverty reduction strategies. The pro-poor consortia emerging at both local and national levels can therefore have far-reaching implications for the fine-tuning and successful implementation of these strategies.

4.2.4 Increasing Access to Private Capital

The multifunctional platform concept as currently defined hinges on community ownership and management of the platform through women's groups. Many services provided to the multifunctional platform (supply of equipment and spare parts, installation and maintenance, sale of diesel fuel, etc.) and some of the activities occurring around the platform (welding, soapmaking, etc.) are private enterprises, but the platform itself and the electricity and water networks are community based. The merits of this community-based approach include literacy programmes for many women, credit access and direct income mainly for women's management committee members, free electricity supply to rural schools and clinics where available, and free or reduced prices for the very poor of the community (mainly for water).

The disadvantage of the community-based approach is that communities may become too dependent on free project services that then may collapse when the project closes. In Mali, there is no record of any village multifunctional platform weaning itself from the project during more than six years of platform activities. However, some villages in Burkina Faso and Mali that are not part of the project and thus not monitored appear to have mixed results. Their main achievement is that all engines are functioning, but no further evaluation has been made.

Private ownership of multifunctional platforms would lose the advantages listed above for community-based platforms. Fewer individuals would own and manage the platforms, the prices charged for platform services would likely be higher than those for the community-owned platforms, and free services (mainly lighting and water) to facilities that benefit the whole community and to the poorest would almost certainly be curtailed. Thus private enterprise development frameworks are likely to lead to socio-economic impacts not quite as comprehensive as those currently observed.

On the positive side, privately owned multifunctional platforms would be more attractive to many financial institutions and therefore should be more successful at accessing private capital. Privately owned multifunctional platforms may thus have greater potential for becoming self-sustaining in the shortest possible time. If the ownership were vested in women, privately owned multifunctional platforms would still offer great prospects for women's empowerment through non-farm income generation and improved access to private capital. It is therefore worth undertaking a separate pilot project in one or two countries to establish the boundary conditions for private-enterprise-based women-owned multifunctional platform initiatives.

4.3 Key Issues for the Expanded Regional Project

4.3.1 Scope of Future Multifunctional Platform Initiatives

Multifunctional platform initiatives are currently under way in five countries: Mali, Burkina Faso, Côte d'Ivoire, Guinea, and Senegal. As noted in chapters 2 and 3, the Mali project is at an advanced stage with 149 MFP installations and many hundreds of women trained in functional literacy. The other country projects – Burkina Faso, Côte d'Ivoire, Guinea, and Senegal – are at the pilot stage.

The multifunctional platform, as clearly demonstrated in Mali, is such a powerful tool for rural transformation that many other sub-Saharan Africa countries – in West Africa as well as East and Southern Africa – are interested in initiating platform pro-

jects. An important lesson from the early history of multifunctional platform initiatives in West Africa is that the multifunctional platform project should not be in too much of a hurry to extend itself.

The first priority in an expanded regional programme, therefore, would be to reinforce the experience in West Africa by moving the multifunctional platform activities in Burkina Faso, Guinea, and Senegal from the pilot stage to the consolidation stage. Other poor Francophone countries like Niger and Mauritania, which lie just outside the coverage of the present regional project, should be allowed to join in the initial stages of the expanded regional project. These countries have socio-economic conditions similar to those prevailing in the project countries; moreover, the pedagogical tools are already available in French.

An Anglophone country like The Gambia, which also lies just outside the coverage of the present regional project, could be allowed to join in the initial stages of the expanded regional project. This would facilitate piloting of English-language pedagogical tools and help preparation for expansion into East and Southern Africa, where most countries are Anglophone.

The experience gained so far with multifunctional platform initiatives suggests strongly that these initiatives may have the most relevance for countries whose incomes and human development index (HDI) are both low²⁴. The countries listed in Table 4.1 are among the poorest and the most likely candidates for the regional programme when it starts activities in East and Southern Africa.

Table 4.1 Indicators for Eight Selected Low HDI Countries in East and Southern Africa

	HDI (1999)	GNP per capita, US\$ (1999)	Adult Literacy Rate, % (1999)	Traditional Fuel Consumption as % of total energy use (1999)
Tanzania	0.44	240	74.7	91.4
Uganda	0.44	320	66.1	89.7
Zambia	0.43	320	77.2	72.7
Eritrea	0.42	200	52.7	96.0
Malawi	0.40	190	59.2	88.6
Rwanda	0.40	250	65.8	88.3
Mozambique	0.32	230	43.2	91.4
Ethiopia	0.32	100	37.4	95.9

Source: GNP per capita from World Bank, 2001; other data from UNDP, 2001a.

²⁴ The Human Development Index (HDI) is a summary measure of human development; it measures the average achievements in a country in three basic dimensions of human development, namely, a long and healthy life, as measured by life expectancy at birth, knowledge as measured by the adult literacy rate and the combined primary, secondary, and tertiary school gross enrolment ratio, and a decent standard of living as measured by GDP per capita (PPP US\$). (UNDP, 2001a).

It will be important to time the onset of multifunctional platform initiatives in East and Southern Africa such that they do not compromise consolidation of platform initiatives in West Africa. For this reason, a fairly long period, say five years, should be considered for the expanded regional project, thereby allowing initiatives in East and Southern Africa to start after a mid-term evaluation (Figure 4.1). Pilot countries from the East and Southern Africa sub-region should be carefully selected to ensure that multifunctional platform initiatives are undertaken not only in the poorer countries but also in the poorer rural areas where the platforms can have the expected positive impacts. Well-designed feasibility studies will have to be conducted, preferably by experienced consultants from the current platform countries working in collaboration with local experts in the target countries. These feasibility studies could be conducted in the second year of the expanded regional project, prior to the mid-term evaluation, to enable full start-up activities around the middle of the proposed five-year project duration. To start with, three or four (at most five) neighbouring countries should be selected in order not to overburden the expanded regional project team.

4.3.2 Roles of Key Stakeholders at Country Level

The many different actors required for successful implementation of the multifunctional platform concept and the multi-dimensional nature of impacts associated with multifunctional platforms, as discussed in chapter 3, require that many different stakeholders be involved in the implementation of platform projects. The key actors are the women's groups that manage the multifunctional platforms and the artisans/technicians who install, maintain, and repair them. Other actors include nongovernmental organisations and private sector entities, such as small consulting firms and individual consultants/experts, who provide functional literacy training and conduct the various feasibility studies. It has also been suggested that private and public organisations like university departments and research centres are needed to provide such services as technical support, socio-economic impact analysis, and ongoing improvement/adjustment. Various government ministries and departments (rural development, women's affairs, industry, energy, water, health, and agriculture) are also related directly or indirectly to the activities and impacts of village multifunctional platforms. Thus in each country, a consortium of government ministries/departments, nongovernmental organisations, community groups, and private sector organisations, with the donor community playing a catalytic role, is required to ensure successful implementation of the multifunctional platform concept (Figure 4.2).

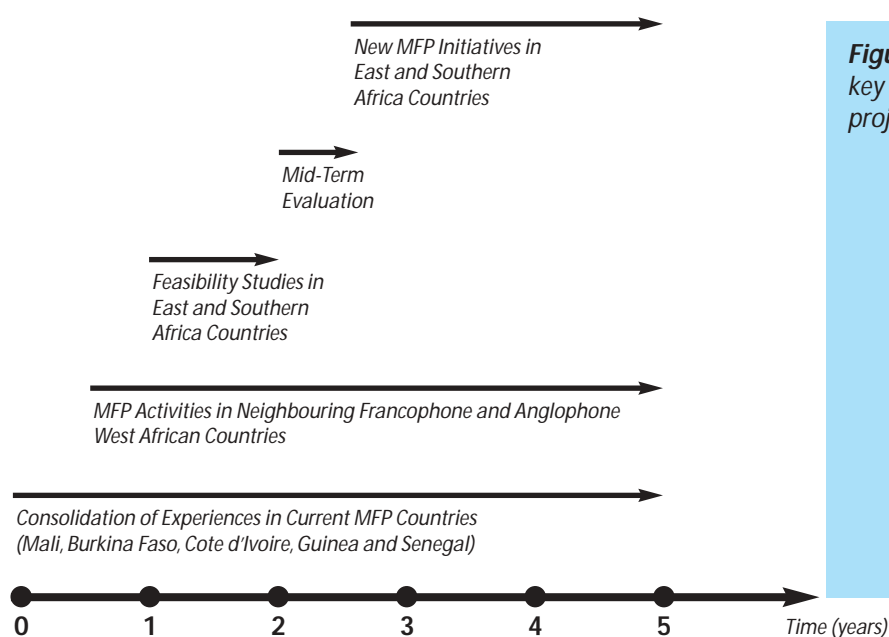
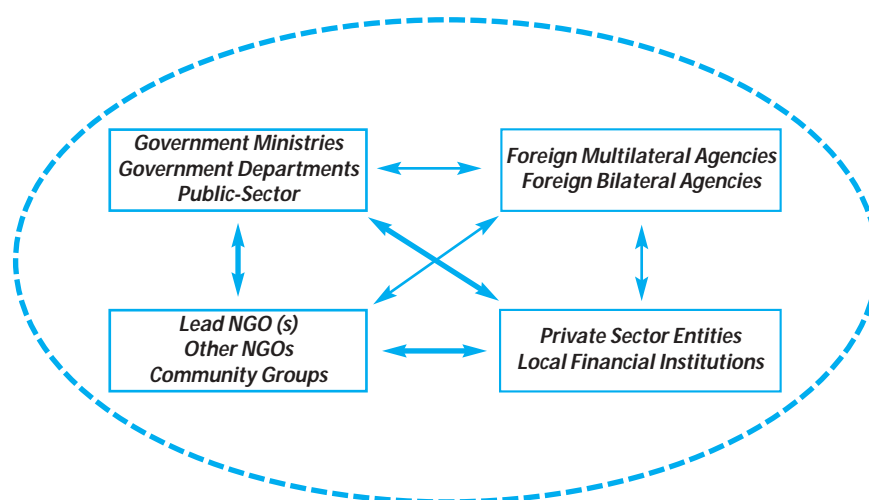


Figure 4.1 Proposed timelines for key activities in expanded regional project

Note: MFP = multifunctional platform.

Figure 4.2
Multifunctional
platform consortium
at country level



As far as government ministries and departments are concerned, their role in policymaking with respect to multifunctional platform-type activities in particular and poverty reduction in general cannot be over-emphasised. Their role in possibly funding and supporting broader fundraising activities will be crucial in enabling widespread implementation of the multifunctional platform concept. The particular ministry or department taking the lead at governmental level will vary from place to place. In the current regional project, the Department for Industry (under the Ministry of Industry, Trade, and Transport) plays the lead role in Mali. In Burkina Faso, the Department for Nongovernmental Organisations (working under and in close co-operation with the Ministry of the Economy and Finance) plays a similar role. Whichever department or ministry plays this lead role in other countries in the expanded programme, it must co-ordinate activities and share information with other related ministries/departments, especially those involved with energy and women's affairs.

In the renewed and expanded regional project, country project teams or lead nongovernmental organisation will be required to play major fundraising and management roles in any given country. As pointed out earlier, a stand-alone country project team with full-time staff and various logistical resources is in place in Mali. Because this has been the case in Mali for close to ten years, the stand-alone country project team may have a tendency to try to institutionalise the direct involvement of donors at country level; this holds the risk of slowing down mainstreaming of the multifunctional platform concept. Furthermore, current trends within UNDP and the donor community at large make it highly unlikely that this situation will be replicated in future multifunctional platform countries.

In most countries, a nongovernmental organisation is likely to be the lead organisation, with other nongovernmental organisations emerging in the country as needed over time. This approach is already evident in Senegal (ENDA) and Burkina Faso (TinTua). A lead nongovernmental organisation may be one that is involved with energy (e.g., ENDA) or it may be one that specialises in community development (TinTua), gender issues, or any particular sector/issue relevant to the multifunctional platform concept. Most important is that a leading nongovernmental organisation have the interest and capacity to manage the multifunctional platform project, to build a network of nongovernmental organisations to complement itself (especially in areas where it may be deficient), and to extend multifunctional platform activities throughout a given country in due course.

Community groups play critical roles in implementation of the multifunctional platform concept, since success or failure of the whole initiative in any particular village rests primarily on their shoulders. Community groups include the women's associations that own multifunctional platforms, with the women's management committees actually operating and managing them. They also include the new community groups/committees being formed to manage the water and electricity supply systems that are offshoots of a growing number of multifunctional platforms.

A network of private sector entities and local financial institutions will play crucial roles in the expansion and implementation of the multifunctional platform concept. Already private consulting firms (in addition to nongovernmental organisations) are providing village-level feasibility study services. Private individuals are involved in functional literacy training and technical services at the village level and in technical/management consulting services

at the national level. The multifunctional platforms are also generating a new breed of private rural entrepreneurs (such as the welders) who depend on energy from the platforms. As the multifunctional platform concept reaches advanced stages of implementation, many more such private rural entrepreneurs (including some women) are likely to develop small-scale industrial and commercial activities like soapmaking and oil production for sale in local and external markets, as well as, eventually, information services like telephone and e-mail.

In the near future and beyond, the funding role that until now has been played mostly by external donors will need to be taken up by local financial institutions ranging from city-based banks to rural micro-credit organisations. This promises to be one of the most difficult challenges ahead but it is only when the country-level multifunctional platform consortium succeeds in getting the local financial institutions to rise up to this task that platform initiatives in the country can be said to have reached full sustainability. There are no limits with respect to what the private sector can accomplish with and around multifunctional platforms – both in terms of providing services to multifunctional platform projects and in terms of related entrepre-

neurial activities. Private sector ownership of multifunctional platforms together with private enterprise activities around platforms could unlock financial resources from the private sector to achieve noticeable gains with respect to poverty reduction and rural transformation.

The regional or sub-regional project team should support the process of building such a consortium of government ministries/departments, nongovernmental organisations, community groups, and private sector organisations in each country. How successful this consortium building is should be a major factor in determining the overall success of the multifunctional platform concept in that country. The consortium approach should facilitate the promotion of “upstream-downstream-upstream” linkages, which are critical for informing better policymaking on the poverty-energy / gender-energy nexus at country level. The roles of the lead nongovernmental organisation should include monitoring the performance and impacts of the multifunctional platforms on a regular basis and ensuring that the experiences being acquired in a particular country and elsewhere in the region are fed into the “upstream-downstream-upstream” linkages.



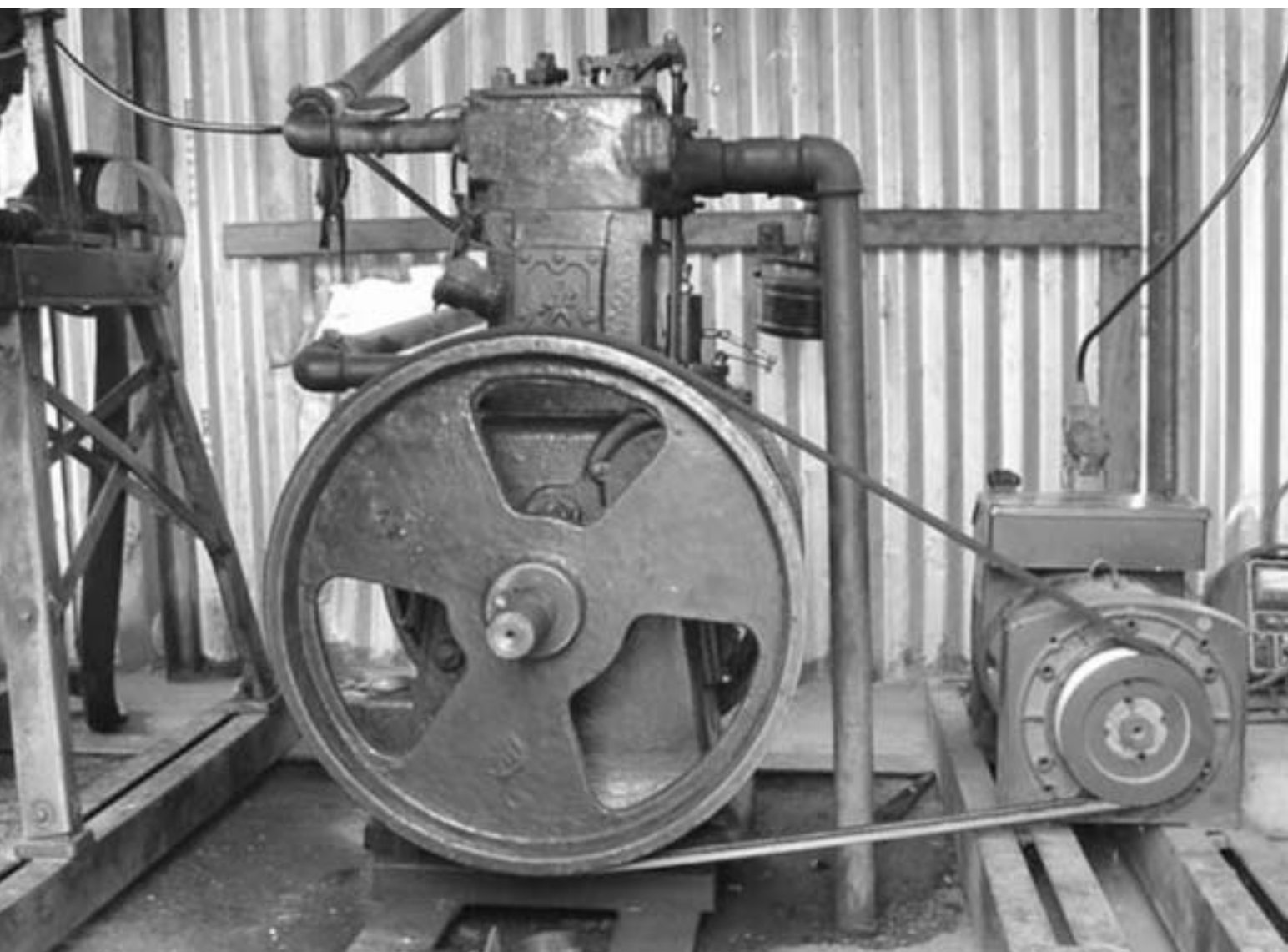
5. CONCLUSION

The experiences of the multifunctional platform project show that modern energy services can make significant contributions to improving the livelihoods of the rural poor. Given appropriate tools, such as multifunctional platforms, poor people in rural areas can develop the rural economy and mobilise necessary local capital, with limited assistance from outside.

Rural development should remain the overall priority in meeting the challenges associated with expanded energy access. These challenges include increasing investment, deploying decentralised energy systems, promoting local energy entrepreneurs, establishing national mechanisms, and

strengthening policies and regulatory systems to expand the level of energy services.

In order to tackle these challenges, macro policies are needed that reflect micro-scale good practices. A well-designed community-level intervention like the multifunctional platform should inform the development of national policies and strategies – such as poverty reduction strategies and national gender action plans – that reflect concerns of the poor. Drawing on successful community-level interventions to develop broad policies and strategies is an important step in scaling-up rural energy development.



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APPENDIX A.

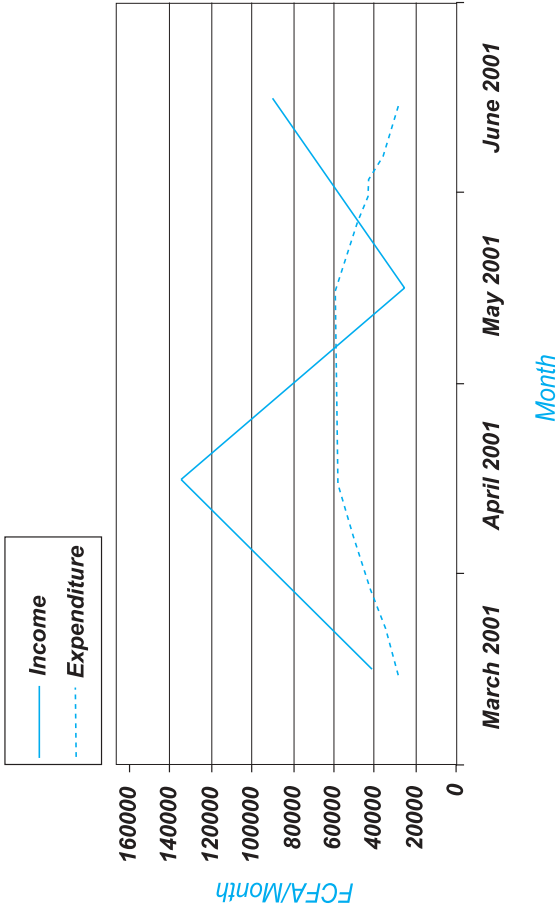
CASE STUDIES OF THREE MULTIFUNCTIONAL PLATFORM VILLAGES

Sampara

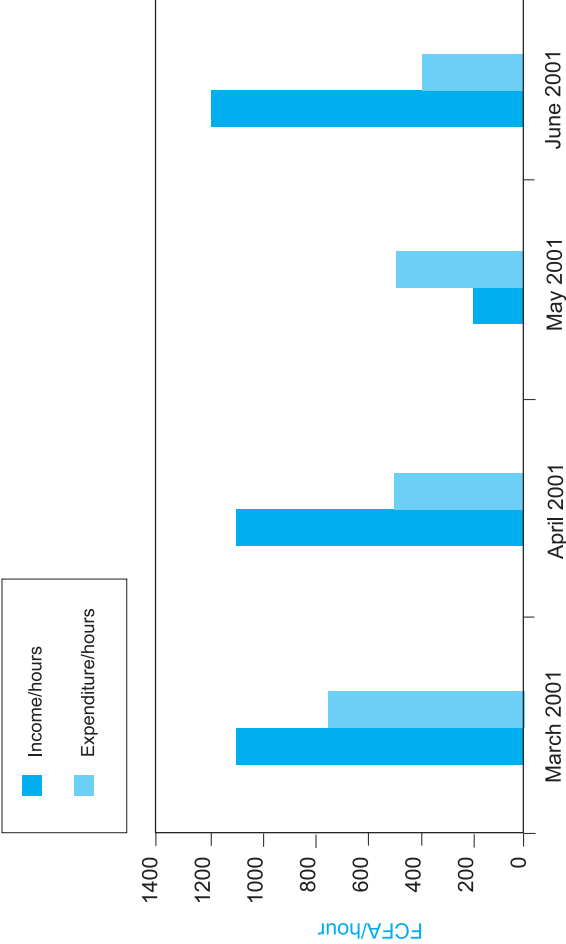
Basic Statistics	Process	Equipment	Financial Results	Acquisition
<ul style="list-style-type: none"> Population: 602 Status: village equipped and monitored Type: new generation (feasibility study conducted) 	<ul style="list-style-type: none"> Request: March 15 and June 10, 2000 Feasibility study: July 16 – 20, 2000 Installation: mid-March 2001 	<ul style="list-style-type: none"> Engine 10 hp 1 mill 1 rice de-huller Battery charger Light for the multifunctional platform building <p>Total investment: 2,430,000</p>	<ul style="list-style-type: none"> Cumulated cash flow (3.5 months): 118,955 FCFA Available cash on hand: 70,965 FCFA Cash in bank: 0 FCFA Amortisation: 243,000 FCFA/year 	<p>Total investment: 2,430,000 FCFA.</p> <p>Women's association: 38% Other members of the village: 12% Project: 49%</p>
		FCFA		
Data Analysis	Income	Welfare	Organisation/Ownership	-
<ul style="list-style-type: none"> Monthly report from facilitator Data not entered in the Results Management System 	<ul style="list-style-type: none"> One of the two traders in the village is now selling fuel at the same price as in Fatoma (9 km away) thus diversifying supply and providing better access for customers, mainly women Increased de-husking and trade of rice Operator earns 80-120 FCFA/engine hour; more opportunity for remunerated employment 	<ul style="list-style-type: none"> "We prefer to pump water than to take our daughters away from school" "Market day is like a Sunday"¹ one operator "Frutigi" (improvement in marriage relations), a village elder Some men are now contributing financially to the domestic task by paying the multifunctional platform services for their wives 	<ul style="list-style-type: none"> Strong support by the men in case of technical problems, "motor noise is like music to the ears" (the elders) Specific working hours for the platform organised by the women 	

¹ Women have organised themselves so that the multifunctional platform opens at a special time the evening before market days. Women can then mill their cereals the day before and are then free to go to the market, located 9 km away, on market days. Before implementation of the multifunctional platform, most women could not leave the village on market days because meal preparation took so much longer.

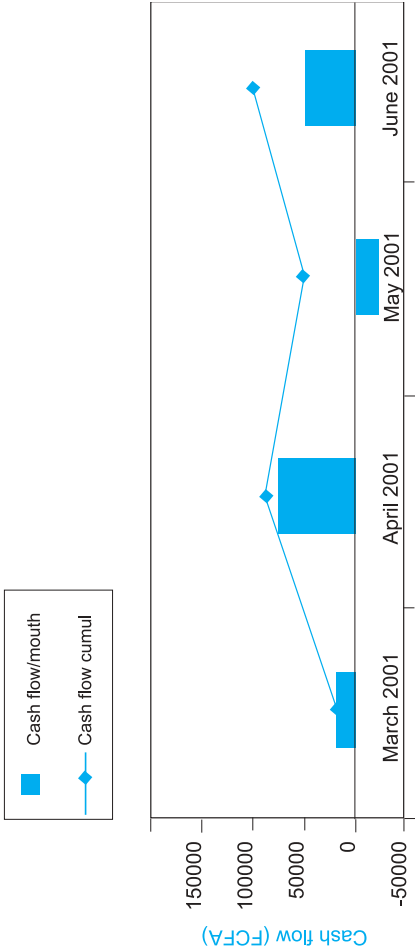
Sampara Multifunctional Platform: Monthly Income and Expenditure, March – June 2001, FCFA



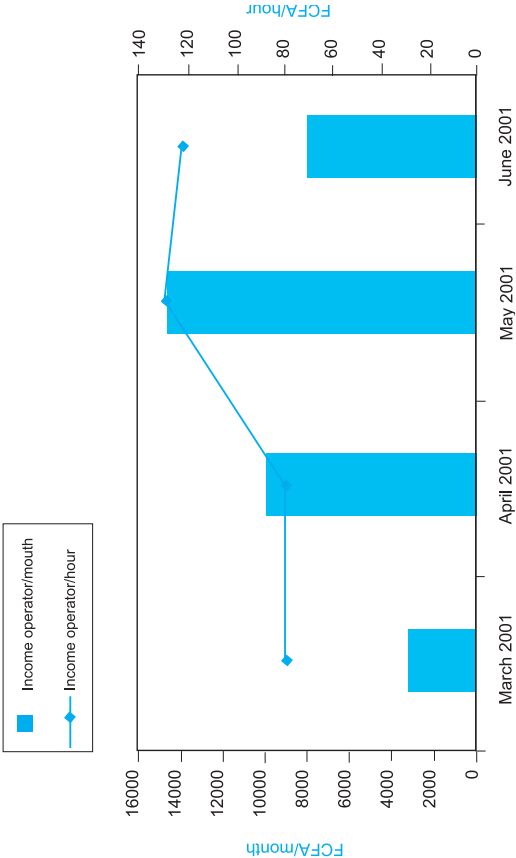
Sampara Multifunctional Platform: Average Hourly Income and Expenditure, March – June 2001, FCFA



Sampara Multifunctional Platform: Monthly and Cumulated Cash Flow, March – June 2001, FCFA



Sampara Multifunctional Platform: Average Monthly and Hourly Remuneration of the Multifunctional Platform Operators ¹, FCFA/month and FCFA/hour, March – June 2001

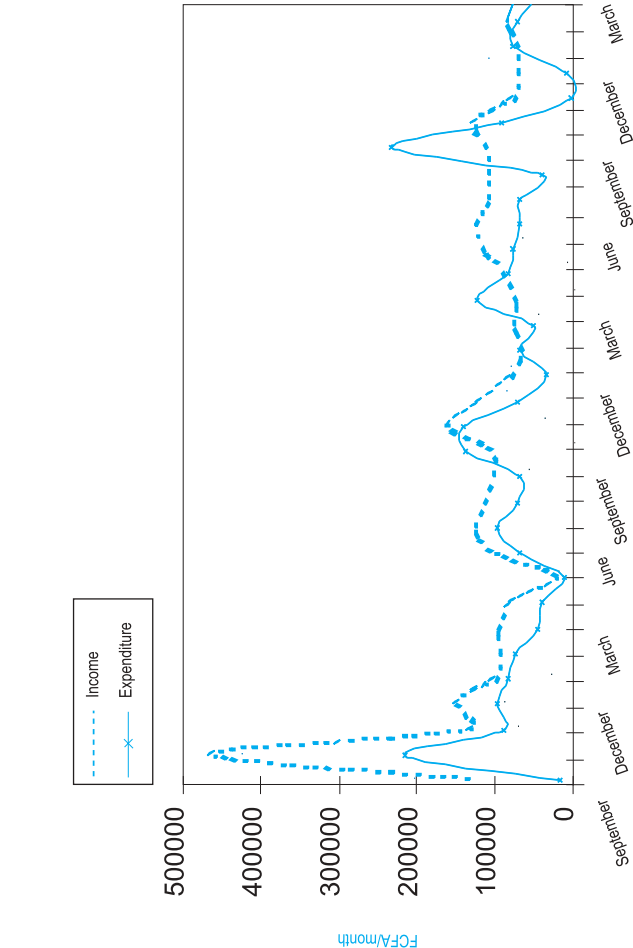


¹ Each multifunctional platform is operated by a cashier, a treasurer, a miller, and two controllers. These functions are remunerated by a percentage of the multifunctional platforms' (gross) income.

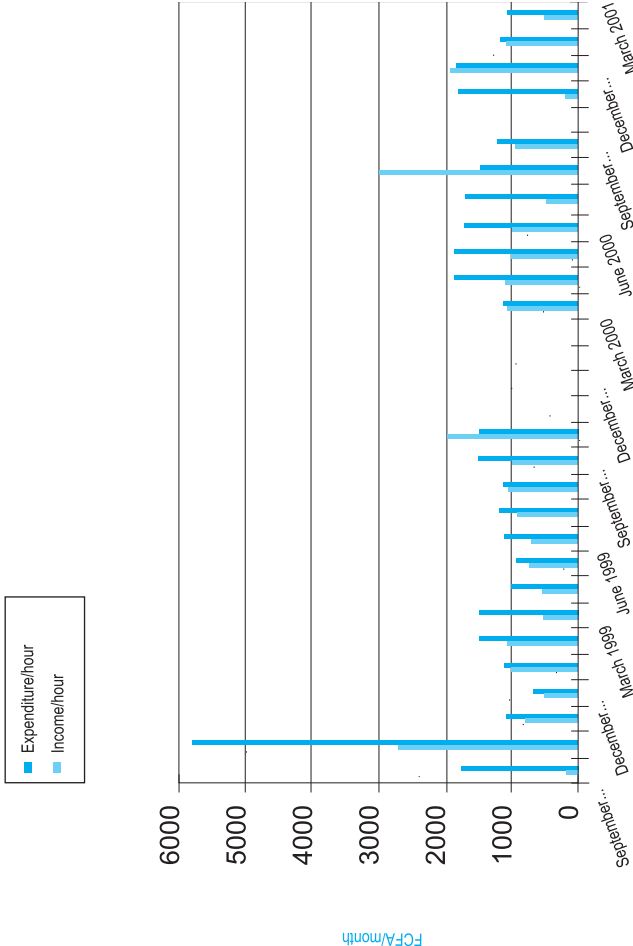
Balanfina

Basic Statistics	Process	Equipment	Financial Results	Acquisition
<ul style="list-style-type: none"> Population: 1,342 Status: village equipped and monitored Type: old generation (pilot village with no participatory feasibility study before implementation) 	<ul style="list-style-type: none"> Request: No expressed demand Feasibility study: none Installation: 1994 (approx.) 	<ul style="list-style-type: none"> Engine 8 hp 2 mills 1 rice de-huller Battery charger Light for the house and the nursery 1 pump (1.5 cubic metre) Water tank (20 cubic metre) and 4 distribution points <p>Total investment: 14,894,250 FCFA</p>	<ul style="list-style-type: none"> Cumulated cash flow (32 months): 1,098,860 FCFA Available cash on hand (29 months): 346,455 FCFA Cash in bank (29 months): 419,800 FCFA Amortisation: not available <p>Cumulated cash (end 1999): 318,725 FCFA Cumulated cash (end 2000): 219,855 FCFA</p>	Total investment: 14,894,250 FCFA
Data Analysis	Income	Welfare	Organisation/Ownership	-
<ul style="list-style-type: none"> Monthly report from animatrice Data entered in Results Management System (December 1999-April 2001) and in Excel file (September 1998-November 1999) 	No data available	No observation	<ul style="list-style-type: none"> Dispute between the Women's Association and the Water Management Committee over the price of energy (pumping) 	

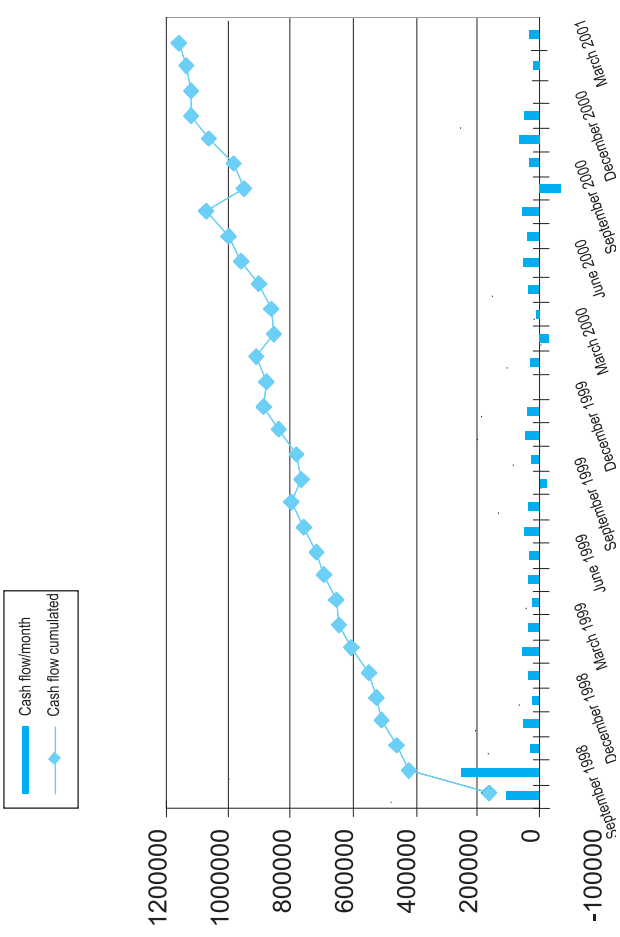
Balanfina Multifunctional Platform: Monthly Income and Expenditure, September 1998 – April 2001, FCFA



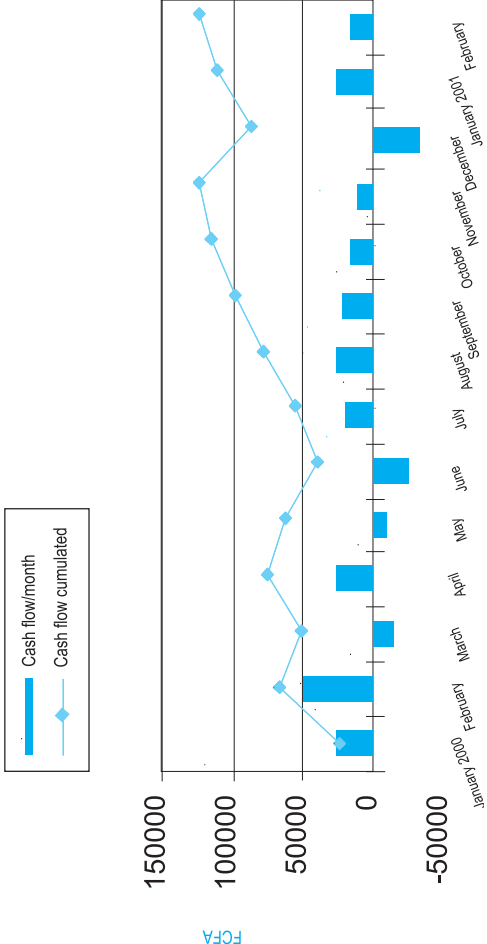
Balanfina Multifunctional Platform: Average Hourly Income and Expenditure, September 1998 – April 2001, FCFA



Balanfina Multifunctional Platform: Monthly and Cumulated Cash Flow, September 1998 – April 2001, FCFA



Maurolo Multifunctional Platform: Monthly and Cumulated Cash Flow, January 2000 – February 2001, FCFA



Maurolo: The Jatrophha Platform

Basic Statistics	Process	Equipment	Financial Results	Acquisition
<ul style="list-style-type: none"> Population: Not available Status: village equipped and monitored Type: old generation (no participatory feasibility study before implementation) 	<ul style="list-style-type: none"> Request: No expressed demand Feasibility study: none Installation: January 1999 	<ul style="list-style-type: none"> Engine 8 hp 1 mill 1 press <p>Total investment: 1,712,387 FCFA</p>	<ul style="list-style-type: none"> Cumulated cash flow (14 months): 133,625 FCFA Available cash on hand: 116,685 FCFA Cash in bank: 0 FCFA Amortisation: not available <p>Cumulated cash (end 2000): 92,835 FCFA</p>	<p>Total investment: 1,712,387 FCFA</p> <p>Village contribution: 10 tonnes of jatrophha, equivalent to 500,000 FCFA (with 50 FCFA/kg) or 29% of the total investment cost.</p>
Data Analysis	Income	Welfare	Organisation/Ownership	
<ul style="list-style-type: none"> Data entered in Results Management System (June 1999-February 2001) 	No data available	No observation	No observation	-

Note: This village was not visited.

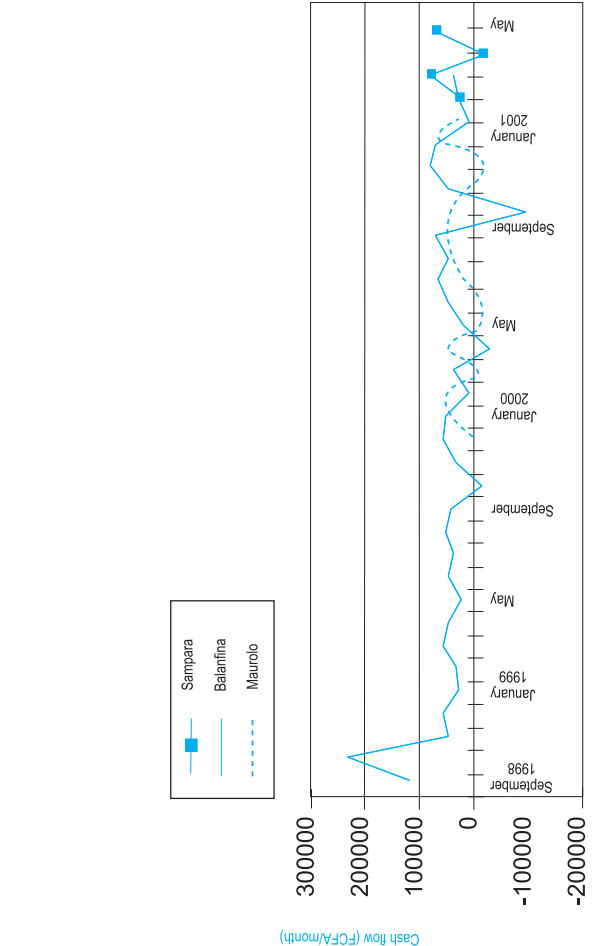
Overview of the Case Studies

	Sampara	Balanfina	Maurola
Months	3.5	32	14
Average cash flow (FCFA/month)	29,300 (-35,000 - 76,000)	34,000 (-12,00 - 250,000)	9,500 (-41,000 - 46,000)
Average income / hour (FCFA/hour)	912 (222 - 1,266)	1,576 (633 - 5,500) ^a	678 (400 - 857)
Average expenditure / hour (FCFA/hour)	529	1,059 (193 - 2,990) ^a	512
Average operator's remuneration (FCFA/hour)	104 (79 - 130)	Not available	Not available
Average fuel used (l/hour)	0.93 (0.71 - 1.0)	0.87 (0.73 - 1.16)	0.9 (0.61 - 1.1)
Average hours of engine operation (hours/month)	96.0 (71 - 124)	76.5 (16 - 233)	58.7 (37 - 93)
Number of clients (% of population)	Not available	Not available	Not available
Number of services per day (% of population)	Not available	Not available	Not available

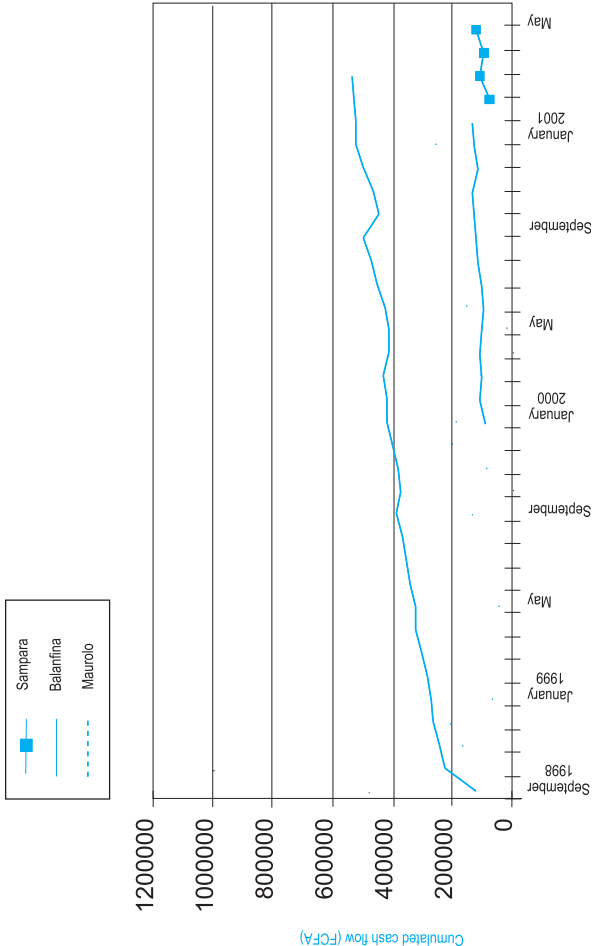
Notes: Numbers in parentheses are the range.

^a Data for 25 months.

Monthly Cash Flow: Sampara, Balanfina, Maurolo, FCFA



Cumulated Cash Flow: Sampara, Balanfina, Maurolo, FCFA



APPENDIX B.

POVERTY INDICATORS AND STRATEGIC RESPONSES IN AFRICA

Overview

Sub-Saharan Africa is synonymous with poverty in the world today. The 28 countries with the lowest Human Development Index (HDI) for 1999 are all in sub-Saharan Africa. The region also accounts for 30 out of the world's 49 least developed countries (61 percent) and 38 out of 64 low-income countries (59 percent), using the World Bank's classification. Poverty-related indicators for the five West African countries involved in the UNDP Regional Multifunctional Platform Project – Burkina Faso, Mali, Guinea, Senegal, and Côte d'Ivoire – and for

three other sub-Saharan African countries are shown in the table below. The five project countries all have HDI numbers less than 0.5 and adult literacy rates less than 50 percent. Also, all five countries plus Ghana in West Africa have GNPs per capita ranging from US\$ 240 in Burkina Faso to US\$ 710 in Côte d'Ivoire. This is in sharp contrast to the few sub-Saharan African countries that are relatively better off, such as Botswana and South Africa, whose GNPs per capita exceed US\$ 3,000. The poorest countries also have high levels of traditional fuel consumption ranging from 91.2 percent in Côte d'Ivoire to 56.2 percent in Senegal.

Poverty-Related Indicators for Selected Sub-Saharan African Countries

	HDI (1999)	GNP per capita, US\$ (1999)	Adult Literacy Rate, % (1999)	Traditional Fuel Consumption, % of total energy use (1999)
Burkina Faso	0.32	240	23.0	84.1
Mali	0.38	240	39.8	88.9
Guinea	0.40	510	35.0	74.2
Senegal	0.42	510	36.4	56.2
Côte d'Ivoire	0.43	710	45.7	91.5
Ghana	0.54	390	70.3	78.1
Botswana	0.58	3,240	76.4	...
South Africa	0.70	3,160	84.9	4.9

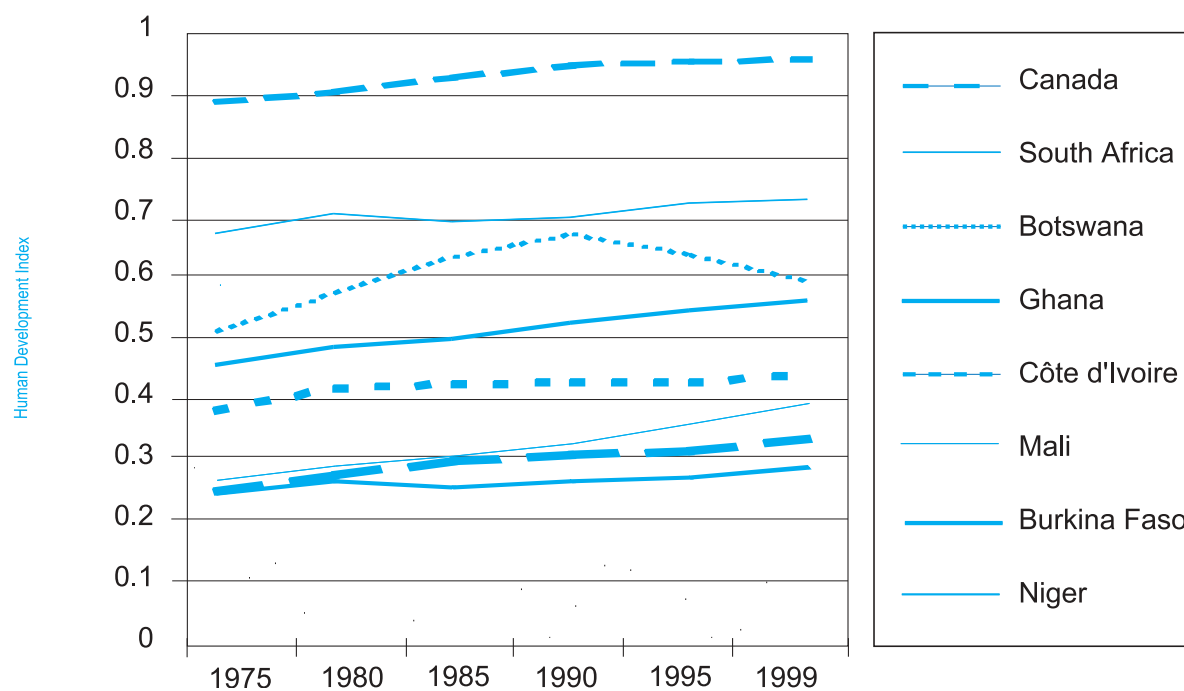
Sources: GNP data from World Bank (2001); other indicators from UNDP (2001^a).



Trends in the HDI over the last quarter century are shown in the figure below for the project countries, as well as a few selected countries with higher HDI levels both within and outside Africa. Although some progress has been made in individual countries, the gap between poorer and richer countries

remains wide. In order to deal more decisively with poverty, many African governments have been working in partnership with the major multilateral and bilateral agencies, particularly the World Bank and UNDP, to formulate national development and poverty reduction strategies.

HDI Trends for Selected Countries



Sources: UNDP (2001^a).



Burkina Faso

Burkina Faso has 45.3 percent of its population living below the national poverty line, measured as an annual income of US\$ 140 per capita (adult) in 1998³, with rural poverty accounting for about 95 percent of national poverty. Furthermore, rural women are comparatively more affected by poverty than men: school enrolment ratios are 47.7 percent for boys and 34.6 percent for girls (1999/2000 academic year), and literacy rates are 33.0 percent for men and 13.3 percent for women (1999). Malnutrition affects 14 percent of women and 29 percent of children (1995). Even though the country's economy grew at an average rate of 5 percent per annum between 1995 and 1998, population growth rates averaged 2.4 per year and the country's environmental situation is characterised by continual degradation of its natural resources. Wood continues to be the principal type of fuel used in households, rising from 87.3 percent of households in 1994 to 88.2 percent in 1998.

The Government of Burkina Faso has responded to this gloomy economic situation with a strategic initiative for the elimination of poverty and also joined the World Bank Group's Highly Indebted Poor Countries (HIPC) Debt Initiative. The primary objectives outlined in Burkina Faso's strategic initiative are: (a) to accelerate growth on an equitable basis; (b) to guarantee access to basic social services for the poor; (c) to expand employment opportunities and income-generating activities for the poor; and (d) to promote good governance.

Mali

In Mali, the rural population lives in about 11,000 villages, most of which are remote and isolated. A poverty level of 69 percent was reported for 1998 – 76 percent in rural areas and 36.3 percent in urban areas. Literacy rates (1999) are 47.3 percent for men and 32.7 percent for women. Only 8.6 percent of the total population of the country had access to electricity in 1998; 46 percent of villages had access to potable water supply (wells and boreholes) in 1996.

The Government of Mali adopted a National Poverty Reduction Strategy in 1998 with the support of UNDP and the World Bank. The strategy has eight objectives: *[authors' translation from the French]*

1. To improve the economic, political, legal, social, and cultural environment in favour of the poor;
2. To promote income generation and self-employment activities targeted at the poor;
3. To improve access by the poor to financial services and other factors of production;
4. To promote development and improve the performance of agricultural and food industries where the poor are concentrated;
5. To improve access by the poor to education and training;
6. To improve access by the poor to basic health, nutrition, potable water, and sanitation.
7. To improve housing conditions for the poor; and
8. To ensure effective co-ordination of the poverty reduction strategy.

The Mali Government's energy policy objectives are: (1) to improve access to modern energy services, (2) to rationalise utilisation of existing energy sources, (3) to make better use of local energy sources (hydroelectricity, solar energy, and wind), (4) to preserve and protect forest resources, notably wood fuels, through sustainable harvesting, and (5) to improve the public management of various sub-sectors by simplifying procedures, concentrating effort, and utilising the private sector more effectively.

Accordingly, the Government has privatised the national electric utility, *Energie du Mali*. The Government is currently in the process of setting targets to improve access to electricity from 7 percent in 1995 to 23 percent in 2007, and plans are under way to develop rural electrification projects for 500 villages by 2007. Mali is also in the process of developing policies to reduce wood energy consumption by 20 percent by 2007 and to increase the proportion of national energy use that is renewable energy to 3 percent during that time period. Under consideration, are measures to improve equipment and to promote gas and kerosene use.

³ The 1998 poverty line, in local currency, is 72,690 CFA francs.

Ghana

Ghana had 31.4 percent of its population below the national poverty line in 1999, (UNDP, 2001a) with the majority of poor people being women and girls (SIF, n.d.). Ghana's adult literacy rate in 1999 was 79.4 percent for men and 61.5 percent for women. In that same year, 62.1 percent of the population lived in rural areas and 32 percent had no access to improved water sources (wells, boreholes, etc.).

In the 1990s, Ghana developed a twenty-five-year development strategy, known as Vision 2020, with the aim of becoming a middle-income country with GDP per capita of about US\$ 4,000 by the year 2020. The long-term development objective of Vision 2020 is to improve the quality of life and expand opportunities (for employment and leisure) for the entire society. The Vision is to be realised by:

- ❑ reducing poverty by improving access to basic social, technical, and economic infrastructure, especially among the poor;
- ❑ increasing participation of the poor and the vulnerable in the decision-making process;
- ❑ enhancing human resources by implementing programmes on population, health, nutrition, women's empowerment, etc.;
- ❑ increasing employment opportunities through vocational training and skill development, promoting labour-intensive programmes, and supporting the informal sector;
- ❑ safe-guarding the rights of women and improving educational opportunities for girls; and
- ❑ providing a safety net for the extremely poor and most vulnerable (the aged, the disabled, etc.)

A National Poverty Reduction Programme developed in tandem with Vision 2020 in 1997 took into account the finding from numerous studies which indicate that reducing gender inequities and increasing women's access to productive resources are strongly correlated with improvements in family health and well-being, and poverty reduction (SIF, n.d.). The Programme had five main objectives:

1. Build management capacity to plan and co-ordinate poverty reduction interventions, both at the national and at the district level, including interventions by civil society organisations;
2. Adapt technology to reduce workload and drudgery at the community and household levels and to improve productivity;
3. Develop skills to enable people to engage in

- productive self-employment and income generation and to develop innovative projects;
4. Establish a Social Investment Fund to support the provision of social services and infrastructure; and
5. Create a social development mechanisms to empower women and girls and to address the problems of society's disadvantaged.

Five districts were selected to participate in the National Poverty Reduction Programme. The Government's decentralisation policy was used as a strategy to help build capacity of the districts to participate in the Programme.

In January 2000, a new Government was elected and quickly took Ghana into the World Bank's HIPC Debt Initiative. A new national poverty reduction strategy was prepared to satisfy HIPC requirements.

Immediately following assumption of office, Ghana's Government committed itself to reversing the social and economic decline facing the country and creating a conducive environment for strong and sustainable growth and prosperity. The President of Ghana further identified the following as the Government's priority developmental objectives:

1. Bringing down the cost of living
2. Creating jobs within the economy
3. Alleviating poverty
4. Providing more affordable health care
5. Improving access to quality education.

Ghana's Ministry of Energy developed an energy policy framework to respond to these priority developmental objectives. This framework recognised the critical need for injection of substantial levels of investment capital into Ghana's economy as well as for availability of adequate, secure, and reliable energy services to drive productive value-added industries and services. Specific objectives within the energy policy framework include increasing access to high quality energy services, minimising environmental impacts of energy supply and consumption, and accelerating the development and utilisation of renewable energy sources. A national electrification project, which has been in progress since the late 1980s and aims to electrify the whole country by 2020, has increased access to electricity from about 23 percent in 1988 to nearly 50 percent in 2000 ⁴.

⁴ Oteng-Adjei, J., "Overview of Ghana's Rural Electrification Programme," Sustainable Energy Advisory Facility Workshop, Kumasi, Ghana (2001).

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