

NIGER ENERGY II: HOUSEHOLD ENERGY PROJECT MID-TERM EVALUATION REPORT

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MID-TERM EVALUATION REPORT

Introduction

(a) Country Background

The population of Niger was 7.3 million in 1988 and growing at about 3.3% per year. The per capita income of US\$ 260 is one of the lowest in the world. Niger covers an area of 1.3 million km². But two thirds of the area is covered by the Sahara desert, and the productivity on the rest of the land is low. Overgrazing is widespread as the land is unable to support the total livestock.

The total forest cover in Niger in 1980 was estimated at around 15 million has. Most of this is classified as agropastoral or sylvopastoral forest. The production is 0.1 m³/ha/year in the dryer areas and up to 0.5 to 1 m³/ha/year in the Sudanese zone. The annual wood production in 1980 was thus estimated at 4.2 million m³ (2.9 million tons), of which only 1.4 million m³ (1 million tons) were accessible. Since then, the forest cover and its productivity have been reduced through the combined effect of draught, agricultural expansion and the demands of a growing livestock. Yet the demand for fuelwood which accounts for the major share of energy demand and for service wood continues to increase. In 1990, the consumption of fuelwood was estimated at 2.3 million tons and of service wood 0.15 million tons.

The ESMAP "Niger Household Energy Strategy Project" report from 1988 observed that (i) the annual demand for fuelwood had reached a level, which equaled the total accessible natural annual wood production in the country, and (ii) that the uncontrolled nature of the commercial supply of fuelwood to the cities lead to an overexploitation of the resource base in some areas, and to an underexploitation of available standing stock in other areas.

Niger has favourable solar radiation. Since 1960 Niger has carried out research in solar energy applications, mostly through ONERSOL, the national energy research institute. The R&D work centered on the exploitation of thermal solar energy. But in later years, several pilot projects promoted the use of PV-systems in telecommunication, water pumping, communal TV, refrigeration and household lighting. With the exception of the first two applications, the introduction of PV systems has been a failure.

(b) The Niger Energy II Project: Household Energy Policy Component

The World Bank decided to include the execution of the proposed household energy strategy in the IDA loan for "Energy II". The household energy component was financed by a grant from Danida amounting to US\$ 10.3 million. US\$ 0.6 million were destined for the so-called "volet solaire", which intended to promote the use of PV systems for domestic lighting. The remaining US\$ 9.7 million were split between a 60% share for "volet offre", which promotes forestry management for fuelwood production; and a 40% share for "volet demande", which intends to promote the use of kerosene stoves and of improved fuelwood stoves for cooking. Since IDA loan regulations limit the duration of a project to a maximum of five years, the project was supposed to run from mid-1989 to mid-1994.

The project is the largest woodfuels project that has been implemented in Africa and highly experimental. While improved household stoves have been promoted in all African countries, neither the rapid and widespread implementation of natural forestry management practices nor the massive promotion of a new kerosene stove had ever been attempted except at a pilot scale. This meant that new approaches and practices had to be developed, and that few other experiences could be used as guidelines for the definition of activities.

(c) Mid-Term Evaluation

The project document foresaw a mid-term evaluation. Danida and the World Bank decided to ask Mr. Wolfgang Mostert (management consultant and energy economist) from PA Consulting Group to carry out the review assisted by Mr. Per Cristian Christensen (forester) from Østjysk Skovdyrkerforening. The TOR for the mission are enclosed as annex I. Prior to its departure, the team prepared a scheme for the evaluation (see Annex II). The review mission in Niger took place from February 16 to March 7, 1992. Mrs. Nanna Hvidt from Danida and Mr. Willem Floor from the World Bank participated in some of the visits (see programme of visits in Annex III). A final meeting to discuss the preliminary conclusions of the mission (see Aide Memoire in Annex IV) was held on March 6 at the office of the Director of Energy, Mr. Zanguina.

The review team would like to express its thanks to all officials and individuals met for kind support and valuable information which the mission received during its stay in Niger and which greatly facilitated the work of the mission.

This report contains the views of the review team which do not necessarily correspond to the views of the World Bank or Danida. All proposals are subject to approval by the two institutions.

PART I: EXECUTIVE SUMMARY

I. Project Organisation

Project responsibility. The "*Direction Energie*" is the national counterpart which has the overall responsibility for the project. It nominated the project directors for the "demande and solaire volets" from its senior staff. The "*Direction Environnement*" of the Ministère de L'Hidraulique et Environnement is in charge of the "volet offre" and nominated the director and the national staff for the "volet offre". In the *World Bank*, "Africa Region" was responsible for the IDA loan. The operational responsibility for the three volets was entrusted to an official from ESMAP, who is one of the best-known household energy experts. The tender for the "offre and demande" volets was won by a French joint venture team which has some of the best *consultancy expertise* in the field - SEED (experts in energy demand management) and (experts in West-African forestry issues). The Danish consultant firm Krüger which won the contract for the market study in the "volet solaire" had extensive project expertise in Niger with, inter alia, the promotion of PV-powered water pumps.

Project preparation and planning was given sufficient time, which lead to well-defined and coherent strategies, detailed plans of operation for the project period and realistic budget estimates for the "demand and offre" volets. The "volet solaire" was somewhat weaker in this aspect.

II. Volet offre

The objective of the *volet offre* is

The strategy of the *volet offre* for the regulation of the commercial fuelwood market comprises four main elements. (i) Local villagers gain exclusive user rights for the commercial exploitation of the locally available forestry resources through the establishment of a so-called "marchè rural". (ii) The responsibility for the protection and the management of the forest resources is shifted to these "marchès ruraux". The national forestry service, the SEE, changes its role from being a "policeman" to being a provider of advisory services to the "marchès ruraux" in the techniques of natural forest management. (iii) The cutting of forested area is regulated through a system of cutting and transport permits by zone of origin. The marchés ruraux receive annual transport permits that correspond to the sustainable level of production as defined by the management plan, and issue these to transporters when they purchase fuelwood. (iv) In order to ensure compliance with the regulatory system, the system of control with the transport of fuelwood to the cities is strengthened.

The activities of the *volet offre*

The "*demande and offre volets*" are very ambitious. It is the largest woodfuels project in Africa and faces a particularly difficult environment in Niger:

- *The promotion of substitute fuels faces the constraint that the purchasing power of the population is one of the lowest in Africa, while the cost of petroleum products is one of the highest. The transport costs are high for petroleum products, as Niger is a landlocked country with long distances to the suppliers.
- *The promotion of a natural forest management faces the constraint that the low productivity of the wooden resources provides a disincentive to investments in resource protection by the local villagers.
- *The project will achieve its goal of sustainable demand and supply only if the whole chain of mutually reinforcing proposed measures is implemented. The project depends on the political will to implement supporting measures and laws.

Strategic Efficiency

All three volets address the key structural issues in their respective fields, and introduce novel approaches to deal with these. The sectoral constraints are handled in a by and large very convincing manner.

2.2 Efficiency of Implementation

At mid-term it is apparent that the *implementation of the volet offre strategy has progressed smoothly at the technical level*, but that the volet offre faces practical difficulties on two fronts. Firstly, *the implementation of the volet offre strategy is not sufficiently supported at the political level* in the crucial areas of control with woodfuel flows and the adoption of higher levels of woodfuel taxation. Secondly, it has become apparent, that although the strategy of the volet offre is logically coherent in the description of the end-product, the functioning of the fully reorganised woodfuel market, *the process of getting the strategy implemented is filled with contradictions*.

The work of the volet offre team has been impressively productive. (i) A substantial part of the potential fuelwood supply areas for the four largest cities have been inventoried, maps have been elaborated and research in the productivity of natural forests and of natural management practices has been

initiated. (ii) A supply plan for Nimamey has been prepared, and similar plans for the other cities are under preparation. (iii) Several "marchès ruraux" have been set up. (iv) A draft law for a new fee system for fuelwood has been prepared and is being discussed. (v) The project hired staff for the control of woodfuel supplies in the four major cities and set up check points on both the primary and some of the secondary access routes. Training was provided to the staff and supporting equipment, e.g. cars and mopeds were provided. The result was a rapid increase in revenues from fuelwood taxation and thus in the effective taxation of supplies.

In the second half of 1991, the project transferred the responsibility for the *control posts* to the Direction d'Environnement. Within a couple of months most of the gains in the effectiveness of control were lost again: Monthly revenues dropped from more than 6 million FCFA to less than 2 million FCFA. Since the same resources (staff and equipment) continue to be used in the control system, the loss of performance can only be attributed to the change in management. Unless the Government subjects the management to the attainment of performance standards and is willing to replace non-performing managers, the control system will not be an effective policy tool for the promotion of sustainable woodfuel practices.

The *drafting of the proposal for the new woodfuel taxation law* was entrusted to an interministerial working group, which received active participation from staff and technical support from consultants of the volet offre. In order to allow woodfuel taxation to become an effective instrument in the promotion of a rational system of supply, the revision of the law text has to correct two main weaknesses of the present law: (i) The present fee rate per stère of 300 FCFA is below the production cost of managed woodfuel and makes no impact on the supply chain. (ii) The transport capacities in stères of fuelwood that are defined by the law for the calculation of the transport fees for the different categories of vehicles amount to less than half the actual amounts that are transported. The law proposal which the working group prepared and was discussed at a national seminar in March 1992, leaves the definition of the transport capacities unchanged and introduces an extremely complex system of variable fee rates. The maximum fee rate is 600 FCFA/stère. Rebates are given according to the degree of resource management at the resource base and according to its distance from the center of consumption.

The draft text should be rejected because (i) the continued underestimation of the transport capacities has some overlooked "perverse" effects and because (ii) the differentiated system for the fixing of fee rates and the distribution of revenues is too complex to be workable in practice.

The continued underestimation of the real transport capacities of the vehicles reduces the effective rate of taxation of non-managed woodfuel supplies by more than one half. Secondly, contrary to the law's intentions, it breaks the link between the regulation of supply

III. Volet Demande

3.1 Logical framework

The volet demande, in principle

3.2 Efficiency of implementation

The project document fixed very optimistic penetration targets for the diffusion of *improved fuelwood stoves* (F.A.). But so far, the project has developed few initiatives in this field. The EC had a project in operation for the diffusion of FAs in urban areas, the PFAII and the GTZ financed a project to promote FAs in rural areas. In the beginning of 1992, when the PFAII project ended its activities, the volet set up its "Service Promotion Foyers Améliorés". The project faces the situation that the user rate of FAs in urban households has been stuck at about 20% for the last four years and that the artisans who produce the FAs have become so used to Government subsidies from different FA projects that they develop no initiatives on their own. The new "service" expects that a collaboration with the private entrepreneur, who markets the Thomas Cup kerosene stoves in Niger, may lead to some reactivation of the market. The hope is based on two aspects. (i) The entrepreneur has obtained favourable price quotations on metal plates from Chekoslovakian producers, to be used for the production of the stove supports. They are at least as cheap as the second hand metal plates that are used in the artisanal production of FAs. The intention is to use the new metal plates in the production of FAs using teams of experienced craftsmen that are contracted for the purpose. By providing a superior (looking) product at the same price as traditional F.A. (ii) The distribution network for the FAs will be enlarged by the sales points that are used for the kerosene stoves. It is an interesting attempt. But the low prices on the Chekoslovakian metal plates may only be a short term phenomenon of selling out of stock from state enterprise production. It is certain, in any case, that the quantitative objectives for sales and user rates will not be reached.

In *fuelwood substitution*, the project has achieved its goal of creating an urban household market for a kerosene stove, and to transfer the marketing activities to the private sector. The kerosene stove which has been introduced on the market - the Indonesian Thomas Cup adapted with a locally manufactured support - seems to meet the local user requirements. A modern marketing

campaign using TV and spots and billboards as media) created effective demand for the stove among households in Niamey, Zinder, Maradi and Tahoua. Insufficient production capacity at the Indonesian producer's plant and logistical mistakes by the project management created supply shortages during the first year of the campaign. But the producer has now invested in expanded production and a private entrepreneur has taken over full responsibility for the import, the local adaptation and the marketing of the Thomas Cup and signed purchase contract with the producer.

The *training of project staff* has focused on the provision of technical skills in software use for wordprocessing and data processing, on the presentation of promotional material and on basic manufacturing and maintenance skills. Hardly any training has been provided in basic household energy economics. Knowledge of the energy content of different fuels and of the energy efficiencies of different types of stoves is a minimum requirement for the efficient provision of advisory services on energy savings and on fuel substitution. Yet not even the economist responsible for the data processing and monitoring activities of the volet had this basic information.

IV. Volet solaire

(a) Logical framework of the "volet solaire"

The "*volet solaire*" is a complementary activity to the power sector component of the IDA loan, in the sense that it seeks to define a strategy for the marketing of PV- electricity systems for households that are not connected to the grid. Several donors have shown an active interest in the promotion of PVsystems in Niger. But apart from the use of PVsystems in telecommunications and in water pumping, most projects have failed. The project seeks to widen the consumer's choice of a source for lighting by improving the service level of the suppliers.

V. Conclusions:

(a) Results

General. At mid-term, it can be concluded that the "*demande and offre volets*" will yield important results, whereas there is no likelihood that the "*volet solaire*" will yield results of substance.

Quantitative targets. The quantitative targets that were set in the project planning document of 1989 for the "demande and offre" components will not be met - the output targets for the demand side and the supply side measures were unrealistic.

The *volet offre* has reduced the quantitative target for 1984 to 140,000 has being managed by 150 villages in 30 different zones.

Institution building

At the operational level, it could be noted that the *training of project staff* had been insufficient in some aspects.

The sociologists of the project had no idea of the order of magnitude

Qualitative results.

Volet Offre

Volet Demande

Volet Solaire

The volet solaire is a failure. It has two basic problems:

*First of all, the project has suffered from an absence of management. The projet director has been unable to apply the logic of the project at the operational level. During its first phase, a market study was made, the results of which were to be used for the the selection of equipment for the second pahse, the implementation of pilot projects to test the marketing concept with the introduction of several PVsystems. But deficiencies in the approach of the market study were not sufficiently criticized, nor were its results used in the selection of equipment in any way. The negotiations with potential suppliers of equipment dragged on for months.

*Secondly, the market for the private PVsystems in Niger is too low to sustain the operation of an efficient maintenance and service system. The creation of such an infrastructure was the main operational objective of the project. The market study in any case does not provide evidence of the existence of a household demand for PV systems for lighting that is sufficient to finance its cost. Since the creation of such a system is the objective of the project, the rationale for the implementation of a pilot phase is not there.

Probably because the volet is a secondary activity within the overall framework of the project, the volet solaire was not subject to the same close quality control by the World Bank as the other two volets. The Bank did not intervene at an early stage to address the obvious weaknesses of management, nor was a proper assessment made of the market study to verify whether the implementation of the second phase was warranted.

(b) Recommendations:

Volet Solaire

It is recommended that the volet solaire component be closed, and that the remaining funds be transferred for the funding of activities under the "volets offre and demande".

Volet Offre

At the strategic level the volet offre does not need to make any changes to its basic approach, which remains valid. But firstly, it needs to take a stronger stand on some of the policy issues that are of crucial importance for the success of its strategy. + periodical limitations of the market

At the functional level this means that the project team has to be reorganised and that the staff has to receive adequate training to be able to fulfill its new functions.. Since the emphasis behind the "marchés ruraux" is on widening (setting up more centres) rather than deepening (setting up efficient forestry management schemes) the actions of the two technical disciplines - sociology and forestry - have to be better integrated. Therefore, the two "services" of should be joined. Both the responsible foresters in the region and the sociologists need to get a better understanding of the effective availability of resources and the limits to exploitation. Both professions, but the sociologists in particular, need to become "polyvalent" in both sociological and forestry aspects.

At the operational level, the "animateurs" need to put more emphasis on resource availability + rudimentary methods of resource assessment + mixing of green and dead wood + links with land management

Volet Demande

At the strategic level, the *volet demande* needs to broaden its strategy to encompass *energy savings in households* in general, and to identify low-investment measures, like behavioural changes. The project document did not foresee any *energy saving campaigns that sought to influence user behaviour* in order to achieve a more energy efficient use of existing stoves, and the programme was not adjusted during implementation to include these.

Volet Offre

(a) Strategic level

Land management

For the individual peasant, the productivity of land in Niger will almost always be higher for agricultural uses than for forestry uses. Since the growth in the population and in the livestock has led to shortages of land already, the forested area will be subjected to pressures from agricultural expansion. In order to succeed, the project areas will have to expand the scope of perspective from "natural forest management" into "land management" as soon as possible. This means, that the project at the technical level has to begin a cooperation with INRAN (Institut National de Recherche Agronomique en Niger), and at the project implementation with the forthcoming World Bank/FAO supported land management projects.

(b) Functional level

Adjustment of the draft decree law

(c) Operational level

Reducing the number of offices

Information - conveying the results of the forest resource estimates to the foresters

Training of sociologists in natural forest management.

Volet Demande

Strategy Level

Turn into a rational use of energy project, with stronger emphasis on energy

savings through behavioural changes.

Functional level

Closer integration with the work of the Direction d'Energie, and the promotion of savings of electricity.

Operational level

Improving the painting proces, changing of wicks
Training in basic energy economics.

Volet solaire

This project component should be closed and the unused funds be transfered to the other two volets. Firstly, the market studies have shown, that although a demand for privately owned PVsystems exists, it is not large enough to economically justify the set up of a larger integrated system of marketing and maintenance services. Therefore, the rationale for making a specific effort to rationalise the private sector based system of PVmarketing evaporates. Secondly, the management of the project has been incapable of interpreting the results of the project activities correctly and of using the results from the market study to define the contents of the pilot project activities for the testing of the marketing concept. There is therefore no realistic hope that a continuation of the project will produce results of value.

PART II: TECHNICAL PAPERS

I. THE QUALITY OF THE PROJECT DESIGN

1.1 The logical framework of the project

The Niger Household Energy Project consists of three components ("volets"), that all deal with household energy issues. Two of the components - the volets "offre" and "demande" - deal with the woodfuel situation in a complementary and mutually reinforcing way. The "volet solaire" is a complimentary activity to the "power project component" of the IDA loan in the sense that it deals with individual household lighting systems, whereas the latter is concerned with grid based electricity systems.

1.1.1 Objectives

The objective of the "demande and offre volets" is to obtain an ecologically sustainable equilibrium between the demand and the supply of woodfuels by the year 2000. To achieve this, very ambitious *quantitative targets* were fixed in the project document for the period up to the end of 1994, when the project stops.

*The role of the *volet demande* in the strategy is to prevent the level of the commercial (urban) demand for fuelwood from rising - total urban and rural fuelwood demand already equals the level of the annual natural growth of woodfuels. The consumption of the four largest cities (Niamey, Tahoua, Maradi, Zinder) is to be kept at 200,000 tons of woodfuels. Therefore, the potential demand increase from the annual 5-6% growth in the urban population has to be kept in check by the promotion of substitute fuels and of more efficient woodfuel stoves. By the end of 1994, some 80,000 kerosene stoves were to be used by 50,000 households (an increase in the rate of penetration from 1% of urban households in 1988 to 38%), 15,000 LPG stoves by 12,000 households (from 3% to 9%) and 110,000 improved stoves by 60,000 households (from 20% to 46%).

*The objective of the *volet offre* is to change the uncontrolled urban woodfuel supply into a system based on supplies from managed forest areas. This should increase the productivity of annual production and eliminate the present coexistence of underexploitation and overexploitation of the standing stock. The goal for end 1994 was to have 250,000 ha. of forest under natural management. Assuming that the sustainable productivity of the lands averages 0.5 m³/ha/year, the production could cover about 40% of the urban demand at the end of 1994

The quantified objectives for the "demande and offre" volets, however, were based on a "top-down" calculation of what was needed in order to achieve an ecologically sustainable balance between the demand and the supply of woodfuels. They were not based on a "bottoms up" estimate of the market for the proposed technologies (volet demande) or of the resource requirements at micro level (volet offre). The objectives are unrealistic and it is unlikely that the project designers really believed that they could be attained. Presumably, the targets were set ambitiously to be used as a selling-motivating point.

The objective of the *volet solaire* is to improve the access of households to well-functioning PVsystems for domestic lighting. This is to be achieved by changing the private sector's marketing of PVsystems from a simple import and distribution function to a high quality system of marketing that puts high emphasis on the provision of adequate maintenance services.

1.1.2 Activities, outputs, inputs

The "*demande and offre volets*" address the key woodfuel issues through a balanced package of activities on the demand and the supply side. The relationship between the activities, the expected outputs and the needed inputs are described in a coherent and a substantive manner in the planning documents of the household energy project. Sufficient resources are set aside for the training of staff from the project and from relevant ministries in the fulfilment of their new functions.

The expected *output* of the **volet solaire** is the definition of a strategy for the diffusion of privately purchased PVsystems. The *activities* are undertaken in two-steps:

- *First a market study is made for domestic lighting systems based on PVsystems for households that live outside grid-served areas which defines a framework for effective action. In parallel staff at the Direction d'Énergie and at ONERSOL is trained in the technology and the maintenance of PVsystems.
- *Next, if the study confirms the existence of a commercially viable market, a pilot project for the promotion of various types of PVsystems is launched in cooperation with the private distributors of PVsystems, where also the maintenance concepts are tested.

The definition of the level of *inputs* was more than sufficient as far as the equipment was concerned, the amount allocated to training was also adequate although some more emphasis could have been put on "on the spot training", rather than to the financing of stages and of project visits abroad. The amounts

and man-months that were allocated for technical assistance were rather low compared to the needs of the project.

1.2 The Organisational Framework for the Project

1.2.1 Project responsibility

The "*Direction Energie*" is the national counterpart which has the overall responsibility for the project. It nominated the project directors for the "demande and solaire volets" from its senior staff. The "*Direction Environnement*" of the Ministère de L'Hidraulique et Environnement is in charge of the "volet offre" and nominated the director and the national staff for the "volet offre". In the *World Bank*, "Africa Region" was responsible for the IDA loan. The operational responsibility for the three volets was entrusted to an official from ESMAP, who is one of the best-known household energy experts. The tender for the "offre and demande" volets was won by a French joint venture team which has some of the best *consultancy expertise* in the field - SEED (experts in energy demand management) and (experts in West-African forestry issues). The Danish consultant firm KrÜger which won the contract for the market study in the "volet solaire" had project expertise in Niger with, inter alia, the promotion of PV-powered water pumps.

The secondment of ministerial staff to projects is usual in Niger. The public sector distinguishes between "détachement" and "mises à disposition" of staff for project activities. The former are temporarily released from the ministerial payroll whereas the latter continues to receive their base salary from their ministry. All seconded staff in the three volets was "mise à disposition". From a formal point of view, the "volet demande", which has official status as a "projet " is closer integrated with the Direction d'Energie than the "volet offre" is with the Direction d'Environnement, as it is officially classified as "". In practice, the situation is the reverse. The Direction d'Energie seconded only two staff to the volet demande, whereas most of the professional staff in the volet offre was seconded from the volet offre.

1.2.2 Project planning

The project officer at the World Bank allowed sufficient resources for the preparation and planning phases of the project cycle. The consultant joint-venture team which won the tender for the "demande and offre volets" prepared a planning document in 1989 with detailed plans of operation and realistic budget estimates for the "demand and offre" volets. The "volet solaire" was slightly weaker in this aspect. The TOR for the PVsystems market study, for example, did not include an evaluation of the economic capacity of the households, a point that

was raised by the consultants in their comments on the tender material for the study.

1.2.3 Monitoring.

(a) Self-monitoring

The "*volets offre and demande*" established a data monitoring system, called "Système d'Information et d'Evaluation Permanent", **SIEP**, which allows the management of the volets and of the ministries to monitor the developments on the household energy market, and thus, the results of most project activities. The SIEP consists of twelve modules: "zones et suivi des zones d'exploitation, couvert forestier, contrôle de flux, prix bois en ville, prix bois en milieu rural, vente foyers améliorés, vente réchauds pétrole, prix pétrole, vente pétrole, vente gaz et réchauds de gaz, panel consommateurs, contexte économique". The last module is not yet operational, the first was first taken into use in April 1992, whereas the rest have been operational for a year.

The *volet solaire* was weaker in this aspect. Already in their comments on the TOR for the market studies, the consultant Kruger criticized that the technical assistance foreseen for the project implementation phase did not permit a proper assistance for monitoring and evaluation.

(b) External monitoring

All three volets are required to submit yearly project plans and yearly progress reports to the World Bank. In addition, the project manager at the World Bank paid biannual visits to the project. Finally, the project document foresaw both a mid-term and an end-of-project evaluation by external consultants.

1.3 **Compatibility with general Government policies**

1.3.1 Système de partenariat

A central element of the Government's political philosophy is the promotion of the "**système de partenariat**" - that the trades should be regulated in consultation with the officially established interest groups for the trades that are involved in the sector. In February 1990, a decree law was adopted which regulated the activities of the professional associations. The project has supported this policy with its assistance to the creation of official representations for the trades in household energy. In 1986 an "Association des Exploitants de Bois en Niamey" had been established. In April 1991 the *volet offre* succeeded in creating ANEB (Association Nationale Exploitants de Bois). ANEB has suboffices at the

departemental/ regional level and at the subregional level in the Arrondissement. The "marchés ruraux" can set up committees at the national level. The volet demande attempts to set up an association for the informal chain of petroleum distributors.

1.3.2 Land management

The environment in Niger is subject to severe pressures from the resource demands of a growing population and the stock of domestic animals. The estimated carrying capacity of pastures in Niger is below the annual demand from the herds in Niger. Therefore, land management will have to be introduced at a larger scale during the 1990s. Several donors have made their first - and resource costly - experiences in small pilot areas. A combined FAO/World Bank mission in March 1992 had first discussions with the Government on the formulation of a larger land use management project. The activities of the volet offre fit well into this future framework. They provide first hand experience with the large scale promotion of a "limited form" of land management. The marchés ruraux can serve as a "point d'entrée" for the initiation of field activities, once a national land management project is launched.

II. VOLET OFFRE

2.1 The strategic efficiency of the project

2.1.1 The elements of the strategy

The key structural *issue* in the woodfuel supply chain is the absence of property rights to the open access forest resources, that provide a disincentive to investments in resource protection. The proposed *solution* is to transfer the user rights to the commercial exploitation of the resources to local villagers.

The *strategy* of the volet offre for the regulation of the commercial fuelwood market comprises *four main elements*. (i) Local villagers gain exclusive user rights for the commercial exploitation of the locally available forestry resources through the establishment of a so-called "marchè rural". (ii) The responsibility for the protection and the management of the forest resources is shifted to these "marchès ruraux". The national forestry service, the SEE, changes its role from being a "policeman" to being a provider of advisory services to the "marchès ruraux" in the techniques of natural forest management. (iii) The cutting of forested area is regulated through a system of cutting and transport permits by zone of origin. The fee rates are differentiated according to the distance from the center of demand (to discourage an excessive concentration of exploitation near the demand centers) and according to the degree of management of the resource (to improve the competitive situation of managed supplies). (iv) In order to ensure compliance with the regulatory system, the system of control with the transport of fuelwood to the cities is strengthened.

2.1.2 Handling of constraints

Attempts to implement a more rational system of woodfuel supply face three major constraints: (i) the low productivity of the forest resources in the country, (ii) the limited financial and manpower resources of the public sector; and (iii) political unwillingness to adopt supporting measures.

The natural dry-zone forests in Niger typically have a standing volume of between 4 and 20 m³/ha and growth rates of between 0.1 and 2.0 m³/ha/year. The *low productivity of the forest resources*, on the one hand, provides one of the rationales for the project. There is an urgent need to protect the existing resource base and to maximise the sustainable exploitation of it. On the other hand, it makes the project a high risk project. The low rates of return - to the private investor - of engaging in either reforestation schemes or in natural forest management makes it difficult to attract the needed efforts by the local

population at the scale and with the speed that is needed. The strategy correctly focuses on the introduction of natural forest management as the only economically and environmentally viable system for the production of fuelwood.

The approach of the strategy solves the problem of the *limited financial and manpower resources in the public sector* as far as the end product, the new structure of the fuelwood market, is concerned. Most of the control and the administration of the forest resources is transferred to the local communities. But the technical assistance work that is involved in setting up the new structure is rather resource intensive in terms of use of public sector staff. Sufficient ministerial resources must be provided in two areas: (i) efficient control of the commercial woodfuel resources upon entry to the cities, (ii) efficient advisory services to the *marchés ruraux*. The "Direction de l'Environnement" has a total staff of 533 spread over the country, of which 310 are "cadres" and 223 are "auxiliaires". Some of these are assigned to other projects. Of those which remain only a few can be assigned to natural forest management activities.

The "volet offre" depends on the *political will* for the adoption of supporting legal texts, particularly in the area of taxation, and for enforcing an efficient control with the flow of woodfuel resources into the cities. The project can only influence the political process by providing technical information on the needs and the options to cover the needs in a precise and unequivocal manner. The formulation of the strategy for the volet offre made an important contribution to stimulate the political thinking on the issue of resource protection. But during implementation, as we shall see below, the project failed in putting forward a technically objective draft decree law on fuelwood taxation and control for the consideration of the policy makers.

2.1.3 Efficiency of the proposed solutions

The strategy of the volet offre is logically coherent in the *description of the end-product*, the functioning of the fully converted fuelwood market. But although the strategy tries to address the key constraints during implementation, the *process of getting to the end product* is filled with contradictions. It takes time and resources to set up the "marchés ruraux". As long as the production from the "marchés ruraux" is unable to cover total demand, transporters will have legal access to resources from non-managed areas. This means, that the "marchés ruraux" sell their fuelwood products in competition with fuelwood from nonmanaged areas. The "marchés ruraux" offer one advantage - the transporters get their supplies from a designated area and need not circulate to collect fuelwood from several producers. But they face several disadvantages in their fight for market share. The "bucherons" who work for the transporters are paid low wages, which puts a downward pressure on the fuelwood prices of the "marchés ruraux". If the

"marché rural" has started to manage the forest and to cut live trees, it is at a disadvantage compared to areas where dead wood is still available. The quality of dead wood is better - it is not attacked by insects and the calorific quality per kilo is higher.

Therefore, no matter how well designed and well executed the project is, the complexity at the *micro* level of the reorganisation of the woodfuel chain may make it impossible to achieve as profound a structural change as is desirable from a *macro* point of view.

2.2 Efficiency of Implementation

2.2.1 Project Organisation

The volet offre set up a *project office* in a building, which is relatively far away from the central offices of the Direction d'Environnement. The physical separation of the volet from the Direction d'Environnement did not reduce neither the flow of information to and from the Direction nor the Direction's identification with the volet objectives and activities. The Direction has a number of provincial offices and subsectoral institutions. Therefore, the staff of the Direction is used to operate and to communicate within a decentralised structure. Most of the national staff, including the director of the volet, are seconded from the Direction d'Environnement. The Conseiller Technique Principal" from the consultant is de facto comanager. The project team is divided into six "services", each headed by a Chef: The "service comptabilité"; the "service personnel"; the "service de contrôle" is in charge of the implementation of the control system for fuelwood transport; the "service filière bois" makes basic studies on the woodfuel supply chain; the "service aménagement de forêt" provides technical assistance to the "marchés ruraux" in setting up forestry management schemes; the "service animation et sociologie" is responsible for the creation and the initial operation of the "marchés ruraux". Finally, the staff comprises one "expert in sociology" and one in "filière de bois", who in practice have more influence than the correspondent chiefs of the two services and are much better paid.

1.2.2 Implementation of activities

(a) Data generation

A substantial part of the potential fuelwood supply areas for the four largest cities have been inventoried and maps have been elaborated. (ii) A supply plan for Nimamey has been prepared, and similar plans for the other cities are under preparation. (iii) Several "marchés ruraux" have been set up. (iv) A draft law for a new fee system for fuelwood has been prepared and is being discussed. (v) The

project hired staff for the control of woodfuel supplies in the four major cities and set up check points on both the primary and some of the secondary access routes. Training was provided to the staff and supporting equipment, e.g. cars and mopeds were provided. The result was a rapid increase in revenues from fuelwood taxation, and thus in the effective taxation of supplies.

(b) Creation of the "marchés ruraux"

(c) Reinforcement of the control with commercial woodfuel deliveries

The build up of an efficient system of control that can enforce the taxation of commercial woodfuel flows into the cities is a central element of the strategy. Without an effective enforcement of taxation on non-managed fuelwood, the market share of managed fuelwood will be reduced. As transporters have to pay transport fees at the "marchés ruraux", the rate of returns of supplies from non-managed areas will increase if the likelihood increases that the payment of the transport fee can be avoided.

Existing regulations require the payment of fees in the form of cutting permits and transport permits for commercial fuelwood deliveries. Before the purchase of fuelwood, transporters have to acquire a transport permit from the forestry authorities. But before the project's start, only a minor percentage of fuelwood entries were effectively taxed, as the enforcement of the law was not backed up by an efficient system of control. The control was left to a mobile unit, and there was no control at the administrative level.

The project established a number of control centers at all the main access routes to the four major cities, where woodfuel transporters have to stop to hand over their transport permits. The secondary access routes are patrolled by a mobile unit. Transporters who are caught without a permit forfeit their load, which is sold on auctions by the forestry service. To man the control posts, the project hired a team of guards. 21 guards received a two weeks training course, followed by one month of practical training on site. Three agents were assigned to each post of control, which on a rotating basis permitted at 24 hours guard per day.

With the introduction of the new system, the monthly revenues were increased from less than 1 million FCFA to more than FCFA 6 million in the beginning of 1991. In mid-1991 the responsibility of the control was transferred to the local forestry authorities, in Niamey the "Communauté Urbaine de Niamey". The project continued to pay a monthly bonus of FCFA 10,000 on top of the base

salary of FCFA 25,000 (= US\$ 80). Although the means (staff, buildings, vehicles) were the same, the transfer of management control led to a fall in the monthly fee income to less than FCFA 2 million within a couple of months.

The control with the work of the agents had become too lax. An additional factor, but was that the system changed from the emission of weekly transport permits to daily transport permits (at one seventh the weekly cost), which made it possible for transporters to claim, that "late arrivals" were caused by the breakdown of the vehicle on the day of validity.

How large a percentage of commercial woodfuel entries escapes the control of the forestry service? The total demand for fuelwood in the four cities is estimated at 180,000 tons per year. If we assume that 10% of this demand is covered either through self-collection or self-use purchases outside the towns, the taxable fuelwood flow amounts to 160,000 tons, or about 600,000 stères. Since the effectively transported volume by the means of transport are more than twice as large as the capacities that are used for the fixing of the transport permit fee, the annual fee income should amount to 90 million FCFA or to 7.5 million FCFA/month. The record level of 6 million FCFA thus amounts to an impressive 80 % control rate with the flow of fuelwood, the 2 million FCFA to a 25% control rate.

Since the resources (staff and equipment) that are used in the control system were the same, the development can only be attributed to the effect of the change in management. Unless the Government subjects the management to the attainment of performance standards and is willing to replace non-performing managers, the control system will not be an effective tool for the promotion of sustainable woodfuel practices.

(d) Reform of the fuelwood taxation system

The existing decree law for fuelwood taxation suffers from three key weaknesses: (i) the fee rate of 300 FCFA/stère for the transport permit (the real source of income from fuelwood fees, as cutting permits are cheap) is too low; (ii) the fees are not differentiated as to their origin - fuelwood from free access resources and from managed resources are taxed at the same level; (iii) the levels of transport capacity that are fixed for the calculation of the transport permit fee by category of vehicle are far too low - in reality transporters transport at least twice the amount. Thus, the real level of fuelwood taxation is less than 150 FCFA/stère.

The *drafting of a proposal for the new woodfuel taxation law* was entrusted to an interministerial working group. From the outset, the project director and the "expert filière bois" participated in the group and short term consultants provided

technical inputs to the work. There are two key issues that have to be addressed by the law. (i) The present woodfuel taxation law's fee rate per stère of 300 FCFA is below the production cost of managed woodfuel and makes no impact on the supply chain. (ii) The effective level of the fee rate is undermined by the fact that the transport capacities in stères per category of vehicle are twice as high as in practice as the levels that are fixed in the existing law decree for the calculation of the transport fees per vehicle.

The working group expected political opposition against the adoption of substantially higher effective fee rates. In order to ensure a smooth adoption of a new law proposal, the working group chose a minimalist strategy: The draft increases the fee rate to a maximum of 600 FCFA/stère and leaves the definition of the transport capacities unchanged.

This decision was a mistake. A maximalist strategy - the presentation of a draft proposal that was able to contribute effectively to the goals of the strategy - would have been risk free. If the maximalist proposal were adopted, the benefits would be large, as the law would make a real impact. If it were rejected, one lost the benefits of the possible adoption of the minimalist draft proposal. However, since the fee changes of the draft proposal do not encourage the formation of a rational woodfuel market anyhow, the adoption of the draft is rather irrelevant for the strategy.

The draft merits to be rejected also for the administrative complexity of the system which is proposed. The proposed system suffers from the illusion that it is possible to fine tune the functioning of the woodfuel market through the introduction of multiple levels for the fee rates and for the distribution of the revenue:

*A two-dimensional system is introduced for the fixing of the transport fee. The level of the fee is made dependend on the "*système d'exploitation*" (600 FCFA for "incontrolée", 375 FCFA for "orientée", and 350 FCFA for "controlée") and on *the source's distance from the center of consumption* (rebates of 10% and 20%). This leads to nine different fee rates for a stère of fuelwood.

*The revenues of the woodfuel tax are divided between the "trésor publique", the "structure locale de gestion" (= the marchés ruraux) and the "budgets de collectivités" (= the local forestry authorities). The division of the fee rate depends on the type of exploitation. The share of the woodfuel tax which is handed to the local authorities and to the marchés ruraux increases with the degree of management.

*Finally, the law defines how the local authorities and the marchés ruraux are to split their share of the fee income between expenditures on management activities and on other activities - the law allows to use a higher percentage of the fee income to be used for the latter, if the "exploitation" is "controlée"

instead of "orientée".

The objective of this complex structure, is to provide incentives to transporters to seek fuelwood from larger areas of supply and with preference from managed woodfuel resources; and to encourage the local forestry authorities to promote the introduction of forestry management, and the local villagers to adopt these. This presupposes, that the cahiers of the marchés ruraux are capable of keeping accounts for different types of expenditure.

While the above system works in theory it will not work in practice. Another non-workable proposal in the draft text is a proposed reorganisation of the system for the obtainment of transport permits. Presently, a transporter has to obtain a transport permit before he departs for the place of supply. The draft text proposes that the payment of the transport permits should be done at the control posts upon entry into the city. This proposal will affect only "incontrôlé" supplies, as the marchés ruraux hand over transport permits to the purchaser at the time of purchase of the fuelwood. Evidently, this proposal will weaken the enforcement of the taxation. Any woodfuel trader that is caught on a secondary access route without a transport permit will be able to claim that he was on his way to the control post. Once he is there, he will persuade the official that he obtained his woodfuel from far away zone of production to get a rebate.

In short, the level of quality of the draft text is disappointing.

The ambition of this complex system is to provide incentives to (i) the transporters to seek woodfuel also from remotely located sources, (ii) to the local authorities so that they take initiatives to introduce "marchés ruraux aménagés" in their districts, and (iii) for "marchés ruraux dirigés" to introduce forest management practices. But in practice, the system is far too complex to be manageable - it will create high administrative costs - and the incentive impact will be close to zero, as the absolute differences in the levels of fees are too small to make any real difference to the involved parties. While the foreign technical advisors are to blame for the over ambitious fine-tuning design, the national task force is to blame for the unwillingness to adjust the transport load estimates to realistic levels. They feared that the political willingness did not exist to adjust both the fee rates and the transport capacity estimates upwards. Whatever the reason, the decree if adopted will not be an efficient instrument for the promotion of needed structural adjustment.

Assistance to the transporters

Contrary to popular perceptions, the woodfuel transport industry is not an excessively remunerative industry, as it is subject to fierce forces of competition. Firstly, although the transporters are represented by a common union, rivalry

among existing transporters is strong. There are many different types of transporters on the market. Vehicle owners, for example, who have 85% of the commercial market, can be divided into those that have a truck, and those that operate a Peugeot 404 pick-up. Secondly, the "limits to entry" are low for new "aniers" and "cameliers". Therefore, although the market share of the "aniers" and the "cameliers" is no more than 15%, their presence on the market puts a limit to the price increases that the truck owners can enforce. Higher transport prices are likely to attract new entrants, that erode the market share of motorized transporters.

The trucks are usually 20 to 30 years old. This means, on the one hand, that they are almost completely amortised; on the other hand, that they break down frequently. The annual cost of repair can easily run up into 1.5 million FCFA. Faced with a major cost of repair and non-recourse to bank finance, a truck owner can be forced to withdraw his truck from operation.

With the intended change in the industry structure which is the objective of the "volet offre", the transporters risk that the attractiveness of their industry will be further eroded. The negotiation strengths of the sellers, the woodfuel producers (which is now close to zero, as the transporters can hire their own team of "bucherons") will be increased with the creation of the "marchés ruraux". It may be difficult to pass on higher costs to the consumers, as the increase in the availability of substitutes, which is the aim of the "volet demande" may increase the bargaining power of the buyers. Finally, if the control with the enforcement of fuelwood taxation does not become more effective, new "illegal entrants" will be attracted to the market, as increasing taxation rates will increase the rates of return from non-compliance.

Therefore, the project needs to be able to offer something to the transporters in order to obtain their constructive cooperation in the implementation of the new rules of the game. In fact, the project had incorporated two types of assistance to the transporters in the work programme: technical assistance to improve the professionalism of the operations of the transporters, and the provision of a line of credit at the commercial banks to facilitate the financing of new equipment or of major repairs. The project, however, was not particularly successful in this respect. The so-called technical assistance was limited to courses in bookkeeping. The quality of the course material was low, and the responsible did not succeed in communicating to the transporters that the introduction of bookkeeping had any advantage to them. The transporters saw these courses as an obligation rather than an offer and feared that the real motive for the courses was to facilitate taxation of their revenues. The line of credit to the transporters had not become operational in March.

III. VOLET DEMANDE

3.1 The strategic efficiency of the project

3.1.1 The elements of the strategy

The key demand *issue* at project start was the absence of a suitable substitute for the woodfuel stoves, as the LPG stoves and the price of LPG put this alternative outside the reach of the majority of the population.

3.1.2 Handling of constraints

The implementation of a demand strategy in the household sector faces two key constraints: (i) The low purchasing power of the population, (ii) the fact that Niger is "located too close to Nigeria and too far from everywhere else".

a supply structure for hydrocarbon fuels that is distorted by the informal sector's border trade with Nigeria; (iii) high cost of petroleum fuels and of stoves.

, (iii)

The *low purchasing power of the population* limits the penetration rates for technologies that compared to competing technologies satisfy wants but not new needs. The are promoted by the "volet demande" and by the "volet solaire". The volets have attempted to take this constraint into account by indentifying the respective lowest cost technical solutions within their respective fields - the focus on kerosene stoves instead of on LPGstoves as the main substitute stove in the volet demande and the inclusion of portable lamps among the PVsystems that were to be tested in the volet solaire. What can be criticised though, is the absence of initiatives to promote energy savings through a more rational use of existing technologies.

3.1.3 Efficiency of the proposed solutions

The objective of the volet demande should have been to define and to implement an overall strategy for demand management in the household sector. Seen from this angle, the volet demande fails. Firstly, the volet's energy saving strategy is basically restricted to the promotion of improved stoves. It leaves out any promotion of rational use of electricity although this is and will be the fastest

growing section of household energy demand; no assistance is given to users of traditional stoves; and the promotion of energy saving cooking practices of LPG and kerosene stoves receives only scant attention. Secondly, within its defined area of action, other donors already are implementing comprehensive programmes to promote LPG stoves and FAs. The project, therefore, had to find niches for intervention, and correctly focused its stove activities on the promotion of a household kerosene stove.

The marketing concept for the introduction of a new kerosene stove for urban household market is built up professionally around three pillars: (i) A thorough testing of potential stoves, (ii) the use of professional marketing bureaus to produce the promotional material, and (iii) the build up of a service infrastructure to ensure proper maintenance.

3.2 Efficiency of Implementation

3.2.1 Project Organisation

The "volet demande" established its *central project office* in a building that was located relatively far away from the building inhabited by the Direction d'Energie. But the building housed the EC financed Projet National de Gaz and Projet Foyer Amélioré projects and the GTZ financed Projet Foyer Amélioré project, which largely facilitated the exchange of information between the projects. The Direction d'Energie seconded the Chief of its office for energy savings to manage the volet as project director together with the "Conseiller Technique Principal" of the consultant team. The team in Niamey was organised into six "services" each headed by a Chef who was assisted by one to three professionals. Project offices, called "antennes" were set up in Tahoua, Maradi and Zinder. Apart from the director, one further professional staff was seconded from the Direction d'Energie, one staff was seconded from the Direction Environnement, one from the Ministère de Promotion d'Economie, the others were recruited on the "open" consultant market. Use was also made of short term national and foreign consultants to provide expertise on specific issues.

The "service personnel" and the "service comptabilité" serve central administrative functions. The "service promotion produits appliqué" is in charge of market studies and of marketing. The "service réseaux commerciaux" is responsible for the creation of sales points, for monitoring the distribution of kerosene and of improved stoves and the organisation of maintenance services. The "service promotions foyers améliorés" was created in the beginning of 1992 to strengthen the level of activities in this area. The "service evaluation programmation" publishes monthly statistics on stove sales and fuel prices and undertakes consumer panel surveys.

The number of services is too large to be optimal. Although the project management justifies the gradual increase in the number of services with the need to put focus on functional areas, consideration of prestige wishes probably played a role as well. But since the overall staff is small the proliferation of services has had a marginal impact on efficiency so far. The physical separation of the two volets from their ministerial buildings has the potential disadvantage that it risks to reduce the flow of information between the volets and the pertinent ministerial offices and to lower the ministerial identification with the volet objectives and activities. The potential advantage is that it may reduce the risk that political interventions influence preparatory technical analytical work before basic issues have been sufficiently clarified. The existence of the antennes should encourage a balanced implementation of activities between Niamey and the other urban centers. Thus, the project organisation was basically sound.

3.2.2 Implementation of activities

(a) Promotion of kerosene stoves

The original quantitative objectives for end-1994 were to sell 80,000 kerosene stoves to 50,000 urban households (a penetration rate of more than 40%). Since, at that time, no adequate stove was available on the market, the target was highly speculative.

The project started *a search on the international market to identify a kerosene stove* that could satisfy the heavy power and stability requirements of the local cuisine. The search process took longer than expected. *Consumer tests in Niger* showed that the Indonesian Thomas Cup stove was the most suitable internationally available model. The stove, which is produced by a small Indonesian producer, is sold to restaurants in Indonesia. But equipped with a special *locally manufactured support*, which was designed by the project, the stove called Tchip can be used by households in Niger.

Next, the project defined a *comprehensive marketing strategy* for the Tchip, which puts high emphasis on the provision of proper after sales services - the Tchip is sold with a guarantee period of one year, technicians pay visits in the beginning to the households to inform on proper application of the stove and repair shops are trained to perform repair tasks on the Tchip. This concept is valuable. It ensured that consumer dissatisfaction with stove failures could be solved quickly and that the project received valuable feedback on the main operational problems with the stove. For the mass diffusion The project *identified local workshops for the manufacturing of the support* in Niamey and in Zinder and for providing the Tchips

with blue paint and ordered the production of several hundred supports. The project did large scale promotion was tested on a pilot scale in all four cities. The project ordered 1500 stoves from the Indonesian manufacturer very correctly had three main elements: (i) A thorough consumer testing of potential stoves that were identified through an international search to identify the most suitable product

Testing + maintenance

In the beginning of 1992 a little more than 2000 kerosene stoves had been sold. Therefore, the objective was reduced to 36,000 stoves or less than 25,000 households (a penetration rate of %). 19,000 were expected to be sold in Niamey, 9,000 in Zinder, 6,000 in Maradi, and 2,700 in Tahoua. In view of the fact the 7% of Niamey households who own a LPG stove are unlikely to switch to kerosene and that the economic situation is unlikely to improve, even the new target seems to be ambitious.

Promotion of improved fuelwood stoves

Various donors have implemented FA programmes in Niger over the last ten years. During the second half of the 1980s, the Mai Sauki FA was enjoying a relatively successful penetration on the urban market. When the volet demande started, two major FA-projects were operating - the EC financed PFAII for the diffusion of the Mai Sauki and a of a "multimarmite"-model in urban areas, and a GTZ project which promoted FAs in rural areas. The project's main functions in this field, therefore, were

The project document fixed very optimistic penetration targets for the diffusion of *improved fuelwood stoves* (F.A.). But so far, the project has developed few initiatives in this field.

In the beginning of 1992, when the PFAII project ended its activities, the volet set up its "Service Promotion Foyers Améliorés". The project faces the situation that the user rate of FAs in urban households has been stuck at about 20% for the last four years and that the artisans who produce the FAs have become so used to Government subsidies from different FA-projects that they develop no initiatives on their own. The new "service" expects that a collaboration with the private entrepreneur, who markets the Thomas Cup kerosene stoves in Niger, may lead to some reactivation of the market. The hope is based on two aspects. (i) The entrepreneur has obtained favourable price quotations on metal plates from Czechoslovakian producers, to be used for the production of the stove supports. They are at least as cheap as the second hand metal plates that are used in the artisanal production of FAs. The intention is to use the new metal plates in the

production of FAs using teams of experienced craftsmen that are contracted for the purpose. By providing a superior (looking) product at the same price as traditional F.A. (ii) The distribution network for the FAs will be enlarged by the sales points that are used for the kerosene stoves. It is an interesting attempt. But the low prices on the Chekoslovakian metal plates may only be a short term phenomenon of selling out of stock from state enterprise production. It is certain, in any case, that the quantitative objectives for sales and user rates will not be reached.

In *fuelwood substitution*, the project has achieved its goal of creating an urban household market for a kerosene stove, and to transfer the marketing activities to the private sector. The kerosene stove which has been introduced on the market - the Indonesian Thomas Cup adapted with a locally manufactured support - seems to meet the local user requirements. A modern marketing campaign using TV and spots and billboards as media) created effective demand for the stove among households in Niamey, Zinder, Maradi and Tahoua. Insufficient production capacity at the Indonesian producer's plant and logistical mistakes by the project management created supply shortages during the first year of the campaign. But the producer has now invested in expanded production and a private entrepreneur has taken over full responsibility for the import, the local adaptation and the marketing of the Thomas Cup and signed purchase contract with the producer.

The *training of project staff* has focused on the provision of technical skills in software use for wordprocessing and data processing, on the presentation of promotional material and on basic manufacturing and maintenance skills. Hardly any training has been provided in basic household energy economics. Knowledge of the energy content of different fuels and of the energy efficiencies of different types of stoves is a minimum requirement for the efficient provision of advisory services on energy savings and on fuel substitution. Yet not even the economist responsible for the data processing and monitoring activities of the volet had this basic information.

Impact. The original objective of the household energy project was to diffuse a total of 110,000 improved woodfuel stoves until the end of 1994. At the beginning of 1992, it could be noted that only 21% of the households in Niamey possessed an improved woodfuel stove, and that their average level of consumption was 10% lower than the consumption of household that used a traditional stove. Since the type of households differ in social status and household size, no reliable estimate of savings can be drawn from this figure. In February 1992, the promotional objective to be reached by end-1994 was reduced to

Promotion of LPG stoves

Collaboration with "Projet National Gas Butane". As part of an EC-financed regional CILLS programme for the promotion of LPG as a substitute fuel, a national unit was set up in 1990 to administer the programme activities in Niger under the name of "Projet National Gaz Butane". The "volet demande" thus did not undertake any specific activities apart from the monitoring of LPG consumption and apart from exchanging experiences with the LPG promotion programme. However, some marketing collaboration took place - the TV spots on improved stoves presented the Mai Sauki improved woodfuel stove, the kerosene stove and the LPG stove as the stove choices for a modern household; and the on-the-spot promotion campaigns by the LPG promotion programme also made references to the existence of kerosene stoves.

The strategy of the "Projet National Gaz Butane" comprised four components: (i) The introduction "low-cost" LPG stoves on the market that were based on either 3 kg or 6 kg cylinders (preferable to low consumers compared to 12 kg cylinders as they reduce the cash outlay for refilling). The price of the stoves was reduced from 17,000 FCFA to 12,000 FCFA by a subsidy. (ii) The stoves were adapted to the heavy use requirements of the local cuisine by being equipped by a locally manufactured support. (iii) The cost of LPG storage and bottling plants is subject to rather substantial economies of scale up to an annual throughput of around 15,000 tons. Existing demand in Niger was around 300 tons. The price of LPG (around 330 FCFA/kg) was reduced to the cost of LPG if annual demand had reached 2000 tons (around 240 FCFA/kg). This was the expected level of consumption once the programme finished after three years. (iv) The programme offered the stoves to salaried staff at a down payment, with the remaining amount being repaid over three months by the withholding of salaries.

The EC/CILLS project activities were limited to Niamey. SHELL was disinterested in the project, whereas NIGERGAZ and TOTAL participated. The project started its activities early 1990 with a three year budget of 793,000 ECU to finance the subsidies and various promotional activities. In the beginning the project had relative success with monthly sales of about 620 3&6 kg stoves. LPG sales reached 437 tons in 1990 and 600 tons in 1991. From mid-1991 however, the programme came to a stand still although the price of LPG at that time was reduced from 330 FCFA/kg to 240 FCFA/kg. The demand for new LPG stoves was affected by the deepening of the economic crisis that affected the country. The demand for substitute stoves that remained was taken over by the kerosene stoves, that were introduced by the household project. The reduction of the LPG price under these circumstances had no expansive impact. From December onwards, the loan programme "sur retenu des salaires" broke down, as the Government became unable to pay the salaries of its staff, and as most of the larger private firms had been visited by promotional project staff already.

The original project objectives were to diffuse 25,000 gas stoves among households until the end of 1994. In the beginning of February 1992, a total of 8300 3&6kg stoves had been sold. The penetration rate of total LPG stoves in Niamey households amounted to 7%, and of the 3&6 kg stoves to 3%; but only 2% of Niamey households used LPG stoves as their principal stove. The share of total gas demand of the two types of stoves amounted to 72% and 28% respectively. The quantitative objectives were revised to a realistic 15,000 LPG stoves.

Consequences for the project's strategy

The objective of the project

III. VOLET SOLAIRE - BASIC CONCEPTS AND ACTIVITIES

Project justification.

Presently, the private demand for PVsystems for domestic electricity is small, and the trade companies that commercialize the systems take high margins. Apart from the requirement of a relatively high cash outlay for the acquisition of a PV system for the provision of lighting in a private household, the key structural issue that prevents a large scale promotion of PV systems is the absence of a proper system for preventive maintenance and for repairs of privately purchased systems. The absence of such a system is linked to the low level of demand for the systems, which makes it uneconomic for private companies to invest in basic structures capable of servicing the systems that have been sold to the consumers. The "*volet solaire*" seeks to establish such a maintenance system and tries to stimulate the demand for the systems by the active promotion of several types of systems in different pilot areas. addresses this issue attempts to tackle the key constraints on the demand and the supply side in the provide a rational framework for a market based promotion of PV-systems.

Previous donor financed projects dealt with covering potential public sector demand for PVsystems. This project is concerned with the satisfaction of potential private household demand for PVsystems. Presently, *private companies*, in particular the firm PHOTOWATT, already sell PVsystems to private households in Niger, albeit at a high mark up. The market is small consisting of high income families that are fascinated by the technology as such, and who live out of the reach of the power distribution grid.

For household lighting, *two generic PVbased solutions* are offered to the consumers: Stationay systems and portable lamps. *Portable lamps* have a duration per charge of six hours and can be marketed equipped with a battery and a PV module for the charging of the battery, or without the PV module for charging. The latter case is a relevant possibility if a local shop is willing to invest in a PVmodule for charging batteries at a given price. A foreign supplier's quoted price CIF for a 4 W portable lamp that included a small PVmodule for charging was FCFA 26,000 (US\$ 87). For a 2x6 W portable lamp with battery but without a module for charging, the quoted CIF price was FCFA 15.600 (US\$ 50). A private importer and marketer of these systems needs a mark up of at least 30% on these prices at the retail level. *Stationary household PVsystems* are more expensive. But they can also power audiovisual appliances. The quoted cost CIF for a 50 W PV pannel alone was FCFA 90,000 (US\$ 300) to which has to be added the cost of a battery , a charger, a regulator and two fluorescent lamps. The CIFprice thus increases to FCFA 140,000.

The objective of the project is to define the socio-economic conditions for the large scale promotion of PVsystems for household lighting in Niger. This was to

involve the definition of the appropriate (i) institutional and financial mechanisms, (ii) incentive systems for consumers and for distributors, (iii) marketing system, (iv) fiscal regime (v) credit system, (vi) depot-sales system, (vii) and monitoring and maintenance system. The intention was that the marketing system should be private sector based, but that the public sector could provide support in terms of testing the concepts, training of staff and providing cooperation between the public technical institutions, like ONERSOL and the private firms.

The work programme for the project foresaw three types of basic activities. (i) A *market study* of the household demand for PVsystems. This included an evaluation of previous PVprojects in Niger, a sociological study in different regions of the potential demand for PVsystems, identification of ideal sites for pilot marketing campaigns and a definition of the marketing approach. (ii) *Training* of national staff in different aspects of PV marketing. This included visits to Nigeria, Mali, Burkina Faso and Senegal to study the experience in these countries; participation of the project director at a course in renewable energy technologies organised by AFMI in France; and training to the staff from the project unit in the use of PCs and together with staff from ONERSOL in the manufacturing and the maintenance of voltage regulators for PVsystems. (iii) A pilot project to test the marketing of different types of PVsystems at seven locations in Niger.

Efficiency of Implementation

Organisation of activities

The project offices of the "*volet solaire*" are located in the premises of the Direction d'Energie. The volet is managed by the Chef Service Energies Nouvelles et Renouvelables in the Direction d'Energie on a part time basis. The volet employs four professionals - one energy economist, one sociologist, one expert in PVsystems, and one engineer. Technical consultants are used on a short term and ad hoc basis. In principle, the set up permits a close integration of the project's activities with the Ministry's programmes in renewable energy in general.

Implementation of activities

The *evaluation of the results of previous PVprojects* in Niger confirmed that there is a genuine need to rationalize the approach of PVprojects in Niger. Previous projects apart from uses for water pumping and for telecommunications have been notoriously unsuccessful: Few years after the installment of 1000 PVpowered communal TVs, 80 percent are out of order; only two of 17 Pvpowered "dispensaires" worked; none of the 22 traffic counters and none of the 10 PVsystems for lighting and ventilation set up by the GTZ's "Programme Espèciale

Energie" from 1984-88 are working any longer. The success of the private sector in the promotion of PVsystems was not much larger. Inter alia TOTAL had marketed portable lamps in Niger, but the durability of these was very low.

Market study. Use of PVsystems replaces the consumption of kerosene for lighting and of batteries for use in audiovisual equipment. The project's market study prepared by Krüger showed that the average monthly expenditures on these two items by households were FCFA 1800-3200 dependend on the area. The study also showed, that although the PVsystems were price competitive on a lumen basis (which would give rise to a consumer surplus if the monthly operating costs for lighting were equal), they were much more expensive, when measured on the basis of the number of lamps (and the actual monthly expenditures for lighting, that depend on the ability to pay). The study also showed that a majority of the households kept their kerosene lamps burning throught the night for security reasons. Street vendors offer a possible clientel as merchandise that is lit by a better quality of light might attract more customers.

The market study gave no indication of what the potential demand for the PVsystems is. The demand will come from the minority of the population that has the money to purchase the system, and that has a relatively high demand for lighting and TV systems services. The study made the error to inform only about average levels of consumption, and income levels. Therefore, it is not possible to form a reliable opinion on the size of the market. Judging from the average figures, however, it is unlikely that the market has a size that is large enough to amortize the cost of a private sector based system of preventive maintenance.

System for marketing and maintenance. The project attempted to encourage the creation of a mixed enterprise between the private importer of PVsystems, PHOTOWATTS, and the public company

Local production. The project director decided that the project should not buy complete PVsystem kits for assembly. The batteries were to be purchased locally and that the charge and decharge regulators should be manufactured locally by ONERSOL. This decision was critisable. A PV promotion programme will only be able to stimulate the demand if the technology operates succesfully in practice. A high incidence of system failures will give the technology a bad name among potential customers. By changing the project objective to a dual objective of demand creation and stimulation of local manufacturing capabilities, the project increases the risk of failure. Experience from PVprojects in other parts of the world have shown that the system failures usually are caused by problems with either the battery or the charge regulators. ONERSOL, which does not have a good track record for quality, has manufactured 300 "règulateurs de charge et de décharge" for use in the pilot project.

Ordering af equipment. Shortly after project start, the project ordered two Peugeot 305s and a PC with software. For the functional purposes of the project the selection of cars was not ideal. The pilot project was to take place at 7 different locations, that each had more than 3000 inhabitants. The selection of PV equipment for the pilot promotion campaigns was supposed to be determined by the results of the market study. However, the equipment that the project director decided to order for the programme did not relate to any recommendations of the study. In mid-1991 the project director took contact with potential European suppliers and received price quotations from a Danish and a German supplier for a number of different systems. By March 1992 no order had been placed.

ANNEXES