

PN-NAM-783

ISFD-28185

6980135/62

AFR/DOE

G 100

SUGGESTIONS FOR CADA INITIATIVES IN
FORESTRY AND FUELWOOD PRODUCTION

A background paper prepared
for CADA and other donor
countries and agencies inte-
rested in forestry and fuel-
wood production in Sub-Saharan
Africa.

Drafted by Frances A. Gulick
Consultant, AID/AFR
October 18, 1980
Paris

Revised
November 20, 1980
Washington, D. C.

AID/AFR-C-1700

**CONTRACT FOR
Project Design for Concerted Action for
Development of Africa
PROJECT NO. 698-0135**

S U M M A R Y

Fuelwood is the primary source of energy throughout sub-Saharan Africa, accounting for more than three-fourths of all energy consumed. Demand already exceeds annual replenishment. To meet future rural and urban needs, annual fuelwood planting will need to be increased by about 15 times over current levels -- nearly one million hectares (2.5 million acres) of new fuelwood plantings a year -- for twenty years.

This estimate already assumes that about one-fourth of future fuelwood needs will be substituted for by alternative fuels or by more efficient use of fuelwood and that an additional one-fourth can be met from fuelwood harvested as a byproduct from improved management of natural forests.

Although very sizeable CADA resources are currently being committed to forestry projects and programs (about \$450 million, including \$355 million in proposed projects) the amounts devoted to establishing fuelwood supply plantations of any significant size is negligible: about \$30 million for the life of projects adding up to perhaps 25,000 hectares overall, including proposed projects. If Africa's rural and urban energy needs are to be met, CADA and African governments will need to undertake additional measures explicitly focussed on the goal of achieving substantially increased fuelwood supplies.

Technical experts representing the six CADA countries -- Belgium, Canada, France, Germany, the United Kingdom and the United States -- met in Washington, D.C., on November 13-14, to consider possible initiatives which could be undertaken to fulfill this objective, reaching the following general conclusions:

Greater Priority for Increased Fuelwood Supply Programs: The task of increasing the supply of fuelwood should be given increased priority in donor and African development programs as a major and indispensable element in sub-Saharan agricultural production systems and energy supply.

Essential Components for Enhanced Programs: To be successful a nation-wide forestry and fuelwood production effort by any African government would need to include several major prerequisites or program components:

- African government commitment to increased priority for this sector.
 - Expanded manpower and training, improved in content and institutional capability.
 - Improved management of natural forests and woodlands for fuelwood production as well as for other purposes.
 - Early planning for larger scale fuelwood plantations, especially to meet growing urban needs.
 - Decentralized seedling supply and extension services, to enlist voluntary efforts at the village and household level and to serve individual needs. Additional efforts should be made to enlist and involve women in these activities.
- 11

- More effective methods of fuelwood use and development of alternative energy supplies.
- Up to date knowledge of existing land use and land use potential, on which to base agricultural, forest and fuelwood, and urban planning decisions, and to provide baseline data for popular education and extension programs.

Participants agreed that it was preferable at this stage to concentrate member efforts on specific projects in two or more African countries, seeking to insure that, in combination with the country's ongoing national program and with other donor efforts, all of the previously identified essential components are brought on line at the earliest possible date.

iii

TABLE OF CONTENTS

	<u>Page</u>
A. Background and introduction	1
B. The size of the sub-Saharan fuelwood problem	2
1. Fuelwood's dominant energy role	2
2. The size of the supply problem	3
C. The size of current donor involvement in forestry and in fuelwood production	6
1. Size of CADA involvement in forestry	6
2. Combined donor forestry effort in relation to the fuelwood production need	8
3. A note on costs	10
4. The interdependence of fuelwood production and other forestry programs	14
D. Essential components for expanded programs	14
1. African governments' commitment to increased priority for forestry and fuelwood production programs	16
2. Expanded manpower and training	16
3. Improved management of natural forests and woodlands for fuelwood production	18
4. Early planning for larger scale fuelwood plantations especially to meet urban needs	19
5. Expanded seedling supply and extension services	20
6. Conservation of fuelwood use and accelerated development of alternative fuels	20
7. Improved land use data and maps as planning tools	22
E. Possible CADA initiatives	22
1. Technical group discussion on options	23
2. The general consensus	23
F. The role of alternative fuels	27
1. The general situation	27
2. Reassessing hydro-power	28
3. The role of other renewable sources of energy ...	29

W

<u>List of Tables</u>		<u>Page</u>
Table No. 1	Selected African country fuelwood needs: 1980-2000	5
Table No. 2	Donor aid in forestry in sub-Saharan Africa	7
Table No. 3	IBRD Summary of possible Fuelwood programs for selected countries, FY 1981-85	11
Table No. 4	Forestry projects in sub-Saharan African countries with multi-CADA donor programs	25

Annexes

Annex A	List of participants: Meeting of the CADA ad hoc technical group on forestry and fuelwood production, November 13-14, 1980
---------	----------------------------------------------------------------------------------------------------------------------------

✓

NOTE

This paper was originally prepared for discussion by the CADA ad hoc technical group on forestry and fuelwood. It has been revised to reflect comments and suggestions made by participants, speaking in their personal capacities as technical experts, at the group's initial meeting held in Washington, D. C. on November 13 and 14, 1980. Inclusion of any suggestion for action does not imply official endorsement by the U. S. or any other CADA government at this stage.

A. Background and introduction

For the purpose of strengthening their economic assistance effort in sub-Saharan Africa, representatives of Belgium, Canada, the Federal Republic of Germany, France, the United Kingdom and the United States met in Paris in October 1979 and agreed to work towards coordination of resources for joint projects within the framework of a Concerted Action for Development in Africa. The acronym "CADA" was adopted as standing for this effort.

At the first policy-level meeting, held in Bad Honnef near Bonn on the 20th and 21st of May 1980, a preliminary general program of concerted action was adopted. In addition to a number of African railroad and road transport projects, several river valley developments and an extended immunization program, this included a program, B.2., entitled "Methods and other specific contributions towards rural and agricultural development." As elaborated in the discussion, this was understood to include fuelwood production as a matter of high priority.

The United States was assigned the task of exploring suggestions for specific programs and projects on which coordinated member action would be desirable and which could contribute to increased effectiveness of ongoing activities by both Africans and the contributing donor countries.

The United States circulated a preliminary informal paper on the subject at the Bonn meeting and subsequently assigned a consultant to review U. S. and other suggestions and to prepare a background paper for discussion by an ad hoc technical group made up of other CADA members and selected observers invited from other donor agencies.

This group met in Washington on November 13 and 14, 1980 to discuss the problem and possible programs of concerted action which could increase the effectiveness of current and future African and donor efforts in this sector.*

This background paper describes briefly:

- the size of the sub-Saharan fuelwood problem;
- the size of current donor involvement in forestry and fuelwood production;
- key program needs which would have to be met if Africa's fuelwood problems are to be resolved.

*See Annex A for a list of the participants.

These facts and program needs provide the conceptual framework within which the suggested initiatives, as revised and expanded by the technical group, have been developed for policy level review.

B. The size of the sub-Saharan fuelwood problem

There is by now an emerging awareness within the development community as a whole that the size and nature of Africa's energy needs demand a reassessment of national and donor program priorities, particularly in the field of fuelwood needs.

This in turn will require a major upgrading of the priority assigned to development of African forestry manpower and land management capabilities. These will have to be greatly expanded if urban and rural fuelwood needs are to be met on the requisite scale.

1. Fuelwood's dominant energy role

Fuelwood is the primary source of energy throughout Africa.

In sub-Saharan Africa, fuelwood alone accounts for more than three-fourths of total energy consumption--commercial and non-commercial, rural and urban combined. In ten countries, fuelwood accounts for ninety per cent or more of all energy consumed.¹ In rural areas it is virtually the only cooking fuel, supplemented by dung and agricultural wastes in some areas, but it is also the primary cooking fuel for eighty per cent or more of the populations in many of Africa's rapidly burgeoning cities as well.

This fact has important implications for the size of future fuelwood demand and for the location of future supplies to meet urban needs. Quite apart from the expected increase in overall population of this area (from 355 million in 1980 to 644 million in 2000) towns and cities are expected to attract 35 per cent or more of the population, accounting for

¹These are The Central African Republic, Chad, Ethiopia, Gabon, Mali, Rwanda, Somalia, Tanzania, Uganda and Upper Volta, together accounting for 91 million people in 1980.

some 233 million by the year 2000. Land nearest to these urban centers will be the object of strong competition both for additional housing and for more agricultural production to meet urban food needs.

To meet future urban needs, commercial fuelwood plantations will need to be established on a large scale far enough distant from both urban and agricultural production locations to avoid pre-emption for either purpose. Early African government discussions on such land use allocations are essential.

2. The size of the fuelwood supply problem

Already exceeding annual replenishment, demand for fuelwood is growing, fuelled by population growth at rates among the highest in the world and accelerated by conversion to charcoal as fuelwood's disappearance lengthens the distance between the points of consumption and supply.

In the wake of this increased demand, coupled with land clearance for more agricultural production and expanding exports of tropical timber, Africa's forests and woodlands are disappearing with alarming speed.

Given present rates of deforestation, Senegal will be bare of trees in thirty years, Ethiopia in twenty, Burundi in seven. Much of the eight-nation region of the Sahel will have become desert by the year 2000 unless annual reforestation and fuelwood planting is launched on a massive scale.

In a study completed in 1977,² Reidar Persson calculated that Africa as a whole would need new fuelwood plantations at the rate of one million hectares a year for the next twenty years to meet projected rural and urban needs. Estimated in terms of broad categories of land, 700,000 hectares would be

²Reider Persson, Forest Resources of Africa: An Approach to International Forest Resource Appraisals, Part II: Regional Analysis, published by Royal College of Forestry, Stockholm, 1977, pp. 128-132, 144-145. Part I, published in 1975, provides a country-by-country summary analysis of the status of national forests, man-made forests, including details on status and reliability of land use inventories.

The FAO has now completed country monographs for 38 sub-Saharan African countries, as part of its current Tropical Forestry Assessment project. It is expected that these will be available, together with summary tables, early in January 1981. (Information provided by Dr. J. P. Lanly, FAO, Rome, October 28, 1980.)

needed in the savannah and steppe zones, about 100,000 hectares in rural areas of North Africa (excluding Egypt), about 50,000 hectares around large urban centers in rainforest zones and another 100,000 to 150,000 hectares in highland dry areas. Additional plantations would be required for domestic timber and pulpwood needs, but these are quite modest, compared with the plantations needed for fuelwood--150,000 to 200,000 for domestic timber and about 30,000 to 40,000 for pulpwood, outside of South Africa.

More recently, in March 1980, the World Bank concluded an intensive country-by-country analysis of fuelwood and other forestry needs among 83 Third World countries, including 39 countries in sub-Saharan Africa, with results which in the aggregate correspond closely to Persson's estimates.

According to the Renewable Energy Task Force which the Bank commissioned, these 39 countries, accounting now for 355 million people, will need to plant 955,000 hectares a year--fifteen times the current rate--until the year 2000 if Africa's urban and rural fuelwood needs are to be met. Kenya, for example, with a population of about sixteen million now, which is expected to more than double by the year 2000, would need to step up current fuelwood planting efforts from about 1,000 hectares a year to 25,000 hectares annually. Upper Volta, whose population of seven million is expected to grow to twelve million by the end of the century, must accelerate planting from current rates of about 1,500 hectares to 15,000 hectares a year. To enable fuelwood cutting at levels of sustained yield, Kenya will need to plant a total of one million hectares and Upper Volta will need to plant some 300,000 hectares by the turn of the century.

The Bank's Task Force estimates of fuelwood planting required for each of the 39 countries are summarized in Table No. 1 on the following page.

It should be noted that the Task Force figures already allow for the future substitution for fuelwood of alternative fuels, conventional or renewable and varying by country, for, on the average, about 25 per cent of anticipated fuelwood use. To realize these levels of fuelwood savings will also require major program efforts.

Furthermore, the Task Force figures also allow for the supply of fuelwood from improved management of natural forests of 26 per cent of anticipated fuelwood needs in East Africa and of twenty per cent of West Africa's needs, by the year 2000. To realize the volume of fuelwood supply represented in these percentages will require a very substantial expansion of African forest management manpower and in improved training capacity to educate the expanded staff.

Table No. 1

SELECTED AFRICAN COUNTRY FUELWOOD NEEDS: 1980-2000

Country	Population			Natural Forests 1980	Fuelwood Present area	Plantations Area needed by 2000	Annual Planting for Fuelwood		
	1980	2000					Current annual	Annual needed 1980-2000	
	Urban	Rural	Total						
	(in millions)			(All these figures in thousands of hectares: 1 ha = 2.5 acre)					
<u>EAST AFRICA</u>									
Sudan	18	13	18	31	30,000	20	2,300	5.0	115
Ethiopia	32	10	45	55	25,000	10	2,000	2.0	100
Somalia	4	3	3	6	200	Nil	200	0.5	10
Uganda	13	5	20	25	2,000	5	500	1.0	25
Kenya	16	6	28	34	1,000	30	1,000	5.0	50
Tanzania	16	9	25	34	30,000	10	1,200	2.5	60
Rwanda	5	1	8	9	200	7	300	1.5	15
Burundi	5	1	7	8	100	6	200	1.5	10
Zambia	6	6	4	10	6,000	6	200	0.5	10
Malawi	6	8	4	12	100	10	200	2.5	10
Botswana	6	9	5	14	24,000	-	200	0.5	10
Swaziland	Less than 1	-	1	1	100	5	100	0.2	5
Lesotho	Less than 1	-	2	2	100	-	100	0.2	5
Zimbabwe	7	3	12	15	1,000	5	300	2.5	15
Madagascar	9	3	12	15	9,000	15	200	2.0	10
Mozambique	10	3	15	18	70,000	5	300	2.0	15
Angola	7	4	8	12	63,000	40	200	2.0	10
Zaire	28	25	21	46	70,000	-	300	1.0	15
Sub-Totals	192	109	238	347	332,000	174	9,800	32.5	490
<u>WEST AFRICA</u>									
Nigeria	81	50	100	150	10,000	20	5,000	10.0	250
Benin	3	4	2	6	500	-	100	0.5	5
Ghana	12	11	10	21	5,000	7	700	3.5	35
Liberia	2	2	1	3	1,500	1	100	1.0	5
Sierra Leone	3	2	4	6	200	2	200	0.5	10
Mali	7	4	8	12	6,000	1	300	0.5	15
Niger	5	3	7	10	Nil	-	300	0.5	15
Upper Volta	7	2	10	12	3,500	1	300	1.5	15
Ivory Coast	8	8	6	14	4,000	10	100	1.0	5
Togo	2	1	3	4	500	-	200	1.0	10
Cameroon	8	7	6	13	18,000	5	300	1.0	15
C.A.R.	2	2	2	4	3,000	-	100	1.0	5
Chad	5	2	5	7	1,000	-	300	-	15
Congo	1	1	1	2	17,000	2	100	1.0	5
Eq. Guinea	Less than 1	3	5	8	2,000	-	200	0.5	10
Gabon	Less than 1	1	-	1	20,000	10	100	2.5	5
Gambia	Less than 1	-	1	1	300	1	100	0.5	5
Guinea-Bissau	Less than 1	-	1	1	1,200	1	100	0.5	5
Mauritania	2	2	2	4	Nil	Nil	200	0.5	10
Senegal	6	3	7	10	100	2	300	2.0	15
Guinea	5	6	2	8	1,000	Nil	200	-	10
Sub-Totals	163	114	183	297	94,800	63	9,300	29.5	465
Totals:	355	223	421	644	426,800	237	19,100	62.0	955

Source: World Bank (IBRD), Renewable Energy Task Force Study, March 1980, Washington, D.C.

C. The size of current donor involvement in forestry and in fuelwood production

Formidable as the required effort is, it is achievable if both African and donor governments commit themselves to very large-scale fuelwood planting efforts, coupled with sound long-term land use planning and improved management of natural woodlands and forests.

At the present time the combined African and donor efforts fall far short of the pace needed to achieve adequate fuelwood production goals, although many of the elements of a potentially successful program are present.

Combined CADA and other donor assistance for conventional forestry programs is quite substantial and much of this is directed toward strengthening African forestry departments' infrastructure and land use management capabilities prerequisite to larger and stronger domestic fuelwood production programs. Only a few fuelwood planting projects are underway but several CADA donors have had extensive experience in Africa with large-scale commercial forestry plantations, primarily in extraction for export, and this experience is at least partially transferable.

1. Size of CADA involvement in forestry

All CADA members are actively engaged in forestry and related programs in Africa.

According to a recent inventory of forestry activities,³ as of the end of 1979, overall donor involvement in forestry-related projects totalled a little more than \$1.5 billion.

³Forestry Activities and Deforestation Problems in Developing Countries, United States Department of Agriculture, Forest Service, Forest Products Laboratory, June 1980. A Report to the Office of Science and Technology, Development Support Bureau, Agency for International Development, PASA No. AG/TAB - 1080 - 10 - 78. Hereafter cited as USDA Forestry Inventory, June 1980. Excerpts related to sub-Saharan Africa were circulated to participants in the CADA ad hoc technical group.

Although incomplete and already outdated in some instances (e.g., the CILSS second generation forestry projects are not included), it provides a useful working inventory and checklist pending the more complete and regularized exchange of project and planning data among CADA members and other donors which has been suggested as an early procedural CADA initiative.

Table No. 2

DONOR AID IN FORESTRY IN SUB-SAHARAN AFRICA

(in \$'000s)

Region	Total Aid	of which CADA members
<u>Sahel</u>		
completed	4,345	790
ongoing	73,694	64,830
proposed	<u>117,512</u>	<u>41,361</u>
Sub-total	195,551	106,981
<u>Other West Africa</u>		
completed	5,702	3,088
ongoing	23,261	14,951
proposed	<u>128,854</u>	<u>13,500</u>
Sub-total	157,817	31,539
<u>East Africa</u>		
completed	123	88
ongoing	134,512	8,414
proposed	<u>1,016,200*</u>	<u>300,437</u>
Sub-total	1,150,835	308,939
<u>Grand Total</u>		
completed	10,170	3,966
ongoing	231,467	88,195
proposed	<u>1,262,566</u>	<u>355,298</u>
Total	1,504,203	447,459

Source: USDA Forestry Inventory, June 1980.

*Note: This includes \$906 million worth of large pulp and paper projects proposed for Malawi, Tanzania and Zambia.

Of these CADA donors were involved in or had indicated reasonably firm interest in contributing to projects with life-of-project costs estimated at about \$450,000,000, a very substantial amount.

It should be recognized that these figures are skewed by the inclusion of several proposed large pulp and paper projects, accounting for \$906 million in proposed East African projects, in Malawi (\$500 million), Tanzania (\$252 million) and Zambia (\$120 million). So far, among CADA donors Germany has indicated interest in the Tanzania pulp and paper plant.

However, even excluding these, combined donor assistance represents a significant investment in conventional forestry programs, almost \$600 million to date, with CADA involvement accounting for about \$250 million of the total.

2. Combined donor forestry effort in relation to the fuelwood production needed

Given the fact that it is only within the last few years that the problem of African desertification and deforestation has been given any prominence, these figures are quite impressive. However, when the outlays for forestry are measured against the number of hectares of fuelwood plantations being planted, the record is bleak. Despite the very substantial amount of money being spent by CADA and many other donors on forestry, there are still very few new trees being planted for fuelwood use compared to the need.

Although most CADA donors have some small-scale village level projects underway, few of the six CADA participants are as yet involved in anything approximating the area of thousands of hectares annually in each country identified as necessary by the IBRD Renewable Energy Task Force report.

Germany and the U.S. are engaged in a 1,300 hectare fuelwood plantation project in Gambia. France and the IBRD are cooperating in plantations to supply Niamey with fuelwood and in a proposed program of 2,000 hectares in Burundi. Germany, France and the IBRD are engaged in a project to supply fuelwood and lumber around urban areas in Upper Volta. Belgium has a five-year pilot plantation program of 1,000 hectares in Rwanda and has a smaller fuelwood program in Cape Verde. United States and Senegal are cooperating in a 3,000 hectare plantation designed to supply part of Dakar's future fuelwood needs. The United Kingdom has an on-going woodlot project in Lesotho, which has resulted in the planting of 2,170 hectares in five years.

A proposed U. S. multi-purpose project in Mauritania would involve 25,000 hectares of fuelwood, dune stabilization

and forage crops, as replacement of trees and vegetation which will be destroyed when two dams on the Senegal River are completed. Although only part of this would be for fuelwood and would probably not represent net new supplies, it could provide experience with large-scale planting on the scale that will be required for successful fuelwood supply programs.

As variously calculated, these add up to about \$30 million in combined CADA member assistance for life-of-project costs, accounting for perhaps 25,000 hectares of fuelwood planting overall, including the proposed Mauritania program.

Since 1977, the IBRD has funded fuelwood plantations for the following countries as part of wider forestry loans or as a component of agriculture or rural development sector projects, at costs estimated in the neighborhood of \$76 million .

Country	Hectares of Fuelwood Plantations to be planted
Niger	1,600
Mali	3,520
Malawi	12,000
Senegal	5,000
Nigeria	24,000
Burundi	2,000
Upper Volta	1,925
Tanzania	5,435
	<hr/>
	55,480

As part of its broader, longer-range program for energy assistance to developing countries, the World Bank has recommended expanded assistance for fuelwood production, including, but not limited to, assistance for a wide range of related forestry and improved land management tasks: introduction of more efficient stoves, testing of wood-related renewable energy technology, research, training, silvicultural trials, fellowships, sociological studies, fodder production, pilot tree farming credit programs, surveys of land available for fuelwood planting.

Based on calculations by the Bank's Renewable Energy Task Force, a possible five-year (1981-85) fuelwood plantation (and related wood energy project components) has been suggested

for 39 African countries which, if fully funded, would finance 440,000 hectares of new fuelwood planting. The Task Force estimated total costs at about \$680 million over the five years, suggesting that external financing might be required for about half of the total amount, or \$350 million. (See Table 3 on page 11.)

Fuelwood planting even on this increased scale falls well short of the Bank's own estimate of African requirements. Nevertheless, for the selected countries it would represent a very substantial increase in annual fuelwood planting, as compared with current levels, and could serve to galvanize and enlist African government commitment of resources for expanded manpower, training and related forestry infrastructure as well as for fuelwood planting and production programs on a much larger scale.

3. A note on costs

Current costs per planted hectare are quite high, but they also vary widely. Sahel (CILSS) is using an illustrative average of \$725 per hectare, for village woodlots based on recent field experience. This covers the first year's major capital cost of planting plus the next four years of maintenance to get a lot established. It also includes payment for labor and fencing, with labor accounting for 59 per cent of the costs. The World Bank's suggested five-year planting program estimates costs on the average at about \$1,000 per hectare, a figure which includes planting, infrastructure development and overhead, but not the costs of related "wood-based energy components" as elaborated in the Table 3 footnotes on page 13.

It goes without saying that such high costs will be a major barrier for both African and donor countries in their efforts to increase the volume of official capital investment funds allocated for fuelwood planting purposes.

The program initiatives suggested by the ad hoc technical group assume it will be necessary to negotiate within the framework of approximately these costs in the immediate future in order to take advantage of the momentum already underway.

Meanwhile, CADA members will wish to review and exchange their own experiences with woodlot and large-scale plantations for lower cost approaches. Costs as low as \$66 per hectare have been cited for one village in Ethiopia, representing mainly the cost of seedlings, all other costs being voluntary labor. A large-scale multi-purpose reforestation program in Algeria reports costs of about \$300 per hectare, with annual plantings averaging 15,000 hectares a year, underway since 1961, on the south side of the Atlas Mountains. The United States has contracted for a review and evaluation of this project and results will be provided to CADA members as soon as available.

Table No. 3

IBRD SUMMARY OF POSSIBLE FUELWOOD PROGRAMS
FOR SELECTED COUNTRIES, FY 1981-85

<u>Country</u>	Target Planting Area for a First 5-Year Project Suitable for External Agency Support '000 ha	Likely Cost of Plant- ation Compo- nent from Col (1) U.S. \$ Million	Likely Cost of Addi- tional Wood- based Energy Project Compo- nents U.S. \$ Million	Likely Total Cost of 5-Year Project Project (2) + (3) U.S. \$ Million	Possible External Aid Funding Target (50%) U.S. \$ Million
	(1)	(2)	(3)	(4)	(5)
<u>EAST AFRICA</u>					
Sudan	20	20	5	25	12.5
Ethiopia	20	20	5	25	12.5
Somalia	5	5	5	10	5.0
Uganda	20	20	5	25	12.5
Kenya	25	25	15	40	20.0
Tanzania	20	20	5	25	12.5
Rwanda	10	10	5	15	7.5
Burundi	10	10	5	15	7.5
Zambia	15	15	5	20	10.0
Malawi	20	20	5	25	12.5
Botswana	5	5	5	10	5.0
Swaziland	5	5	5	10	5.0
Lesotho	5	5	5	10	5.0
Zimbabwe	15	15	5	20	10.0
Madagascar	15	15	5	20	10.0
Mozambique	10	10	5	15	7.5
Angola	10	10	5	15	7.5
Zaire	<u>5</u>	<u>5</u>	<u>5</u>	<u>10</u>	<u>5.0</u>
Sub-Totals	<u>230</u>	<u>230</u>	<u>100</u>	<u>330</u>	<u>165.0</u>

(Continued on next page)

Table No. 3
IBRD SUMMARY OF POSSIBLE FUELWOOD PROGRAMS
FOR SELECTED COUNTRIES, FY 1981-85

(Continued)

<u>Country</u>	Target Planting Area for a First 5-Year Project Suitable for External Agency Support '000 ha	Likely Cost of Plant- ation Compo- nent from Col (1) U.S. \$ Million	Likely Cost of Addi- tional Wood- based Energy Project Compo- nents U.S. \$ Million	Likely Total Cost of 5-Year Project (2) + (3) U.S. \$ Million	Possible External Aid Funding Target (50%) U.S. \$ Million
	(1)	(2)	(3)	(4)	(5)
<u>WEST AFRICA</u>					
Nigeria	30	30	10	40	20.0
Benin	5	5	5	10	5.0
Ghana	20	20	5	25	12.5
Liberia	10	10	5	15	7.5
Sierre Leone	10	10	5	15	7.5
Mali	15	20	10	30	15.0
Niger	15	20	10	30	15.0
Upper Volta	15	20	10	30	15.0
Ivory Coast	10	10	5	15	7.5
Togo	5	5	5	10	5.0
Cameroun	10	10	5	15	7.5
C.A.R.	5	5	5	10	5.0
Chad	5	5	5	10	5.0
Congo	15	15	5	20	10.0
Equatorial Guinea	5	5	5	10	5.0
Gabon	10	10	5	15	7.5
Gambia	5	5	5	10	5.0
Guinea-Bissau	5	5	5	10	5.0
Mauritania	5	5	5	10	5.0
Senegal	5	5	5	10	5.0
Guinea	5	5	5	10	5.0
Sub-Totals	<u>210</u>	<u>225</u>	<u>125</u>	<u>350</u>	<u>175.0</u>

FOOTNOTES FOR TABLE 3

- Column (1)--The maximum 'credible' fuelwood planting program for a first five-year external aid agency financed planting project based on past Bank lending experience in the countries concerned and on what Bank forestry staff consider to be attainable, taking into account what we know of present social, institutional and infrastructural constraints at the country level. This implies incremental planting over and above on-going fuelwood programs. The assumption is made that a significant proportion of investment over the next five years would be devoted to creation of the necessary infrastructure and institutional framework for larger planting programs in the future. (See also Column 3.)
- Column (2)--Column (1) multiplied by a factor of U.S. \$1,000 per hectare which takes into account both direct planting costs as well as planting infrastructure, development and overheads.
- Column (3)--Other wood based energy components include, e.g., introduction of more efficient stoves, testing of wood related renewable energy technology, e.g., charcoal production methods, research, training, silvicultural trials, fellowships, sociological studies, fodder production, pilot tree farming credit programs, surveys of land available for fuelwood planting, etc.
- Column (4)--Column (2) plus Column (3).
- Column (5)--Fifty per cent of Column (4) assuming External Aid Agencies fund fifty per cent of total project cost.

4. The interdependence of fuelwood production and other forestry programs

It is generally agreed that any large-scale fuelwood production program must include a wide range of other forestry related activities in order to be successful, a premise fully integrated in the CADA initiatives suggested in the next sections. It is less clearly recognized that any reforestation program undertaken for non-fuelwood purposes must include a substantial and adequate fuelwood supply before its own goals can be met.

Successful fuelwood planting programs require greatly increased programs to train and retrain foresters and extension agents and to expand their numbers. They require increased budgets and logistic support for national forestry departments. Sound land use decisions on agriculture, range management, fuelwood plantations and natural forest management, will require improved land use surveys and land use monitoring. Enlistment of local manpower and expertise in planning and execution of all planting projects will be needed to insure the success of any national program and this task in turn will require a greatly expanded capacity for effective extension training and services on a highly localized village and even personal farm and household level. Such programs must also be developed in conjunction with programs to meet agricultural and pastoral needs: forage crops, water supplies, dune stabilization, and a wide range of other programs to increase agricultural productivity, improve soils, conserve energy and develop alternate fuels.

But the bottom line is that there must be massive fuelwood planting programs, adequate to permit rapid replacement of wood and grasses and other vegetable residue now scoured from the land for fuel. Furthermore, these plantations must be established at rates that will eventually permit annual fuelwood cropping with sustained yield. Otherwise dune stabilization efforts, windbreaks, watershed protection programs, regenerated range land, tropical forest reserves--all these very necessary plantings for non-fuelwood uses will also fall prey to ruthless scavenging, plundered to meet the increasingly desperate rural and urban demand for fuel.

D. Essential components for expanded programs

Participants in the ad hoc technical group agreed that, to be successful, any expanded forestry and fuelwood production effort by any African government would need to include several major prerequisites or program components:

- African government commitment to increased priority for forestry and fuelwood production programs within their own national economic and social development programs.
- Expanded manpower and training, improved in content and institutional capability.
- Improved management of natural forests and woodlands for fuelwood production as well as for other purposes.
- Early planning for larger scale fuelwood plantations, especially to meet urban needs.
- Decentralized seedling supply and extension services, to enlist voluntary efforts at the village and household level and to serve their individual needs. In this connection additional efforts should be made to enlist and involve women in these activities.
- More effective methods of fuelwood use and development of alternative energy supplies. These might include intensified efforts at improved wood and charcoal stoves and kilns, solar pre-heated water for cooking, development of solar energy and other non-conventional fuels as fuelwood substitutes.
- Up-to-date knowledge of existing land use and land use potential on which to base agricultural, forest and fuelwood, and urban planning decisions, and to provide baseline data for popular education and extension programs.

It goes without saying that investment capital will be needed on an accelerating scale once African fuelwood production programs move beyond what is now, even for the largest programs, essentially a pilot stage.

Members of the technical group were generally agreed that foreign assistance would be needed on a larger scale than is now reflected in donors' direct fuelwood planting aid, including the need to be prepared to finance a substantial portion of local costs, including recurring costs, until plantations were well established.

However, participants were also agreed that until the program components listed above were firmly in place and operating efficiently, the capacity of most if not all countries in sub-Saharan Africa to absorb large amounts of additional assistance would remain well within even the comparatively modest limits suggested by the World Bank's five-year indicative plan.

These components and their relationships to the larger and longer term fuelwood supply goals are discussed briefly below.

1. African governments' commitment to increased priority for forestry and fuelwood production programs

Before donor assistance can be harnessed more effectively to African efforts, African government officials will need to commit themselves to increased priority for forestry and fuelwood production programs within their own national economic and social development programs.

At a minimum, this will require reassessment of resources currently devoted to support of their existing forestry departments which have traditionally, throughout Africa, received very low levels of funding. In some Sahelian countries, these departments receive less than two per cent of national departmental funding. While qualitative improvements in manpower, training and deployment are obviously time consuming, basically even these boil down simply to inadequate funding. A recognition that greatly increased financial and logistic support will be required for the expanded national effort demanded by fuelwood supply requirements will have to take visible form in substantially increased funding for ongoing forestry services.

On a more fundamental scale, African commitment to such increased priorities may take visible form by including, in five- and ten-year development plans, specific quantitative targets for forestry manpower development and for establishment of increasingly larger annual increments of plantations, for fuelwood and for other non-fuelwood uses. Such long-range planning could also involve early decisions at the highest African government planning levels to locate and earmark nationally controlled (or controllable) land sufficient in total area for programs capable of meeting future fuelwood needs from sustained yields.

2. Expanded manpower and training

There is probably no single barrier to improved management of natural forests for fuelwood and other forestry purposes and to expanded capacity to undertake larger plantation programs than the grossly understaffed and undertrained manpower component of existing programs.

A recent study prepared for the Eleventh Commonwealth Forestry Conference held in September 1980 explained such understaffing in these terms:⁴

It was previously thought that the elimination of national forest ecosystems over large areas was not of great consequence if a residue was reserved for industrial forestry production, and the forester, confined to his protected forest enclave, would ensure a steady supply of industrial timber. The fact that all other forest products, including fuelwood, were called "minor" greatly facilitated the concept of the reserved forest estate. In turn this concept, and the realities stemming from it, have powerfully and adversely influenced the status of government departments of forestry and in many countries have kept their manpower requirements at levels derisory in relation to real needs.

An example of such inadequate support is found in a recent case history from a Koudougou (Upper Volta) regional development project, assisted by FAO/UNDP funds. This illustrates the fact that, without manpower, transport and gasoline, foresters, however well motivated, cannot be expected to service and supervise even small-scale planting programs successfully.⁵

A three-year project resulted in the following accomplishments:

Year	Total Costs	No. of Hectares Planted	Avg. % Survival	Hectares of Live Trees	Cost/Ha Surviving Trees
1977	\$ 59,323	81	38%	31	\$ 1,914
1978	194,343	198	40%	79	2,460
1979	174,538	300	--	--	--

The administrative barriers are easy to identify, as indicated in the following quotations from the evaluation report:

⁴L. Roche and R. Cooper, "Forestry for Local Community Development: Manpower, Training and Education Requirements," Department of Forestry and Wood Science, University College of North Wales, Bangor, North Wales, United Kingdom, 24 pp. September 1980

⁵As described in a draft evaluation reported prepared by Robert Winterbottom, Forester/Ecologist, CILSS forestry team, Ouagadougou, Upper Volta, September 1979.

At present the Forest Service has a single 404 pick-up at its disposal for the entire Inspection area (about 2,630,000 hectares). Preposes (forest assistants) are obliged to use their own mobylettes in most cases. In principle, the field staff receives 30 litres of fuel per month, which would allow them to cover about 45 km total per day. In reality, they do not regularly receive this much.

The Inspection's annual budget varies from 400,000 to 500,000 CFA (about \$2150.00); unless project funds are available, the 14 staff persons of the Inspection have very little to work with on a day-to-day basis.

There are at least 10 nurseries scattered around the region, but several nurseries produce few if any seedlings because of a lack of funds to pay workers, provide water, replace tools, etc. Staff are called upon to cover very large areas, and are expected to give priority to their policing function (enforcement of Forest Service regulations against cutting protected species, use restrictions in forest reserves, etc.) The prepose in Yako is responsible for 328,500 hectares and the prepose in Leo attempts to survey (with a mobylette and less than 30 liters of fuel a month) more than 1 million hectares (10,920 km²).

Costs for training and salaries for an adequately expanded manpower component may be thought to be relatively modest compared with the capital outlays which will be required when African governments accelerate their planting programs on a scale commensurate with the fuelwood needs. However, given the extremely low level of staffing now in place, the sheer volume of added manpower that will be required may cumulatively add up to a substantial amount, a fact donors and African countries considering adequately expanded manpower must be prepared to accept and whose costs they ought to be prepared to support.

3. Improved management of natural forests and woodlands for fuelwood production

It is often overlooked that an immediate source of expanded fuelwood supplies may be found in a system of organized management of natural forests and woodlands, by means of which systematic thinning and salvaging of deadwood is undertaken, with the residues being deliberately assigned to fuelwood and charcoal supply. Where management of natural forest is now pursued (reportedly rarely if at all in Africa) residues obtained are usually burned or otherwise discarded.

Under the assumptions used in the World Bank's Renewable Energy Task Force Estimate, very substantial supplies are anticipated from this source: 54 million cubic meters of wood annually for East Africa alone by the year 2000, an amount which would require establishment of 3.3 million hectares of new fuelwood plantations to permit annual harvesting of that volume of wood from sustained yield. Fuelwood in such volume from this source will not be available, however, unless adequate and new management systems for natural forests are organized, staffed and put into operation now.

4. Early planning for larger scale fuelwood plantations especially to meet urban needs

The volume of fuelwood required to meet projected demand is so large that, regardless of all the other sources of supply, much greater effort must be made, sooner rather than later, in establishing quite large-scale plantations whose primary purpose would be production of fuelwood as a major element in energy supply.

The needs for land to accommodate expanded urban populations and for additional agricultural crops are quite large. By the year 2000, towns and city islands of population may contain 33% of the population in sub-Saharan Africa which overall is growing at an estimated rate of more than three per cent. While adjacent woodlots for city needs may serve an interim supply need, recent experience around African capitals and towns, already scoured clean of trees and scrubwood, suggests that as population pressure and the size of cities grow, the competition for land for both urban construction and for more food will overtake and supplant nearby woodlots for local supply.⁶

As noted above, African governments can be encouraged to include the areas needed for future fuelwood production in their long-range land use planning for overall national economic and social development.

Several CADA donors already have programs or projects of technical assistance in land use planning in a number of African countries. These will provide appropriate opportunities for more systematic discussion of the importance of early national planning and rational designation of appropriate land, sufficient in scale to meet future demand and in areas that will not be pre-empted by either urban expansion or by rural needs for additional agricultural land.

⁶These problems and a strategy for dealing with them are provided in a paper circulated to participants, entitled "Location in the Commercialisation of Fuelwood Production and Supply in Tropical Africa", by W.B. Morgan, Kings College, University of London, 15 pp. It was prepared for a UNU-CGET conference held in Bordeaux, France, 5-9 May 1980.

5. Expanded seedling supply and extension services

As has already been emphasized, administrative and logistic barriers will remain even if African and donor countries declare their commitments to substantially increased fuelwood planting programs. While the longer term programs to improve African forestry program infrastructure and capabilities are taking effect, a special effort needs to be made to insure that an expanded supply of seedlings is made available as close to the planting sites as possible to insure improved chances to survival and to make the most effective use of available labor, voluntary and paid. In this connection, additional efforts should be made to enlist and involve women in these activities.

Decentralized and subsidized seedling programs can materially add to the effectiveness of both large-scale commercial planting programs and village level efforts. Examples include the spread of the neem tree in village household compounds in Senegal, launched with a free seedling distribution program through the national forestry service, on the advice of a French expatriate forestry advisor. In Upper Volta and Niger significant results have been achieved in voluntary agency programs involving local seedling nurseries and free or highly subsidized distribution. An earlier program in Kenya, the "Swynnerton" program, provided similarly successful results with extensive distribution of seeds and seedlings. The World Bank's wood-based energy project in Malawi includes a pilot program for the establishment of a national network of some 88 nurseries which will produce seedlings for distribution to farmers, agricultural processing industries and local townships.

Administratively, decentralized seedling supply and extension services offer opportunities for the maximum participation of the population with a minimum of overhead and layered bureaucracy. All participants endorsed continuing and expanded emphasis on this element of any national African program.

6. Conservation of fuelwood use and accelerated development of alternative fuels

Alarming as are the African fuelwood supply/demand forecasts, there is a very real possibility that they understate the case. The presumption that up to a fourth of future fuelwood demand can be met by savings from improved efficiencies in use or by alternative fuels has not yet been proved. On the contrary, some initial studies comparing the fuel efficiency of selected wood stoves and the traditional three-stone methods suggest that the latter are as good or better. Furthermore, there is a good deal of evidence that African women

are already extremely frugal in their use of wood, a fact that should not be surprising since they are the primary gatherers and users.

The anticipated increased urban population will require increased supplies of cooking fuel and most of this is likely to be supplied in the form of charcoal which itself consumes wood in the process of conversion.

So much depends on achieving fuelwood savings of the magnitude assumed that existing and additional programs for fuelwood conservation need to be pursued as matters of highest urgency.

So far, most donor efforts have concentrated on improved wood and charcoal stoves and kilns and these efforts should be accelerated, with increased attention to (a) rigorous testing of fuelwood savings from improved wood stoves, as experienced by African women in their own kitchens rather than by Peace Corps volunteers or in technical laboratories; and (b) their introduction into urban centers. For urban users, design and acceptability criteria may be significantly different from rural tastes and constraints and faster diffusion may be possible.

Meanwhile additional methods of woodfuel conservation have remained virtually unexamined and deserve to be urgently explored. It seems curious that there has not yet been any systematic investigation of African women's ideas and proposals for woodfuel conversion, although such simple techniques as the use of pot covers while cooking, and hot stones for low heat simmering are known to be practiced in some areas.

The use of solar pre-heated water is claimed to permit savings of 35 to 50 per cent of fuelwood--equivalent to that claimed for better woodstoves--but has received no attention in African fuelwood conservation efforts. If this is in fact verified and if there are no major cultural or other barriers, a major program for local manufacture, demonstration and diffusion, and government purchases of solar water heaters may be needed and desirable to promote adoption of the practice on a broad scale.

The Economic Commission for Africa and the UNDP are sponsoring a regional training workshop for extension workers to involve women in fuelwood production and methods of conserving firewood use, in Bamako, the first two weeks of December 1980. This workshop may provide a model which could be adopted for similar, national training programs in selected African countries.

7. Improved land use data and maps as planning tools

Although there is a great deal of regional and individual African country mapping, including satellite imagery, underway, very little of the result is available in a form which provides up-to-date information on which reliable multi-sectoral land use decisions can be made.

Completion of land use mapping and wide distribution of resultant maps throughout the African government agencies concerned with inter-sectoral development planning decisions could serve to focus the attention of high-level officials on the need for early decisions and large-scale allocation of land for fuelwood plantations. It would not insure such decisions, but it would fill a major information gap and it could eliminate an excellent (and valid) excuse for not making them. Such maps, designed for laymen's use, could also play a useful role in general public education and promotional campaigns.

France, Canada, Belgium, the U.S., Germany and FAO are already associated with present and projected natural resource mapping in the Sahel, including the use of regional remote sensing facilities, and the UK has had extensive resource survey experience in East Africa.

All members of the ad hoc technical group emphasized the need for additional up-to-date land use data and for maps and map reproduction services, and endorsed the desirability of additional efforts as part of any CADA initiatives.

E. Possible CADA initiatives

If CADA governments do in fact decide to move in the direction of substantially increased support for accelerated forestry and fuelwood production programs in Africa, there are several approaches through which members could concert their efforts for increased effectiveness:

- * Members could agree on a few broad policy and program initiatives which they would undertake to pursue within each member's bi-lateral program, relying on the collective effect to produce accelerated African country efforts;

and/or

- * Members could coordinate their assistance for a particular program component, such as training or fuelwood conservation, within a broader regional or multi-country framework;

and/or

- * Members could coordinate their forestry and fuelwood assistance within a specific country.

1. Technical group discussion on options

The first and second options were elaborated in the original draft of this background paper and were presented as a point of departure for discussion and alternative suggestions for action by the members of the ad hoc technical committee.

The illustrative policy proposals included three broad decisions involving: (a) efforts to persuade each African government to launch large-scale fuelwood planting programs, earmarking adequate areas of nationally controlled land for this purpose; (b) commitment by each CADA member to seek approval from its own financing authorities for up to \$50 million over the next five years to finance expanded programs; and (c) an offer by each member to add decentralized seedling production and distribution programs to all national forestry programs and all village level Peace Corps and other similar government or private voluntary projects now included in each members' bilateral assistance program.

These were to be supplemented by several projects (options conforming generally to the second category listed above) which would (a) expand the availability of up-dated land use maps throughout Africa, subject to the request for such services from each country; (b) increase efforts to promote conservation of fuelwood and use of alternative fuels; and (c) involve women more closely in conservation and household forestry programs.

2. The general consensus

Members of the technical group dealt with each of the suggestions in turn, commenting on both the broad options and their possible applications in specific countries or as elaborated in illustrative specific projects. They reached, in conclusion, what appears to be a unanimous consensus that the most useful CADA approach at this stage would be via the third option, namely:

To concert the project efforts of member efforts in two or more specific African countries, seeking to insure that in combination with the country's on-going national program and with other donor efforts, all of the previously

identified essential components are brought on line at the earliest possible date.

Such a decision would not rule out the possibility of one or more high visibility special or regional projects, but these would not be the initial thrust of a CADA initiative in this sector.

The criteria to be applied for selecting project initiatives to be concerted in selected countries are still under discussion. These might include African countries where governments are already committed to expanded national forestry and fuelwood supply programs and where several CADA members are already engaged in related projects and programs. Table 4 on page 25 provides a list of countries in which two or more CADA members are already involved.

In reaching this consensus, members of the technical group believed that it would be premature to have CADA members place a quantitative measure on either the amount donors might earmark for these efforts or on the volume of future fuelwood plantings, national or local, which should be elicited from any African government.

Such commitments are best made on a case-by-case, country-by-country basis, within the context of specific project or overall development assistance negotiations.

This does not rule out the earmarking of funds for forestry and fuelwood as a component of any one donor's internal foreign aid strategy, but it does reject its promotion as an element of CADA initiative and strategy.

Similarly, it was agreed that concerted action to bring on line the program components identified in Section D as essential for successfully expanding African programs could most usefully be pursued within one or more specific countries. This applies to the project suggestions as well:

- * Decentralized seedlings. These would be a special focus for action in any country chosen. The use of the regional improved seed multiplication program financed by France in Upper Volta was suggested as one useful source of supply.
- * Involvement of women. It was agreed that sponsoring of national programs to involve women more closely in forestry and fuelwood conservation programs would be desirable, but it should begin with perhaps a pilot demonstration project serving one country.

Table No. 4
FORESTRY PROJECTS IN SUB-SAHARAN AFRICA
COUNTRIES WITH MULTI-CADA DONOR PROGRAMS

Selected countries	Belgium	Canada	France	Germany	U.K.	U.S.A.	IBRD	Other Donors
<u>WEST AFRICA</u>								
Cape Verde	X		X			X		FAO, WFP Holland-EDF Switzerland
Chad		X		X		X	X	WFP, UNDP/FAO
Gambia				X		X	X	
Mali		X	X	X		X	X	Switzerland Holland
Mauritania			X			X		Luthern WS
Niger		X	X	X		X	X	Switzerland, CWS WFP, FAO/UNDP
Senegal		X	X	X		X	X	FAO/UNDP African DB Switzerland UNDP/FAO
Upper Volta			X	X		X	X	FAO/UNDP Switzerland Holland
Liberia				X		X	X	WFP, FAO/UNDP African DB
Nigeria		X		X	X		X	FAO/UNDP
Sierra Leone				X	X			
Sahel Regional Natural Resource Mapping	X	X	X	X		X		FAO
<u>EAST AFRICA</u>								
Burundi	X		X			X	X	EDF, UNDP
Kenya		X				X	X	Finland, FAO/UNDP
Lesotho					X	X		
Rwanda	X					X		
Somalia					X	X	X	FAO/UNDP
Sudan		X		X	X	X	X	FAO/UNDP
Tanzania				X		X	X	Sweden, OPEC SPF Kuwait Fund Norway, Finland

Source: USDA Forestry Inventory, June 1980

- * Land use maps, all participants agreed, are a useful and necessary tool in national and local planning, but must be hand tailored to particular country projects for formal and technical land planning use at the official level. The possibility of sponsoring less elaborate maps to complement and complete the FAO's recently completed narrative analysis of the African Tropical Forests Assessment projects was mentioned. This could be a useful contribution to wider dissemination of current knowledge and deserves exploration to determine costs and timing.

Two areas not given adequate emphasis in the original background paper were singled out as deserving substantially increased donor and African attention and support in any country which may be considered as the focus of additional CADA initiatives:

- * Manpower and training. All participants underlined the need for improved and expanded manpower and training programs, including "recyclage" and continuing education in all African countries. They also insisted, however, that the need was so great that emphasis should be placed on establishing national programs in each country, although assistance to regional centers is not ruled out. Hence, the choice of CACA concentration on one or more specific countries is not so much a reluctance to commit more funds as to give effect to the technical judgment that, in any case, a national focus must be found.
- * Management of natural forests as a source of fuelwood. Several members of the technical group emphasized the importance of undertaking new systems of management of natural forests. The trees from which fuelwood supplies could be culled or coppiced are already grown. Even woodlands and forests degraded by indiscriminate cutting of tropical timber for export provide species suitable for fuelwood supply. Special efforts ought to be made, they agreed, in any country selected for CADA initiatives, to encourage and support this action by the African government.

These general conclusions of the ad hoc technical committee are being referred to CADA member governments for policy review and decision.

F. The role of alternative fuels

Several participants in the ad hoc group argued the case for a much greater effort in development of fuels, conventional and non-conventional, which could be expected to substitute for fuelwood on a scale sufficient to relieve the pressure on existing natural forests and to reduce the land and capital requirements for the large-scale planting that will otherwise be required.

None of the members disagreed with the need for such an accelerated effort. However, two major points were made.

First, the technical competence of the ad hoc group on forestry and fuelwood was rather closely limited to expertise in that subject. Hence, technical consideration of an expanded effort in alternatives should, in any event, be assigned to another technical group.

Second, however, several participants pointed out that there is a very real question as to whether any foreseeable alternative fuels can be developed on a quantitative scale sufficient to substitute for fuelwood's primary African use, namely for domestic cooking needs. Other fuels can substitute for other uses, the energy requirements for which are expected to grow quite rapidly given any adoption of higher technical processes.

For example, one participant from Africa reported on a research study in Mali, comparing two villages with the same climate and general population characteristics, but one at a slightly higher technical level. Results showed that the latter village consumed twice the amount of fuel. The difference was accounted for mainly by the demand by metal smiths for charcoal, needed to repair plows and other tools.

Except where domestic oil and gas can be produced in quantities very largely in surplus to industrial and commercial uses--unlikely in sub-Saharan Africa--there are no major indigenous alternatives likely to be available on the requisite scale.

It seems useful, therefore, to conclude this background paper with an elaboration of this important limiting factor, an unavoidable constraint in considering fuelwood supply options and alternatives.

Note: This concluding section is drawn from a paper previously circulated which includes documentation and additional details: Fuelwood and Other Renewable Energies in Africa: A Progress Report on the Problem and the Response, by James W. Howe and Frances A. Gulick, the Overseas Development Council, Washington, D. C., March 31, 1980.

1. The general situation

With few exceptions, sub-Saharan African countries have no major indigenous alternative fuels to substitute for either firewood or imported oil, except for hydro-electric power for which there are, unevenly distributed, substantial undeveloped resources.

Four countries are currently net exporters of energy--mainly oil and natural gas--Angola, Congo, Gabon and Nigeria. Cameroon, Mozambique, Niger, Tanzania, Zambia and Zaire have some endowment of oil, natural gas or coal, which could be developed.

Several countries have reasonably assured uranium reserves (the Central African Empire, Gabon, Niger and Zaire) but none is likely to be able to convert this resource to indigenous use very soon.

The remaining sub-Saharan countries have only hydro resources or, practically speaking, no other conventional alternative to imported energy or firewood on which to rely for their industrial, commercial and household needs. It must be conceded that not much exploration of coal or oil has been done in Africa and hence, when explorations take place, significant resources may be found. However, primary demand on such new domestic fuels will be as replacements for imported oil. Little can be expected to substitute for wood.

2. Reassessing hydro power

Fortunately, potential hydro resources of these countries, as well as of those with some alternative energy resources are quite abundant. According to an UNCTAD study,* less than two per cent of the potential installable capacity has been harnessed for current electric power production. Although other estimates of installable capacity are substantially lower than those cited in the UNCTAD study, there is general agreement that for most African countries, hydro resources constitute a very important alternative to imported oil.

*Report prepared by the UNCTAD Secretariat, Energy Supplies for Developing Countries: Issues in Transfer and Development of Technology, UNCTAD, TB/B/C.6/31, 17 October, 1978, Table 4-17, pp. 23-25.

In the Sahel, for example, almost all electricity is produced in thermal power plants (diesel or steam) burning imported oil products. In 1976, total output was about 900 GWh (approximately 32 kWh per person per year), corresponding to consumption of approximately 220,000 tons of oil products per year or some 20 per cent of total oil imports. According to the Sahel energy task force report, development of the Sahel's hydro potential for power would allow a doubling of capacity and a direct saving of imported oil if deliberately substituted for current oil-fuelled thermal power.

So far, except in the Moshi district of Tanzania where most Chagga households are electrified and use electric stoves for cooking, drawing from nearby large-scale hydro-generated supplies, and in Mauritius where reportedly by 1977 virtually all homesteads had electricity in their homes, supply and use of electric power in Africa has been confined primarily to urban areas, dedicated to industrial, commercial and urban household use, with some service to district headquarters levels or to provincial towns. This preemptive pattern is expected to continue for the next decade or so as industrial and rising urban household demand increases rapidly.

Botswana, Nigeria, Kenya and Tanzania have included rural electrification in their long-range power planning. However, in addition to the cost, the physical magnitude of the task of its transmission to the hundreds of thousands of widely dispersed villages has made it unlikely that rural electrification from the conventional grid could be installed widely enough to provide a substantial alternative to fuelwood for rural cooking needs.

3. The role of other renewable sources of energy

In the absence of the conventional transitional alternatives to fuelwood--kerosene or cheap household electricity or cooking gas--African and donor countries are exploring on an accelerating scale the role which might be made by other renewable sources of energy: solar thermal and photovoltaic energy power for pumping and other village industrial needs; mini-hydro and windmills for water lifting or power generation; photovoltaic battery systems for communications, including rural educational television; solar distilled water and solar drying for crop preservation. In a few areas, biogas is being tried. In Tanzania, over fifty rural health centers have installed biogas plants for cooking, lighting, and water-heating. For some wood-using village tasks--not large in total African energy use or even in total rural energy use, say 5 to 15 per cent of rural firewood use--these substitutes can save fuelwood.

These tasks clearly meet basic human needs. They provide water for human consumption, for cattle and for irrigating crops, including firewood. They provide power to help run village

industries, to supplement human labor and shift its burden. They permit Africans far distant from the conventional electric power grid to share the urban and developed world's most modern means of communication to exchange information, expand commerce and improve education. Where mini-hydro, photovoltaic or wind powered systems exist on sufficient scale, they can provide lighting too.

But there remains the even more basic need: food. As the Sahel energy team flatly states: "Food self-sufficiency makes no sense if there is no more fuel to cook food in the Sahel."

So far, despite twenty years of more of imaginative experiments, there is still no culturally acceptable solar cooker which can satisfy African cooking styles and working hours. As noted above, major fuelwood savings have been claimed for improved woodstoves and if solar pre-heated water were used for cooking, but these remain to be proved and must be widely adopted to make the significant dent in demand already assumed.

This does not mean that CADA members need not consider policy and project initiatives involving alternative fuels. Indeed, major hydro-electric capital projects including plans for rural electrification appear to be currently underway with little consideration of either donor or African coordinated energy development strategy. CADA may wish to add such consideration as another agenda item when it considers additional tasks at subsequent policy level meetings. Similarly, development of deliberate and coordinated donor strategies for the commercialization of photovoltaic solar energy systems could be given high priority among candidates for new CADA initiatives. For each of these, new ad hoc technical groups should be convened.

For purposes of the task under consideration in this paper, however, it is sufficient to underline the fact that, within the known limits of current technology and quantitative supply, even greatly accelerated development of alternative fuels cannot take the place of wood.

There is simply no alternative to very large reforestation and fuelwood planting programs, stepped up on a gigantic scale, if sub-Saharan Africa's basic cooking energy needs are to be satisfied.

The CADA initiatives discussed in this paper are intended rapidly to mobilize substantially increased donor and national program commitments for the long-term effort required to reach this goal.

Annex A
List of Participants

Meeting of the
CADA Ad Hoc Technical Group On
Forestry and Fuelwood Production
November 13-14, 1980
Department of State
Washington, DC

CADA Representatives

BELGIUM

Marc G. Otte
Economic Counselor
Embassy of Belgium
3330 Garfield Street, N. W.
Washington, D. C. 20008
(202) 333-6900

Julien Ronchaine
Attache Agricole
Embassy of Belgium
3330 Garfield Street, N. W.
Washington, D. C. 20008
(202) 333-6900, Ext. 243

CANADA

G. Barchachat
Directeur de Programme
Afrique Francophone
ACDI
200 Promenade du Portage
Hull, Canada
(819) 997-6040

Michel Laverdière
Conseiller en Foresterie
ACDI
200 Promenade du Portage
Hull, P.Q., Canada
(819) 997-3318
Telex/Cable: 053-4140

FRANCE

Jaques P. Alliot
Administrateur General du GERDAT
42 rue Scheffer 75016
Paris, France
Telephone: 7043215
Telex/Cable: 620 871 INFRANCA

Guy T. Vallaeys
Directeur General Adjoint
IRAT
110 rue de l'Universite
Paris, France
Telephone: 5503210 or 7059406
Telex/Cable: SATEC A 200339 F.

Henri Lefébure
Chef du Bureau Sylviculture
Ministere de la Cooperation
20 rue Monsieur
75700 Paris, France
Telephone: 567-55-90
Telex: COPCE B202363 F.

GERMANY

Werner N. Treitz
Ministerialrat, Head Agr.,
Forestry, Fishery, Rural Dev.
Fed. Min. for Economic Cooperation
Karl Marx-Str 4-6, D5300
Bonn, Federal Republic of Germany
Telephone: 535233/535234

UNITED KINGDOM

David C. P. Evans
Principal Agricultural
Advisor
Overseas Development
Administration
Eland House, Stag Place
London, S.W.1
Telephone: 01 213 3991

UNITED STATES

W. Haven North
Deputy Assistant
Administrator
AID, Bureau for Africa
Room 6936, New State
Washington, D. C. 20523
Telephone: (202) 632-9244

UNITED STATES (Continued)

John W. Koehring
Associate Assistant
Administrator
AID/AFR/DR Rm 2497, New State
Washington, D. C. 20523
Telephone: (202) 632-8178

Lawrence C. Heilman
Deputy Director for
Technical Services
AID/AFR/DR Rm. 2493, New State
Washington, D. C. 20523
Telephone: (202) 632-8181

Other Donor Observers

AFRICAN DEVELOPMENT BANK

Agyeman Atwereboanda
Principal Agronomist
African Development Bank
P. O. Box 1387
Abidjan, Ivory Coast
Telephone: 32-07-011, Ext 524
Telex/Cable: 3717/AFDEVA

FOOD AND AGRICULTURE ORGANIZATION

Jean Djigui Keita
Regional Forestry Officer
FAO Regional Office
P. O. Box 1628
Accra, Ghana
Telephone: 66851-4
Telex/Cable: FOODAGRI ACCRA

WORLD BANK

John Spears
Forestry Advisor
Room D-827
The World Bank
1818 H Street, N. W.
Washington, D. C. 20433
Telephone: (202) 477-5761
Cable: INTBAAFRAD

CADA LIAISON GROUP (PARIS)

Norman Schoonover
American Embassy
Paris, France
Telephone: 296-1202, Ext. 2825

AID/W OBSERVERS

John Blumgart
Chief, Special Development
Problems Division (SDP)
AFR/DR, Room 2480, N.S.
Washington, D. C. 20523

Telephone: (202) 632-8168

Robert MacAlister
Deputy Chief, SDP
AFR/DR, Room 2480, New State
Washington, D. C. 20523

Telephone: (202) 632-8169

Kevin J. Mullally
Forestry Advisor
AFR/DR/SDP, Room 2480, N.S.
Washington, D. C. 20523

Telephone: (202) 632-1808

RAPPORTEUR

Mrs. Frances A. Gulick
Consultant, AID/AFR
c/o OECD-DCD
2 rue Andre Pascal
Paris CEDEX 16 France

Telephone: 288-6946