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Survey on Energy Potentials and Needs in North Cameroon

- I. Survey Findings
- II. Survey Methodology
- III. Future Energy Surveys

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Appendix:

"Remarques sur le Rapport de M. Thomas Graham"

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## INTRODUCTION

This report is based on the "Survey on Energy Potentials and Needs in North Cameroon" of 1,002 families, March 1980 - April 1981 in the North Province of Cameroon.

The Survey was designed and executed by the Laboratory for Research in Energy with sponsorship and financing from its parent, the Institute for Geological and Mining Research, one of the research centers of the General Delegation for Scientific and Technical Research, of the Government of the United Republic of Cameroon. The U.S. Agency for International Development helped finance this undertaking and provided technical assistance in the form of three contractors, Charles Steedman, who assessed Cameroon's renewable energy potential in June 1979; Dolores Koenig, who assisted in the design of the questionnaire in March 1980; and, the present writer, who consulted on survey methodology from March 1980 to February 1981.

The objectives of the report are to suggest certain energy policy options and program interventions, as well as to describe and evaluate the methodology practices, and to reflect upon the potential for undertaking similar surveys elsewhere in Africa. The Laboratory's report, due in April 1981 is expected to focus on identification of specific renewable energy research and development and demonstration projects.

The present writer would like to thank the above two fellow consultants along with the following individuals for their assistance and collaboration: Augustin Simo, survey director and Chief of the Laboratory, currently at the University of Marseille. Mr. Simo offers his comments on survey findings and interpretations in the Appendix to this report, page 60. Professor Basile Kamdoum of the University of Yaounde, consultant on data processing, who has processed survey data through the computer. Djallo Soba, Director of the Laboratory's parent institute, who provided executive and financial direction. The enumerator staff who did their best to educate the present writer on North Province realities, especially Samuel Haman Milaye, who took much time in reviewing and criticizing candidate study hypothesis, and offered some detailed explanations for fuel use behavior. Marcel Ngue was the project officer at USAID Cameroon. Professor Loung, Director of the Institute for Humanistic Sciences advised on sample frame variables. Mohammadou Eldridge of Professor Luong's Institute offered helpful comments on survey methodology and selection of sampled localities. Ali Ezzati and Emmanuel Mbi of the World Bank offered useful suggestions. John Blumgart and Robert MacAlister of AID Washington were the supervisors of the work of the present writer. Finally, more than a thousand people took a few hours of their time and responded to quite a few questions, as well as allowing our enumerator staff to observe their daily activities, and Ms. Gleason and staff AID/SER/DM, for their last minute computer runs.

Responsibility for accuracy and interpretation in this report must rest solely with the present writer. His conclusions and recommendations do not necessarily reflect the Cameroon government research center outlook related to the survey, nor reflect the policies and practices of AID.

## SUMMARY

### PART I - SURVEY FINDINGS

This section is intended to readers interested in energy statistics in the residential sector and for energy policy and program planners.

Lack of water and good roads are the most frequent responses listed by people in the North Province of Cameroon. Work in the fields and domestic housework, especially millet sifting and grinding, are drudgery tasks most frequently mentioned. These problems may have some effect on why diets have to vary involuntarily; the reasons of which were identified as lack of ingredients and lack of supply of vegetables all year around.

Biomass and kerosene are chosen mostly because of their availability; however, woodfuels are principally used for cooking, while kerosene is popular for lighting and quick heating. The most frequently mentioned benefit for one technology employing motive is rest for the user.

Batteries and oil products are popular outside-manufactured sources of energy for radios, lighting and for vehicles. Electricity is not so prominently mentioned, although the supply position for hydro and thermal electricity appears promising for at least future increased non-residential connections.

Biomass gets frequent use: woodfuels in the rainy season especially; whereas agricultural residues enjoy wide use during the dry season. Much forest land is protected, but some locations are remote. Unprotected woodlands are being over-cut. The easiest way to get wood is to buy and stock it. Men and women share responsibility for wood purchases; women and children otherwise go out and collect it for free. Three trunks are used mostly for crafts and for house construction; whereas, branches and leaves are popular for heating and cooking. A lot of charcoal appears to be made for domestic uses and for cottage industries, leading to the impression that a beneficial resource recovery effect occurs when the original wood, used for some energy purpose, becomes charcoal for later use. Charcoal does not appear to be intensively used all the time, year round. Animal droppings are favored for fertilizer rather than for fuel use. Certain agricultural residues, apparently not used to feed cattle, are popular in helping to start fires, and for quick heating. Water is hard to get because it is inconveniently located, and sometimes has to be bought when alternative water supplies are not potable, or when nearby wells dry up.

In discussion of certain policy options it is concluded that family energy conservation behavior, given present resources needs no improvement. There may be scope for substitution of a lighter, smaller and easy to store wood by-product in lieu of wood itself, in order to facilitate easier use of fuel in remote wood-deficit areas. A greater diversification of alternative fuel supplies would be beneficial during the rainy season, when there appears to be an excessive dependency on supply of one fuel - wood. The writer recommends serious consideration to provision of more kerosene and diesel oil for remote rural lighting, cooking, shaft and motive power purposes, until the time when alternative/renewable energies become economically available. The present government policy on kerosene subsidy appears to be helpful for easing household energy needs. The urban woodfuels markets should be investigated to see how poorer people in biomass-deficit areas, who cannot afford even a lower-pegged price for kerosene, can get what they need from surplus areas via market towns. Woodlots programs are not seen as easy.

## PART II - SURVEY METHODOLOGY

This section is intended for a readership involved in issues on research methodology in conduct of energy surveys.

Data collection from 1,002 families and from a number of local authorities and functionaires took place from May to end of November 1980; with coding for electric data processing taking place from October onward.

Documentation and survey operations are described and assessed: survey purposes and study objectives, questionnaire, sampling frame, locality characteristics, sample size calculation, family compound siting, enumerator recruitment, training and performance, logistics and scheduling, field supervision, documentary research, study hypotheses, questionnaire classification and numbering, codebook, coding training, coding and keypunching, question selection for final report, programming and print-cuts: and, finally post-survey village visit.

The writer's main conclusion is that, although the performance of the appropriate activities was satisfactory, the sequence for undertaking these activities was in the wrong order. Due to consultant scheduling of arrival in Cameroon, the questionnaire was designed prematurely and set in print before it could have been modified from results from documentary research, study hypothesis, and meaningful pretesting; all activities of which followed too late. The final decision to use the computer resulted in some time and labor lost in having to convert a manual-processing-oriented codebook for electronic data processing. Computer programming only met minimal requirements, resulting in the fact that all data were aggregated Province-wide, thereby disguising important variations and identities. In addition due to technical difficulties not all questions could indicate number of respondents sampled; rather, most provided only sampling figures on responses for those questions having multiple possible answers.

## PART III - FUTURE ENERGY SURVEYS

This section addresses the funding agency energy project designer and appropriate social science researchers.

A number of similarities on social and physical conditions as well as energy use patterns are identified that may be appropriate to relevant regions outside Cameroon, especially in the way people appear to optimize use of existing energy resources. But many exceptions to our generalizations are offered, with particular stress on the fact that promising energy-supply position of Cameroon may not be very representative of that of nearby countries.

Energy survey methods offer a host of problems that practitioners elsewhere in Africa might note. There have got to be found accepted ways to force authorities and designers to make energy surveys less expensive; and, at the same time, get a better control over the sheer bulk of information solicited before even computers are chosen and ready for operation; subsume outside-induced survey purposes and study objectives to those to be met by the local implementing organization; and, finally, try to avoid the temptation to design energy surveys from prepackaged survey instruments developed elsewhere.

Based on observation of what is at present underway in Malawi, the writer recommends a series of steps to make energy surveys more cost-effective by fragmenting in a series of the quantitative demands for non-elementary data elements. He also suggests that the household survey to be considered last

after one has thoroughly looked into the possibility of employing perhaps less statistically effective but cheaper alternatives. When energy has to be regarded in a multi-sectoral way, he recommends that the subject matter of energy as a candidate for a survey be also considered last after thorough investigation of data and information on similar studies for other energy-using sectors has been completed. Finally, the writer pleads for a professional determination of standard weights and volume measures for universally accepted sizes of quantities of fuels and some meaningful way to understand price implications other than relying on somewhat artificial foreign exchange rates.

#### APPENDIX

Mr. Simo warns the reader about excessive reliance on interpretations based on response frequencies as contrasted with the more preferable respondent frequencies. He doubts that kerosene and electrification serve as useful fuel alternatives to biomass, as recommended by his colleague in the main body of the report. His doubt is based on his estimate that, despite increased supply, the costs for kerosene and electricity will increase, making it more difficult for needy people to obtain. He also expresses concern on his colleague's promotion of fossil fuels for the countryside, based on his belief that people should not be encouraged to develop use habits for sources of energy that are exhaustible in relatively a short time on the planet. He acknowledges that families may conserve fuel well in terms of their management of scarce resources, but he argues that a program on energy conservation not be de-emphasized at the expense of depriving people of more thermally-efficient conversions and end-use technologies, such as improved fireplaces, for example. He requests readers of this report to hold in reserve their reactions to conclusions reached here until they have an opportunity to read his institute's report due in April 1981.

## PART I - SURVEY FINDINGS

### 1. THE STUDY ENVIRONMENT

#### The North Province

Cameroon has seven provinces, of which the one under study has the largest land mass and population. The five eco-climatic zones in the North Province range from Sahelian-like characteristics in the extreme north to the cooler and wetter southernmost Sudanian plateau. There is a great variance in terrain, rainfall and temperature, as Tables 1 and 2 indicate below:

Table 1  
topography of localities surveyed

<u>Features</u>	<u>Number</u>
Village on the plain	7
Alongside a river	1
On the edge of a hill	5
In the mountains	2
Plains and mountains	4
River and mountains	1
River and plains	4
	<u>24</u>

Source: Survey, Carte 1(L), Q 11.

Table 2  
Climatic data, North Province, Cameroon

<u>Eco-climatic zone</u>	<u>Average mean rainfall (mm)</u>	<u>Average annual temperature (°C)</u>	<u>Number of dry months</u>	<u>Number of months with rainfall</u>
Sahelian	554	28.1	7	5
Sudanian highlands	961-1477	25.6-26.0	5-6	6-7
Sudan-Sahelian	804	28.6	6	6
Sudanian	982	28.1	6	6
Sudanian plateau	1574	22.2	5	7

Source: Resource Inventory of North Cameroon, Africa. Washington DC: USDA, USDI, AID, FAC. 1978. Table 1, page 5.

#### Localities Surveyed

The Survey covered 24 towns and villages, all containing a cumulative population of about 307,000 in a Province with almost 2,000,000 people. The population of the five largest towns range between 10,722 and 74,135. In other sites, the average number of people is 3,300. Over half of the main roads approaching each locality are considered difficult to pass by during the rainy season. Almost 80% of all family compounds are clustered closely, with the remainder being scattered. Only seven of the 24 localities were connected to the government's central electricity grid.<sup>1</sup>

<sup>1</sup>Source: Survey: Carte 1(L), Q 7-2, Q 10; Carte 2(L), Q 18; Carte 3(L), Q 34-a.

The map on the next page indicates where these zones and localities are located.

Families Interviewed and Observed

As the table points out below, most of the families interviewed and observed were engaged in agriculture and animal husbandry, with lesser representation from commercial and clerical people.

Table 3

Principal activities of heads of households surveyed (N=756)<sup>2</sup>

<u>Activity</u>	<u>Percentage of Families Interviewed</u>
Agri/animal husbandry	52
Trade/retail	15
Clerical	10
Crafts	4
Housework	3
Priestly	1
Inoccupied	1
Others	12
	<u>100</u>

Source: Survey, Carte 11, V011, V018.

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<sup>2</sup>The capital letter, "N", refers to number of families interviewed for the particular question.

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 DELEGATION GENERALE A LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE  
 INSTITUT DE RECHERCHES GEOLOGIQUES ET MINIERES  
 UNITE DE RECHERCHE SUR LES ENERGIES

REPUBLIQUE UNIE DU CAMEROUN  
 PROVINCE DU NORD

ENQUETE SUR LES POTENTIALITES ET LES BESOINS ENERGETIQUES

CARTE DES LOCALITES ENQUETES

Légende

- Villes principales (plus de 50 000 habitants)
- Villes de moins de 50 000 habitants
- Villages
- ▬ Villes d'accès, bifurcations
- Villes d'accès non bifurcées
- Points d'attache d'accroches
- Cours d'eau et affluents
- ..... Frontières

Map of the survey area  
 North Province  
 Cameroon

- = towns and villages surveyed
- ⊗ = Post-survey return visit

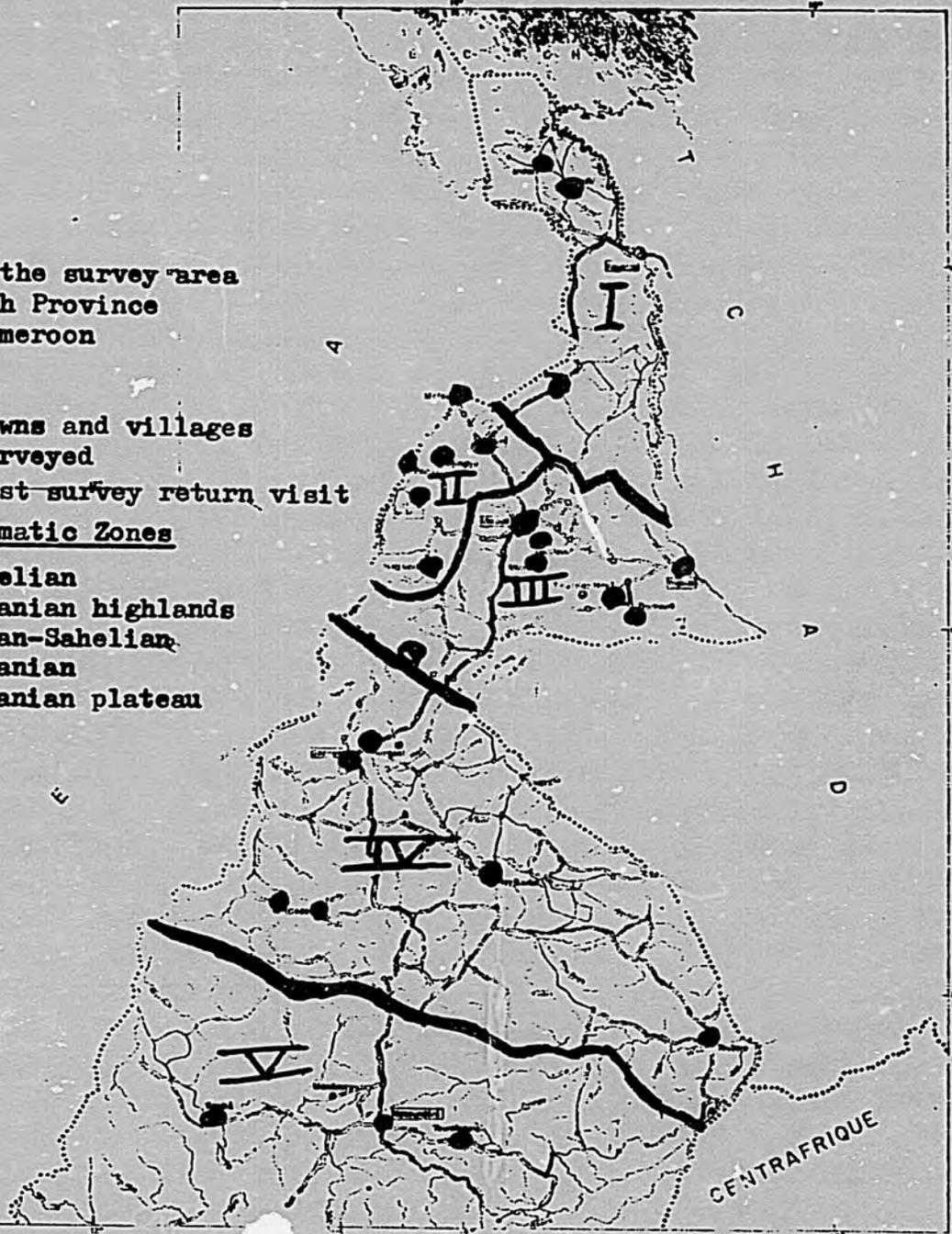
Eco-Climatic Zones

- I Sahelian
- II Sudanian highlands
- III Sudan-Sahelian
- IV Sudanian
- V Sudanian plateau

ECHELLE 1:100 000

0 5 10

76  
 44  
 A



Source: Document de travail (juillet 80- decembre 80). Yaounde: LRE (IRGM, DGRST)1981.

## 2. PROBLEMS

Lack of water clearly stands out as the most important problem affecting all. To a lesser extent in frequency of mention, the lack of all-season roads, and famine prevail.

Table 4

Problems considered the most important to affect all (n=2023)<sup>1</sup>

<u>Problems</u>	<u>Percentate Frequency of Response</u>
lack of water	30
lack of all-season roads	13
famine	10
lack of wood	4
lack of dispensaries	4
lack of water pumps	3
lack of schools	1
flooding	1
others	31
no problems	3
	<u>100</u>

Source: Survey, Carte 1, Q 1, VARU011

One indication of pressing difficulties is to find out if, and why, people's diets vary involuntarily. A lack of ingredients served for main dishes is the principal reason. On our return visit after the conclusion of the Survey to the village of Guider, we found out that sometimes women are so exhausted after the end of the day that they have little energy, time and inclination to search out those favored ingredients. Concurrently, lack of vegetables out of season is another cause for involuntary diet variance; followed by now, a familiar problem, lack of water.

Table 5

Reasons for having to change the diet in the household compound (N=690)

<u>Reasons</u>	<u>Percentage of Families Interviewed</u>
lack of ingredients	26
vegetables available only seasonally	16
lack of water	9
poverty in general	3
lack of fuel	1
others	4
no changes in the diet	41
	<u>100</u>

Source: Survey, Carte 10. Q 115. D42.

Another way to characterize problems is to find out what work people consider as the most bothersome, hard and difficult. As we can see in the two tables on the next page, the most frequent response for men is working in the fields, with animal care as second.

<sup>1</sup>The small letter, "n", refers to the number of responses for multi-response questions, and not to be number of respondents.

For women, housework is extreme drudgery. Their searching for water appears to be more difficult than searching for wood. More specifically, grinding millet is the hardest work in the kitchen. First, people have to separate the grain from the chaff; then separate the outer layer from the pulp; and, finally, grind the pulp into flour.

Table 6  
Work considered the most laborous  
(n=2760)

<u>Work</u>	Percentage Frequency of Response	
	Men (n=1466)	Women (n=1394)
Working in the fields before harvesting	38	20
Harvesting	13	7
Watching over animals	12	6
Feeding, watering and other care for animals	11	6
Housework	9	27
Building houses	3	1
Cultivating cotton	2	1
Searching for water	2	9
Gathering wood	1	3
Collecting cattle droppings	1	1
Cereals grinding	1	13
Others	7	6
	100	100

Source: Survey, Carte 2, Q 13, Q 14, VD 63, VD 67

Table 7  
Hardest work performed in the kitchen (n=936)

<u>Task</u>	Percentage Frequency of Response
Millet grinding	50
Gathering water	27
Preparing meals	4
Gathering wood	3
Others	16
	100

Source: Survey, Carte 10, Q 116, D43.

### 3. ENERGY

#### Sources

In general most explored hydropower, forestry and almost all oil and gas resources are located in other provinces of Cameroon. The North Province contains high solar energy intensity with woodfuels (i.e., wood and charcoal), agricultural residues (i.e., plant stalks) and animal wastes prevailing.

#### Uses

It appears that mere availability represents by far the important criterion for choice of any fuel, as well as, almost equally, the choice of one fuel over another according to the same criterion. It is interesting to note that fossil fuels are considered the most economical among all three fuels listed in the table below. Plant stalks, on the other hand, are appreciated relatively more than the other two fuels for calorific value.

Table 8  
Consumer criteria for fuel choice (n=697)

		<u>Percentage Frequency of Response Criteria</u>			
<u>n=</u>	<u>Fuel</u>	<u>Availability</u>	<u>Less Costly</u>	<u>Lot of Heat for rapid inflammation</u>	<u>Total percentage</u>
193	Petroleum products	70	24	6	100
313	Wood	79	17	4	100
191	Agricultural residues	70	14	16	100

Source: Survey, Carte 5, Q 53, V553.

In the table below we wanted to see how both woodfuels and kerosene compete for the same uses. The frequency of mention figures show that, except for secondary uses, kerosene does not dominate over woodfuels for cooking and heating. Rather, as we shall see in the next section, the major use of kerosene is for lighting.

Table 9  
Comparative uses of woodfuels and kerosene (n=2780)  
(principal urban areas only)

<u>Uses</u>	<u>Woodfuels (n=791)</u>		<u>Kerosene(n=1989)</u>	
	<u>Wood (n=411)</u>	<u>Charcoal (n=380)</u>	<u>Principal Uses (n=1193)</u>	<u>Secondary Uses (n=796)</u>
Cooking	54	21	10	49
Heating	3	43	3	13
Other Non-comparative uses	<u>43</u>	<u>36</u>	<u>87</u>	<u>38</u>
	100	100	100	100

Source: Survey, "Verify Hypothesis 11 Job Step 2," pages 3, 5, 17.

Of course one major use for energy is for shaft and motive power. As noted in the previous section dealing with problems, there is a great deal of hand labor going on that represents difficult and exhausting work for many. Outside energy - renewable, fossil, traditional - could save time and people's own energy. Although this paper cannot deal with specific technological solutions, it should be noted that from people's own viewpoint outside energy yields mostly intangible self-satisfying benefits, as the table below shows:

Table 10

If the respondent had a mill, what would he or she do with the free time gained?  
(n=720)

<u>Use of Free Time Gained</u>	<u>Percentage Frequency of Responses</u>
Rest	30
Take up economic activities	16
Housework	11
Other domestic activities	9
Look for water	6
Crafts	4
Agriculture	3
Look for wood	3
Trade	3
Cooking	2
Others	<u>13</u>
	100

Source: Survey: Carte 10, Q 124, D53.

#### 4. FOSSIL FUELS AND ELECTRICITY

##### Sources

The price of kerosene is subsidized as initial source of supply in Cameroon from tax earnings from gasoline and diesel sales. This policy encourages the fossil-fuel-deficit North Province to continue to use kerosene. Nevertheless the price for kerosene is sensitive to changes in import costs. In 1980 a liter of kerosene costs the end-use consumer in some parts about F CFA 70 (or about \$1.25 a gallon).

The supply of electricity is growing. In the North Province the 56 MW Lagdo multipurposes hydroelectric project is being constructed on the Benoue Riverto reach a 1984 capacity figure of 350 Gwh. Rural electrification will not only benefit from this project; but also, will benefit from the soon-to-be-extended 32 MW diesel electric plant in the provincial capital of Garoua. The total network represents a 90 kv interconnection. For construction of line extensions, intensive use will be made of locally-produced, pressure-treated eucalyptus poles.

The parastatal electricity utility plans to increase its capacity in the Province from 13.5 MW in 1982-1983 to 26 MW in 1983-1984, and continue at the same level of magnitude until 1989-1990. However peak loads are expected to climb only up to 10 MW by 1989-1990. It is expected that the Lagdo Dam will suffice to cover all what the utility considers as requirements for the Province for the next 30 years, given present tariff structure and assumed future growth rate in demand.

As much as the supply side of electricity appears promising overall, it remains unclear how beneficial this will be to the many lower-income households, especially in outlying rural areas. Present electricity connection charges are about \$200.

##### Uses

In our data below we have restricted consideration to only the five largest populated areas, where such fuels are most frequently used, as compared with rural areas. In the immediate table on the next page we can note that batteries and kerosene are most frequently mentioned as sources, with electricity following in a less prominent position. By relating to sources in the successive table, we see that lighting is the significant use for such types of energy sources. Energy for vehicles and radios follow in frequency.

Table 11  
Sources of fossil fuels and electricity (n=1128)  
(principal urban areas only)

<u>Sources</u>	<u>Percentage Frequency of Response</u>
batteries	22
kerosene	21
gasoline	17
diesel	15
electricity	14
bottled natural gas	9
others	<u>1</u>
	100

Source: Survey, "Verify Hypothesis 11 Job Step 2", page 6.

Table 12  
Principal uses of fossil fuels and electricity (n=1194)  
(principal urban areas only)

<u>Uses</u>	<u>Percentage Frequency of Response</u>
lighting	35
vehicles	21
radio	13
cooking	9
flashlights	9
motorcycles/bikes	5
utility engines	5
heating	2
others	<u>1</u>
	100

Source: Survey, "Verify Hypothesis 11 Job Step 2", page 7.

Now we should look into the comparison between each principal and secondary use for each fuel and electricity source within the same urban study population. The principal use of electricity clearly dominates the need for lighting, although kerosene follows closely. Batteries also assist in lighting with use of flashlights, as well in powering radios. There is some significant mention of bottled natural gas for lighting also. But the latter energy source is reserved mostly for cooking. It is no surprise that diesel and gasoline are mainly used for vehicles; but kerosene is mentioned more frequently as a source for lighting than for cooking and heating.

Table 13

Frequency of uses of each source of fossil fuels and electricity

Principal uses (n=1169)  
 Secondary uses (n=800)  
 (principal urban areas only)  
Uses (percentage frequency of response )  
engines radio light cycle ioles heat ing ing other total  
%

electricity

Principal uses (n=164)	1	4	0	0	0	0	2	93	0	100
Secondary uses (n=80)	15	33	0	1	1	9	24	7	10	100

bottled natural gas

Principal uses (n=111)	1	0	0	0	0	16	74	9	0	100
Secondary uses (n=39)	3	3	0	3	3	0	33	35	20	100

diesel

Principal uses (n=168)	32	0	0	2	60	1	0	1	4	100
Secondary uses (n=124)	51	0	0	9	28	1	0	1	10	100

gasoline

Principal uses (n=209)	1	0	0	28	70	0	0	0	1	100
Secondary uses (n=153)	10	0	0	61	26	0	0	0	3	100

kerosene

Principal uses (n=257)	0	1	0	0	0	3	10	85	1	100
Secondary uses (n=161)	5	0	1	0	0	13	49	21	11	100

batteries

Principal uses (n=260)	0	56	43	0	0	0	0	1	0	100
Secondary uses (n=243)	0	41	56	0	0	0	0	3	0	100

Source: Survey, "Verify Hypothesis 11 Job Step 2", p 17.

## 5. WOODFUELS AND PLANT AND ANIMAL WASTES

Wood, charcoal, agricultural residues and animal droppings are used in varying proportions both during the rainy and dry seasons, except for charcoal everyday during the dry season. As the table indicates below, practically all responses listed use of wood everyday during the rainy season; but during the dry season, high mention of a larger proportion of agricultural residues, coupled with wood. Informants in the village visited after the end of survey data collection related that heavy reliance on wood during the rainy season is due to lack of sufficient amount of agricultural residues, which were mostly consumed during the dry season. However, there is observation that some will store agricultural residues for use in rainy season to help start the fire. The same informants mentioned that they used only a particular quick-burning species of tree during the rainy season; whereas, during the dry season, they exploited all species of wood.

Charcoal is more popular for use in the rainy season. Post-survey village informants stated that charcoal was easier to store during the rainy season than is wood, and, for its size, could generate a lot of heat. But in the survey localities almost nine out of ten responses indicated that charcoal is never used during the rainy season.

Use patterns for agricultural residues appear to be indifferent to the type of season, although post-survey respondents stated that more were used in the dry season than in the wet season. Most survey responses excluded majority frequency of mention of this fuel for both seasons.

For animal droppings, almost one in ten responses indicate use of this source as a fuel during both seasons.

Table 14  
Frequency of use of traditional fuels (Rainy and Dry Seasons) (n=7432)

<u>n=</u>	<u>Fuel/Season</u>	<u>Percentage frequency response</u>			<u>Total percentage</u>
		<u>Everyday</u>	<u>Only a few days a week</u>	<u>Never</u>	
	Wood				
977	Rainy	93	5	2	100
1857	Dry	55	16	29	100
	charcoal				
929	Rainy	12	32	56	100
18	Dry	0	11	89	100
	Agri residues				
943	Rainy	32	22	46	100
906	Dry	35	21	44	100
	animal droppings				
910	Rainy	3	7	90	100
892	Dry	1	7	92	100

Source: Survey, Carte 1, Q 6-a-1, Q 6-b-1, VARU033 VARU041

6. WOOD

Sources

In the North Province there are 890,000 hectares of officially-designated forests, out of which 574,000 hectares are classified as National Parks. However, one 300,000 hectare forest in the southwest Benoue Department of the Province is so remote that its wood supply does not make much of an impact in the nearby town areas. Rather, woodlands not classified as forests, nor officially protected as such, are in danger of exhaustion within the next 25 years through over-cutting, fire and farming pressure. In any case transport is the major bottleneck for equitable distribution of fuelwood, even from the more wood-plentiful southern Provinces of the country.

People have ways to cope with procuring wood. As the table below shows, by far the most frequent mention is to budget funds for purchase; to a much lesser extent, to stock up in the dry season. The fact that women have to go out and collect wood is not mentioned so frequently as a convenient way to get wood. Tree planting gets little response as an easy option. Our informants in the post-survey village mentioned that fuel-tree planting is not considered a routine or habitual activity. Most expect that this activity is Government's work.

Table 15  
Steps taken to find wood early (n=471)

<u>Steps</u>	<u>Percentage frequency of response</u>
Budget money to buy wood	70
Stocking up wood in the dry season	22
All the women go out and collect wood	6
Tree planting	2
	<hr/> 100

Source: Survey, Carte 10, Q 125, D 55 ..

In Table 16 below, we note that husbands and wives appear to share almost equal responsibility in buying wood, with children assisting. In collecting wood, wives and children share this activity, with servants helping. In the post-survey village, we were told that in the countryside, Muslim women prefer to have their husbands search for wood. In towns, Muslim women like to buy at their doorstep. But where the distance is great, husbands may search for wood, if the woman is tied up at home.

Table 16  
Buying and collecting wood (n=39) (observations)

<u>Person</u>	<u>Percentage frequency of observations</u>	
	<u>Buy (n=23)</u>	<u>Collect (n=16)</u>
(male) head of household	39	0
wife	35	44
child	26	44
servant	0	12
	<hr/> 100	<hr/> 100

Source: Survey: "Verifying hypothesis 10" File HY10, Cross tab Carte 13, TZ 12 by TZ 14.

## Uses

For heating and cooking, the table below indicates that the part of the tree most frequently mentioned is branches. But for crafts and for building houses, tree trunks are favored. Our informants in the post-survey village mentioned that artisans use tree trunks as a fuel in fabricating light objects; but tend to use tree trunks as materials and/or tools for making large heavy objects. When we compare all urban and rural localities with only the top five urban areas, we see that tree trunks are exclusively used for crafts in the principal towns. This interpretation should be read with caution: the sample size of responses is very small. In the same urban areas there is somewhat a greater preference for use of branches for heating than for cooking, compared with a smaller spread for the two uses in all areas combined. Perhaps the greater spread of difference in urban areas, compared with the spread of differences in all areas, is due to availability of a greater range of fuel choices for cooking.

Table 17

Uses for certain parts of trees

(All areas - n=1156 - compared with only principal urban areas - n=347)

<u>Uses</u>	<u>Percentage frequency of response</u>				
	<u>Parts of trees</u>				<u>total percentage</u>
	<u>trunk</u>	<u>branches</u>	<u>Both trunk &amp; branches</u>	<u>all parts</u>	
<b>crafts</b>					
all areas (n=104)	79	14	6	1	100
urban (n=12)	100	0	0	0	100
<b>heating</b>					
all areas (n=65)	18	74	3	5	100
urban (n=12)	8	92	0	0	100
<b>building houses</b>					
all areas (n=442)	45	47	5	3	100
urban (n=114)	55	40	2	2	100
<b>cooking</b>					
all areas (n=545)	11	69	10	10	100
urban (n=209)	10	73	7	10	100

Source: Survey, Carte 5, Q 45, V532; "Verify Hypothesis 11 Job Step 2," p. 14.

## 7. CHARCOAL

### Sources

There will soon be a 7,500 hectare eucalyptus plantation around the town of Ngaoundere in the southern department of the North Province. About 3,000 tons of charcoal per year are projected to be supplied to the main towns of Province.

The most frequent mention for making charcoal is either by burning in pits, and/or extinguishing embers with water, as the table below points out. But the reader's attention should be directed toward mention in Table 18, "from cooking at home and from baking bread in bakeries." Similarly in the successive table a lot of household respondents mention that charcoal is "personally made" exclusively or in part. In Table 20, (pg. 15) note that blacksmith's, housewives, alone, or both, or in combination with others, sell charcoal. We infer this from evidence that a great deal of resource recovery in form of charcoal as such as a by-product of wood that was originally used for its energy giving properties as wood, before the wood became charcoal. In other words the burning advantages of wood are not wasted before the wood becomes charcoal. Our post-survey informants mentioned that sale of the derived charcoal can recover some of the initial cost of wood purchase, or equivalent time in wood collection. Thus it seems that maximum advantage is gained if charcoal is manufactured after the heat properties of its original form - wood - are exploited.

Table 18  
How charcoal is made (n=718)

<u>Method</u>	<u>Percentage frequency of response</u>
Burning branches and tree trunks in pits	40
Extinguishing embers with water from cooking at home and from baking bread in bakeries	24
Extinguishing embers with soil	11
Do not know	7
Not applicable	14
	<u>4</u>
	100

Source: Survey, Carte 5, Q 52, V550.

Table 19  
How charcoal is procured (N=602)

<u>How procured</u>	<u>Percentage of families interviewed</u>
purchased	44
personally made	34
both purchased and personally made	11
others	1
do not know	5
not applicable	5
	<u>5</u>
	100

Source: Survey, Carte 5, Q 49, V547.

Table 20  
Charcoal sellers (n=469)

<u>Person</u>	<u>Percentage frequency of responses</u>
Blacksmiths	37
housewives	19
trade/retail	11
blacksmiths and housewives	3
housewives and trade/retail	1
blacksmiths and trade/retail	1
blacksmiths and trade/retail and housewives	1
others	7
do not know	7
not applicable	13
	100

Source: Survey, Carte 5, Q 51, V548.

Uses

In Table 21, we note that charcoal is used mainly for heating, followed by a lesser extent for crafts manufacture, and then for cooking in general. In Table 22, frequency of use is not always intensive: only a half of all responses indicate that charcoal is used a lot, and less than a third mention that it is used only a little. The fact that nobody uses at all, or does not know, represents the answers of about one in five respondents.

Table 21  
Charcoal uses (n=985)

<u>Uses</u>	<u>Percentage frequency of response</u>
heating	41
crafts	31
cooking	19
others	4
	100

Source: Survey, Carte 5, Q 48, V543

Table 22

Frequency of charcoal use (N=716)

<u>Frequency</u>	<u>Percentage of families interviewed</u>
a lot	49
a little	30
nobody uses	13
do not know	8
	100

Source: Survey: Carte 5, Q 46, V540.

## 8. ANIMAL DROPPINGS

The table below indicated that animal droppings are preferred for fertilizer a bit over preference for use as a fuel. In our post-survey village, informants stated that only in very rare cases would the very poor use animal droppings, properly dried, as fuel; especially in the case where women brewing millet beer may run out of wood. Rather, the same informants asserted that the overwhelming use of animal droppings is for fertilizer. There are cases where animals are rented out to other cultivators in order to provide organic fertilizer for their fields. There was mention that such organic fertilizer is popular for planting fruit trees. But frequency of mention by survey statistical evidence of droppings-as-fuel at a level of 15% frequency of response appears to contradict being told in the post-survey village that such use-as-fuel represents only "very rare cases."

Table 23

Advantages offered by animals (n=763)

<u>Advantages</u>	<u>Percentage frequency of response</u>
animal droppings used for fertilizer	19
animal droppings used as fuel	15
others (milk, dowry, sale, etc.)	<u>66</u>
	100

Source: Survey, Carte 8, Q 81, V811

## 9. AGRICULTURAL RESIDUES

Three out of four responses in Table 24 below indicates that agricultural residues are favored as a fuel, compared with only three percent mention of animal droppings as fuel. The dramatic difference in spread between 75% and 3% with the spread (Table 23) between 19% (animal droppings as fertilizer) and 15% (the same used for fuel) appear not worrisome to the writer as contradictory evidence. One question is specific to fuel; the other question asks reactions to "advantages offered by keeping animals."

Table 24  
Uses of all wastes for fuel (n=748)

<u>Uses</u>	<u>Percentage frequency of response</u>
agricultural residues	75
cattle droppings	3
others	2
none are used as fuel	16
do not know	2
not applicable	2
	<u>100</u>

Source: Survey, Carte 5, Q 52, V550.

We have learned in our post-survey village that most people favor agricultural wastes as a quick way to get the woodfuel fire started. The informants stated that there is no substitution of agricultural residues for woodfuels because no market exists for agricultural residues.

10. Water

In the table below 43% of all families interviewed stated that their source of water came from wells outside the family compound. But the same percentage of families claim surface sources such as streams, rivers, fountains, springs and dams. Hardly any families at all report existence of water taps.

Table 25  
Water sources (N=927)

<u>sources</u>	<u>Percentage of families interviewed</u>
wells outside family compound	43
streams and rivers	23
fountains and springs	17
wells inside family compound	9
dams	3
water tap inside family compound	1
rainwater	1
others	3
	<u>100</u>

Source: Survey: Carte 4, Q 32, VQ 69.

In the next table we compare specific sources of water to ways of procurement. There is a greater frequency of responses that people obtain "free service" from streams and rivers than from fountains and springs. Yet "cash purchase" provoked a greater percentage of frequency of response from fountains and springs compared with streams and rivers. Again caution has to be exercised with acceptance of these comparisons, because the sample size of 45 responses detailing cash purchase sources is much less statistically representative than the sample size of 745 detailing sources for free service.

Table 26  
Ways to procure water and from where (n=790)

<u>Ways to procure water</u>	<u>n=</u>	<u>Percentage frequency of responses:</u>				
		<u>streams and rivers</u>	<u>tap water</u>	<u>fountains and springs</u>	<u>wells outside home</u>	<u>total percent sources</u>
free service	745	30	1	23	46	100
cash purchase	45	7	7	47	39	100

Source: Survey: Carte 4, Q 32, VQ 69

With reference to Table 27 (next page), one can note that the reasons people have to buy water at all appear to be mostly that water nearby is not potable; wells have dried up; or, because other wells are too far away.

Table 27

**Circumstances justifying purchase of water (N=808)**

<u>Factor</u>	<u>Percentage of families interviewed</u>
Lack of potable water	13
dried up wells	11
wells are too far away	10
rainy season, dry season	9
dried up rivers	2
others	15
do not purchase water	<u>40</u>
	100

Source: Survey: Carte 2, Q 10, VD 47.

Access to water sources is mostly public, as almost three-fourths of all families interviewed indicate in the table below. This interpretation should be regarded with caution, as the writer and his colleague suspect that enumerators and respondents did not clearly understand the distinctions between "public" and "private"; and between "private" and "owned by using family" (coded as "familiale").

Table 28

**Ownership of water sources (N=900)**

<u>Ownership</u>	<u>Percentage of families interviewed</u>
public	72
private in general	13
owned by using family	<u>15</u>
	100

Source: Survey: Carte 4, Q 32, VQ 69.

There does not appear to be a great problem of equity on access to public sources of water. Only 15% of all respondents interviewed as shown in the table below indicated that certain parties had priority access to water purchases.

Table 29

**Priority of purchase of water (N=623)**

<u>Priority persons</u>	<u>Percentage of families interviewed</u>
Traditional leaders and civil servants	7
Initial settlers in the region	1
others	9
no problem, or do not purchase water	<u>83</u>
	100

Source: Survey: Carte 5, Q 46, V531.

Installing water taps is hardly mentioned at all as an easy way to get water, as we can see below. Rather, fetching water, or reserving enough money to buy it, are seen as more frequently mentioned ways to find water easily.

Table 30  
Steps taken to find water easily (n=465)

<u>Steps</u>	<u>Percentage frequency of responses</u>
All the women go out and get water	35
Budget money to buy water	32
Personal wells	19
Children and women go out and get water	5
Water taps or pumps in the family compound	5
All the children go out and get water	4
	<hr style="width: 50px; margin-left: auto; margin-right: 0;"/> 100

Source: Survey, Carte 10, Q 125, D55.

## 11. CONCLUSIONS

### Policy Options

We shall discuss the Survey findings in terms of four policy options:

- . conservation;
- . substitution;
- . diversification; and,
- . augmentation

### Conservation

There is a great deal of evidence to support our contention that rural and urban householders in the North Province already practice good energy conservation. As we have discussed on page 14, in many cases, housewives brewing millet beer or cooking slow-burning dishes; or blacksmiths fabricating small products, all use wood for one benefit and then sell or give away the by-product-charcoal. Such resource recovery creates two burning benefits for the same source. Similarly, on page 13 we note that people use certain parts of trees for specified purposes. In the wet season only quick-burning species of trees are used. The writer has the impression that dead trees and branches are gathered first, resulting from his observation in an urban wood market that all the wood parts appeared to be dirty and dried out. Province-wide evidence shows that charcoal is not used intensively everyday throughout the seasons. Those agricultural wastes earmarked for fuel purposes are not the same ones fed to cattle. Minimal reliance on cattle droppings as fuel appear to be evident.

### Substitution

What we mean by this term is either to create an additional derivative from the same source; or, substitute a new source for an old one.

There is the distribution problem of transporting bulky, heavy wood loads especially over long distances in isolated areas only seasonally accessible to motorized transport. Consideration might be given to substitution of an easy-to-store, light, cheap and easy-to-carry wood product derivative in lieu of the same stock of wood to be hauled, through the process of pyrolysis. But it is important to retain the resource recovery effect we have noted above. Charcoal or briquette makers should be encouraged to sell, as long as the manufacturers have received initially a fuel-burning benefit from the original wood. Therefore, cottage industry or at-home wood-burning activities should be encouraged in lieu of encouraging commercial production except on well-run plantations.

On the other hand, to substitute one energy source for another source does not appear feasible. Kerosene and agricultural residues seem to be

ideal for quick burning, or fire-starting purposes. Woodfuels remain best for long-cooking, slow-burning benefits. As long as agricultural residues for fuel remain in adequate supply in the countryside, there is no need to substitute kerosene. As long as wood remains adequate, and critical shortages are avoided, the negative substitution effect of kerosene can be equally avoided; otherwise, poor families may be forced to pay for kerosene, who otherwise cannot afford it. Similarly it is important to keep up supplies of kerosene in towns to avoid the negative substitution effect of wood being imported from the countryside, thereby depriving habitual wood users of their limited choice for fuel.

### Diversification

We have noted on page 11 that there might be an excessive exposure to risk of depletion of woodfuel supply during the rainy season, as people appear to have during that time a somewhat lesser range of fuel alternatives. Again with encouraged pyrolysis at home or at the foundry (in order to preserve the resource-recovery effect) wood could be complemented with charcoal or briquettes. If kerosene could complement, not substitute for agricultural residues during that season, in outlying areas, then supply diversification could be enhanced.

### Augmentation

Evidence in the survey shows that people are burdened with tasks that increased fossil fuel and, we hope, later renewable energy could alleviate. The countryside lacks lighting for household compounds because kerosene is not used so plentifully at present. In some pockets of the North Province, some people are depriving themselves of their usual diet of cooked food because wood is scarce. With the fossil fuel resources in the country, and some wood availability in protected areas in the North Province, such a problem of fuels supply need not be constrained by problems of production alone.

In sum, there is potential that some fuels be substituted for the existing stock of energy in order to facilitate convenience of distribution; some fuels can complement or diversify supply of others during the rainy season to lessen risk of excessive depletion of wood; and finally, all forms of energy should be augmented for higher productivity in economic activities and for higher standard of domestic life. This means increasing fossil fuel use until renewables can take over.

### Program Interventions

Let us now look at the above four policy options in terms of feasibility for certain program interventions:

- . financial;
- . economic; and
- . technological

### Financial

We do not know what portion of household budgets people reserve for fuel purchases; nor the extent that such purchases pinch them. For reasons of cultural sensitivity, we avoided income and expenditure

questions in the survey. But we do know that the base price for kerosene remains subsidized largely for urban users. Price distortions appear at the level of end-use transport and retailing. The writer recommends that the government policy of kerosene subsidy continue, in the light that Cameroon is becoming self-sufficient in fossil fuel energy and in refining capacity. But one should look into inequitable price structures that adversely affect poorer income households in the city. In order to encourage wider distribution of kerosene into the countryside for more rural lighting, the government should examine feasibility for further price manipulation. Equally, for the woodfuels urban market, it appears that price structures, as unregulated as they are, may not be prejudicial to large family wood burners with small incomes. This requires investigation. It would also be beneficial to see what could be done with price manipulation for greater rural use of diesel, although experience elsewhere in the world show that such increased use causes many maintenance and repair problems for such fuel using engines and pumps. As soon as renewable energy conversions and end-use technologies become economical, price subsidies for fossil fuels could be relaxed.

### Economic

Woodfuels markets in towns appear to flourish, with an informal network of suppliers, transport operators, depots and neighborhood retail outlets in private houses. But it is not clear how effective these urban markets are in transferring fuels from wood-surplus areas to wood-deficit areas. Improved transport, roads and storage facilities could be looked into as possible ways to make these markets more equitable and efficient. It is pretty clear that such sale markets will remain permanent; in cities wood is more and more difficult to obtain for free.

Woodlots programs especially in wood-deficit areas where the nearby lands are not protected forests appear to be a popular alternative. However some of our survey evidence suggest that people's participation in such activities would require a new set of acquired habits. It might be a good idea to see how distribution from flow, not stock, of protected lands, along with better roads and market mechanisms, could serve deficit areas more effectively. Unprotected lands that could be saved through erosion control appears to the writer to be a more positive approach than looking at unprotected lands as an energy source. Deforestation could lessen if people had options.

### Technological

Energy conservation by improvement of thermal efficiencies in end-use technologies (now, fossil and biomass; later, renewable and new sources of energy) might be a more realistic approach to that policy option. But the writer suspects that market acceptance of improved end-use technologies depends on more non-conservation appeals; such as, price, style, convenience, and psychic satisfaction. The need is definitely there: grain grinding, work in the fields, cheap rural lighting. But as we have seen on page 7, the hard-nosed, cost-effective oriented economists in the national capital will have to accept the reality that the benefits for such technologies largely save time and labor and give people a chance to rest. It is not automatic that with a new solar-powered grain grinder, people are going to necessarily increase their agricultural productivity. A lot of other things have to happen in their lives to make this happen. Most of those "other" things are beyond the scope of this paper. In any case, technology today is fossil-fuel dependent. We have to wait for the future for renewable sources and electricity in the countryside.

In sum, retain kerosene subsidies; improve markets and protected lands and encourage more labor and time saving technologies.

## PART II - SURVEY METHODOLOGY

This part on survey methodology presents four principal sections:

- . chronology;
- . survey purposes and study objectives;
- . description and assessment of documentation and conduct; and
- . conclusions

### 1. CHRONOLOGY

In 1978 the survey director (Augustin Simo) proposed the idea of an energy survey in Cameroon to A.I.D. Washington (AFR/DR/SDP). The idea was accepted in principle. An A.I.D. consultant, Mr. Charles Steedman, was sent to Cameroon in June 1979 in order to assess and inventory research, development, demonstration and institutional capability for renewable energies in the country. In his final report Mr. Steedman supported the initial proposal to undertake a household energy survey oriented toward residential needs.

The sponsoring organization (Laboratory for Research in Energy - LRE - of the Institute for Geological and Mining Research - IRGM) then submitted in late 1979 a formal proposal containing a workplan and questionnaire to USAID Cameroon. In March 1980 A.I.D. Washington sent Dr. Dolores Koenig for a week to assist the LRE in its redesign of the survey questionnaire. During the same month A.I.D. Washington also sent the present writer to Cameroon to assist LRE as a methods consultant for the duration of the survey. He has since spent about 140 working days in Cameroon in five trips to Cameroon, March 1980 to end of February 1981.

By the beginning of April the questionnaire had been revised and stenciled, ready for enumerator training in April. At the same time LRE recruited, trained and hired 18 men and women as enumerators, along with two field supervisors and two drivers. During the same month a sampling frame and sample size of 1057 families was developed.

In May the survey started in the northernmost reaches of the Province. At the end of that month USAID signed an agreement with the Government of Cameroon, detailing its financial support of \$92,000 representing about two-thirds of the total survey budget, not including costs for the present writer. In July USAID approved IRGM's budget proposal, and procedures for the series of disbursements commenced in August.

Meanwhile, in July, the consultant returned to Cameroon and began preparing procedures for data processing in close cooperation with the survey director. In September, LRE published a codebook for the entire questionnaire, and hired a local consultant, Dr. Basile Kamdoum, of the University of Yaounde to assist in data processing.

In September a short supervisory workshop was held with the two field supervisors. At the same time, all questionnaires filled out since May were transported to one central location to be classified and numbered, ready for coding. In October a coding staff was trained and undertook coding, which lasted up until the end of February 1981. Meanwhile the survey director and the consultant from AID set about documentary research and interviews with knowledgeable local persons in order to formulate a set of study hypotheses to be proved for the final reports. By the end of November all data collection was completed, resulting in coverage of 24 localities and 1,002 families.

On the consultant's final trip in February, all questions for LRE's and his reports had been traded in the form of computer print-outs. During this time the consultant and two LRE staff members travelled to the North Province, in order to interview very informally a number of inhabitants of a prominent market town in the survey region to get their reactions to the statistical results and to add some perspective and understanding to the survey answers. The consultant then drafted a final report for discussion with IRGM and with USAID. He then left for Marseille in order to incorporate the reactions of his colleague, the survey director. Upon arrival in Washington the consultant had some last minute data processed in the AID computer (SER/DM).

## 2. SURVEY PURPOSES AND STUDY OBJECTIVES

### Survey Purposes

Identify and evaluate feasible research, development and demonstration pilot opportunities for renewable energy conversion and end-use technologies.

Identify and evaluate feasible policy and program options for interventions intended to benefit urban and rural household populations.

Evaluate the content and processes of the energy survey for usefulness for adaptation to other contexts in Africa.

Help develop the institutional technological expertise and experience of LRE through provision of financial and technical assistance to the energy survey.

### Study Objectives

Collect and analyze climatic data in order to locate favorable sites for solar energy experimentation.

Inventory family needs for energy and problems in procurement and end use of existing energy forms and conversions.

Identify local priorities for improved access and availability of energy forms and conversions.

Study the acceptability of improved energy technologies in a socio-economic context.

Identify opportunities for self-sufficiency in management of energy resources.

### Results

The present writer feels satisfied that sufficient information on family needs and a sense of local priorities, as well as a Province-wide aggregation of energy sources, conversions and uses was helpful in analyzing certain policy and program interventions, and in giving an idea of feasibility of employing such surveys elsewhere in Africa. However the present report had to exclude description and analysis of feasibility for renewable energy conversions and end-use technologies, as well as how people can become more sufficient in management of their own energy resources. These exclusions will be covered in the IRGM report due in April 1981. It is clear that in any case conduct of this survey did not provide a sharper focus and facilitate useful expertise and experience for staff persons of the LRE.

### 3. DESCRIPTION AND ASSESSMENT OF DOCUMENTATION AND CONDUCT\*

#### Questionnaire\*\*

The questionnaire for the survey is made up of four sections. The first covers questions from interviews with administrative authorities on the social, economic and administrative infrastructure of the localities to be surveyed. The second section contains questions for interviews with selected families, covering needs, agriculture, fishing, water, crafts, animal husbandry, wood, transport, cooking, family census data and fuels. The third section covers one-day observations at three discrete intervals for about a third of the number of the same families interviewed. The content areas here covered searching for and purchase of fuels and water, water consumption, fuel use, use of tools and equipment, preparation of meals and manufacture of handicrafts and tools. The last section covers information of fuels, prices and quantities obtained from local markets, as well as provides a format for converting local measurements into the metric system. On the next page, Exhibit 1 displays a sample page from the questionnaire.

The questionnaire contains about 300 question sets, representing about 500 discrete questions, creating about 500,000 non-elementary (sample size) data elements; in turn, creating up to 2,006,000 basic data elements. The reason for the high increase in basic elements was because in some cases questions were tied to others (e.g., fuel<sup>1</sup>, ownership<sup>2</sup>, use<sup>1</sup>,...fuel<sup>n</sup>, ownership<sup>m</sup>, use<sup>o</sup>). In other cases, single questions provided for more than one possible answer (e.g., if you had a mill, what would you do with the free time gained?) Qualitative information was oriented toward socio-economic concerns, supplemented by quantitative data to be collected on measurements, quantities and sizes. All questions on income and expenditure were avoided. Detailed instruction for interviewing, observing and writing were included within each question cluster set. The instrument was written in French for the enumerators to translate on-the-spot into the local language. Two drafts were made: one for the training program in April followed by the revision ready for the start of data collection in the following month.

There were several problems encountered in data collection. First was the difficulty of direct measurement of quantities of fuels procured, sold/bought and used. Although enumerators did use weights and measures during their observation period, and all local units were translated later into metri units, still much data remained overly dependent upon respondent's memory and estimation. Even though analogous local measures were taken in nearby local markets, there is still not standard between market and household sizes. For example in the market a small bundle (fagot) of wood will differ in size from the same term used in the nearby household.

Second, although the questionnaire provided for objective measurements on solar and wind intensity, insolation, velocity and duration, as well as rainfall and temperature data, the equipment for these purposes did not arrive in time during the data collection period.

Third, provision was made for enumerator observation. But these

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\*Highly recommended in Gerald César-Hurst and Prodipto Roy, Survey Research in Developing Countries. New Delhi: Prentice-Hall, 1973.

\*\*A copy of the instrument, Questionnaire d'Enquête (mimeo) can be requested from Institute des Recherches Géologiques et Minières, B.P. 4110, Yaoundé, Cameroon.

Exhibit 1

Sample of Questionnaire

b) En saison sèche.

		Régulièrement (tous les jours)	Rarement (quelques jours par semaine)	Jamais
SOURCES TRADITIONNELLES	Bois			
	Charbon			
	Bouse de vache			
	Fumier (autre)			
	Déchets (agricoles)			
SOURCES NON TRADITIONNELLES	Bougies			
	Piles			
	Pétrole			
	Gas			
	Gas-oil			
	Essence et Sous-Produits			
	Essence			
AUTRES (préciser)				

7. Est-ce qu'ils achètent les combustibles suivants? Donner les quantités en unités locales et par jour dans chaque colonne.

a) Saison de pluies

	Régulièrement (tous les jours)	Rarement (quelques jours par semaine)	Jamais
Bois			
Charbon de bois			
Bouse de vache			
Fumier (autres)			
Déchets agricoles			

observations had to be restricted to a single visit on one day. Subsequent repeat visits were not feasible, due to logistical problems, budget, time and last-minute great expansion of sample size coverage. It was also originally designed that observations were to be made once during the day. It was decided that these data would not provide sufficient variation; therefore the number of observation intervals were increased from one to three to coincide with estimated meal preparation times. Because there is a variance in timing for meal preparation, or that lunches are sometimes made during breakfast time, some of our interval periods continuous or overlapping instead of remaining discrete; thereby making more difficult cross-sectional comparisons. Furthermore, again logistical considerations required that on-day observations be made concurrently with interview visits to the same locality. Therefore, the potential for time series comparisons for the same family was severely limited. However, all observations are coded for time of visit; and given similar matching of variables, the computer may be able to make some rough comparisons between wet and dry seasons. In addition, all observations of household compound behavior had to be restricted to that space; logistical, budget and time constraints prevented observations to be made outside the family compound in the fields, foundries, etc. Therefore, in sum, our observations allow us only to make comparisons intra-daily, not among different days.

The questionnaire was originally designed to cover two or three selected sites in one selected area of the Province. When the decision was taken later to expand the survey Province-wide to include 25 localities and 1,002 families, the deliberate bulk and density of data required reached almost unmanageable proportions which placed, we found out later, an unavoidable dependency upon electronic data processing.

The questionnaire had certain positive features: the amount of data collected can accommodate a host of follow up studies (policy and program feasibilities, technological research and development identification; socio-economic studies and valuable material for national census requirements). Furthermore the instrument was designed to accommodate as many cultural sensitivities and sensibilities as possible. For example, exclusion of questions on income and expenditure resulted in easier access to respondents.

There were three pretests of the questionnaire; one in neighboring villages around the country's capital city of Yaounde; the second and third among a few town families in the provincial capital of Garoua and among village inhabitants outside Garoua. Pretesting basically concentrated on the style in which questions were asked, and in the difficulties faced in writing down answers. The initial pretest near Yaounde because of language difficulties and the fact that many of the questions were inappropriate to the local scene. The survey director, his assistant and the consultant were inexperienced in testing those questions in households where previous access had not been gracefully negotiated. In the North Province, during the enumerator training period, proper field supervision of monitoring trainee administration of the draft questionnaire was lacking. The supervisors did not know the local language and thus were not able to be sensitive to facial and tone reactions by respondents to questions addressed to them. The trainees themselves, because of customs of courtesy biases, were less than candid in evaluation feedback to the supervisory staff on respondent.

reaction. Finally, the content of the questionnaire could hardly be edited through pretesting if insufficient research on what was already known (documentary research) existed, or no a priori study hypotheses had been made. We shall see later the problem of the circular question, how can we focus on what is important in documentary research without an idea of hypotheses; conversely, how can we prepare hypotheses without preliminary documentary research? In any case, there was an in-built reluctance to do too much damage to questionnaire content on two grounds: the tendency to regard a lengthy, quasi-official document as sacrosanct and not to be profoundly tampered with; and, our problem that we do not know much is complicated by our not even knowing what we do not know (especially in the socio-economic, wide-sweeping field of residential energy patterns). Given the great pressure to get on with it, a back-to-the-drawing-board decision to alter the questionnaire radically was just not administratively feasible. Of course, once data collection activities started, we were unable to make any further changes without doing damage to later analytical cross comparisons. Finally, the desirability to lighten the burden of our paraprofessional enumerators by translating the instrument into local dialects was just not feasible from a budgetary and time consideration. The variance of spoken communication in the North Province (so representative of the country as a whole with its 200 ethnic groups) prevented practical consideration on this matter. Yet we suspect that some communication was lost between translation from French into the local languages.

Nevertheless, as a result of pretests and enumerator and supervisory staff evaluations, a number of changes were made in the original instrument. First the culture-bound tendency to ask agreement questions (yes, no, n'est-ce pas) was resolved by rephrasing those questions into who, what, how, when, where. Similarly, why questions were restricted to a minimum by being rephrased to include a different interrogative. Second, many questions framed in an essay mode were redrawn into matrices to facilitate easier questioning, observation, transcription, and later data processing. Finally some awkward expressions were rewritten to stress every-day terms, rather than abstract words or development jargon.

#### Sampling frame

A matrix was constructed from our initial documentary research and interviews, with the horizontal axis being a number of socio-economic variables, the vertical axis denoting five eco-climatic zones and the cells identifying the names of specific localities. (refer to Exhibit 2 on the next page). The five largest towns were chosen a priori in order to represent as many urban characteristics as possible. Then, for the remaining rural areas, the following variables were chosen:

- . Agriculture: intensive (fertilizer application, productivity per hectare) - three locations.
- . Livestock: stalled or fenced in (density of animal population)- three localities.
- . Artisanal activities (i.e., crafts) serving as principle occupation (expert's advice) - one locality.
- . Density of population: above the mean of 33.75 persons per square kilometer- three localities. Below the mean - one locality.
- . Degrees of isolation (i.e., vehicular access from outside). Total: no indication on the map of any road at all-four localities. Seasonal: dirt road probably open during dry season - three localities. No isolation: asphalted road - one locality

Exhibit 2

Sampling frame

METHODOLOGIE DE L'ECANTILLONNAGE

ZONES Eco-climati- ques	DEPARTE- MENTS	PRINCIPALES VILLES.					Agriculture Traditionnelle	Agriculture Intensive	Elevage sédentaire (Femmes)	Elevage ambulante (trou- peau)	ARTI- SANAT principal	Arti- sanat secondaire	Débité moyenne inférieure à 33,75	Densité moyenne supérieure à 33,75	Isolement Total	Isolement saisonnier	Sans Isolement
		MO KOLO	YA GOUA	Ga roua	NGA oun do ro	Ma RO UA											
SAHELIEN	LOGONE ET CHARI							WOULKI					NDRA	MAKARI		WAZA	
SOUDANIEN DE HAUTE MONTAGNES	MARGUI- WANDALA	x					HINA MARBAK			DJIN- GLYA				TOUROU	MOFOU		
SOUDANO- SAHELIEN	DIAMARE MAYO DANA		x			x	DOUKOU- LA	MINDIF						TONG (KAR-HAY)	DJOU- GOUF		
SOUDANIEN	BENOUE			x			TOUBO- RO	POLI					RAY BOUBA		CODE (POLI)		
SOUDANIEN DE HAUTES TERRES	ADAMAOUA				x			TOURNI NGAL					HANDOU ROU	TIGNE RE			

By counting up the rural localities listed in Exhibit 2, page 30, we find 20 localities indicated. The reason for the other 35 blanks was that to be cost effective we did not need to add an additional 35 localities as long as we were assured that the 20 chosen included the variables not represented per eco-climatic zone. In any case all localities chosen for the Survey had to possess some form of vehicular access during the dry season and fit a reasonable trip scheduling format. Our assumption to exclude totally inaccessible localities was based on our belief that such places would be too remote for outside interventions.

The variables chosen appear to be somewhat too general in retrospect. That is to say, each sampling frame variable may contain too many interior variations. For example, density of population along may disguise more energy-related specifics. But again, lack of in-depth documentary research, imperfect pretesting and lack of study hypotheses prevented greater specificity. Another difficulty was in identifying an ideal place for crafts serving as the primary occupation. The place chosen received a lot of outside attention on crafts manufacture, but another locality chosen because it was the second largest town in the Province actually had more of a natural context for handicrafts manufacture. The most important possible deficiency however was the possibility that our variables were not mutually exclusive. For example, agriculture and livestock are joint ventures for many of the people in the North. A town with an asphalt road access ("no isolation") could fit well one of the principal towns selected. For the variable of "total isolation", we found out later the chosen site was indeed totally unapproachable except for long distance walking.

#### Locality Characteristics

Once the locality had been identified, a brief study was made of a number of neighborhoods according to such criteria as an impression of wealth in the neighborhood, religion, ethnic groups and principal occupations practiced. In cooperation with the local leader, the number was estimated of families, or local household compounds (sare). (refer to Exhibit 3, pages 32-33). Neighborhood selection tended to be oriented toward poorer, more traditional areas.

#### Sample Size Calculation

In order to determine how many facilities were to be interviewed, a number of steps for final calculation are shown in Exhibit 4 on pages 34-35:

- Population was taken of each locality (or its county or arrondissement) from the recent census, with linear rates of growth projected to 1980.
- The number of families within the population was calculated on the following assumptions: 15 members per family (for 10 localities), 10 members per family (for 10 localities) and five members in five locations.
- The assumption was made that the higher the population density in each locality, the larger the spacing counting-off-number (pas de selection) among families to be finally interviewed. The justification for this step was the greater the density of population, the lesser the variations among certain socio-economic variables. Thus, the count-off spacing number was 40 for the urban locations (four in number); 20 for nine other localities; and, finally 10 for the last 12 rural locations. We have yet to know through further research if our assumptions were realistic to North Province conditions.



Exhibit 3 (continued)

Neighborhood characteristics

3) Décrire les différentes zones retenues.

N° ZONE	:	QUARTIERS COUVERTS	:	NOMBRE DE FAMILLE SARES
	:		:	
	:		:	
	:		:	
	:		:	
	:		:	
	:		:	
	:		:	
	:		:	
	:		:	

Exhibit 4

Sample Size

ECHANTILLON DE L'ENQUETE

Choix des familles/Sarés à enquêter

Départements (1)	Arrondissements (2)	Localités de l'enquête (3)	Population (1980) (4)	Nombre de Familles/Sarés (5)	Nombre de Familles/Sarés à enquêter (6)	Pas de Sélection (7)
LOGONE ET CHARI	M A K A R I	01 MAKARI	4 562	456	46	10
		02 WOULKI	680	68	7	10
	KOUSSERI	03 WAZA	1 986	200	20	10
MARGUI	MOKOLO	04 MOKOLO	6 199	413	21	20
		05 HINA-MARBAK	2 124	142	14	10
		06 TOUROU	8 496	566	28	20
WANDALA		07 DJINGLYA	3 980	265	27	10
		08 MOUFOU	5 746	383	17	20
	MORA	09 MORA	4 562	304	15	20
MAYO-DANAI ET DIAMARE	YAGOUA	10 YAGOUA	15 714	1571	39	40
	KAR-HAY	11 DCUKOULA	1 217	81	8	10
		12 TIOU	2 319	155	15	10
	MINDIF	13 MINDIF	5 420	542	27	20
	MAROUA	14 MAROUA	71 890	4793	120	40
		15 DJOULGOLF	2 400	160	16	10
BENOUÉ	TCHOLLIRE	16 TOUBON	3 478	696	70	10
		17 REY-BOUBA	9 898	990	49	20
	P O L I	18 POLI	8 298	1660	83	20
		19 GODE	4 557	911	46	20
	GAROUA	20 GAROUA	74 135	7413	185	40
		21 BOUNGUEL	481	48	5	10
ADAMAOUA	TIGNERE	22 TIGNERE	6 193	1240	62	20
	NGAOUNDERE	23 NGAOUNDERE	44 980	4498	112	40
		24 TOUR-NIGAL	924	185	18	10
		25 MANDOU-ROU	153	15	5	10

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Exhibit 4 (continued)

Sample Size

1er Cas: Pas de sélection égal 10 (colonne 7).

Quand les enquêteurs arrivent dans la localité de l'enquête ils prennent contact avec le chef et sollicitent son aide pour numéroté les familles/Sarés de 1 jusqu'au nombre figurant dans la colonne 5.

Exemple: à MAKARI on numérote les familles/Sarés de 1 à 456.

Les numéros sont marqués à l'entrée des domiciles et doivent être facilement réperables;

Exemple: EE26

EE signifie Enquête Energétique.

L'enquête commence dans la famille n° EE1; la deuxième famille d'enquête est le n° EE(1+10) soit EE11 et la troisième le n° EE(11+10) soit EE21 et ainsi de suite, jusqu'à atteindre le nombre de familles/Sarés indiqué dans la colonne 6.

(46 pour MAKARI)

2e Cas: Pas de sélection égal 20. (colonne 7).

Ici il est fastidieux de compter toutes les familles/Sarés jusqu'au nombre indiqué dans la colonne 5. On divise par 2 les nombres des colonnes 5, 6 et 7, ce qui revient à diviser la ville en deux zones. Dans chaque zone les familles sont numérotées de EE1 à la moitié du nombre de la colonne 5 et on y enquête la moitié des familles/Sarés de la colonne 6, avec un pas de sélection égal à 10 comme au 1e cas.

3e cas: Pas de sélection égal à 40 (colonne 7).

On divise la localité en quatre zones et on numérote les familles/Sarés de chacune de EE1 au quart du nombre de la colonne 5 et on y enquête le quart du nombre de familles/Sarés de la colonne 6, avec un pas de sélection égal à 10. (voir 1e cas).

Exemple: YAGOUA.

On divise la ville en quatre zones et dans chaque zone les familles/Sarés sont numérotés de EE1 à EE438; on enquête dans chacune des quatre zones les familles

EE1, EE11, EE21, ...

Les zones devront être chaque fois bien délimitées par des points de référence précis choisis dans la localité.

### Family Compound Siting

When the supervisors and enumerators arrived in the neighborhood, in cooperation with local traditional and administrative authorities, the numbered code for each neighborhood, plus "EE" (Enquete Energetique), plus each house number was chalked on the outside wall (e.g., "3 EE 24") every 10th, 20th, or 40th household compound (pas de selection), wherever appropriate. For every 15 household compounds identified in this manner, five were chosen for a repeat visit to make the one day observation.

### Enumerator Recruitment

Our initial interviews for training comprised about 50 applicants, who showed up the next day through word-of-mouth, before the announcement on the radio could even be made. Criteria for trainee selection were as follows:

- . availability for temporary work for six months
- . willingness to be on the road most of the time
- . possessing at least six years of less-than-U.S.-highschool equivalency (cinqueme classe)
- . can read, write and speak French
- . can speak the lingua franca of the Province, Fulfulde
- . the staff taken as a whole represented sufficient linguistic capability to cover all known local primary dialects spoken in the 25 localities
- . the staff taken as a whole represented an equal proportion of men and women
- . had to be a resident of the North Province.

Final recruitment for hire as field enumerators was based on the following results:

- . daily evaluation of classroom and field performance from personal observation by the training staff
- . results of a final examination, of which the upper two tiers were considered as "passed" based on such questions as:
  - give at least three study objectives of the survey,
  - give at least five questions relevant to water,
  - for each fuel-kerosene and wood-give at least five relevant questions,
  - what do you say to the respondent after you have concluded the interview?
- . one woman with weak literacy in French was arbitrarily favored because of her strong identity as a Muslim and as a member of the Fulbe ethnic group; factors which would facilitate access into the traditional kitchen.

In retrospect we were satisfied with our recruitment criteria. Having local residents, instead of more sophisticated University students from outside the region, helped a great deal in avoiding problems of access and rapport. In some cases local language interpreters were hired by enumerators at government expense, where there were not enough local speakers of that dialect available that day for the interview. We did find out that equal representation of women was not necessarily required from the viewpoint that only women could enter the kitchen. If a male enumerator was on the spot, he could speak to women in the kitchen, as long as he was accompanied by her husband or other adult male member.

## Enumerator Training

In terms of content, the following was covered over a ten day period in Garoua in April 1980:

- . purposes of survey
  - . overview of renewable and traditional energy forms
  - . introduction to questionnaire
  - . sensitivity to being an enumerator in private households (day 1)
  - . practice interviewing with one another
  - . discussion of performance
  - . practice of transcription (days 2-5)
  - . morning visit to selected urban household compounds nearby: the first visit to observe a peer interviewing a family; subsequent visits in small teams for personal practice.
  - . morning visits to a nearby village outside Garoua: observation of village entry negotiations in meeting with traditional leaders; observation of one peer interviewing a family, followed by practice interviews alone; practice talks with authorities
  - . each afternoon session covered a critique on problems in interviewing, observing and transcription problems as well as style and content of questionnaire questions. (days 6-9)
  - . overview of community-development animation principles
  - . final examination
  - . administrative procedures (day 10)
- NOTE: "pretesting" of the questionnaire (see pages 28-29) took place during days 6-9.

We used the following processes during the training period:

- . lectures with mandatory note taking to practice transcription
- . role playing of interviewer and respondent by trainees exchanging roles after each performance had been critiqued by training staff and peers
- . observation and critique of peer performance in the field
- . practice interviews
- . open discussion

Our emphasis in training on personal conduct in establishing rapport with respondents was found later to have been rewarding in the sense that no incidents of lack of cooperation were ever reported. Stress on knowledge of the content of the questionnaire especially on fuel and water made later interviewing easier.

On the more negative side, there were several lessons we learned. First, we found that the training technique of employing peer criticism after each role play performance was not culturally appropriate; such an activity only exacerbated the ongoing sexual rivalry between two groups of men and women. We later tried having only peers of the same sex criticize one another, with underwhelming results. Secondly, our reliance on the quality of trainee feedback was excessive. Due to local customs of courtesy bias, deference to authority, we lacked candid remarks. In addition, by mixing a class with 10 women and 10 men, the present writer noticed that there emerged almost two armed camps. The men were insulted sharing such "serious" work with women; the women were always overly defensive and constantly argued with the men; both groups refused to share seating. As soon as we relaxed the need to make peer criticisms, the two groups got along better. But initially, the present writer had been seized with a powerful sense of déjà vu. Furthermore we noticed that the lecture on community development catalyst principles was a bit too abstract. One major deficiency was that field supervision during the

practice interview sessions was almost non-existent, because of administrative and language problems. Finally, we should comment on the representativeness of families for the practice sessions. In the town, they were personal friends of the enumerators. In the nearby village they had been hand-picked by the head man. Given the urgent time needs to get as much practice as possible, and that the enumerators were already local people, such an arbitrary selection did not cause problems. Initial enumerator confidence was bolstered due to the ease of interviewing cooperative respondents.

#### Enumerator Performance

In general the enumerators were faced with a very complex and difficult questionnaire to administer. Even though the instrument was designed to solicit subtle responses, we found out later that in most cases replies written down were overly general, too brief and cliché ridden. We suspect this was due to the exhaustion of administering a 2½ hour interview. We observed that questions were asked in a choppy manner with too much pause between each one for on-the-spot transcription. Improvement of this process with increased but expensive training might have resulted in a greater free flow of information. In the post-survey village visit we were able to get some additional depth to original questions. It was not logistically possible that enumerators could stay resident in a locality for an extended period to obtain more in-depth rapport. In any case, some questions were still difficult to ask. We suspect this to be the case because of the high frequency of blank responses to similar questions, or in part what the computer registered later as "missing cases." Simple language translation from French to the local dialect slang was a tough enough job.

#### Logistics and Scheduling

A staff of 18 enumerators, two field supervisors and two drivers, with a short time, two vehicles, were developed in two teams, one per vehicle and supervisor. Starting in May 1980 (dry season) all areas vulnerable to later rainy season road isolation were covered first. Therefore the survey progressed from the extreme north southward until the end of November, always trying to avoid the possibility of confronting impassable roads. Despite availability of only one vehicle since September, scheduling was effectively re-adjusted. When all staff convened in Garoua for coding work in October, that city had been reserved for interviewing and observation during that same month. Since practically all the enumerator staff lived in Garoua, data collection could continue on foot while coding continued. Meanwhile the one vehicle was used to transport coding staff out of town at a nearby empty laboratory where coding went on. When coding staff were to be transferred to Yaounde, they first used one vehicle to finish up data collection in the extreme south of the Province.

Because enumerator staff were considered as temporary staff, in many cases they never recovered all expenses for per diem and medicine purchases. Payments for some out-of-pocket expenses were made on an ad hoc sporadic basis, which affected morale. In two instances cash flow problems held up salary payments for a few weeks at a time; in most cases, a great deal of trouble was taken to insure that payments reached on time. But dependency on one vehicle did cause problems: with the entire staff to be transported, several trips had to be made; some were idle, all wasting time. On one particular trip, the staff had to be cramped into one vehicle and their baggage sent by public transport.

### Field Supervision

Supervisors had several duties of their own in addition to monitoring the performance of the enumerators:

- . in order to keep them sensitized to field conditions, they were expected to undertake a number of family interviews themselves, where language presented no problem, as the two could not speak Fulfulbe.
- . introduce and interpret survey objectives and practices to local and traditional authorities on initial visits to localities. Only in one locality did they fail to produce to the local magistrate the necessary government travel orders (ordre d'emission) and the data collection activities were postponed until a repeat visit could be made by the survey director.
- . undertake interviews with local authorities on Section I of the questionnaire - information concerning the locality.
- . collect quantitative data quantities and prices in locality markets for Section IV of the questionnaire.
- . convert all local units to metric system.
- . handle all cash payments for gasoline and other similar expenses.
- . arrange for as much free lodging as possible, which meant contacting local high schools and other public places to let out empty dormitory space. In some villages, supervisors had to approach local authorities for help.
- . reimburse enumerators for interpreter expenses when necessary.
- . verify all completed interview and observation questionnaires for each family to check for legibility, explanation of blank responses, and clear expression.
- . monitor consolidation of all documents, verify proper classification and numbering of questionnaires.

With such a host of duties above, it became clear that personal supervision of the enumerators was suffering. Therefore it was decided in August to convene a three day workshop with the two field supervisors by the survey director and his consultant. A look at Exhibit 5 on pages 40-42 list the powers and duties for each supervisor, after a two day exercise to identify them clearly, as well as to work out difficult inter-personal relationships between the two supervisors. For the latter problem they were left alone on the verandah for about two hours and then called in the trainer when they felt there was proper resolve. In order to arrive at the schedule of weekly work as outlined in the matrix on page 42, a division of labor by task and time was chalked out according to meeting a reasonable weekly labor time budget. Roles in the form of planning, coordination, approval, execution, verification and decision-making then were assigned to each supervisor for each task. The two supervisors had the burden of determining these duties, time budgets and assigned roles, with the trainer acting only as a facilitator.

As a result of this workshop, there was no clear indication of field supervisory performance improving in terms of more initiative, decisiveness and better-organized and more-productive supervisory time. Perhaps the

Roles and work schedule for supervisors

DELEGATION ALE A LA RECHERCHE  
SCIENTIFIQUE ET TECHNIQUE

REPUBLIQUE UNIE DU CAMEROUN  
Paix - Travail - Patrie

INSTITUT DE RECHERCHES GEOLOGIQUES  
ET MINIERES

UNITE DE RECHERCHES SUR LES ENERGIES.

E NQUETE SUR LES POTENTIALITES ET LES BESOINS  
ENERGETIQUES DANS LA PROVINCE DU NORD.

1) ROLE DU SUPERVISEUR GENERAL

- Apprécier chaque jour la qualité des informations reçues par les enquêteurs et demander si possible une reprise de l'interview dans la même famille.
- Déterminer la tendance des enquêteurs au cours des interviews.
- Justifier les déplacements des véhicules de l'enquête.
- Remettre les questionnaires bien remplis aux codeurs.
- Superviser les opérations du codage.
- Analyser le contenu des réponses non codées.
- Embaucher un interprète ou un guide suivant la nécessité et négocier son salaire dans la limite du budget.
- Présenter chaque mois un bref rapport donnant le nombre de familles enquêtées, le nombre de questionnaires codés, le nombre de questionnaires non remplis, la liste des localités enquêtées, la conduite des enquêteurs et les dépenses effectuées.

2) ROLE DU SUPERVISEUR ADJOINT

- Soumettre à l'appréciation du superviseur général le plan logistique de l'enquête : affectation des enquêteurs, lieux et dates de l'enquête, circulation des véhicules.
- Apprécier chaque jour la qualité des informations reçues par les enquêteurs et exiger si possible la reprise de l'interview dans la même famille.
- Soumettre à l'appréciation du superviseur général les questionnaires remplis et jugés acceptables.
- Présenter au superviseur général des mesures à prendre pour la bonne marche de l'enquête : réunion de tous les enquêteurs ou un sous groupe d'enquêteurs, nomination d'un chef de groupe, entretien individuel avec les enquêteurs.
- Présenter au superviseur général un rapport hebdomadaire sur la conduite des enquêteurs.

Exhibit 5 (continued)

Roles and work schedule for supervisors

Le superviseur général peut déléguer une partie de ses pouvoirs à son Adjoint si les deux responsables se trouvent dans des localités différentes.

Fait à Garoua, le 5 Août 1980

Le Responsable de l'Enquête

Augustin SIMO

Superviseur Général

Superviseur Adjoint

Exhibit 5 (continued)

Notes and work schedule for supervisors

= plan - E = Evaluation A = Approbation - C = constatation - S = suggestion  
 / = décision V = vérification \* = leader

Acte	Lundi	Mardi	Mercredi	Jeudi	Vendredi	SAMEDI	Dimanche	Signaux	Equipement	TEMPS PAR SEM
1) SECTION I									E	1h
2) - Mesure IV		Jour	BE	Marche.				E	E	2h
3) Suivre l'ENquêteur								V	V	9h
4) Corriger Erreurs Techniques								V	V	6h.
5) Contacter les autorités								C	C	2h
6) ENquêteur Travail?								V	V	12h
7) Evaluation								S/C	S	2h.
8) Discipline								S	S	1h.
9) Gestion Véhicules								C	S	0.5
10) Logements								C	C	1h
11) Circulation + déplacement Véhicules	Exemple plan.			Véhicule départ				A	P	0.5
12) Interpréter								E	S	1h
13) Corriger & précision Questionnaire								V	V	1h
14) Analyse Tendance								S	S	0.5h.
15) Classification Vérification - des cartes + perforation								A	N	16h.
16) constatation + auto-évaluation pour accord commun								V	V	1h
17) Réunion de supervision (sodaux)								C	C	1h
								E	E	

ON ATTEND jusqu'au programme de formation -

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personal characteristics of both supervisors accounted for this. But what is clear is that adaptation of Western-style management-by-objectives training and planning assistance techniques show limited potential in the context where they were applied. Even a very simple system for recurrent evaluation of enumerators to give the latter staff an idea how they were doing was never implemented.

Other actions of a more successful nature were taken in order to try to improve the quality of enumerator field performance.

In August the survey director convened the entire staff and carefully reviewed all technical and disciplinary problems. Staff morale and performance, especially among the enumerators, visibly improved following that meeting.

A number of enumerators who presented inter-personal problems or who were unproductive or took unprofessional short cuts were quickly and decisively terminated on the spot. Later appeals never worked.

Finally the junior supervisor was shifted to coding duties where he found his true level of competence and a member of the enumerator staff was promoted into that vacant position.

Despite these problems a great deal of valuable time by the survey director, otherwise engaged in technical and administrative duties relating to the survey in Yaounde had to be sub-optimally diverted in solving day-to-day logistical problems with drivers, vehicles, deployment of staff and discipline problems.

#### Documentary Research\*

Before the commencement of the data collection, in March work began on collecting a bibliography and annotation of socio-economic documents on North Province conditions. This activity was useful for initial creation of sample frame and size, but the activity lapsed until October. When LRE gained a cadre of additional researchers in December, efforts continued up until the present time. Practically all bibliographic sources for research were borrowed from USAID Cameroon.

Such research has several purposes: to determine what is already known in order to help edit the questionnaire, to assist in sampling decisions, to assist in framing study hypotheses (see next section) and to offer supplementary evidence for the final report.

There were two main difficulties with documentary research during the survey. First not enough of it was done soon enough. The content of the questionnaire remained unedited and thus contained questions that had already probably been answered in other documents. Secondly, after October so much annotated information got collected, that there was no organized way to retrieve and manipulate documentary data. When the survey director and the consultant combed through the documents to laundry-listed possible hypotheses, it was difficult to know what was important, accurate and relevant. Nevertheless the present writer is confident that sufficient documentary evidence will be added to the IRGM survey report due in April 1981.

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\*Highly recommended, although the source is oriented to physical features, U.S. Dept. of Agriculture, Soil Conservation Service, and Fonds d'Aide et de Cooperation, France, in cooperation with U.S. Dept. of State, Agency for International Development. Resource Inventory of North Cameroon, Africa. Washington, D.C.: n.d. (also available in French).

## Study Hypotheses

From reading and interviews with experts and with enumerators, the survey director and the present writer began to formulate in September a number of study hypotheses, relating a number of dependent variables to independent or intervening variables to prove an a priori point. There were a number of reasons why this activity was considered important. First, the sheer bulk of information we were collecting, even later to be coded for electronic data processing, made it very difficult to know what was important to know in the data collected. Secondly we had no pre-conceived ideas of what we wanted to know, and with reasonable accuracy and realism we had to create a few of such ideas in order to formulate some focus in our investigation. This was essential for our final report, and would prove useful in providing a focus on what was important in the documentary evidence.

Initially 65 statements were prepared. An example is shown on Exhibit 6, page 45:

- . Independent variable: eco-climatic zone
- . Intervening variables: crafts manufacture requiring a lot of fuel availability of alternative fuels
- . Dependent variable: fuels used for all crafts manufacture
- . Hypothesis: people tend to use same fuel for crafts, even with provision of optional choices for other fuels
- . Extrapolation: the nature of crafts technology governs fuel use, rather than availability of supplies.

Then with a number of prolonged interviews with a few enumerators, well experienced with impressions of data gathered in the survey, as well as their own familiarity as residents of the North Province, each hypothesis was examined. About 30 were found to be unrealistic or inaccurate. Then careful examination of the questionnaire and codebook resulted in another 25 or so being cancelled because of problems in questionnaire design or in data processing technology. Three more hypotheses were discarded when we saw simple frequency print-outs for one of several questions to be included in the statement. Finally, seven left were processed. There were programming problems for two, and five lacked sufficient sample of size of responses to be valuable. The result was that no hypothesis could be proved statistically for this report. Nevertheless, the exercise was beneficial in that it helped to identify the important parameters and variables useful for outlining the final report and in final question selection for computer processing. For example, several unsuccessful hypotheses stressed the importance of purchase/sale versus free collection for fuels and water. Most frustrating was the inability to determine a proxy for an individual's notion of wood scarcity. Since asking distances was not included in the questionnaire on the assumption that people do not think in length of distances as they do in terms of time, we attempted to get a frequency distribution of the amount of time it would take for a person observed to be leaving the household compound to go out and collect wood on foot and noting the time of return. We found that even determining time to collect wood would not be very valid as we were informed by our staff that when people go out and collect wood, they also pick vegetables or shop or see friends.

Exhibit 6

Sample of study hypothesis

line no.	Code-book no.	pg. no.	Desc.	Codes	Code-book Card no.	Instruction
L1			localit.	04		
L2			(and zona)	05,06,07,08,09		compare L1 with L2
L3				10,14		
L4				11,12,13,15		compare L3 with L4
L5						
L6				17,18,19,21		compare L5 with L6
L7				23		
L8				22,2		compare L7 with L8
L9			famille	0001- 02		
L10	21	31	activite	(A,P,T,U)	4	compare below within family
L11	21	31	activite	(C,E,F,X)	4	compare L10 with L11
L12	5	5-a-1	ener.trad(sp)	B,C	1	
L13	6	5-b-1	ener.trad(ss)	B,C	1	compare L12,13 with L14,15
L14	6	5-a-2	en/non-trad(sp)	1,2,3,4	1	
L15	6	5-b-2	en/non-trad(ss)	1,2,3,4	1	compare L12-15 with L10-11

(In towns and countryside in same eco-climatic zones, those families engaging in those artisanal activities requiring chemical fuels compared with those activities only using hand labor, will tend to use the same ene. source (traditional), whether they be in towns (where it is assumed there is greater availability of non-traditional energy sources) or in the countryside. Probably because the conversion technology will not change simply because of greater availability of fuel source.)

## Questionnaire Classification and Numbering

In September, efforts began to consolidate all interview and observations of the same questionnaire together. Then the packet was coded for location and family, although the latter was numbered in random order of classified questionnaire. These numbers did not correspond with family household compound numbers used for siting. (see page 36). This effort took a great deal of time, about 25-30 person days. In order to maintain better control in the future it is recommended that the family interviewed be initially assigned its control number during the time of interview rather than in classification. Even though the family's results are discarded for some reason, it is not necessary that family coded numbers are consecutive.

### Codebook\*

The book comprises 18 ensembles for families and five ensembles for information on the survey sites. Each ensemble includes all information that can be key punched on an IBM 80-column data processing card. These ensembles are called "cartes" for the pre-coded information and are called by the same term "carte" for the coded data for each family entered on each line of the coding summary sheet.

Each question is formatted in the code book as follows:

- . number of the question (according to same numbering system used in the questionnaire).
- . instructions on coding
- . the column number of the summary coding sheet where code is to be entered, e.g., "col. 11-20."
- . the number of columns reserved for each number of allowable answers; e.g., "(     )".
- . list of answers with their appropriate pre-codes.

To come to the point of publishing this document, we went through a rather hit and miss process:

- . take the complete questionnaire and rearrange all questions according to some logical progression (i.e., problems, sources, uses, environment), rather than in the original order for enumerator and logistical convenience. This process allowed us to spot repetitions and ambiguities.
- . Make a list of all questions to standardize expression and to economize on wordage.
- . Convene a number of enumerators to list all possible, frequently mentioned (from their experience) answers to each question.
- . Rearrange all questions back to the original questionnaire order.
- . On the assumption that electronic data processing was not available in Cameroon, and that it was not politic to carry all raw data back to the United States for machine processing, we initially devised in somewhat a romantic view a hand-processing system based on the edge-hole

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\*A copy of the instrument, Codification des Données can be requested from  
Institute des Recherches Geologiques et Minieres, B.P. 4110, Yaounde, Cameroun.

**Sample of Codebook**

QUATRIEME CARTE

**IIB, IIS, D RENSEIGNEMENTS GENERAUX SUR LA PECHE, L'EAU,  
L'ARTISANAT ET L'ELEVAGE**

Identification :

Localité : col.1-2 (2c)

Famille : col.3-6 (4c)

Numéro de carte : col.8 (4 on col. 8)

Sexe : col. 9 (M - F)

Mois : col. 10 (1c)

Codage :

Mois

Janvier .....	1	Juillet .....	7
Février .....	2	Août .....	8
Mars .....	3	Septembre .....	9
Avril .....	4	Octobre .....	Ø
Mai .....	5	Novembre .....	N
Juin .....	6	Decembre .....	D

**23. Animaux élevés par la famille et leurs propriétaires.**  
col. 11-20 (10c)

La transcription des données de la figure se fait suivant le schéma ci-après :

Animaux (1c) → propriétaire (1c)

→ " ← " " "

pour un maximum de 5 animaux donc 10c (col. 11-20).

Codage :

animaux (1c)

<u>Bœufs</u> .....	B	Porcs .....	P
Moutons .....	M	Lapins .....	L
Chèvres .....	C	Chèvres .....	S
Volailles .....	V	Canard .....	T
		Autres .....	+
		Non concerné...	*

format of the McBee Card, where wires could be pushed through to count off similar answers.

- . The survey director has serious doubts whether such a system could be used for processing up to 2,006,000 basic data elements without instituting employment scheme. He therefore was successful in identifying a computer science consultant at the University of Yaounde, with whom the IRGM signed a contract to provide all services from codebook preparation, supply of summary coding sheets, keypunching, programming and computer runs. The consultant's university already has a contractual access to the Government's computer at the Presidency used by many ministries already.
- . Given the availability of a source for electronic data processing in-country, the entire code book draft had to be revised, to accommodate multiple answers for single questions and multiple series of questions to conform to matrices in the questionnaire.
- . In order to validate the pre-coding the survey director took a small sample of 33 completed, verified, classified and numbered questionnaires to Yaounde. There, he, the consultants and a small staff surveyed all answers to each question in order to resolve last-minute ambiguities and confirm estimates of numbers of columns that had to be reserved for each question.

The coding tool turned out to be quite useful. Pre-codes were found to be quite accurate, based on later computer results showing that the amount of absolute frequencies in the pre-coded answer "others" was quite small. Only in very few cases did certain codes have to be added in pencil. A small problem that did not create difficulty was that some pre-codes were found later to lack complete mutual exclusiveness. For example the pre-code for a family owned well could overlap with the other pre-code for a "private" well. However, in preparation of the final report such non-mutually-exclusive codes were easy to consolidate.

#### Coding Training

A two-day training program was held with the below content elements:

- . purposes of coding
- . explanation of how to use the three tools: questionnaire, code book and summary code sheets (see Exhibit 8, page 49)
- . penmanship practice for letters, numbers and symbols. For example, need to write the capital letter, "O", as "Ø".
- . Coding practice: all use tools at same time for same questions.
- . Coding agreement. Without supervision determine what coders wrote down to see if certain biases could be removed.
- . Need for discipline, quiet, neat, comfortable (air conditioning provided) atmosphere.

The two-day exercise gave supervisory staff an opportunity to determine who could continue on coding and who should continue on interviewing.

#### Coding and Key punching

Coding went on for about five months, with reduced staff, overlapping the period of data collection of two months. Initially there was too much stress on speed at the expense of accuracy; priorities were quickly reversed.



Initial coding went through the first to the 18th ensemble for the 700-odd questionnaires ready for coding. As soon as that batch was finished, the remaining number of questionnaires were covered.

Supervision involved certain elements: troubleshooting, verification by each column to insure that the proper codes only were entered. At the end of each ensemble the coded families entered on the summary coding sheet were checked for duplication or missing cases.

The greatest problem we faced in this activity was weak coding supervision. Other than the personal intervention of the survey director, no-line-by-line, family cartes were checked. For example, for a particular ensemble "Fifth Card" the appropriate codes for family "0294" needed to be checked for accuracy. Spot checks were made for some and not all ensembles. However, during coding some coding agreement exercises with dummy questionnaires were employed in order to identify coder biases.

Despite columnar verification (codes for one question, 30 families each summary sheet), a number of "unauthorized" codes entered onto the final computer print out sheets; fortunately in all cases the number of absolute frequencies against these "unauthorized" codes were trivial. These codes might have represented keypunching errors. The possibility of coding errors does exist however. The computer consultant reported that the computer had to reject quite a number of inapplicable codes. The computer print outs (see Exhibit 9 on page 51) show a number of "missing cases"; i.e., no computer electronic reaction to the reserved space. This number of missing or not answered and no explanation for no-response given by interviewer or observer); coding or keypunching blanks; and finally, and certainly not prejudicial the number of reserved spaces allocated for multiple answers to single questions exceeded actual frequency of respondent reply. For example, if five possible columns are reserved for the question, "what are the principal problems affecting all?", and respondent gives only two answers, then the number of "missing cases" is automatically three.

#### Question Selection for Final Report

With the help of some documentary research and the number of study hypotheses, the present writer felt confident that about 45 questions would be germane to his report on survey findings out of a possible field of 300 questions. The IRGM chose an additional 35 or so questions. In the present writer's final report a few of the selected questions were not used.

#### Programming and Print-outs

With the help of the packaged program, "Statistical Package for the Social Sciences"\* the 80-odd questions were provided in the form of absolute, relative, adjusted (i.e., excluding "missing cases") and cumulative frequencies. A number of cross tabulations for matrix construction were also provided as well as programming for the study hypotheses, later run in AID Washington. For an example of a print out, refer to Exhibit 9, page 51. For all print-outs the frequencies for "others" ("autres") were provided. The present writer had no time to check the notebooks for each ensemble to determine what answers were written down. As stated earlier, however, the frequency of "others" averaged between 3-6 percent.

\*Order from McGraw-Hill: SPSS ed. (principal text), SPSS Primer and SPSS update. Order from SPSS, Inc.: SPSS Statistical Algorithms, SPSS Pocket Guide, Release 8. Keywords: "The SPSS Inc. Newsletter".

Exhibit 9

Sample of computer print-out

VERIFY HYPOTHESIS 11 JOB STEP 2

FILE NUNAME (CREATION DATE = 02/21/01)

USAGE USAGE BCIS

CATEGORY LABEL	CODE	(total no. valid and missing cases)	(percent of valid missing)	(percent valid only)	CUM FREQ
		ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	
AUTRES	+	9	0.3	2.2	2.2
NON CONCERNE	*	7	0.2	1.7	3.9
NE SAIT PAS	-	17	0.6	4.1	8.0
CUISSON ALIM	A	223	7.5	54.3	62.3
(unauthorized code)	B	2	0.1	0.5	62.8
(unauthorized code)	D	1	0.0	0.2	63.1
CONST HAB	E	122	4.1	29.7	92.7
CHAUFFAGE	I	14	0.5	3.4	96.1
ARTISANAT	U	16	0.5	3.9	100.0
		2559	86.2	MISSING	100.0
	TOTAL	2970	100.0	100.0	

VALID CASES 411 MISSING CASES 2559

## Post Survey Village Visit

The visit to a market town to discuss preliminary survey statistical evidence proved to be valuable. One enumerator, an inhabitant of the town, had easy access to women brewing beer in a nearby bar, men selling cattle at a nearby market and crafts people at home. The present writer chose properly not to witness these discussions because he felt his presence would distort the atmosphere of informality. Even the supervisor of the enumerator, a citizen of Cameroon but not native to the Province, was told politely by the inhabitants to wait in the vehicle. The intent here was to lend a certain human dimension to cold statistical tabulations. The results of the visit confirmed key survey evidence and lent valuable perspective and depth to certain questions.

### 4. CONCLUSIONS

The main methodological difficulty faced in this survey was that, although we did all the right things pretty well, we did them in the wrong order. A look at Exhibit 10 below will give an idea of the problem.

#### Exhibit 10

<u>Principal</u> <u>Activity start</u>	Sequence of survey activities	
	<u>Order</u> <u>Ideal</u>	<u>Actual</u>
documentary research	1	13
survey purposes	2	1
study objectives	3	3
study hypotheses	4	14
data processing soft/hardware	5	10
sampling frame	6	7
sampling size	7	8
budget	8	4
draft questionnaire	9	2
(a) pretest questionnaire	10(a)	6
(b)(incorporate)codebook	10(b)	11 (not incorporated)
train enumerators	11	5
(a) start data collection	12(a)	9
(b) start coding	12(b)	12 (not started with data collection)

Drafting the questionnaire was our second activity; ideally it should have been the ninth, following research, aims, finding out what data processing facilities are available, undertaking sampling planning and then budgeting. The initial budget was prepared for government approval before we had an idea of a more accurate estimate of later real data processing costs, as well as predicting what would be the financial implications of what turned out to be complicated and expensive data collection activities. Our enumerators were trained during the same time that the questionnaire needed pretesting. The outstanding gap between the ideal and reality was our putting documentary research and formulating study hypotheses last instead of ideally first.

The main explanation for the bad sequence was that technical assistance for design of the questionnaire had to be deployed at the start of preparations for the survey, because the consultant was available only at that time. Therefore the designer was handicapped by lacking knowledge of the outcomes from documentary research, study hypotheses and sampling planning. Besides, the pressure to start data collection was so intense that we were in too great a haste; although such pressure did create

a productive atmosphere. Finally it must be admitted that the present writer cannot exculpate himself from some responsibility in wrong sequencing. The project was a learning experience for him and for his colleagues. At least the experience has proved conclusively that outside technical assistance is never infallible.

Nevertheless premature design of the questionnaire placed frustrating burdens on later survey development. We looked for secondary research to fit the questionnaire; rather than the preferable reverse. Our study objectives became fossilized before we could edit them into more manageable proportions, all to serve the purpose to cut down on the number of questions asked. Because the knowledge of what technology was most feasible for data processing became apparent five months after questionnaire design, we were forced to publish a separate code book. Most frustrating was that in many cases the questionnaire instrument could not accommodate the study hypotheses that had to be formulated once the questionnaire was a fait accompli.

There are a few other technical difficulties in the methodology, especially relevant to data processing for the final report on survey findings. (refer to pages 1-23). Because of limits on programming budget, all data had to be aggregated Province-wide. For scientists and project planners in Cameroon, much of the information presented disguises important variations among regions, localities, principal activities, urban, rural factors, wet/dry seasons and other cultural phenomena. Even for readers who are interested in extrapolating results here to apply to drylands outside Cameroon have to be warned that data from relatively rainy verdant areas had to be aggregated with drylands data. However, the former type of area represented only about a 25% frequency with the other areas. Secondly, in agreement with his colleague's rejoinder in the Appendix, the writer cautions the reader to interpret frequency distributions carefully. In most cases, multiple-answer questions have been chosen for the report on survey findings. Consequently, percentage frequencies could not be according to number of respondents but only to number of responses. For example to say that the lack of water is repeated 30% of the time for all possible responses as an important problem affecting all (see page 4), may represent that population most articulate in expressing themselves by being quite expansive (i.e., listing five allowable responses instead of other respondents less thoughtful of reflective listing only one or two responses). It is important to know out of the total sample, how many families stated lack of water was a problem, and where are they located. Unfortunately such computer programming expenses were not affordable. It is hoped that IRGM report due in April 1981 will handle this matter.

## PART III-FUTURE ENERGY SURVEYS

What we have learned about energy and survey methodology from our recent experience in North Province, Cameroon, can now be discussed in the following terms applicable elsewhere in Africa:

- . the study environment
- . energy
- . survey methodology
- . conclusions

### 1. THE STUDY ENVIRONMENT

The limieu for our survey has certain comparable features with areas outside Cameroon. Our survey covered mostly drylands and savannah country. However, we did include the southernmost administrative department of the Province; an area having more in common in rainfall patterns with the rest of Cameroon, than with the rest of its own Province. That is why the document cited in the footnote on page 43, Resource Inventory of North Cameroon, Africa, excluded that Department in its study terms of references from the other five departments of the Province.

Culturally, the North Province provides a pattern for other analogous areas. The Province contains Muslims, Christians and animists. Families appear to be made-dominated in a joint family structure. In the northern plains of the Province there is some ex-mountain migration. The Province contains about 25 major ethnic groups, including one that after settling in the region for the last few centuries has dominated in cultural, political and economic ways, after having enriched itself from culture from populations already established. The observer has a sense that daily life exemplifies what are conveniently classified as rural behaviors and values as compared with urban ones, even in neighborhoods of localities we arbitrarily listed as "urban." Although people in the Province practice nomadic as well as sedentary activities, we suspect our survey data collection was more oriented toward the latter than to the former. Perhaps the same pattern of "isolation" exists elsewhere (i.e., entry from outside).

### 2. ENERGY

Our findings on energy are probably daily representative of some other areas in Africa. People use fuel at home mainly for cooking: people with disposable cash income in larger settlements but kerosene for lighting (perhaps more than electricity for that purpose) and for quick heating purposes.

But we offer a few warnings on the above generalizations.

Although there might be room for improvement of distribution of energy between the southern portions of Cameroon and the North Province, the country as a whole is becoming self-sufficient in fossil fuels including their own in-country refinery. The country may be able to afford subsidizing the initial costs of kerosene. Obviously not all other African countries might be so blessed, especially Kenya, which has to use the bulk of its foreign exchange for fossil fuel imports.

Cameroon has one of the richest reserves of forest on the continent. Even the North Province has almost 900,000 hectares of protected woodlands.

We might recommend that for the North Province there should be a greater diversification of fuel choices and that the stock and flow of wood supplies be better managed; in other areas of Africa, gross shortages of biomass may require augmentation of the supply, period. We would say the same for a few isolated pockets within the North Province itself. Furthermore, we suspect that the availability of disposable income in the North Province that people say they have to buy wood and water easily, may not be the cases in other income-poorer areas. We still do not know yet who has all this money to spend, because our initial programming on processing our data had to be overly-aggregated to be Province-wide. We can say with some assurance that in Cameroon's North Province, animal droppings are continued to be diverted toward fertilizer and not fuel. People in Lesotho lacking fossil fuels and all forms of biomass rely strongly on animal droppings for fuel. Most people in the North Province do not have to use animal droppings for that purpose, not simply because, as one writer has remarked, the quality of animal droppings there is rather poor (too much water; thin substance, etc.), but because there are alternatives. Similarly, people in the North Province use certain agricultural residues for fuel; the same types of residues that are not fed to cattle. Other areas with less potential for vegetation may not have this option.

In terms of the potential for substituting renewable energy conversions and end-use technologies for the existing stock and flow of biomass and supply of fossil fuels, perhaps the state-of-the-art for such technologies in Cameroon is in a less advanced stage relative to other African countries, such as Senegal, Niger, Sudan and Rwanda. But these countries may be in a much greater risk exposure to interruptions of fossil fuel supplies, as well as financial vulnerability to pay the import bills. Given a relatively healthier energy balance sheet and flow statement in Cameroon, perhaps that country can afford to buy more time until their own renewable technologies come on stream; therefore, flooding the countryside in the North Province with more kerosene and diesel oil may make more sense today than for the other four countries mentioned.

However, one pattern inferred by the present writer in the North Province, is that even given a macro-supply picture of energy that may appear not to be so problematical compared with more distressed areas elsewhere, deemphasizing energy conservation, may be useful as a policy consideration elsewhere. That is, on the micro level, people, given scarce energy resources, conserve in an optimal manner, whether they like to or not. Nobody can convince them they need to cook less, drive less, pump water less frequently, or turn out their lights earlier. More energy, albeit, more-efficient energy have to be brought in from the outside; and, as far as end-users are concerned, greater thermal efficiencies can safely remain a hidden agenda.

### 3. SURVEY METHODOLOGIES

The conventional approach to something that we admit we do not know much about is to decide, let us learn more about it. Fair enough, but the way we in the rich countries go about finding out more is to get very data and information-intensive, especially in social science inquiries, through heavy reliance on lengthy and expensive household surveys.

For the future, the present writer asks that the above assumptions be seriously questioned for finding out more about energy in Africa:

- How can such household surveys, indeed, investigations in a more general sense, be more cost-effective?

- . Do we have to insist that energy surveys be so totally comprehensive about energy in daily life?
- . To what extent are unfettered social science energy surveys more self-serving to the financial sponsor than to the surveyors in the data country of origin?
- . To what extent can we package and export energy survey instruments elsewhere?

Let us take up the first question. The survey on energy potentials and needs in North Cameroon costs funders about \$180,000, without including hidden costs of free use of facilities and management support, but including outside consultants. What did we buy? How do we know if we were being economical or not? What is a good measurement - \$180 per family (1002 families); \$72 per interview contact hour (2½ hours per family); or \$0.36 for each family to ask one of 500 basic questions or \$0.09 to retrieve one basic data element for the same family given the above family sample size. All we know is, that even if we exclude consultant's costs, it does not appear likely the local government would be persuaded to fund such an activity totally.

For whatever figure economists finally decide is the fairest most objective measurement standard, let us ask an additional question: was the survey worth the money to reach the objective of identifying a feasible policy, program, or even, project intervention; or identify valuable further research and development studies? Maybe no, just to identify interventions; maybe yes, to discover a lot of useful data on that intervention found out some other and cheaper means.

We suspect intuitively that the price was high, and will remain high if we leave the survey results in Cameroon and not try to make the next survey much cheaper by exploiting all we learned in a similar place- North Cameroon. Many social science researchers, however, love to start anew with tabula rasas, with scarce dollars grabbed from many competitive priorities; let alone developing country scarce research and managerial resources to support the effort. Without risking any longer the possibility of being considered vulgar in trying to put a price tag on knowledge, let us accept for the time being that the knowledge we gained about energy and water was worth every cent. Then we have to ask the question, can be learn as much and as well with a cheaper budget? In the next section on conclusions we offer a few ideas.

To get at the second question about comprehensiveness we argue that pretty decisive limits have to be imposed at the outset on the scope of what we need to learn about energy in daily life, with the help of documentary research that becomes contributory to our investigations. "Energy" in its pure form is abstract; an invisible good, no matter how overridingly important it is. We can pursue energy into almost any imaginable dark corner of enquiry that our knowledge and logic lead us to. We can continue to be risk-averse by starting first with what energy informs - agriculture, handicrafts, industry, etc. - and then look for the energy dimension. This means not making a survey of energy-in-agriculture, but taking existing agricultural surveys and supplementing the data results with a few additional questions relative to energy. The families interviewed beforehand on agriculture and the previous survey authorities and funders might appreciate the gesture.

But more importantly, we have to worry how people in developing countries become affected by such survey attention. In our culture in the U.S. we have learned that people may react quite positively (i.e., increase their work productivity) when they perceive that special attention (i.e., surveys, efficiency studies) is being paid to them, i.e., the so-called "Hawthorne Effect." Such questioning of course is not new also to people in developing lands who are approached by a host of authorities to assess their wealth for tax purposes. They either say nothing, or say what they believe the interrogator wants to hear. A good survey can avoid such a courtesy bias. But even the best-administered, most sensitive survey cannot avoid raising people's expectations that something beneficial might happen to their lives following their interviews. Nobody ever remains around to help make the connection. Comprehensive energy surveys risk using up the line of credit of welcome the respondent offers to the enumerator. There may not be another chance to find out something new. In the next section the writer offers ways that energy concerns can be folded into an existing enquiry.

To address the third question, who benefits from energy surveys, we acknowledge that it is nice that people who have money to spend on energy should be as sophisticated as possible about how energy works in other societies. Sometimes this concern crowds out what the country of origin wants to learn about energy. For example in Cameroon, the outside funding authority wanted to find out what the results of an energy survey might tell them what to do about energy in the future. This meant stressing a social-science-oriented instrument to get at the answers. The local surveying organization agreed and cooperated in helping to make the desired outcome happen. But the organization had originally its own idea of what it wanted to learn in a rather brief, physical measurement-oriented, technology-oriented, balance sheet on energy. The social science concerns were grafted onto this approach; hence, both parties found out what they wanted to. But we have to acknowledge that the outside funding organization got its work done by a local institution with its own, and different, research priorities. The answer is not simple, then let the outside funding organization do its own studies without local sponsorship and collaboration. Such efforts do not build local institutions, but rather, crowd out the potential for developing appropriate theory and empirical investigations. Some developing countries - India comes quickly to mind - have instituted rather tight controls on who is allowed to do what, and from what origin of funding source. Authorities even insist there that all studies by outsiders have to be comparative; i.e., phenomena observed in that country have to be related to similar phenomena elsewhere. Therefore, Indian society is not to be studied in isolation by foreigners. This is an example of a country placing a proprietary interest on the "mining", "extraction" processing and "export" of data. Such an approach may do violence to our own liberal tradition that ideas belong in a free unfettered marketplace. The reality is that many developing countries are supporting UNESCO's proposals on a New International Information Order, to include consideration of controls on the free flow of information across borders.

For the final question, is it feasible to package survey methodologies for similar studies elsewhere? As much as the present writer pleads for cost-effective restrictions on the number of questions asked in energy surveys, he also pleads that it is very important to treat the question instrument in each particular area as akin to a custom-tailored suit of clothes. Given the photocopy revolution it is so easy to set up surveys quickly with instruments developed elsewhere. In doing so, surveyors will learn much to their dismay that the wrong questions get asked; the right questions might not be asked, and what is to be done

with all the information gained, which ends up not having been influenced by local documentary research, pretesting and study hypotheses. Therefore it is urged that people planning new surveys read old questionnaires for background purposes only. It might be healthy that they be forced to think from scratch what they really have to find out. This means not copying other questionnaires but doing documentary research and trying to determine what they want to prove from the survey. There is no easy way to do this, but people will maintain their respect for social science research if they can resist the temptation of turning on the photocopy machine, and copy what other people have thought out for only their own needs in different places elsewhere, to include even use for other Provinces in Cameroon of North Province instruments.

#### 4. CONCLUSIONS

The writer offers for consideration a series of steps that could be taken to help make energy surveys more cost effective.

- . For the next census, national sample survey, or general socio-economic survey coming up, get, say, 10 very important questions on energy plugged in (after documentary research has been exhausted). Let us say, this means at least for a large census, a sample size of 10,000 respondents, creating 100,000 non-elementary data elements; which, when processed, suggest that in Region X, people do not have enough fuel for cooking; Region Y, people lack lighting at night; and in Region Z, yes, people have enough cooking wood, but trees nearby are being cut down at an alarming rate.
- . Teams could visit Regions X, Y, Z, and institute for 100 respondents each an instrument containing 50 questions on how people at present are coping with the problems identified and what resources do they need to solve their difficulties. Thus we add an additional 45,000 non-elementary data elements; total so far; 145,000.
- . An action project is planned for Region X only with a number of proposed candidate solutions. This now means selecting another 100 families with a detailed and narrowly focused 100 question questionnaire, resulting in 10,000 new non-elementary data elements on feasibility-economic, financial social and technical in nature. We now have a cumulative total of 155,000 non-elementary data elements. This number stands in great contrast to asking 10,000 families 160 questions, creating 1,600,000 non-elementary data elements.

A variant on the above approach has been planned for a wood energy survey already being instituted in Malawi by the Ministry of Agriculture and Natural Resources. In Cameroon's North Province the USAID-funded Mindif project has instituted a survey with at least the first two steps above in mind.

There are a few other suggestions to offer to keep energy surveys alive in Africa. First, think of doing a survey last, after having exhausted the possibilities of doing desk research, literature review, energy source-and-use balance sheet figures, energy inventories and talking to authorities, experts, local leaders and residents. Is the survey still necessary to fit the objectives originally drawn up? Secondly, before a new survey on energy is instituted, what possibly can be exploited from similar energy surveys done elsewhere; if there are gaps, can the questions on the missing knowledge be plugged into someone else's forthcoming survey? All these steps are made because Africa can afford only tangible programs to come out of previous investigations. Our goal should be to get to the program with deliberate intelligent speed and accuracy, without taking a detour and arriving at the energy surveys as an end in itself.

One last comment is in order. There is a very important need that all design instruments for energy surveys come to an agreement on a standard set of measurement indicators and procedures for determining quantities and prices of fuels. Local market sizes may be good proxies, but household quantities need to be the final determinant. The challenge is to determine the variables that make cross sectional and time-series comparisons possible. We should get some workable idea of how much energy people use for what purpose, given a set of universally accepted and understood assumptions and conditions. Such precision is not only worthwhile in itself, but helps the national energy balance sheet investigator integrate knowledge gained from residential and commercial end-use energy sector surveys, which in their aggregated form will assist planners in thinking ahead; while at the same time, helping to design local projects.

## APPENDIX

### Remarques sur le Rapport de M. Thomas GRAHAM.

par Augustin SIMO.

Le but de cette critique est de nuancer certaines conclusions de l'auteur qui ne tiennent pas compte de tous les résultats de l'enquête. Vu le temps qui lui était imparti pour rédiger son rapport et le volume impressionnant du questionnaire à dépouiller, l'auteur mérite des félicitations pour avoir pu fournir les premiers résultats de l'enquête à cette date.

#### Calcul des fréquences de réponses.

En travaillant sans tenir compte du nombre de répondants, l'auteur a privilégié le poids de chaque élément de l'ensemble des réponses (une question donne lieu à plusieurs réponses à la fois) sur sa représentativité au sein des familles ~~enquêtées~~. Le lecteur de ce rapport est invité à se souvenir constamment que les pourcentages signalés ne sont pas relatifs aux populations enquêtées; il aurait fallu tenir compte de ces dernières, ne serait-ce qu'en signalant chaque fois le nombre de personnes ayant répondu à la question posée.

#### Utilisation de l'énergie.

Le calcul des fréquences des réponses, tel qu'il est fait ici, et la non discrimination de ces fréquences suivant les différentes localités de l'enquête peuvent conduire à des erreurs d'interprétation. Par exemple, les 193 réponses du tableau D sur "les critères du choix du pétrole comme combustible" subissent sans aucun doute une grande influence de la ville de Ngaoundéré: 121 familles y ont été interviewées et le pétrole y est relativement moins cher que dans les autres localités de la Province.

En effet cette ville est située au terminus du chemin de fer qui relie le Sud et le Nord du Cameroun; son approvisionnement en pétrole est ainsi facilité par cette infrastructure. Quand on passe des villes vers les villages de la Province, le pétrole devient plus rare et plus coûteux (plus de \$3.50 par litre à Rey-Bouba contre \$0.30 à Ngaoundéré). Contrairement à ce qui se passait dans les villes, la question signalée ci-dessus n'avait parfois pas de réponse dans les villages de campagne et le calcul des fréquences a ignoré ces cas.

#### Electrifications.

Un grand effort d'électrification de la Province est en cours; mais il convient de noter que ce sont les localités proches des Centres de distributions d'électricité qui pourront en bénéficier, à cause de grandes étendues de terres inoccupées qui séparent les différents points de concentration des populations. L'extension du réseau électrique entrainera une augmentation inévitable du prix du Kwh qui dépasse déjà \$0.30 à Makari. Ainsi reste toujours posé le problème d'approvisionnement énergétique des populations pauvres du monde rural.

## Complémentarité

L'auteur pense dans sa conclusion qu'il faut introduire plus de pétrole dans les campagnes pour diminuer la dépendance de celles-ci vis à vis de la biomasse énergétique. Il semble assez dangereux de donner aux populations une certaine habitude du pétrole dont les réserves mondiales seront épuisées d'ici 30 ans. Cette hypothèse suppose par ailleurs que les intéressés auront les moyens nécessaires pour s'en approvisionner, ce qui n'est pas évident vis leurs revenus et la montée incessante du prix du pétrole. Quelle que soit la quantité de ce carburant sur leurs marchés locaux, ils le préféreront difficilement au bois pour la cuisson des aliments. D'ailleurs on a remarqué un commerce intense du bois dans les principales villes de la Province pourtant bien ravitaillées en pétrole. Chez les populations à faible revenus, ce combustible est couramment utilisé pour la satisfaction des besoins d'éclairage et non de cuisson. Cet avis sera mieux étayé dans le rapport de l'I.R.G.M. qui présentera les usages du pétrole reconnus par les enquêtes.

## Conservation de l'énergie

L'utilisation rationnelle du bois constatée à partir des résultats de l'enquête ne suffit pas pour conclure qu'il y a conservation de l'énergie, surtout qu'il n'est pas utilisé seulement comme combustible. Il faudrait ajouter au non-gaspillage du bois et de ses sous-produits, l'efficacité des foyers traditionnels dans lesquels ils sont brûlés avant d'oser dire comme l'auteur qu'un programme pour la conservation d'énergie dans la Province du Nord est inutile. Si les populations avaient déjà cette conception avancée, elles ne considéreraient pas, en ce qui concerne le bois, que le reboisement est une activité qui concerne uniquement le Gouvernement. La conservation d'énergie doit se faire de manière consciente, afin de mieux appréhender les bénéfices qu'on peut en escompter. Il est plus judicieux d'interpréter les résultats ci-dessus comme une attitude des populations favorable à une gestion rigoureuse des ressources énergétiques et à l'acceptation des contraintes que pourraient leur imposer des solutions éventuelles à leurs besoins.

L'Institut de Recherches Géologiques et Minières rédige actuellement le rapport détaillé de l'Enquête; on y trouve l'ensemble des résultats statistiques et leurs interprétations, ainsi que les recommandations sur les actions concrètes qu'il convient de mener à court et à long termes.