

3-a. Piège à glossines (piège biconique de Challier-Laveissère).



3-b. Récolte de mollusques aquatiques avec une épuiette à canne.





4-a. Passage d'un "pont de singes" sur la rivière BIWOME.



4-b. Recensement et sélection des participants d'une famille.





5-a. Examen microscopique sur le terrain.



5-b. Examens des prélèvements au CUSS-YAOUNDE.



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- TABLEAUX K, L, M : Infections ORL, Bucco-dentaires et oculaires
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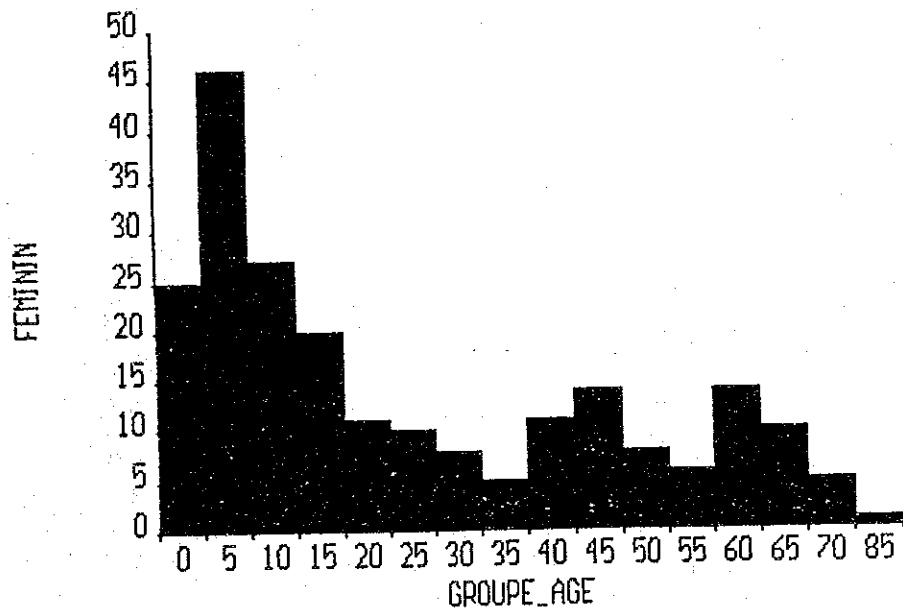
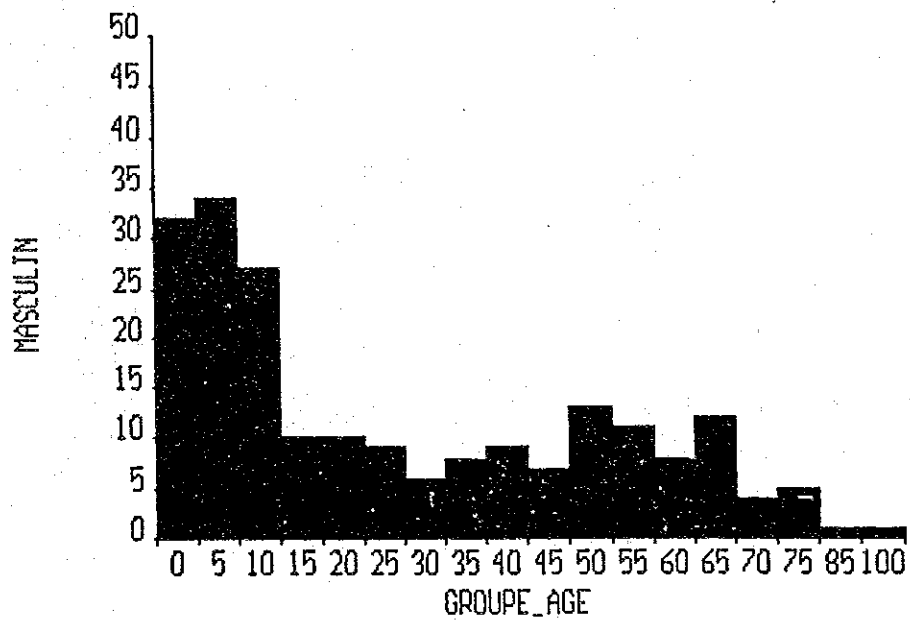




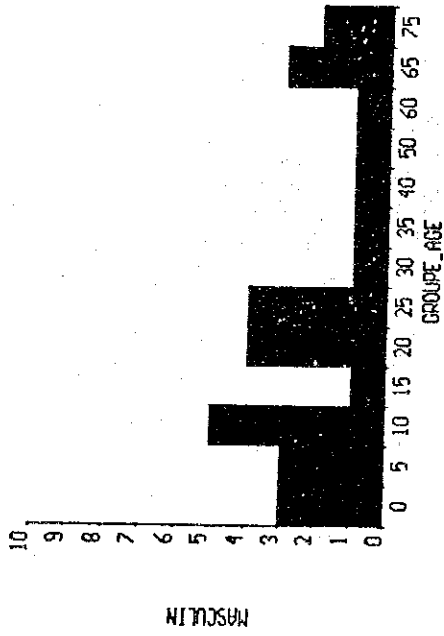
**A. HISTOGRAMMES  
DES POPULATIONS DES VILLAGES  
PAR GROUPES D'AGE**



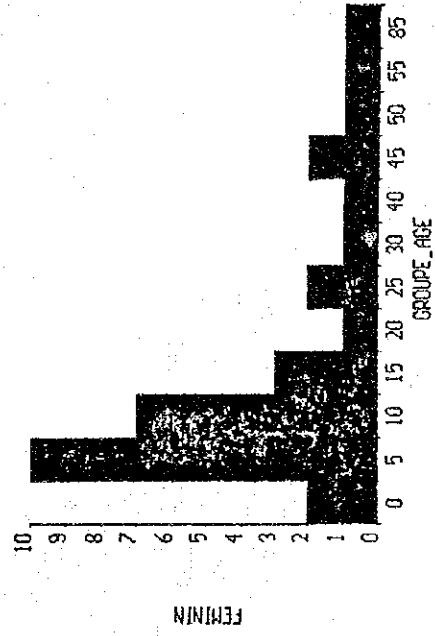
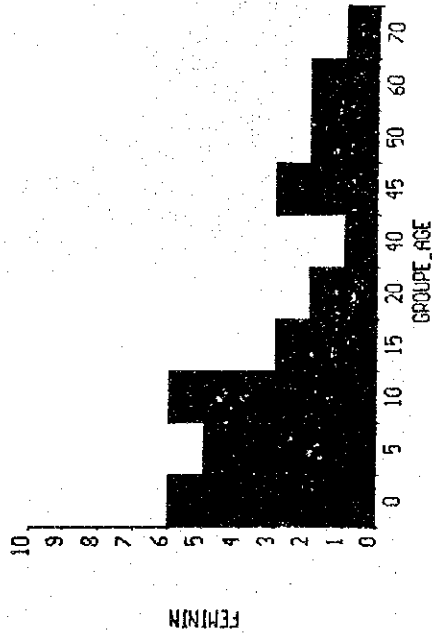
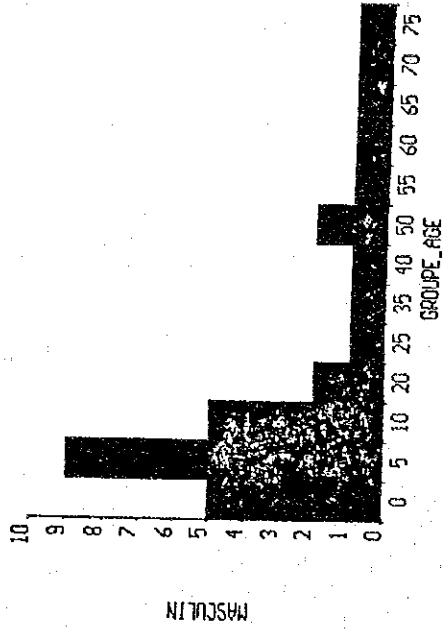
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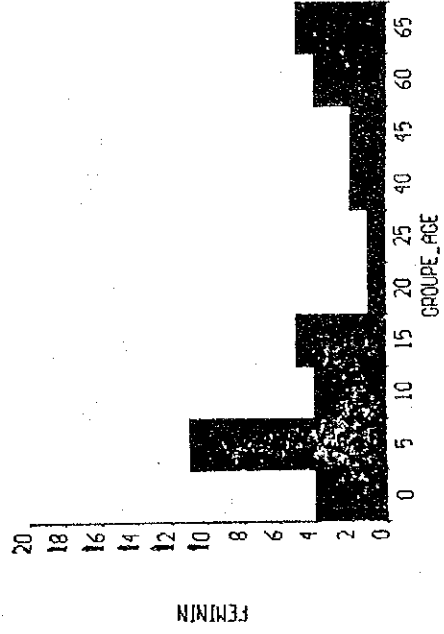
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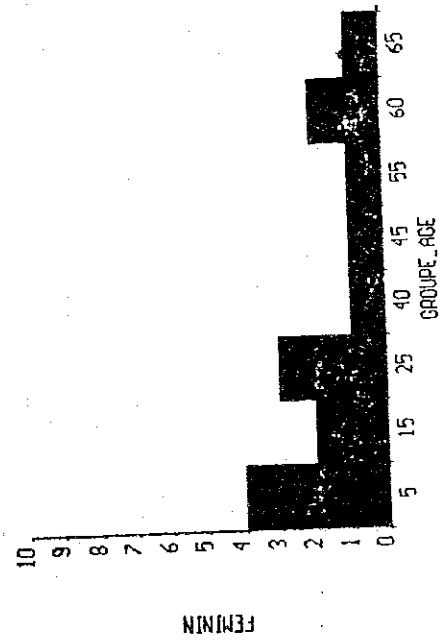
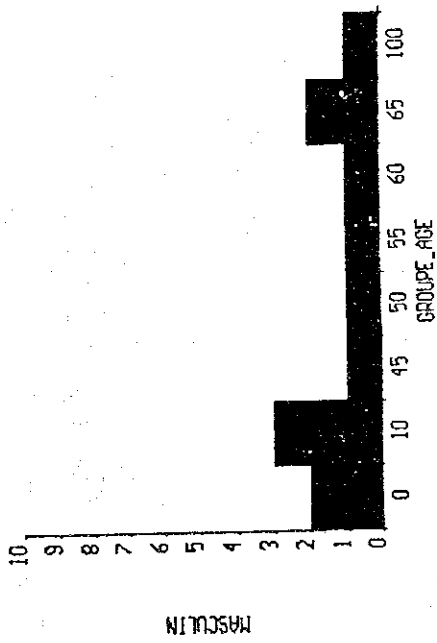
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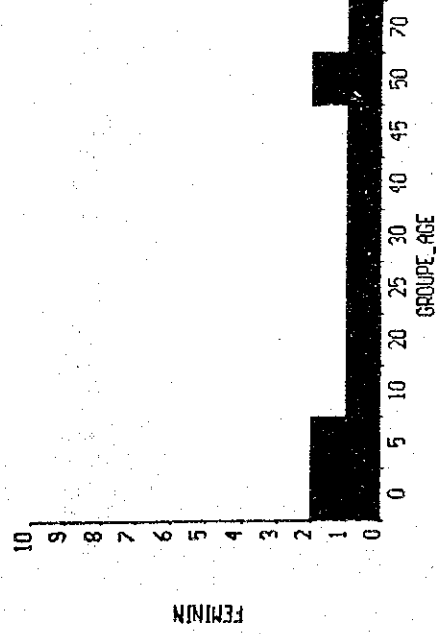
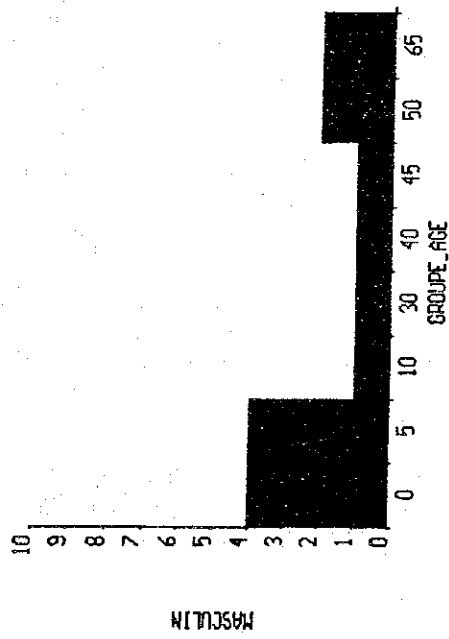
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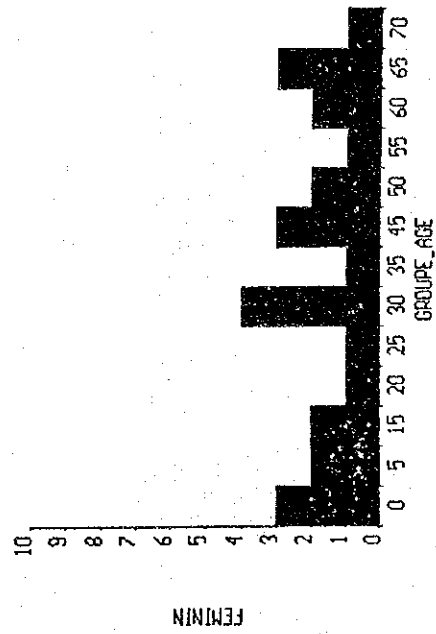
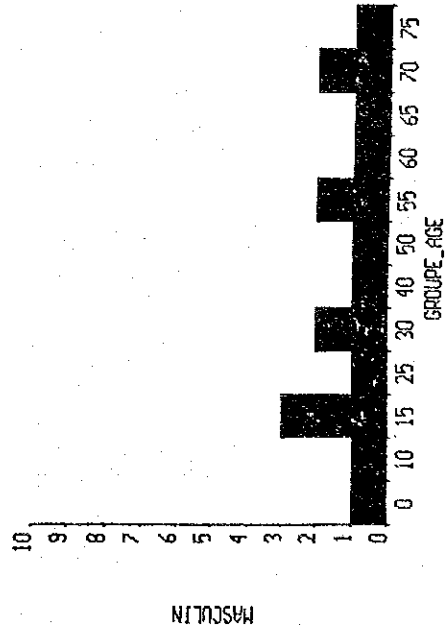
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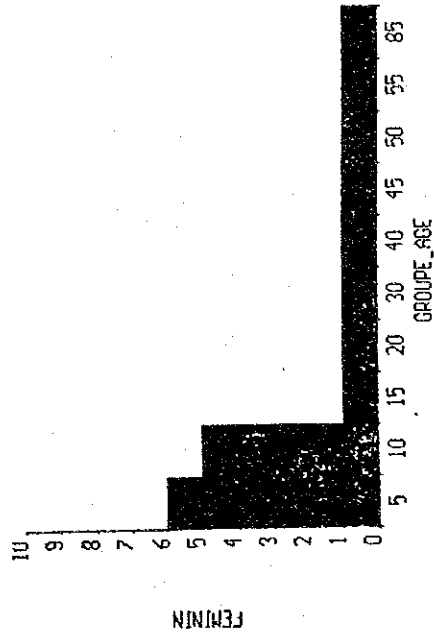
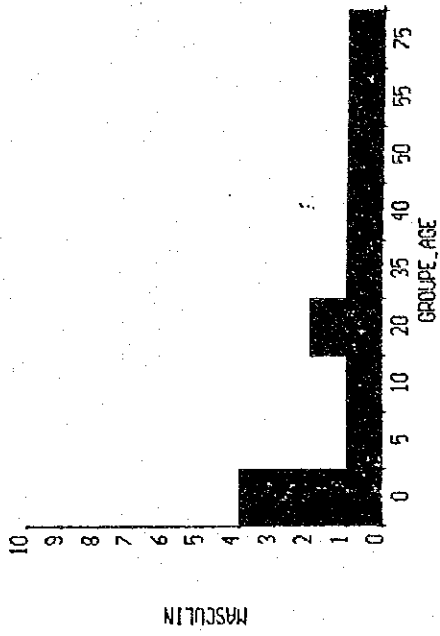
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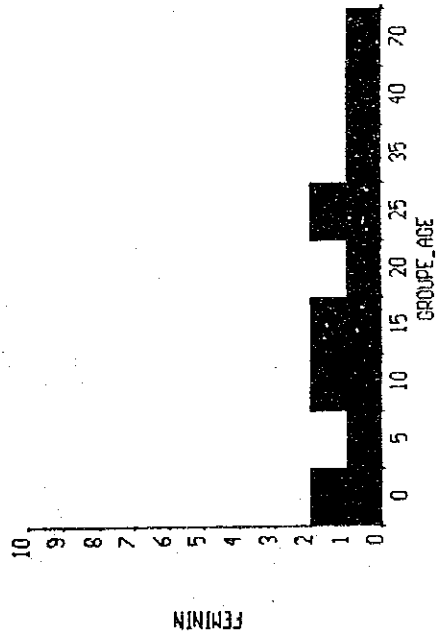
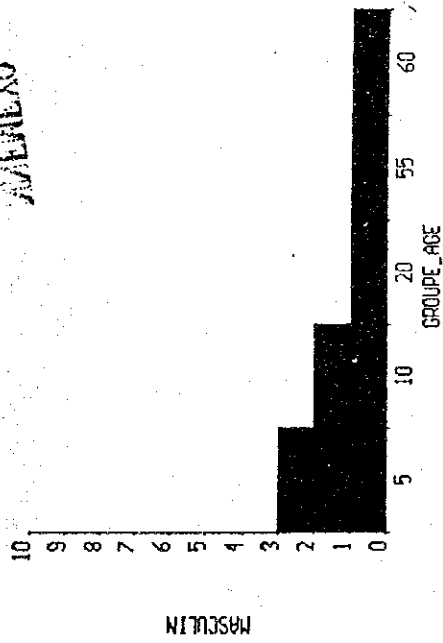
### AYA AMANG



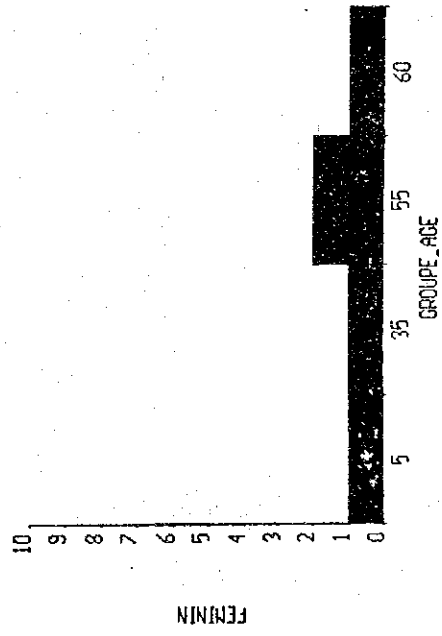
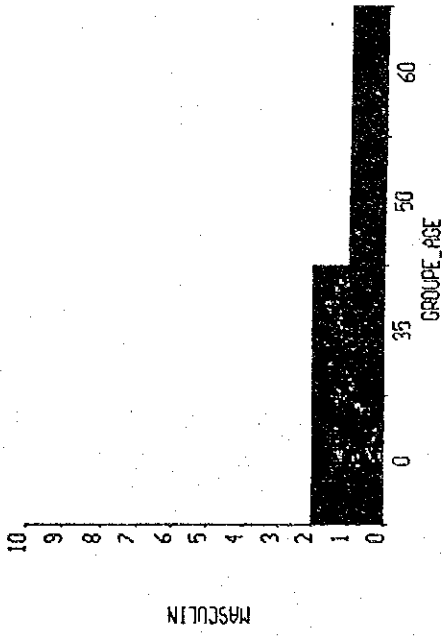
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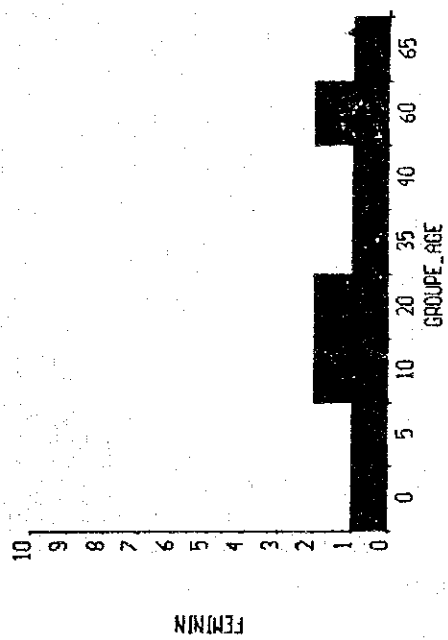
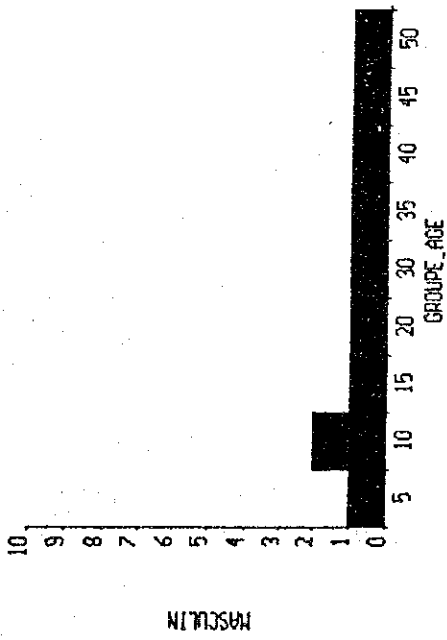
**ALEN II**  
AMERLELO



### AKOM

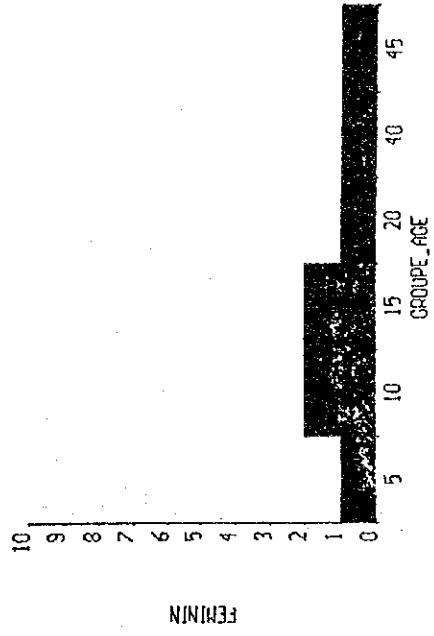
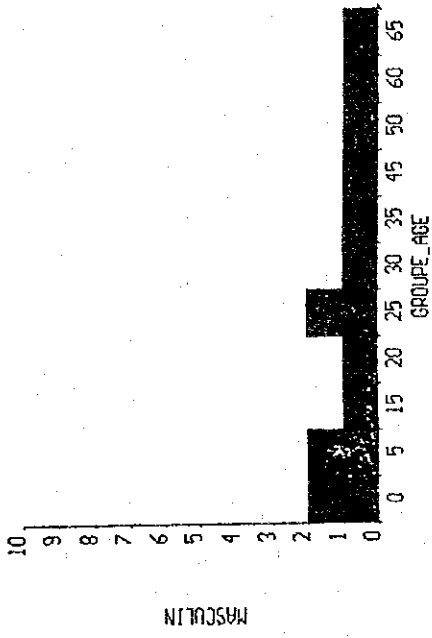


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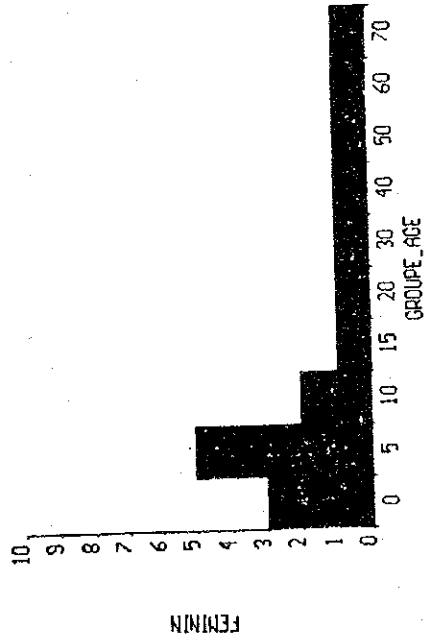
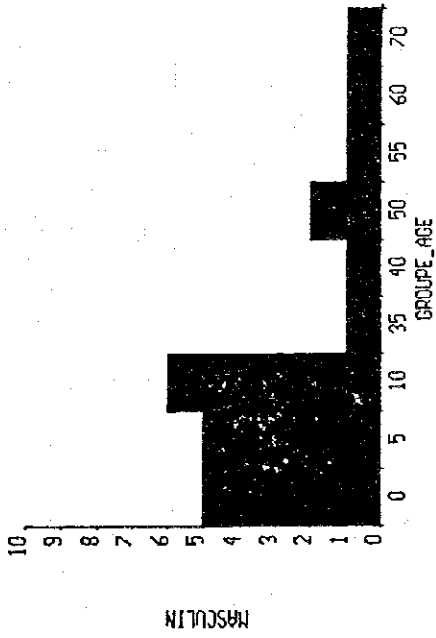




# ALCUM



# TOM



## B . METHODES ET MOYENS D'INVESTIGATION

**TABLEAUX A et B :** indiquent pour chacune des affections les paramètres cliniques et biologiques qui ont été recherchés pour leur identification ainsi que le type de prélèvement approprié.

**A . .**

PATHOLOGIES	PARAMETRES CLINIQUES	PRELEVEMENT	PARAMETRES BIOLOGIQUES
Lèpre	- Lésions cutanées - Lésions neurologiques - Déformations	Néant	
Tuberculose et Bronchite chronique	- Toux - Hémoptysies - IDR (10 UI)	Crachats	Bacille acido-alcool-résistants
<b>Hémopathies :</b>  . Drépanocytose . Anémies carenciales  . Lymphome de Burkitt  . Splénomégalie	( Pâleur ( Asthénie ( Dyspnée  - Tuméfaction mandibulaire - Adénopathies cervicales  - Grosse rate	Sang  Néant  Sang Urine Selles	Taux d'hémoglobine Test d'Emel  Néant  Plasmodium Schistosomes Schistosomes
<b>Pathologies cardio-vasculaires</b>	Hypertension artérielle (pression systolique et diastolique)	Néant	Néant
<b>Pathologie hépatique :</b>  . Hépatite . Cancer primitif du foie . Cirrhose	Ictère Hépatomégalie Fièvre Arthralgie Asthénie	Urines	Pigments et sels biliaires

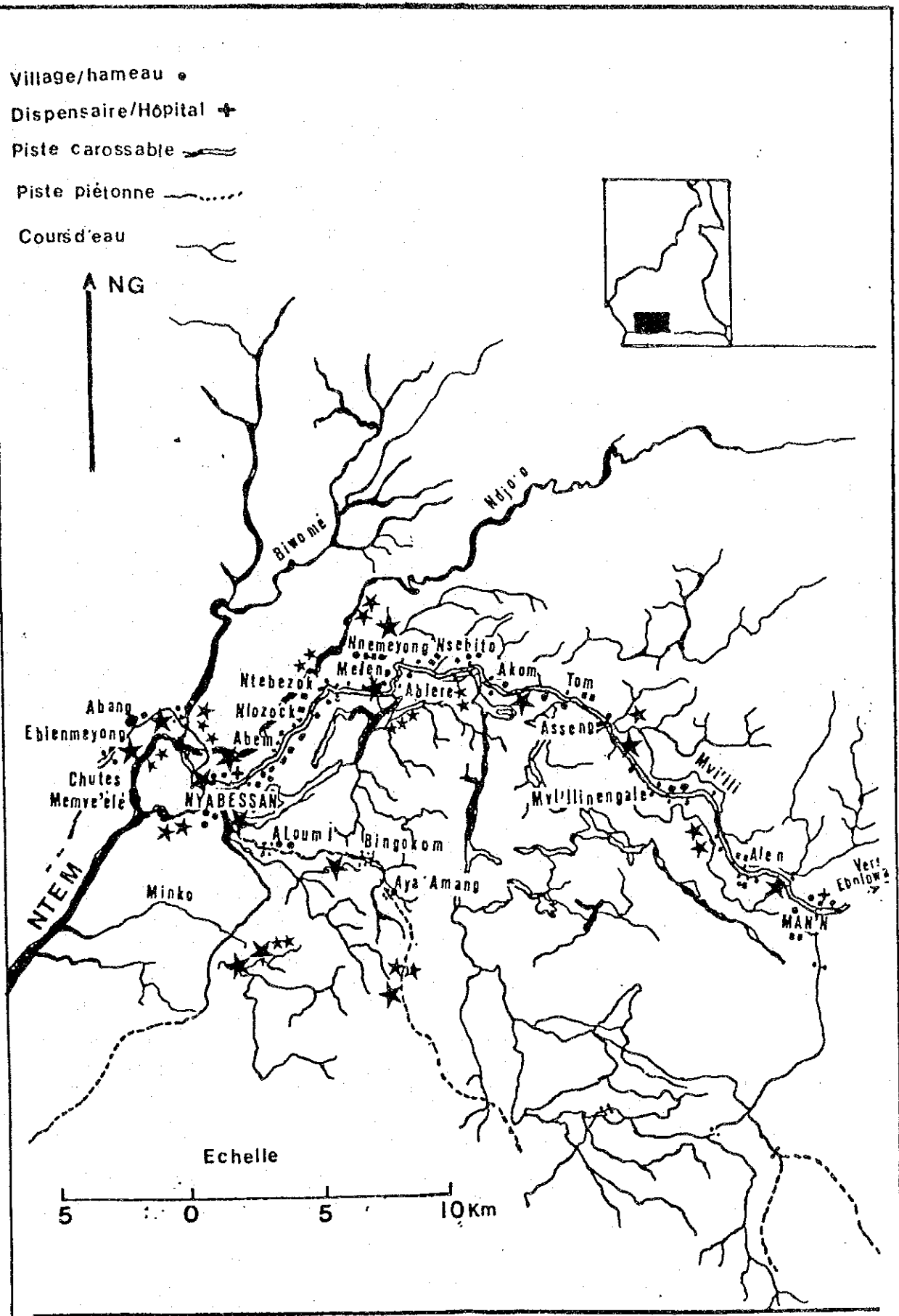
**B.**

<b>Gastro-entérologie</b>	Diarrhées multiformes, épisodiques, épidémique	Selles	Parasites Germe bannaux
<b>Diabète</b>	Polyurie Polydipsie	Urines	Albumine sucre
<b>Affections ORL</b> . Angine . Rhino-pharyngite . Otite	Amygdalite Rhinite Parotidite Otite	Néant	Néant
<b>Goitre endémique</b>	Tuméfaction cervicale basse	Néant	Néant
<b>Ophthalmologie</b> . Conjonctivite . Trachome . Kératite	Conjonctivite Pannus cornéen Kératite	Néant	Néant
<b>Urologie, MST, SIDA Gynécologie</b>	Cas déclarés HIV Urétrite Vaginite Leucorrhées Chancres Bubon Fibrome Annexite Conjonctivite du nouveau-né Parité, Avortement	Néant	Néant

**TABLEAU C : Répartition des sujets selon la durée de séjour  
dans chaque village de la zone d'influence  
socio-économique rapprochée du projet.**

DUREE DE SEJOUR	NYABESSAN		ABEM		NTEBEZOK		ALEN II		MELEN I		NNEMEYONG		NSEBITO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
< 1 an	14	22,9	4	5,8	1	4,3	7	30,4	4	13,3	4	12,5	8	18,6
1 - 5 ans	20	32,7	13	47,8	11	47,8	5	21,7	8	26,6	10	31,2	13	30,2
> 5 ans	27	44,3	52	75,4	11	47,5	11	47,8	18	60	18	56,2	22	51,2
DUREE DE SEJOUR	AKOH		TOM		ASSENG		ALOUH I		MELEN II		AYA'AMANG		EBIENMEYONG	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
< 1 an	4	28,5	11	35,5	3	13,6	2	8,3	0	0	4	7,7	7	20,5
1 - 5 ans	3	21,4	7	22,5	6	27,2	5	20,8	7	19,4	9	17,3	8	23,5
> 5 ans	7	50	13	41,9	13	59	17	70,8	29	80,5	39	75	19	55,8
TOTAL	< 1 an		1 - 5 ans		> 5 ans									
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
	73	14,78	125	25,30	296	59,91								

N = nombre de personnes.      % = pourcentage



**Fig. 7:** Zone d'influence socio-economique rapprochée du projet.  
 ★ Sites des captures entomologiques  
 \*\* Sites des récoltes malacologiques.

## MALADIES PARASITAIRES

**TABLEAU □ :**

**Taux de prévalence dans les 14 villages  
de la zone d'influence socio-économique rapprochée du projet.**

VILLAGES	N	PALU- DISME	FILA- RIOSES	VERS INTES- TINAUX	AMI- BIASE	FLA- GELLO- SES	MST*** PARA- SITAI- RES	GALE
		%	%		%	%	%	%
NYABESSAN*	61	49,1	26,2	78,7	24,5	16,4	22,9	8,2
ABEM*	69	47,8	21,7	63,7	27,5	11,6	11,6	2,8
ALOUM I*	24	41,6	37,5	75	33,3	12,5	8,3	8,3
NTEBEZOK*	23	34,8	26	69,5	34,8	21,7	17,3	0
ALEN II*	23	30,4	30,4	65,2	34,8	17,3	13	0
EBIENMEYONG*	34	41,2	14,2	64,7	35,3	11,8	11,7	11,7
MELEN I*	30	43,3	23,3	70	30	6,7	6,6	10
MELEN II*	36	38,8	22,2	69,4	27	8,3	19,4	5,5
AYA'AMANG*	52	45,5	17,6	66,6	21,6	1,8	9,8	7,8
<b>Sub-total<sub>1</sub></b>	<b>352</b>	<b>43,2</b>	<b>23,3</b>	<b>69</b>	<b>27,5</b>	<b>13,6</b>	<b>12,78</b>	<b>6,25</b>
NNEMEYONG**	32	37,5	18,7	59,4	16,6	12,2	18,7	6,25
NSIBITO**	43	44,2	18,6	60,5	20,9	11,6	16,2	4,65
AKOM**	14	35,7	21,4	57,1	28,5	7,1	35,7	0
TOM**	31	25,8	19,3	58	16,1	9,7	16,1	3,2
ASSENG**	22	22,7	13,6	45,4	18,2	9,1	18,2	0
<b>Sub-total<sub>2</sub></b>	<b>142</b>	<b>34,5</b>	<b>18,3</b>	<b>57</b>	<b>19</b>	<b>10,6</b>	<b>19,7</b>	<b>3,52</b>
<b>TOTAL</b>	<b>494</b>	<b>40,68</b>	<b>21,9</b>	<b>65,6</b>	<b>25,10</b>	<b>12,7</b>	<b>15,6</b>	<b>5,46</b>

N = nombre de sujets examinés.      % = taux de prévalence

\* Villages de première ligne (proches de Nyabessan-centre.

\*\* Villages de deuxième ligne (relativement plus éloignés du CSD de Nyabessan

\*\*\* Il ne s'agit que des maladies sexuellement transmissibles d'origine parasitaire (Candidose et Trichomonase) et non bactériennes ou virales présentées plus loin.

**TABLEAU E : Taux de prévalence des principales parasitoses  
selon l'âge**

CLASSES D'AGE	PALUDISME		FILARIOSES		V. INTESTI.		FLAGELLO-SES	
	N	%	N	%	N	%	N	%
0-4 ans	61	59,8	4	3,92	54	52,94	14	13,72
5-19 ans	76	41,08	44	23,8	185	100	27	14,60
> 19 ans	64	3,92	60	28,9	85	41,06	22	10,62
<b>TOTAUX</b>		40,7	108	21,9	324	65,6	63	12,7

N = nombre de sujets parasités ; % = taux de prévalence.

**TABLEAU F : Taux de prévalence de l'ankylostomose, anguillulose  
et amibiase selon l'âge**

CLASSES D'AGE	ANKYLOSTOMOSE		ANGUILLULOSE		AMIBIASE	
	N	%	N	%	N	%
0-4 ans	60	19,61	6	5,9	29	28,43
5-19 ans	16	8,6	3	1,62	51	26,50
> 19 ans	27	13,09	5	2,41	44	22,2
<b>TOTAUX</b>	63	12,75	14	2,83	124	25,1

N = nombre de sujets examinés. % = taux de prévalence.

**TABLEAU G : Charges parasitaires\* moyennes des principales affections parasitaires dans les villages de première ligne**

VILLAGES	PALU-DISME	ANKYLOSTOMOSE	ASCARIDIOSE	TRICHOCEPHALOSE
Nyabessan	0,48	1 345	5 872	6 641
Abem	1,68	376	5 159	5 132
Aloum I	0,15	2 496	4 777	8 402
Ntebezok	0,50	817	1 302	1 394
Alen II	0,28	487	2 013	1 493
Ebienmeyong	0,30	917	836	794
Melen I	0,55	1 182	1 271	2 090
Melen II	0,90	320	5 337	4 822
Aya'Amang	0,26	167	2 399	1 453
<b>MOYENNES</b>	0,56	901	2 952	3 580

**TABLEAU H : Charges parasitaires\* moyennes des principales affections parasitaires dans les villages de deuxième ligne**

VILLAGES	PALU-DISME	ANKYLOSTOMOSE	ASCARIDIOSE	TRICHOCEPHALOSE
Nnemeyong	0,5	515	2 849	7 464
Nsebito	0,57	3 430	4 982	2 733
Akom	0,30	440	1 188	1 007
Tom	0,26	237	1 128	1 764
Asseng	0,32	108	1 416	1 575
<b>MOYENNES</b>	0,39	1 155	2 412	2 908

\* Les charges parasitaires sont exprimées en % pour le paludisme et en nombre d'oeufs/g pour l'ankylostome, l'ascaris et le trichocéphale.



## ASSOCIATIONS PARASITAIRES

Les cas de polyparasitisme sont fréquents dans toutes les localités ; parmi les sujets parasités, 2,04% seulement sont porteurs d'un parasite, contre 97,96% des cas de polyparasitisme. L'association la plus fréquente est la coexistence du paludisme avec les autres parasitoses dans 97,01% des cas. Les tableaux I et J et le diagramme de fréquence (Fig. 4) indiquent le nombre et le pourcentage des cas de mono et polyparasitisme identifiés ainsi que les principales associations morbides du paludisme.

Il ressort de ces données que dans les villages de première ligne, 98,27% des sujets sont polyparasités, contre 94,92% dans les villages de deuxième ligne.

**TABLEAU I :** Nombre (N) et Pourcentage (%) des cas de mono et polyparasitisme (sujets hébergeant 1 ou plusieurs parasites) dans les villages proches du site du futur barrage

MONOPARASITISME		DOUBLES ASSOCIATION		TRIPLES ASSOCIATIONS		QUADRUPLES ASSOCIATIONS ET PLUS	
N	%	N	%	N	%	N	%
7	2,01	342	98,27	51	14,65	52	7,18

**TABLEAU J :** Nombre (N) et Pourcentage (%) des cas de mono et polyparasitisme (sujets hébergeant 1 ou plusieurs parasites) dans les villages éloignés du site du future barrage

MONOPARASITISME		DOUBLES ASSOCIATION		TRIPLES ASSOCIATIONS		QUADRUPLES ASSOCIATIONS ET PLUS	
N	%	N	%	N	%	N	%
3	2,17	131	94,92	13	9,42	8	5,79

## INFECTIONS ORL, BUCO-DENTAIRES ET OCULAIRES

*Les atteintes infectieuses de la sphère ORL sont dominées par les manifestations aiguës: rhinopharyngite, angine et otite externe ; les états chroniques comme la surdité et la sinusite ont été diagnostiqués respectivement chez 3 et 2 personnes et aucun cas de ces deux affections n'apparaît dans les relevés statistiques consultés dans les services de santé.*

**TABLEAU K :** Infections de la sphère ORL.  
Répartition des cas diagnostiqués en fonction de l'âge.

CLASSES D'AGE	ANGINES				OTITES EXTERNES		RHINO-PHARYNG.		SUR-DITE		SINU-SITE	
	ROUGES		BLANCHES		N	%	N	%	N	%	N	%
	N	%	N	%								
0-4 ans	17	16,6	2	1,96	13	12,7	19	18,6	0	0	0	0
5-19 ans	6	3,2	4	2,16	2	1,08	5	4,9	0	0	1	0,54
> 19 ans	3	1,44	4	1,93	1	0,48	3	1,44	2	0,96	3	1,44
<b>TOTAUX</b>	<b>26</b>	<b>5,2</b>	<b>10</b>	<b>2,2</b>	<b>17</b>	<b>3,44</b>	<b>27</b>	<b>5,4</b>	<b>2</b>	<b>0,4</b>	<b>4</b>	<b>0,8</b>

**TABLEAU L :****Atteintes oculaires.****Répartition des cas diagnostiqués en fonction de l'âge.**

CLASSE D'AGE	CONJONCTIVITES		KERATITE		CECITE	
	N	%	N	%	N	%
0-4 ans	9	8,8	1	0,98	0	0
5-19 ans	13	7	1	0,54	0	0
> 19 ans	5	2,4	19	9,17	7	3,4
<b>TOTAUX</b>	25	5,46	21	4,25	7	1,41

**TABLEAU M :****Pathologie bucco-dentaire.****Distribution des cas diagnostiqués selon l'âge.**

CLASSE D'AGE	CARIE DENTAIRE		STOMATITE		PERLECHE	
	N	%	N	%	N	%
0-4 ans	22	21,6	16	15,7	13	12,7
5-19 ans	70	37,8	4	2,16	6	3,24
> 19 ans	113	5,46	7	3,38	7	3,38
<b>TOTAUX</b>	203	41,5	27	5,46	26	5,26

**TABLEAU N : PLAN DE MOBILISATION DU PERSONNEL**

DATES	ACTIVITES	INTERVENANTS
<b>1ère SEMAINE</b>	<b>CONCERTATIONS ET SAISIE DES DONNEES</b>	
J <sub>1</sub> , J <sub>2</sub> ----->	CONCERTATION AVEC LE MINISTERE DE LA SANTE	Pr. SAME-EKOBO Dr. BASSONG Secrétaire
J <sub>3</sub> ----->	SAISIE DES DONNEES	
J <sub>4</sub> , J <sub>5</sub> ----->	CONCERTATION AU NIVEAU PROVINCIAL (Service Provincial de la Santé Publique d'Ebolowa)	Pr SAME-EKOBO Secrétaire
J <sub>6</sub> ----->	SAISIE DES DONNEES	
J <sub>7</sub> ----->	LIBRE	
<b>2ème SEMAINE</b>	<b>TERRAIN</b>	
J <sub>1</sub> , J <sub>2</sub> ----->	ENQUETE AUPRES DES SERVICES DE LA SANTE EVALUATION CSD NYABESSAN	Pr SAME-EKOBO Dr BASSONG, Dr MBANGUE Infirmière
J <sub>2</sub> , J <sub>3</sub> , J <sub>4</sub> ----->	ETAT NUTRITIONNEL : Examens cliniques Interview de la mère Enquêtes auprès des services de santé	Pr SAME-EKOBO Dr BASSONG, Dr MBANGUE Infirmière
J <sub>5</sub> , J <sub>6</sub> ----->	Prospections entomologique	Dr ENYONG M. EYENGA
J <sub>5</sub> , J <sub>6</sub> ----->	CAUSES DE MORTALITE INFANTILE Examens cliniques Interview des parents	
J <sub>7</sub> ----->	EVALUATION HOPITAL DE MAN'N Prospections malacologiques	Dr MBANGUE, Dr BASSONG Dr TAKOUNGANG
<b>3ème SEMAINE</b>	<b>TERRAIN</b>	
J <sub>1</sub> , J <sub>2</sub> , J <sub>3</sub> , J <sub>4</sub> , J <sub>5</sub> , J <sub>6</sub> ----->	AUTRES PATHOLOGIES : Examens cliniques Enquêtes auprès des services de santé	Pr SAME-EKOBO Infirmière
J <sub>7</sub> ----->	RETOUR SUR YAOUNDE	Toute l'équipe
<b>4è, 5è, 6è, 7è, 8è SEMAINES --&gt;</b>	ANALYSES DE LABORATOIRE SAISIE DES DONNEES	Technicien de Laboratoire Secrétaire
<b>9è, 10è, 11è, 12è SEMAINES --&gt;</b>	EXPLOITATION DES RESULTATS REDACTION DES RAPPORTS	Pr SAME-EKOBO Dr ENYONG Dr TAKOUNGANG Mr EYENGA
<b>13è SEMAINE --&gt;</b>	REMISE DES RAPPORTS	Pr SAME-EKOBO Dr ENYONG

# ETUDE DE L'ETAT NUTRITIONNEL DES ENFANTS DE 0-5 ANS

## QUESTIONNAIRE

- INTERVIEWER :
- INTERVIEWE (E) :

N° \_\_\_\_\_

- . Province : \_\_\_\_\_
- . Département : \_\_\_\_\_
- . Arrondissement : \_\_\_\_\_
- . Formation sanitaire : \_\_\_\_\_

### I - IDENTITE DE L'ENFANT

- . Nom et Prénoms : \_\_\_\_\_
- . Date de naissance : \_\_\_\_\_
- . Sexe : Masculin \_\_\_\_\_ Féminin \_\_\_\_\_ Rang \_\_\_\_\_
- . Quartier : \_\_\_\_\_ Centre d'Etat Civil d'origine : \_\_\_\_\_

### II - ETAT DE SANTE DE L'ENFANT

	ACTUEL	DEPUIS 1 SEMAINE	DEPUIS LA NAISSANCE		
			Jamais	Régulière- ment	Occasion- nellement
Bonne santé					
Rougeole					
Diarrhée					
Coqueluche					
Toux et/ou Rhume					
Amaigrissement					
Vers dans les selles (parasitose)					
Manque d'appétit					
Fièvre (Paludisme)					
Vomissements					

### III - ETAT VACCINAL

- . Cet enfant a-t-il un Carnet de Vaccination ? Oui \_\_\_\_\_ Non \_\_\_\_\_
- . BCG : Oui \_\_\_\_\_ Non \_\_\_\_\_ Cicatrice : Oui \_\_\_\_\_ Non \_\_\_\_\_
- . Rougeole : Oui \_\_\_\_\_ Non \_\_\_\_\_
- . DT Coq Polio : 1ère dose \_\_\_\_\_ 2ème dose \_\_\_\_\_ 3ème dose \_\_\_\_\_  
Rappel : Oui \_\_\_\_\_ Non \_\_\_\_\_

EXAMEN CLINIQUE

a) Anthropométrie :

- Poids en "g" : \_\_\_\_\_ Poids/âge : \_\_\_\_\_ % Norme
- Taille en "cm" : \_\_\_\_\_ Poids/taille : \_\_\_\_\_ % Norme
- Périmètre brachial en "cm" : \_\_\_\_\_
- Pli cutané tricépital en "cm" : \_\_\_\_\_
- Périmètre crânien : \_\_\_\_\_ Périmètre thoracique \_\_\_\_\_

b) Etat général

- Bon \_\_\_\_\_ Moyen \_\_\_\_\_ Mauvais \_\_\_\_\_
- \* Apathie \_\_\_\_\_
- \* Faciès : aspect de vieux \_\_\_\_\_ Pâleur \_\_\_\_\_  
aspect lunaire \_\_\_\_\_ Irritabilité \_\_\_\_\_  
aspect bouffi \_\_\_\_\_ Anorexie \_\_\_\_\_
- \* Amaigrissement \_\_\_\_\_

c) Etat des phanères et téguments

- \* Cheveux normaux \_\_\_\_\_
- \* Cheveux lisses \_\_\_\_\_
- \* Cheveux roux \_\_\_\_\_
- \* Cheveux cassants \_\_\_\_\_
- \* Dermatite + Desquamation \_\_\_\_\_
- \* Ulcère \_\_\_\_\_

Autres lésions carencielles

- Lésions oculaires \_\_\_\_\_
- Ulcération des lèvres \_\_\_\_\_
- Epistaxis/gingivoragie \_\_\_\_\_
- Rachitisme \_\_\_\_\_
- Glossite \_\_\_\_\_
- Goitre \_\_\_\_\_
- Pellagre \_\_\_\_\_

d) Autres :

- \* Fonte adipeuse \_\_\_\_\_
- \* Fonte musculaire \_\_\_\_\_
- \* Oedème bilatérale MI \_\_\_\_\_
- \* Abdomen ballonné \_\_\_\_\_
- \* Hépatomégalie \_\_\_\_\_
- \* Splénomégalie \_\_\_\_\_

e) Impression diagnostique

- \* Normale \_\_\_\_\_ Marasme \_\_\_\_\_ Kwashiorkor \_\_\_\_\_
- \* Etat intermédiaire \_\_\_\_\_
- \* Début de malnutrition protéino-calorique \_\_\_\_\_

#### IV - SOINS MEDICAUX

- . Qui consultez-vous quand l'enfant est malade ?
  - le guérisseur \_\_\_\_\_
  - le personnel de santé (Docteur, infirmier) \_\_\_\_\_
  - Les deux \_\_\_\_\_
- . Combien de fois avez-vous amené l'enfant en consultation ?
  - Pour la maladie :      Jamais \_\_\_\_\_      Souvent \_\_\_\_\_      Occasionnellement \_\_\_\_\_
  - Pour la pesée :      Jamais \_\_\_\_\_      Souvent \_\_\_\_\_      Occasionnellement \_\_\_\_\_
  - Pour la vaccination : Jamais \_\_\_\_\_      Souvent \_\_\_\_\_      Occasionnellement \_\_\_\_\_
- . Sinon, pourquoi ?
  - Enfant en bonne santé \_\_\_\_\_
  - Eloignement d'une formation sanitaire \_\_\_\_\_
  - Manque d'information \_\_\_\_\_
  - Autres : \_\_\_\_\_

#### V - ALIMENTATION

- . Cet enfant a eu (actuellement) l'allaitement :  
maternel \_\_\_\_\_      Artificiel \_\_\_\_\_      Mixte \_\_\_\_\_

##### a) Allaitement maternel

- . Nombre de tétées par jour : \_\_\_\_\_
- . Tête ou tétant autant de fois voulues : \_\_\_\_\_
- . A quel âge arrêterez-vous ou aviez-vous arrêté ? \_\_\_\_\_
- . Régime de la mère pendant la grossesse :  
Restreint \_\_\_\_\_      Enrichi \_\_\_\_\_      Sans changement \_\_\_\_\_
- . Régime de la mère pendant l'allaitement :  
Restreint \_\_\_\_\_      Enrichi \_\_\_\_\_      Sans changement \_\_\_\_\_
- . Interdits alimentaires pendant la grossesse : \_\_\_\_\_
- . Interdits sexuels pendant l'allaitement : \_\_\_\_\_
- . Si l'enfant ne tète plus :
  - . A quel âge a-t-il cessé de téter ? \_\_\_\_\_
  - . Pourquoi a-t-il cessé de téter, ou pourquoi l'arrêtez-vous à cet âge ?
    - . Refus de l'enfant \_\_\_\_\_
    - . Mère devenue enceinte \_\_\_\_\_
    - . Mère malade \_\_\_\_\_
    - . Mère occupée au travail \_\_\_\_\_
    - . Le sein ne coule plus \_\_\_\_\_
    - . Le sein produisant un mauvais lait \_\_\_\_\_
    - . Enfant jugé assez grand \_\_\_\_\_
    - . Autres \_\_\_\_\_
  - . Comment a-t-il été sevré ou bien comment le sevrerez-vous ?
    - . Arrête net \_\_\_\_\_      . Arrête progressif \_\_\_\_\_

##### b) Allaitement artificiel

- Qualité : \_\_\_\_\_
- Dilution : \_\_\_\_\_
- Nombre de Biberon par jour : \_\_\_\_\_
- Eau de préparation : Bouillie ?    Oui \_\_\_\_\_    Non \_\_\_\_\_

e) Famille / Alimentation

- D'où viennent les aliments consommés en famille ?  
 Champs \_\_\_\_\_ Marché \_\_\_\_\_ les deux \_\_\_\_\_
- En avez-vous assez ? Oui \_\_\_\_\_ Non \_\_\_\_\_
- Que faites-vous du produits des champs ?
  - . vendu en majorité \_\_\_\_\_
  - . consommé en majorité \_\_\_\_\_
  - . moitié consommé, moitié vendu \_\_\_\_\_
  - . tontine \_\_\_\_\_
- Principaux aliments familiaux :
 

. Viande,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Poisson,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Haricot,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Soja,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Arachide,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Légumes,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Couscous,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Taro,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Pomme de terre,	Nbre de fois/jour _____	Nombre de fois/semaine _____	Nbre de fois/mois _____
. Macabo,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____
. Ris,	Nbre de fois/jour _____	Nbre de fois/semaine _____	Nbre de fois/mois _____

VI - DONNES SOCIO-ECONOMIQUES

- Mère :
- Nom : \_\_\_\_\_ Age : \_\_\_\_\_ Tribu : \_\_\_\_\_ Religion : \_\_\_\_\_
- Situation familiale : Mariée \_\_\_\_\_ Fiancée \_\_\_\_\_ Vit seule \_\_\_\_\_
- Profession habituelle : \_\_\_\_\_ Gravida : \_\_\_\_\_ Para : \_\_\_\_\_
- Profession pendant la grossesse : \_\_\_\_\_
- Profession pendant l'allaitement : \_\_\_\_\_
- Niveau d'instruction : \_\_\_\_\_

NBRE GROSSESSE	ANNEE	EVOLUTION			POIDS	VIVANT AGE	DECEDE AGE
		AVORTEMENT	PREMATURE	MALADIE			

- Mère :
- Nom : \_\_\_\_\_ Age : \_\_\_\_\_ Tribu : \_\_\_\_\_
- Religion : \_\_\_\_\_ Polygame ? Oui \_\_\_\_\_ Non \_\_\_\_\_ N° des enfants : \_\_\_\_\_
- Nombre d'enfants : \_\_\_\_\_ Profession : \_\_\_\_\_
- Niveau d'instruction : \_\_\_\_\_
- Nombre total de personnes vivant dans la concession : \_\_\_\_\_



- Comment les biberons sont-ils entretenus

. Lavés ? Oui \_\_\_\_\_ Non \_\_\_\_\_

. Bouillis ? Oui \_\_\_\_\_ Non \_\_\_\_\_

Autres : \_\_\_\_\_

- A quel âge l'avez-vous introduit ? \_\_\_\_\_

- Quel fut la réaction de l'enfant à ce nouveau régime ?

. Diarrhée \_\_\_\_\_ . Vomissements \_\_\_\_\_ . Aucune réaction anormale \_\_\_\_\_

Autres : \_\_\_\_\_

c) Allaitement mixte : Oui \_\_\_\_\_ Non \_\_\_\_\_ (Remplir les 2 paragraphes ci-dessus)

d) Autres alimentations

- En dehors du lait, cet enfant prend-il d'autres aliments ?

Oui \_\_\_\_\_ plat spécial \_\_\_\_\_ Composition : \_\_\_\_\_

plat familial \_\_\_\_\_

Non \_\_\_\_\_

- Sinon, pourquoi ?

Enfant trop jeune \_\_\_\_\_ Refus de l'enfant \_\_\_\_\_

Autres : \_\_\_\_\_

- Si oui :

ALIMENTS	AGE D'INTRODUCTION	NOMBRE DE REPAS PAR JOUR	MODE DE PREPARATION	AUTEUR

- Qu'est-ce que l'enfant a mangé dans les dernières 24 heures ?

ALIMENTS	NOMBRE DE FOIS PAR JOUR	MODE DE PREPARATION	AUTEUR

- Quel sont les interdits alimentaires pour les enfants ?

Oeuf \_\_\_\_\_ Viande \_\_\_\_\_ Poisson \_\_\_\_\_ Légumes \_\_\_\_\_

Autres : \_\_\_\_\_

- Qui s'occupe habituellement de l'enfant en l'absence de sa maman ?

Grand-mère \_\_\_\_\_ Grand-père \_\_\_\_\_ Père \_\_\_\_\_ Bonne \_\_\_\_\_ Un autre enfant \_\_\_\_\_

Autres : \_\_\_\_\_

- Y a-t-il un privilège de sexe ?

Non \_\_\_\_\_

Oui : Préférence de garçon \_\_\_\_\_ fille \_\_\_\_\_



**C - STATISTIQUES SANITAIRES**  
**DU SERVICE DEPARTEMENTAL DE LA SANTE PUBLIQUE**  
**DU NTEM (Ebolowa)**

*janvier 1992 - novembre 1992*



C-1. SANTE PUBLIQUE

Mois	Dispen- saire	Médecine	Chirurgie	Pédiatrie ( 4 ans)	Total	Hospita- lité	Mortalité
J	2731	1314	434	286	4765	451	8
F	218	879	82	125	1304	343	10
Mars	1569	748	257	61	2635	27	1
Avril	2169	992	256	90	3541	909	5
Mai	2335	804	96	103	3306	74	3
Juin	2572	535	96	103	3306	74	3
Juillet	1984	647	322	22	2975	4	0
Août	2164	11 431	662	801	15 058	1343	36
Sept.	3413	1757	238	129	5537	1113	32
Octobre	5476	-	÷	79	5555	43	-
Nov.	1154	1296	91	261	2802	67	-
Déc.	-	-	-	-	-	-	-
Total	25 785	20 403	2465	2032	50 685	4577	101

C-2. MATERNITE

MOIS	NAISSANCES NORMALES		PREMATU-RES		Morts- NES	DYSTOCIES	AVOR- TEMENTS	MORTALI- TE MATER- NELLE	TOTAL
	M	F	M	F					
J	90	77	3	3	4	9	14	0	200
F	59	64	1	1	4	14	0	0	143
M	22	22	0	0	1	1	9	0	55
Av.	37	38	1	0	1	3	6	0	86
Mai	110	85	3	1	12	25	7	1	244
Juin	31	21	1	0	1	2	2	0	58
Juil.	26	28	1	0	1	0	1	0	57
Août	249	283	9	3	13	26	47	0	630
Sept.	157	160	7	2	15	9	52	0	402
Oct.	62	57	0	0	5	0	10	0	134
Nov.	12	11	3	0	-	2	5	0	33
Déc.									
Total	855	846	29	10	57	91	153	0	2041

C-3. P M I

Cons-prénat.★		P M-I			Vaccinations					
		0-1a	1-4a	Total	BCG	DTCoq	Polio	Rougeol	Tétanos	Total
Jan.	321	165	49	535	483	1277	1389	356	594	4069
Fév.	319	114	25	458	484	1127	1182	314	674	3297
Mars	88	73	28	189	1331	3107	3273	928	1935	9243
Avril	177	161	106	467	1541	2797	2927	1019	2498	9241
Mai	331	187	12	530	1720	2637	2812	738	2597	8784
Juin	68	49	45	162	700	1671	1819	389	1465	5344
Juil.	121	81		202	0	0	0	0	0	0
Août	456	437	310	1203	0	0	0	0	0	0
Sept.	162	100	53	315	0	0	0	0	0	0
Oct.	178	120	59	357	451	1037	1164	239	727	3618
Nov.	60	104	96	260	0	0	0	0	0	0

★ Consultations prénatales.

G-4. MORBIDITE MENSUELLE

MOIS	MPE		Anémies		Brûlures		Intoxication		Avortements	Complications de la grossesse	Maladies de la peau		S S		Onchocercose	
	M	F	M	F	M	F	M	F			M	F	M	F	M	F
Janvier	24	21	131	203	1	5	3	1	14	33	130	140	8	6	0	0
Février	11	12	93	123	2	7	1	1	3	42	165	89	0	0	0	0
Mars	7	3	57	75	1	5	1	0	9	7	152	99	0	0	0	0
Avril	15	10	92	99	1	0	3	0	6	4	139	99	3	1	1	2
Mai	11	11	166	191	6	10	3	0	7	53	222	250	0	1	0	0
Juin	15	25	124	110	13	15	4	4	2	6	175	95	2	5	3	0
Juillet	20	15	90	85	1	0	1	0	1	1	98	89	1	0	0	0
Août	33	21	146	142	15	6	4	19	47	147	494	454	4	10	0	0
Septembre	34	42	131	164	2	5	6	4	56	540	365	252	6	9	0	2
Octobre	37	22	139	224	6	5	1	0	10	25	278	261	6	5	3	0
Novembre	0	2	58	73	1	1	-	-	5	8	188	109	1	0	3	0
Décembre			-	-	-	-	-	-	-	-						

MPE = Malnutrition protéino-énergétique  
SS = Drépanocytose.



C-5. MORBIDITE MENSUELLE (Suite)

MOIS	Rougeole		Ictère		Diarhée		Méningite		Varicelle		Coqueluche		Syphilis		Pian		Paludisme		ORL		Pneumonie + Bronchop.		Carie		Amibiase		Vers intestinaux		Ankylostome		Loase		Bancroft		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Jan.	8/10		3/0		104/90		2/2		4/2		1/1		10/5		10/6		995/1053		620/576		391/340		84/78		44/98		703/852		49/59		77/92		1/		
Fév.	17/12		0/0		69/50		2/3		5/4		0/2		6/1		1/3		663/774		306/321		392/400		68/59		48/43		547/654		14/15		17/35		5/4		
Mars	26/17		1/0		64/56		3/0		59/43		2/1		3/3		0/1		492/523		204/209		58/74		25/87		16/7		533/591		16/24		26/32		3/3		
Avril	35/19		0/2		61/70		1/0		53/65		2/2		9/4		3/3		578/664		151/119		105/109		22/19		24/10		357/458		7/20		16/18		5/		
Mai	7/4		1/1		16/22		2/2		8/11		1/3		15/22		1/1		1432/1537		296/344		243/251		40/55		20/157		954/1050		145/174		28/28		2/2		
Juin	10/12		2/2		42/22		0		8/3		2/6		4/1		/1		925/927		213/198		82/72		18/12		12/16		344/396		18/26		9/14		0		
Juillet	17/10		1/1		77/69		0/1		30/26		4/1		1/2		9/2		654/774		123/107		69/57		17/8		7/8		269/332		1/3		17/23		2		
Août	21/22		1/3		38/19		5/3		5/3		1/2		17/20		0/0		1353/1399		240/254		204/153		183/226		100/65		740/838		23/32		17/11		12/18		
Sept.	10/12		1/1		49/32		6/4		5/3		8/11		11/7		1/0		1121/1202		176/183		172/158		84/98		15/20		620/815		19/8		13/13		1/2		
Oct.	6/4		5/0		70/48		1/		6/10		5/0		2/2		3/2		1428/1595		425/433		246/325		45/48		82/110		797/930		52/85		36/40		0		
Nov.	0/1		2/2		43/29		-		-		-		30/4		6/0		423/373		117/115		41/35		4/5		9/10		231/238		8/10		4/9		0		
Déc.																																			

Poliomyélite = 1      Tuberculose pulmonaire = 69      Typhoïde = 4  
 Choléra = 2      Lèpre = 368      Tétanos = 7.  
 Pian = 26

**C-7.2. MORTALITE**

MALADIES	CLASSES D'AGE			TOTAUX
	24 ans	5-15 ans	15 ans	
Rougeole	12	-	-	12
Diarrhée	10	11	2	23
Méningite	4	2	6	12
Paludisme	23	4	2	29
Bronchopneumonie	7	1	-	8
Accouchement	-	-	1	1
Diabète	-	-	1	1
Hypertension artérielle	-	-	2	2
Anémie	2	-	-	2
Tétanos	6	-	-	6
Occlusion	1	-	-	1
Morts-nés	57	-	-	57
Non-précisés	27	12	31	70
<b>TOTAUX</b>	<b>149</b>	<b>30</b>	<b>45</b>	<b>224</b>

## CAS DU SIDA\* DANS LA PROVINCE DU SUD

(de janvier 1992 à novembre 1992)

Hôpital d'Ebolowa .....	7
Hôpital d'Enongal .....	44
Hôpital de Kribi .....	10
Hôpital de Sangmelima .....	6
<b>Total</b>	<b>67 cas</b>

\* *Aucun cas n'est originaire de l'arrondissement de MAN'N.*



## HOPITAL D'ARRONDISSEMENT DE MAN'N

**TABLEAU C8 : Actes médicaux enregistrés à l'Hôpital d'arrondissement de Man'n de janvier 1992 à novembre 1992.**

NATURE DES ACTES MEDICAUX	NOMBRE DE CAS
<b>Soins (médicaux et chirurgicaux)</b>	2 371
<b>Accouchements normaux</b>	60
<b>Accouchements prématurés</b>	10
<b>Morts-nés</b>	5
<b>Avortements</b>	9
<b>Consultations des femmes enceintes</b>	244
<b>Vaccinations des femmes enceintes</b>	362
<b>Grossesses à risque</b>	23
<b>Consultations pédiatriques</b>	103
<b>Cas d'anémie</b>	442
<b>Hypertension artérielle</b>	18
<b>MST</b>	44
<b>Oedèmes</b>	10
<b>Hospitalisations</b>	155
<b>Mortalité infantile</b>	5
<b>Activités du PEV :</b>	
<b>BCG</b>	302
<b>DT COQ</b>	934
<b>Rougeole</b>	362
<b>Poliomyélite</b>	1 131
<b>Morbidité infantile :</b>	
<b>Rougeole</b>	5
<b>Diarrhée</b>	144
<b>Malnutrition</b>	34
<b>Paludisme</b>	602

## CENTRE DE SANTE DEVELOPPE (CSD) DE NYABESSAN

**TABLEAU C9:** Actes médicaux enregistrés au CSD de Nyabessan  
du mois de janvier 1992 au mois de novembre 1992.

NATURE DES ACTES MEDICAUX	NOMBRE DE CAS
Ensemble des consultations	1 344
Accouchements normaux	36
Accouchements prématurés	3
Morts-nés	2
Avortements	5
Consultations des femmes enceintes	47
Grossesses à risque	11
Consultations pédiatriques	60
Cas d'anémie	88
Cicatrices opératoires	2
Oedème	3
Divers	67

Il apparaît dans ce tableau que pour 67 actes la nature n'est pas indiquée, et pour ceux dont la nature est donnée, les informations sont incomplètes par rapport aux fiches officielles de notification des cas du Ministère de la Santé.

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**GLOSSAIRE**



DANS CE GLOSSAIRE FIGURENT LES DEFINITIONS  
DES TERMES TECHNIQUES CITES TOUT LE LONG  
DU TEXTE ET DE L'APPENDICE.

### A

ADENOPATHIE : Inflammation des ganglions lymphatiques  
AMYGDALITE : Inflammation des amygdales  
ARTHRALGIE : Douleur articulaire  
ARTHROSE : Atteinte articulaire non rhumatismale.  
ASTHENIE : Etat de fatigue pathologique.

### B

BCG : Bacille de Camette et Guérin : vaccin anti-tuberculeux  
BILHARZIOSE : Synonyme de Schistosomiase ou Schistosome  
BIOTOPE : Habitat précis dans un écosystème  
BUBON : Tuméfaction ganglionnaire.

### C

CANDIDOSE : Maladie provoquée par les champignons parasites du genre candida  
(Ex : Candida albicans)  
CARCINOME : Variété de tumeur cancéreuse  
CHANCRE : Ulcération vénérienne  
CHAPELET COSTAL OU CHAPELET RACHITIQUE : Trouble d'ossification au cours  
du rachitisme donnant des nodosités saillantes aux côtes.  
CHELEITE OU CHEILITE : Inflammation des lèvres  
CHELOIDE : Trouble de cicatrisation donnant à la peau l'aspect de bourrelet  
hypertrophique inesthétique  
CDS : Dispensaire (Centre de Santé Développé) avec quelques lits  
CRANIO-TABES : Ramollissement des os du crâne au cours du rachitisme.  
CREATORRHEE : Elimination exagérée des protéines dans les selles  
CULEX : (Voir Culicidés)  
CULICIDES : Synonyme de Moustiques au sens large englobant les Anophèles,  
les Culex et des Aedes.

## D

- DERMATOPHYTES : Champignons parasites de la peau et des cheveux provoquant la teigne  
DISTOMATOSES : Maladies dues aux distomiens ou douves  
DREPANOCYTOSE : Anémie congénitale due à une hémoglobine anormale de type SS  
DYSPNEE : Difficulté de la respiration au cours des affections respiratoires et cardiaques  
DYSTOCIE : Accouchement difficile quelle qu'en soit la cause.

## E

- ENDEMIQUE : Etat d'une affection qui connaît une transmission permanente dans un secteur géographique donné  
ETIOLOGIE : Cause des maladies  
EXCISION : Ablation des grandes lèvres et/ou du clitoris chez les filles ou les femmes.

## F

- FACIES LUNAIRE : Bouffissure du visage  
FAUNE MALACOLOGIQUE : Faune des mollusques  
FIBROME UTERIN : Tumeur utérine non-cancéreuse  
FILARIOSE : Affection parasitaire due aux filaires  
FLAGELLOSE INTESTINALE : Maladies du tube digestif provoquées par les parasites de la famille des Flagellés : Gardia ; Trichomonas, etc...

## G

- GALE FILARIENNE : Eruption résultant de la surinfection des lésions cutanées au cours des filarioses, et ressemblant à la gale commune.  
GALE SARCOPTIQUE : Gale commune, due à un acarien parasite de la peau : Sarcoptes scabiei  
GINGIVITE : Inflammation des gencives  
GLUCIDORRHEE : Elimination exagérée des glucides dans les selles  
GOITRE : Hypertrophie de la glande thyroïde, par carence d'iode.

## H

- HAVARD 100 % : Courbe de référence de poids maximal chez les enfants en bonne santé de 0 à 5 ans  
HAVARD 80 % : Courbe de référence de poids minimal chez les enfants en bonne santé de 0 à 5 ans  
HEMATOZOAIRES : Nom commun des plasmodiums (agents du Paludisme)  
HELMIPLEGIE : Paralysie complète ou partielle d'une moitié du corps  
HEMOPATHIE : Nom générique donné à toutes les maladies du sang  
HEPATOMEGALIE : Augmentation du volume du foie.

## I

- ICTERE** : Symptôme consistant en une coloration jaune de la peau et des muqueuses ; il est communément appelé jaunisse.
- IDR** : Voir Intradermo-réaction
- IMPETIGO** : Maladie de la peau, contagieuse, caractérisée par la formation de pustules qui laissent échapper un liquide se concrétant en croûtes jaunâtres ; il est dû aux microbes pyogènes
- INFUBILATION** : Fermeture artificielle des grandes lèvres ou du prépuce dans le but d'empêcher les relations sexuelles
- INTRADERMO-REACTION** : Test immunologique cutané, utilisé pour le diagnostic indirect de la tuberculose.

## K

- KERATITE** : Nom générique donné à toutes les inflammations de la cornée.

## L

- LEUCEMIE** : Cancer du sang, caractérisé par une élévation considérable du nombre de globules blancs (leucocytes) dans le sang
- LEUCORRHEE** : "Pertes blanches" chez la femme : écoulement blanchâtre ou muco-purulent en rapport avec une infection vaginale.
- LOASE** : Maladie due à la filaire Loa Loa.

## M

- MALACO-FAUNE** : Voir faune malacologique
- MALACOLOGIE** : Etude des mollusques
- MALADIES ENDOCRINES** : Affections des glandes endocrines (pancréas, thyroïde, hypophyse, ovaires, testicules...)
- MALADIES QUARANTENAIRES** : Nom donné par le règlement sanitaire international à certaines infections (choléra, méningite cérébro-spinale, fièvre typhoïde, variole, peste) qui doivent être déclarées obligatoirement auprès des organismes de santé nationaux et internationaux
- MONOPLÉGIE** : Paralysie complète ou partielle d'un membre
- MORBIDITE** : Caractère de l'état maladif
- MPE** : Malnutrition protéino-énergétique
- MST** : Maladies sexuellement transmissibles
- MYCOSES** : Maladies parasitaires dues aux champignons microscopiques

## N

- NUISANCE** : Caractère nuisible des insectes nuisants
- NUISANTS** : Insectes et autres arthropodes qui ne transmettent aucune maladie, mais nuisibles par leurs piqûres répétées
- NOMA** : Stomatite gangréneuse secondaire à des maladies infectieuses chez les enfants malnutris.

## O

- CEDEME : Infiltration aqueuse des tissus ; au niveau de la peau il se révèle par un gonflement.
- ONG : Organisation Non Gouvernementale
- ORL : Oto-Rhino-Laryngologie.

## P

- PANNUS CORNEEN : Irritation prolongée de la cornée caractérisée par le développement d'un réseau vasculaire à sa surface
- PARASITES SANGUICOLES : Parasites vivant dans le sang pendant une partie de son cycle évolutif :
- PAROTIDITE : Inflammation des glandes parotides (ex :: oreillons)
- PERLECHE : Ulcération des commissures des lèvres traduisant une carence vitaminique
- PHANERES : Terme générique désignant les productions épidermiques apparentes telles que les ongles, les poils, les cheveux, (et les cornes chez les animaux)
- PEV : Programme élargi de vaccination
- PIAN : Maladie contagieuse due à un germe de la même famille que celui de la Syphilis, donnant des lésions cutanées framboisées à surface granuleuse appelées pian
- PMI : Protection maternelle et infantile
- POLYDIPSIE : Soif intense
- POLYURIE : Mictions abondantes et fréquentes
- PONDERAL : Relatif au poids
- PRURIGO : Eruption caractérisée par des papules assez volumineuses recouvertes de croûtelles noirâtres.

## R

- RAA : Rhumatisme Articulaire Aigu
- RASH : Eruption superficielle et transitoire de la phase d'invasion des maladies éruptives
- RHEOPHILE: Qui affectionne les cours d'eau à courant rapide.
- RHINOPHARYNGITE : Association du rhume et de l'angine.

## S

- SESA : Santé de l'Enfant du Sud et de l'Adamaoua. C'est une ONG américaine ayant pour mission d'assister les services provinciaux et départementaux de médecine préventive en matière d'éducation pour la santé, les SSP et la PMI
- SIDA : Syndrome d'Immuno-Déficience Acquise
- SPLENOMEGALIE : Augmentation du volume de la rate
- SSP : Soins de Santé Primaires
- STOMATITE : Inflammation de la muqueuse buccale
- SYNDROME : Ensemble de symptômes qui caractérisent les maladies.



## **T**

**TRACHOME** : Maladie contagieuse de l'oeil donnant des granulations dans les culs-de-sac conjonctivaux, avec inflammation de la conjonctive

**TREMATODOSES** : Maladies transmises par les trématodes (douves et schistosomes).

## **U**

**URETHRITE** : Inflammation de l'urètre souvent causée par des infections vénériennes gonococciques ou non-gonococciques.

## **V**

**VAGINITE** : Inflammation de la muqueuse vaginale.

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**FEASIBILITY STUDY  
ON  
MEMVE ELE HYDROELECTRIC POWER  
DEVELOPMENT PROJECT**

**APPENDIX IV ENVIRONMENTAL ASPECTS**

**ANNEX III  
INFRASTRUCTURES AND ECONOMIC ACTIVITIES**



**FEASIBILITY STUDY  
ON  
MEMVE ELE HYDROELECTRIC POWER DEVELOPMENT PROJECT  
FINAL REPORT**

List of Report

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**FEASIBILITY STUDY  
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**SUMMARY -  
CONCLUSIONS - RECOMMENDATIONS**





## **SUMMARY - CONCLUSIONS - RECOMMENDATIONS**

### **INTRODUCTION**

The Memve Ele dam and reservoir will submerge the following variable areas:

- 7,600 ha along the Ntem river and its tributaries (Biwoumé and Ndjo'o rivers) in the Alternative of maximum water level (El. 400 - 405 m);
- 2,800 ha along the Ntem river only in the Alternative of mean water level (El. 395 - 400 m);
- 1,900 ha along the Ntem river only in the Alternative of optimum water level (El. 392 - 393 m).

Consequently the structure will have an impact on the human establishments, infrastructures and economic activities at varying levels in the villages and hamlets of the following 2nd degree chieftainries:

- West Mvaye ( Mvaye Ouest) in the Ma'an district (1,232 inhabitants in 33 hamlets on the right bank of the Ntem river);
- Ntoumou Bend (Boucle) of the Ntem river in the Ma'an district (313 inhabitants in 16 hamlets on the left bank of the river);
- Ebenmeyong in the Camp district (54 inhabitants in 5 hamlets on the right bank of the Ndjo'o river).

Thus, a total of 1,600 inhabitants from 281 families in the area under the direct influence of the planned reservoir will be affected.

### **I. IMPACTS OF THE DAM**

The following impacts were identified during the field investigations in 1992:

#### **1.1 Impacts on Houses**

- At El. 405 m, 147 houses of various types will be affected;
- At El. 400 m, 31 houses should be moved;
- At El. 395 m, 9 houses will be affected and should be moved as a precaution.

The above houses are mostly located on the right bank of the Ntem river in the West Mvaye chieftainry where the majority of the population under the direct influence of the dam is living.

## 1.2 Impact on Crops

The following areas of cash crops and food crops will be submerged:

Crops	El. 400 m	El. 395 m	El. 392 m
Cacao plantation	53.2 ha	35.9 ha	16.5 ha
Food crops	96.4 ha	65.3 ha	53.8 ha
<b>Total :</b>	<b>149.6 ha</b>	<b>100.9 ha</b>	<b>72.3 ha</b>

Therefore, at any alternative water levels considered, a substantial number (more than a third) of inhabitants in the area will be affected, their customs and living conditions will be considerably disturbed, while the incomes from agricultural production and other supplemental sources (fishing and hunting), estimated on an average at F 508,000/year/household, would hardly ensure self-sufficiency of most families.

## 1.3 Impact on Infrastructures and Collective Facilities

Regardless of the alternative water levels, the reservoir will have negative effects on the Nyabessan-Akom section and several points of the existing Provincial Road No.41 and will badly affect the footpaths and river crossing structures on the Ntem river. Besides, the wells in many hamlets will be submerged. Some churches and one school will be affected at El. 405 m but no socio-collective facilities will be involved at El. 400 m and 395 m.

## 1.4 Impact on Other Sectors

If fishing, which is an additional source of income for most families, will expand following the reservoir filling, the fauna which has already been affected to a large extent and the forest will suffer from a non negligible pressure owing to a reduction in the exploited areas. The reservoir will submerge many interesting and highly marketable species of high value if protection measures are not taken.

## 1.5 Impact on Socio-demographic Condition

The region will witness a demographic increase linked to activities of construction of the dam the disclosing and future openings which may disturb the present low socio-political structuration while having, however, positive effects on the constitution of family ties, the employment of youth and women's activities.

## 2. COMPENSATORY MEASURES

The compensatory measures assessed are essentially geared towards re-establishing and reinforcing production potential in order that the populations of the zone be able respond urgently to the ever increasing demand in farm products and should not be consequently in agony.

### 2.1 Compensations

The population's properties to be compensated represent the most important compensatory measures. They will be subject to a more detailed evaluation by specialized technical and administrative commissions to be created immediately after the final design of the dam has been decided and the construction works have started. In the present study, assessment has been made to suit adequate remuneration of activities and the normalization of the people's lifestyle in the context of the present economic crisis. It is probable that, in spite of the low living

standard of these people, new investments will be made in the short and long terms for compensable properties and, therefore, these will need to be inventoried.

## **2.2 Resettlement and Supporting Infrastructures**

The villages which will be completely or partially affected will be relocated according to a certain number of criteria:

- availability of accessible lands;
- clannish and ethnic affinities;
- water supply;
- links with the affected lands where some farms will remain;
- willingness of the people to move out.

Three sites were consequently identified: One site at Aloum at the crossing of the dam in the direction of Melen 2 for relocation of the hamlets in Aloum; one site at Nyabessan for the hamlets depending on this chieftainry; and one large site in the north of Nhemeyong with unlimited potentialities to accommodate most of the relocated hamlets from the right bank in the case the maximum water level alternative is adopted, or to be used for farming in the case the mean and low water level alternatives are retained.

These sites will be prepared and provided with practicable paths and adequate collective facilities. A program of rehabilitation and restoration of infrastructures in the whole area was formulated and assessed for its smooth implementation.

## **2.3 Agricultural Development**

The envisaged program aims at solving the numerous constraints to the restoration of the potential and the growth of this vital sector in order to enhance the local economy. The program consists of the following:

- Improvement of the production systems (cacao, food crops, home gardening) through modern techniques suitable to the forestry ecology ;
- Supply of inputs required for the restoration of the potential ;
- Guidance on production through the organization and training of production groups;
- Granting of various forms of loans (FIMAC, namely).

## **2.4 Fishing**

The envisaged projects and programs aim at adapting this activity to the new constraints within the area and its possible development through appropriate measures of control and management of stocks. These include :

- Construction of fishing channels and piscicultural sites;
- Fish cultivation in the stretches of water created;
- Construction of a fishing station or centre for organization and guidance of local and immigrated fishermen ;
- Establishment of a research agency to support the above actions and to study the changes in this particular area in the short and long terms;

- Construction of wharves before water filling of the reservoir in order to ensure proper and modern management of the fishing equipment;
- Communal or private initiatives for rational marketing of products (cold storage, sales houses), of which financial viability will be studied by the supporting agency.

## **2.5 Hunting and Forests**

These two sectors should be given a particular attention in the strategy of environment protection which should be implemented in parallel with the commissioning of a structure of such a scale. This involves actions concentrated on:

- protection of the species of value in the submersible forest area;
- education and training of riverside dwellers on management of natural resources;
- establishment of regulations and reinforcement of control on hunting, which require the assignment of personnel in charge and adequate facilities;
- delimitation of affected and/or protected areas;
- supporting studies required for an adequate follow-up of the conditions and developments in the area.

## **2.6 Structures in charge of Project Components - Creation of a Structure for Resettlement and General Development of the Area**

The sectorial programs could be implemented satisfactorily only if the various administrative and research structures and agencies concerned are equipped with adequate facilities, because the following are noted:

- insufficient promotion of traditional production sectors in the area;
- lack of logistic facilities;
- lack of communal organization of the people into active groups;
- limited services of SODECAO, and non existence or limited services of Non Governmental Organizations (NGO) and missionary organizations.

Due to the above conditions, it is judged that, for the resettlement and implementation of directly related projects, a light structure should be in charge of the coordination and monitoring of various operations, because their smooth execution will constitute a requisite for a prompt restoration and development of the potential of the area in a coherent and stimulating manner. The formation and integration of farmers into these programs and the change of their mentality are the basic requirements to ensure the success of the programs. These measures could not be implemented efficiently by the traditional structures if they are not highly motivated.

## **3. EVALUATION OF COMPENSATORY MEASURES AND DEVELOPMENT OPERATIONS - RECOMMENDATIONS**

The costs of compensatory measures and operations required for the development of the area under the project impact are estimated by alternative as follows:

- CFA.F 827,420,000 for the Alternative of maximum water level;
- CFA.F 470,300,000 for the Alternative of mean water level;

- CFA.F 322,520,000 for the main Alternative

According to the result of an analysis of the costs, which are shown in detail in the table below, the following are to be noted:

- Although the compensations and resettlement constitute the operations to be directly undertaken by the project implementing agency, these should be integrated into a development policy for the whole area under the project impact, taking into consideration the anticipated socio-economic disturbances and developments resulting from the dam construction;
- The most important costs are those for compensation and resettlement; they therefore require an urgent mobilization of funds;
- The operations will require the participation of various parties and will be carried out during a period of six (6) years (3 years before water filling of the reservoir and 3 years thereafter).

Consequently, the following are recommended to be implemented by the project executing agency:

- To associate with the technical ministries involved and make them sensitive to the studies to be conducted and the role they have to play in the short term;
- To contact or approach the missionary organizations, NGOs or organizations of volunteers to get them involved in the identified activities;
- To progressively implement the envisaged environmental conservation measures (related to forests, fauna, etc.) by the agencies concerned and to subsequently provide training to the riparian population.

**BREAKDOWN OF COSTS BY ALTERNATIVE**

Project Components	Maximum W.L. Alternative	Mean W.L. Alternative	Main Alternative	Remarks Organizations in charge
<b>I. COMPENSATIONS</b>				
1.1 Houses	345.34	171.48	90.25	(*) CLIR + MINUH
1.2 Cacao plantations	112.37	28.23	7.51	CLIR + MINAGRI
1.3 Fruit trees	103.89	72.45	35.94	CLIR + MINAGRI
1.4 Food crops	2.80	0.60	0.20	CLIR + MINAGRI + MINAT
1.5 Socio-collective infrastructures (school, churches)	64.80	52.00	28.40	CLIR + MINUH + MINEDUC
1.6 Study	43.28	0.00	0.00	SONEL + CLIR
1.7 Compensation and resettlement commissions	15.00	15.00	15.00	SONEL + CLIR
	3.20	3.20	3.20	
<b>II. RESTORATION/COMPENSATION</b>				
2.1 Wells	97.42	60.20	24.15	MINAGRI/Communal Development
2.2 Roads	17.50	7.50	7.50	MINTRAVAUUX PUBLICS (PW Min.)
	79.92	52.70	16.65	
<b>III. RESETTLEMENT</b>				
3.1 Roads and footpaths	100.99	26.87	3.00	MINTRAVAUUX PUBLICS (PW Min.)
3.2 Schools	28.62	25.92	3.00	MINEDUC
3.3 Wells	52.44	0.00	0.00	MINAGRI/Communal Development
3.4 Land preparation	5.00	0.00	0.00	CLIR + MINUH
	14.93	0.95	0.00	
<b>IV. IMPROVEMENT OF POPULATION'S CONDITIONS</b>				
	14.50	14.50	14.50	MINAGRI/Communal Development
<b>V. AGRICULTURAL DEVELOPMENT</b>				
5.1 Guidance/Training	18.80	18.80	18.80	MINAGRI + MISONEL
5.2 Nurseries	16.20	16.20	16.20	MINAGRI
	2.60	2.60	2.60	
<b>VI. FISHING</b>				
6.1 Construction of fishing channels	139.37	67.45	60.82	
6.2 Fish cultivation in created water areas	23.83	8.78	5.95	MINEPIA - MINREST
6.3 Construction of a fishing centre & a fishing station	9.30	9.30	9.30	MINEPIA
6.4 Construction of fishing centre	15.67	0.00	0.00	MINEPIA
6.5 Construction of wharfs	8.25	8.25	8.25	SONEL
6.6 Cold storage facilities	15.00	0.00	0.00	Private or Fishermen Cooperative
6.7 Sales houses	1.32	1.32	1.32	Communal or Fishermen Cooperative
6.8 Development of sites of fishing villages	66.00	39.80	36.00	CLIR + MINUH - MINEPIA

Project Components	Maximum W.L. Alternative	Mean W.L. Alternative	Main Alternative	Remarks Organizations in charge
VII. FOREST, HUNTING	31.50	31.50	31.50	
7.1 Reinforcement of hunting control	7.50	7.50	7.50	MINTOUR - MINEF
7.2 Studies and research	24.00	24.00	24.00	MINREST
VIII. STRUCTURE OF COORDINATION AND MONITORING	79.50	79.50	79.50	SONEL
8.1 Staff	54.00	54.00	54.00	
8.2 Accommodation	5.70	5.70	5.70	
8.3 Secretariat/Animation	4.80	4.80	4.80	
8.4 Vehicles	12.90	12.90	12.90	
8.5 Miscellaneous	2.10	2.10	2.10	
Total	827.42	470.30	322.52	

\* CLIR: Local Compensation and Resettlement Commission





## **INTRODUCTION**



## **INTRODUCTION : BACKGROUND, CONTEXT, TERMS OF REFERENCE AND METHODOLOGY OF STUDY**

### **A) BACKGROUND AND CONTEXT**

The Socio-economic Impact Studies of the Memve Ele Dam entrusted to SEDA (Société d'Etudes pour le Développement de l'Afrique) by a letter-order JT/GM/SERAH/No 015016 of June 29 1992 by SONEL are part of the preliminary studies within the framework of feasibility study of the hydroelectric dam on the Ntem river at the waterfalls called Memve Ele. These preliminary studies were identified in the "Preliminary Analysis Report on the Initial Condition of the Environment, Recommendations and Specifications for Continuation of the Impact Study" JICA, Tokyo, Japan, October 1991.

The Memve Ele Project is in line with SONEL's objective of ensuring a balance between demand and supply in all the regions of Cameroon through :

- Investigation and development of new sites with large hydroelectric potentials;
- Substitution of thermal energy for hydroelectric energy, within the limits of demand and possibilities;
- Interconnection of the national power network in the medium term, in order to cover the demand of rural and urban areas.

This project is also integrated in the general and macro-economic context of the national development policy, on the one hand, and in the regional development framework, on the other hand, namely through such projects as:

- "Development of the border area of Ambam", presently Department of Valley of Ntem, for which studies were carried out during the 6th development plan;
- "Development of Southern Coastal Area of Cameroon", of which the most important projects under implementation or being identified include the following:
  - Agro-industries (Hevecam and Socapalm)
  - Deep water port at Kribi (Grand Batanga)
  - Development of forestry resources in wood
  - Exploitation of iron mineral in the "Massif des Mamelles".
  - Preservation of certain fauna and flora reserves which have important potential in this area.

### **B) TERMS OF REFERENCE**

According to the Terms of Reference attached in Appendices, the works entrusted to SEDA include:

- Preparation of a sectorial diagnosis of the initial condition of the environment, in particular the economic activities ;

- Study and analysis of the impacts of the dam on the environment and mainly on production structures;
- Evaluation of the costs of compensations and compensatory measures with a view of restoring and improving the production potential.

### **C) METHODOLOGY OF THE STUDY**

#### **i) Assumptions and Basic Topographic Maps and Data Referred to in Work Execution**

The surveys conducted by SEDA were based on the following assumptions:

- Maximum water level Alternative: The dam will be built downstream of the confluence of the Biwoumé and Ndjo'o rivers and the Ntem river. The impacts on human establishments were inventoried at El. 400 m for crops and at El. 405 m for houses;
- Mean water level Alternative: The dam will be built on the Ntem river, downstream of Nyabessan. Evaluations were made for crops at El. 395 m and for houses at El. 398 m;
- Minimum water level Alternative: The dam will be built at the same site as above and evaluations were made crops at El. 392 m and for houses at El. 395 m.

The maps prepared by the Société de Topographie et Services (STS) from topographic survey on the scales of 1:10,000 and 1:5,000 indicate sufficiently the contour lines at El. 395, 400 and 405 m, and identify the villages and farms that would be affected within these contour lines, especially those under El. 400 m which is considered as a safety level in the maximum alternative. These STS's topographic maps were referred to in supplement to the following IGN's maps obtained from ONADEF:

- Maps of Kribi on a scale of 1:5200,000;
- Topographic maps of Nyabessan 2D and 2C on a scale of 1:50,000.

Moreover, SEDA supplemented the STS's maps by adding the locations of cacao plantations which were omitted and used an enlarged map on a scale of 1:100,000 from the 1:200,000 scale map of Kribi obtained from CGN for plotting some data.

- The aerial photographs used by ONADEF for forestry inventory could not be obtained.

#### **ii) Investigations and Borings**

To comply with the stipulations in the Terms of Reference, SEDA carried out the following surveys and investigations:

- Agro-socio-economic survey on 50 family heads;
- Food crop production survey on 50 working women;

- Systematic survey on cacao plantations by questionnaire, which enabled to supplement the insufficient details indicated in the STS's maps and to analyze the economy of cacao production in the villages located within the impact area;
- Survey on twenty (20) hunters and forty (40) fishermen through semi-official meetings;
- Interviews of administrative and traditional and technical agencies concerned in the area.

Besides, SEDA also carried out:

- Borings, sampling and reconnaissance of sites in the biotic and abiotic aspects in order to collect necessary data for studies on fishing, pedology, and infrastructures.



**I. CONDITION AND DIAGNOSIS  
OF INFRASTRUCTURES  
AND ECONOMIC ACTIVITIES**





# **I. CONDITION AND DIAGNOSIS OF INFRASTRUCTURES AND ECONOMIC ACTIVITIES**

## **1.1 LOCATION AND AREA OF THE STUDY AREA**

The study area lies between latitudes 2°20 and 2°30 North and longitudes 10°20 and 10°30 East. It stretches to a large extent on the newly created Department of Valley of Ntem (West boundary of the Ma'an sub-district) but also on the Ocean division (East boundary of the Campo sub-district on the Biwome). It is located at 10 km West of Ma'an, at the end of the Provincial Road No.41 (Meyo-Centre - Nyabessan). It covers an area of 52.00 km<sup>2</sup> with its longest extension over 15 km in the West-East direction from Nyabessan to NSEBITO along the divisional road 41 on which the human establishments (most) are concentrated.

The location map of the study area is shown in the next page.

## **1.2 LOCAL ADMINISTRATIVE FRAMEWORK**

### **1.2.1 Uneven Population Distribution**

The impact zone of the project is characterized by the juxtaposition of empty zones and zones of low and average density. With an area of 2,436 km<sup>2</sup> the present density of the population of Ma'an district would be only 5 inhabitants per km<sup>2</sup> as against an average of 10 inhabitants/km<sup>2</sup> for the whole of the former Ntem division which covers 16,000 km<sup>2</sup>. The regional South-West 1 Atlas of ORSTOM shows that:

- In the Mvaye-West canton (district), 159 km<sup>2</sup> only are inhabited out of the 599 km<sup>2</sup> of the canton. The area of 440 km<sup>2</sup> situated north of Nyabessan-Assenf axis is therefore virtually uninhabited.
- In the Ntem Bend district, 593 km<sup>2</sup> would be inhabited out of the 969 km<sup>2</sup> of the canton 376 km<sup>2</sup> located south-west of the district and of the canton are uninhabited.

The population densities in the inhabited areas are as follows:

- 8 inhabitants/km<sup>2</sup> in the Mvaye canton; and
- 1 inhabitant/km<sup>2</sup> in the Ntougou Ntem Bend canton.

These densities are therefore particularly low though the dense occupation of space on the Nyabessan-Asseng-Ma'an road can in the first place call for illusion.

### **1.2.2 Socio-political Organization and Land System**

The Government has adopted the traditional organization of the society for structuring and framing the population as discussed in Annex 1: Institutional Context, Environment and Anthropology.

The 2nd degree and 3rd degree chiefs are generally elected and then confirmed by administrative authority to whom they are the main auxiliaries in the collection of taxes, the application of instructions and government directives in what concerns development and sensitization and mobilization of the populations.

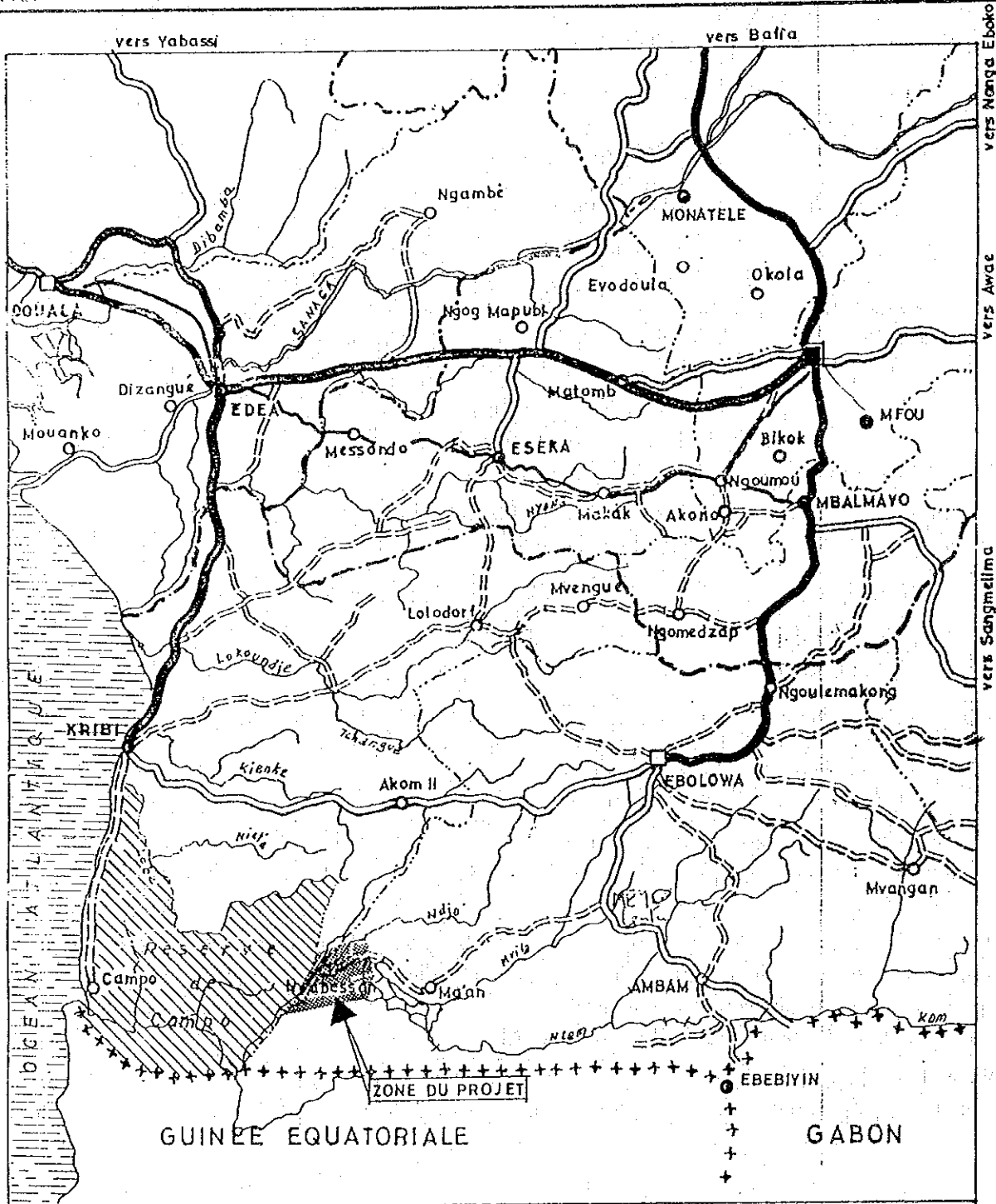
We notice however that in spite of this hierarchy the chiefs have no real moral authority over their people and consequently they remain equal to the other family heads in the traditional

# Location Map

ECHELLE: 1/1 500 000

## LEGENDE

- |         |                       |   |                            |       |                          |
|---------|-----------------------|---|----------------------------|-------|--------------------------|
| ++++    | Limite d'Etat         | ■ | Capitale politique         | ———   | Route principale bitumée |
| - - - - | Limite de province    | □ | Chef-lieu de province      | ———   | permanente               |
| .....   | Limite de département | ● | Chef-lieu de département   | == == | secondaire               |
| ▨       | Zone du projet        | ○ | Chef-lieu d'arrondissement | ———   | Voie ferrée              |



system management of space and the family patrimony. Also, the solution to any problem in the clan or tribe must be found by a consensus in the clan or tribe council; in case of persisting disagreement, the case is forwarded to the customary court at Nyabessan or to the Court of first instance of Ebolowa or Abam. The role of these chiefs in the mobilization of the local human resources is up to date very negligible: no important development action was recorded during the investigation, most probably because of the enclavement of the zone and its low development.

The traditional land system is a reflex of this socio-political organization: the land patrimony is managed by the head of family who knows the limits of his lands (farms under production and fallow) and organizes the crop exploitation, hunting and picking. In this system, the virgin lands (primary forests) are a common property of the clan and the tribe which exploits it essentially for hunting, picking and possibly for creating new cacao plantations.

### 1.3 ECONOMIC AND SOCIAL INFRASTRUCTURES

#### 1.3.1 Roads and River Crossings

Access to the project zone is done only by secondary road 42 from the main town of the Ma'an district up to Nyabessan. Therefore there is no road network, since the zone is cut from the rest of the country. This road which is passable in all seasons, serves all the villages along the right bank of NTEM whereas those along the left bank are linked among themselves, to the rest of the zone and to Equatorial Guinea, only by the help of footpaths.

The only road MA'AN-NYABESSAN is by this moment receiving a simple reshaping.

The crossing of the Ntem at the level of Nyabessan is done by canoe against payment. For topographic reasons the left bank is characterized by a flooded zone which requires the construction of a footbridge of about 70 m.

#### 1.3.2 Schools

The Ma'an district has 24 full primary schools with 5 in the study zone. The school at Aloum I does not function due to lack of pupils. The following table shows the number in the 5 schools.

Schools	1991 - 1992	1992 - 1993	Teachers
Melen	-	-	2
Nyabessan	142	120	3
Allen II	90	82	2
Nemeyong	61	54	3
Tom	59	82	3
<b>Total</b>	<b>352</b>	<b>338</b>	<b>13</b>

Apart from the school in Nyabessan constructed in 1973 by the Government, all the other schools are built by the population. The Presbyterian Orthodox school of Tom and its branch of MELEN have mat roofs whereas the walls are made of corrugated iron sheet. In a whole, the classrooms are in temporal materials without tables. The children sit on pieces of woods supported by short pegs sunk into the ground. There are also no adequate blackboards.

Generally these schools have only three classrooms for the whole cycle; this brings about cohabitation of two classes in the same hall, thus obliging the teacher to handle two classes

each. This insolvency adds to that of didactic material (chalk, textbooks, exercise books) for the teachers who don't have houses. For religious schools, salary delays have reached two years due to non-payment of subsidies by the Government and due to parents' incapacity to pay the fees which have been reduced from 7,000 F CFA to 2,000 F CFA.

In spite of all these loopholes, the rate of schooling is high (nearly 90% of the mass at school age for the entire district) and also the rates of success in the trance examination into colleges (66%) from the 1991 - 1992 school year. Although girls are married at an early age, their number in schools is still large than boys.

Finally, we see that;

- there is a satisfactory spatial distribution of schools
- there is interest by the parents to send their children, both sexes to school.
- there is an inadequate school infrastructure
- there is an insufficient teaching staff.

### **1.3.3 Water Supply**

The region under study is characterized by a potential of hydraulic resources. In effect, the zone is drained by the Ntem, Biwome, Ndj'u'o and their multiple tribe. Moreover, this zone lies on a calco-magnesium complex which constitute a good water reservoir. Thus water is available and only needs to be mobilized.

The population get their water from marshland or from rivers like Ntem. The AFVP (Association Française des Volontaires du Progrès), (French Association for Voluntary of Progress) in 1988 had to construct open wells in certain villages. The only way to draw water was by buckets. These wells are located either in the courtyards or in the swampy areas. Generally, the wells in the courtyards with rectangular curb stone do not function throughout the year due to the fact that they are not quite deep, about 10m. More they are not entirely channeled.

In a whole, though the region has a good potential in water, the population consume poor quality water containing parasites. Efforts to the end must be in line with the rehabilitation of the wells by concrete casing, increasing the depth and the setting up of manual pumps.

### **1.3.4 Sanitary Infrastructures**

The Nyabbesan health center is already in an advance state of disrepair. The staff, with only one qualified nurse, has reached retirement age. This health center is practically non operational as it is unable to carry out its basic obligations that is ; minor surgeries, prenatal consultations, health education and the creation of health villages. For it to function again, there is need to repair the buildings, transfer sufficient and qualified staff there, equip the center with materials and drugs that are compatible to a developed health center and to diseases and illnesses existing there or foreseeable ones (see DCEAC and Center Pasteur Study going on).

### **1.3.5 Other Infrastructures**

The rest of the social infrastructures is summarized in six chapels between Nyabessan and Tom of the Protestant churches and an agricultural post. There is no constructed market except at Nyabessan where there is an open shed set up by the marketing of cacao and it is also used presently by foodstuff sellers.

### 1.3.6 Housing

Traditional houses are the grouped type: huts and houses are arranged in a semi-rectangle around a central spot generally opening towards the road; on this spot here's an ABA'A (guardhouse) which is always and is predominating. This guardhouse is the meeting place for members or heads of family for meals, discussions and ceremonies and especially for relaxation.

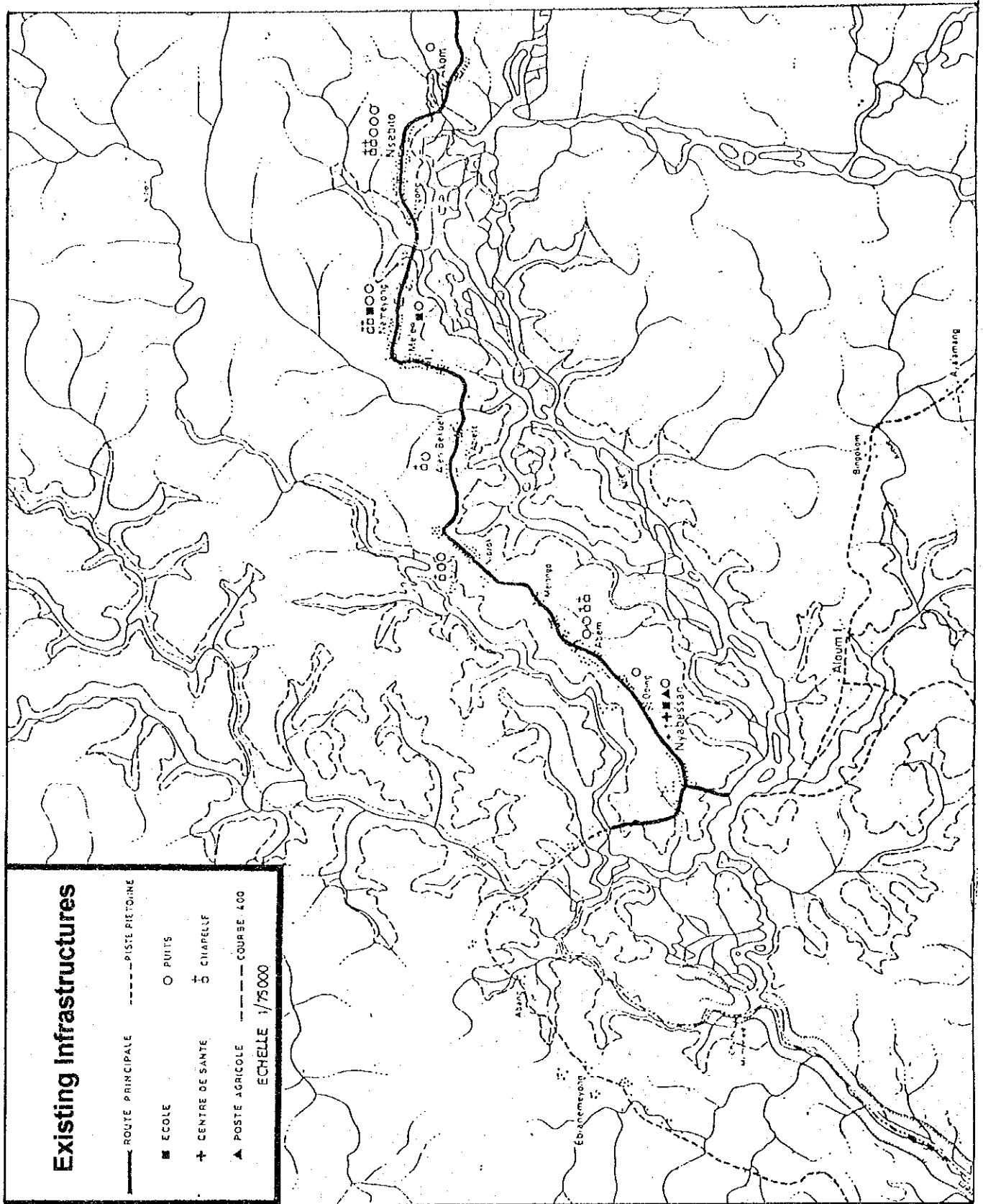
The modern type of linear housing along the road is also found in the pre-urban center of Nyabessan and in some big villages (Nsebito, Nnemeyong etc.).

These two types of housing are often found in all the villages in the zone in the same village and hamlet.

The huts are generally in *poto-poto-* (mud) or semi-block (reinforced with cement) with zinc roofs. Meanwhile roofs in raffia mats are still wide-spread in certain villages. One also notices houses in *bond stones* or in *earth blocs* belonging to some elites or retire persons and houses built with planks.

The typology of housing will be analyzed in a further chapter of the compensation norms.

The existing infrastructures described above are shown in the following map.



## 1.4 AGRO-PASTORAL ACTIVITIES

Since the present study aims at formulating agricultural development strategies, this chapter diagnoses the production system in order to bring out the problems and constraints that affect the system.

### 1.4.1 Factors Governing the Farming Systems

#### 1.4.1.1 Geomorphology and Pedology

##### a) Physiography and Geomorphology

Generally, the study zone is a zone of depression below 400 m. altitude surrounded by rough landscape with variable slope ; the altitudes are close to soon in the East and 600 m in the West of the zone. The hydrographic network which is very thick cuts the relief into many sections separated by thalwegs that are more or less large. This generates the forms of model of landscape defined below:

- The Semi-orange model : at the summit of "1/2 oranges" the floors are thick with a coarse profound horizon are sometimes thin. On low slope hillsides, the rough horizon is thicker and one notices an inclination with a cementation shell. On the high slope hillsides, there are real concrete masses, more of ferruginous pieces of works. This type of model is found at Nsebito towards river Ndjo'o.
- The model with a convex-concave crossing profile frequently found in the zones of Akom and Tom is characterized by : generally thick floors in a plateau position ; on high slope we notice a rough horizon close to the surface or outcropping. Below the slope is found a floor but with a coarse horizon close to the surface.

##### b) Pedology

The aim of this study is to inventory the main potentials and constraints related to soils which will be taken into consideration in the recommendations.

##### i) Pedological Prospecting

Field works were done between the 20th and the 30th of October 1992. They consisted of :

- A rapid coverage of the periphery passing through the main access roads of major penetration in a way to have a general idea of the topography, morphology, vegetation, occupation and distribution of the main lands,
- observations by hand boring (one or two boreholes per km<sup>2</sup> depending on the topography) along the roads to appreciate the physical characteristics of the soils. The chemical characteristics used for classification come from 1984 study mentioned above.

#### 1.4.1.2 Soil Classification

Two classes can be identified in this area: the group of ferralitic soils and the group of hydromorphic soils.

a) Hydromorphic soils (III)

The soils occupy the low-bottoms in a non significant manner. The largest unit is localized between the Ntem, Aloum and Melen. These soils are characterized by a poor drainage (spots of hydromorphy appearing immediately after the first 40 cm). The humiferous horizon has the gray color and the texture is sandy-alluvial, under which there is a beige alluvial-clayey horizon with clayey-sandy. Lastly there appears a gray horizon with clayey texture dotted with numerous brown spots. The chemical aspect show a high standard of organic matter in the surface (2 to 3 %), a slightly variable pH between 5 and 5.5 an exchangeable tenor in base, very low (0.7 meg/100g of soil) in the surface, a low cationic exchange capacity (16 meg in the surface and 7 meg in its depth).

These soils are classified as less humiferous hydromorphic soils with surface pseudogley or Dystic Gleysols.

b) Ferralitic soils

They occupy almost the entire zone and belong to the sub-group of the fairly saturated ferralitic soils in (B) typical yellow according to classification C.P.C.S (Ferrasoils for FAO classification and Typic Haplorthox for USDA classification). They generally characterized by an acid pH (4 to 5), a number of low exchangeable bases (1 to 3 meg/100g of soil) and degree of average saturation of 20 to 40%. Morphologically they are very deep soils (more than 1.20m). The organic matter is high (2%) and well decayed. The tenors in clay are generally high (40 to 60%), the tenor in sand is also high (40 - 50%) and the silt is never above 15%. The gravels in variable proportion are composed of quartz grains of these ferruginous concrete masses.

According to the slope, this group can be divided into two sub-groups:

- the soils with flat topography (slope inferior to 8%) (I) which are predominant in the area;
- soils with undulated to hilly topography (slopes of over 8%) (II) mostly extending on the right bank of the Ndjo'o river.

The suitability to farming of the lands in the study area based on the results of a pedologic study conducted in 1984 in Amban area is described in the Appendices.

**1.4.1.3 Vegetation**

The project area is part of the thick and humid evergreen Guinean-Congolese forest sector. According to farmers' information, there are trees and bushes that indicate the productive capacity of the land, such as:



Local Name	Scientific Name	Family
Species showing good soil fertility:		
Akouk	<i>Alstonia bronei</i>	Apocynaceae
Akom	<i>Terminalia Superba</i>	Combretaceae
Ayous	<i>Triplochiton scleroxylon</i>	Sterculiaceae
Eteng	<i>Pycnanthus angolensis</i>	Myristicaceae
Duma	<i>Ceiba pentandra</i>	Bombaceae
Abang (Iroko)	<i>Milicia excelsa</i>	Moraceae
Atol	<i>Ficus Mucoso</i>	Moraceae
Sissongo	<i>Setaria anceps</i>	Gramiceae
Asseng	<i>Musanga cecropoides</i>	Moraceae
Melen	<i>Elaeis guinensis</i>	Palmaceae

Species showing poor soil fertility:

Elon	<i>Erythrophleum ivorensis</i>	Cesalpinaceae
Ewome	<i>Coula edulis</i>	Olaceae
Akole	<i>Ficus exaperata</i>	Moraceae
Bongo	<i>Fagara macrophylla</i>	Rutaceae
Ebebeng	<i>Phyllantus discodeus</i>	Euphorbiaceae
Engkokom	<i>Miryanthus arbereus</i>	Moraceae

## 1.4.2 Farming Systems and Techniques, Crop Rotation and Cropping Pattern

### 1.4.2.1 Food crops

The system of associated crops is practiced in the whole zone and the only technique of restoration of fertilizer is fallow. No artificial intake (fertilizer, pesticide, herbicide) is used in the farms and preparation of the land is generally done with manual tools; (machetes, axes, hoes) but in certain cases, chain saws do the work of felling at the price of 30,000 FCFA per hectare. Sowing follows directly after felling without labor and the rotations are as follows:

- from virgin forest:
- clearing and systematic felling of the forest followed by burning;
- setting up on the same piece of land and at the same moment:
- ground nuts (vegetative cycle 3 to 4 months);
- yams (vegetative cycle 8 to 10 months);
- cassava (vegetative cycle 18 to 24 months);
- maize (vegetative cycle 4 months);
- cocoyam (vegetative duration about 18 months with suckers; can occupy land for 5 years).
- After the harvesting of ground nuts and maize, cocoyams, cassava and plantain remain in place and because of the time lag of their maturity, they are harvested tree and tree and

day after day, in relation to the need for consumption of the family. In effect, there is no global harvesting of these three plants and the only means of storage for the tubers is the ground.

- Progressively, the forest invades the land again due to non maintenance and becomes progressively impenetrable

Another variant and most spread consists of setting up the squashes in the first season of the crops simultaneously with yams.

In the second season of the crop the land is well cleared and one finalizes the crops of variant 1 and the same process begins again.

Considering the climatic regime which favors two planting seasons a year, a similar piece of land is set up in the second rainy season (August - September) especially on old follows. If one keeps in mind the large variability of the vegetative cycles of the different cultivated plants, each woman of the female peasant production unit must head at the same time (by rotation), for instance in September - October 1992:

- the first cycle land, set up in March - April 1992 on which the woman has just finished the harvesting of squashes or maize and groundnuts and has planted groundnut, maize, cocoyam, cassava, plantain and vegetables.
- the second cycle land of the preceding year, set up in August-September 1991, where she regularly harvests some cocoyams and cassava to feed the family.
- the second cycle land of 1990, where a few heads of cassava still remaining are invaded by the first growth of forest. This land is therefore going to be abandoned, except a few items of plantains.
- the first cycle land of 1990, becoming more and more impenetrable. This land is practically abandoned and the woman who had ensured planting comes there only to harvest ready plantains. This piece of land will be for at least 10 years before any crop is planted if the woman cannot have a cleared land in the forest.

#### 1.4.2.2 Cacao planting

Parallel to food crops, certain works are undertaken to maintain and especially to harvest in the existing cacao farms. It is important to note that when the price of cacao was attractive the crop was given a prime place. Cacao farming is generally done in mono-farming, that's cacao is not mixed up with other crops except for a few shedding forest trees and a few fruit trees (Kola nut tree, "Ndo'o", Plum tree...).

This crop grows without the use of modern inputs except for phytosanitary which benefits from the services of (Société de Développement du Cacao (SDECAO)).

#### 1.4.2.3 Home gardens

These are farms situated nearby the houses. Here, various crops are planted on small areas and along a line of domestic fruit trees (plums, mango, citrus, papaw trees).

#### 1.4.2.4 Systems of land use

A system of utilization of land is generally defined as the manner of distribution of the different vegetation and animal species in a farm and the way they succeed each other in the same land.

Considering the environmental, socio-economic and agricultural characteristics described earlier, the land use can be classified into the following three systems: fallow system, home garden system, and cacao system.

#### i) Fallow system

This system is to use various land parcels of a family in rotation continuously or uncontinuously. In fact, it consists of a succession of annual and perennial crops, otherwise associated, and of fallow on the same land. It can be divided into 2 sub-systems:

- sub-system of very long time fallow: the fallow period is above ten years. The forest is cleared and the tall trees must be felled; after the burning, crops are planted in association. In some cases, squash is planted as first crop and the other crop (two years for cassava and two to three years for plantain) the last is left in fallow for at least ten years.
- sub-system of long time: this is practiced by families that cannot fell the forest; in this case the fallow period does not go above nine years but the squashes and yams are planted again.

The main constraints to this system are:

- the decline of soil fertility
- the lack or high cost of labor (felling of trees)
- the increase in time of weeding work,
- the colonization of soil by a dangerous herb *Chromolaena odorata*.

#### ii) Home garden system

This system is characterized by small dimension pieces of land around the houses and the presence of a small livestock abandoned to straying. The soils of this system are most often fertile because they benefit from animal and vegetal wastes. Here, women plant only a few vegetables and spicy plants whose harvesting is done during a specific event (arrival of visitor, a rainy day preventing any outgoing etc...). At times, the loose animals cause great damages on these gardens. The fruit trees form the highest layers in this non diversified and non structure system.

#### iii) Cacao system

Cacao farms occupy the lands situated near the houses just close to the home gardens. There, maintenance no longer exists and harvesting is done in a bushy area. Lands are worn out by this crop which is as old as 40 years and the yield are very low. Even labor is a limiting factor.

### 1.4.3 Cultivated Species

The different species found in the zone are:

- for starchy plants: cassava (*Manihot esculenta*), Yam (*Dioscorea* Sp), maize (*Zea mays*) sweet potato (*Ipomea batatas*) and cocoyam (*Xanthosoma Sagittifolium*);
- for fruit plants: citrus fruits (orange tree, lime tree), pineapple, papaw tree (*Carica papaya*), pear tree (*Persea americana*), banana tree (*Musa* Sp), mango tree (*Mangifera indica*), plum tree (*Dacryodes edulis*);
- for vegetable crops: squashes (*Cucurbitis edulis*, *Citrullus lanatus*), onion (*Allium Cepa*), pepper (*Capsicum* Sp) and tomato (*Lycopersicum esculentum*);

- for oil producing plants (oleiferous): ground nuts (*Arachis hypogea*), Palm tree (*Elaeis guinesis*);
- for sacchariferous plants: sugar cane (*saccharum Sp*);
- for stimulant plants: cacao tree (*Theobroma cacao*), cola nut tree (*cola Sp*);

There are some old rubber plantations (introduced by the Germans) but these have been abandoned and the wood is used for fire.

In general the main crops are:

- Cacao, as a cash crop;
- Cassava, peanut, cucumber, maize, and plantain as food crops.

Other crops, although very useful, are considered as secondary crops.

#### **1.4.4 Farming Schedule and Work Distribution**

Various periods of work required for main crops are described in the farming schedule attached in the Appendices.

As for work distribution, in the society called "patrilinear" there exists a sexual division of farm works based on the history of the group.

At present, the main responsibilities are as follows:

- Woman is responsible for food production for self consumption;
- Man takes care of cacao plantation and markets the products destined for sales. In fact, it is the women who help to get monetary income and to control expenses outside the Nda bot.

In this division of labor, however, there is some slight overlapping of work per product as follows:

- Man prepares the woman's portion, while assuming the tedious works of clearing and felling of trees of the forest land;
- the woman assists the man during cacao harvesting.

#### **1.4.5 Processing of Products**

Two main products are subject to conversion before their effective usage in human alimentation. These are cassava which is transformed into "cassava sticks" and palm nuts which are converted into palm oil.

This processing is done by typical traditional method. For the cassava, it is put into water for at least three days. It softens and it is pressed, grounded and put in leaves for cooking. For the palm nuts, they heated and are passed through oil press in order to produce oil used for cooking.

The added value to these products thus becomes important. Field investigations show that 3 bags of cassava tubers costing 3,500F are transformed into one bag of "cassava sticks" and sold at 6,000 F CFA roughly. Similarly, 1.0 head of palm nut costing 300 F CFA would produce one liter of palm oil to sell at 500 F CFA.

We also notice here the transformation of palm wine into the local alcoholic drink ("Arki" or "Odontol") with the ratio of 5 liters of raw palm wine per one liter of arki valued at 1,200 and 1,500F CFA (the selling price of 1 liter of palm wine is 100 F.CFA)

#### 1.4.6 Results of Agricultural Surveys

##### 1.4.6.1 Densities of Crops

###### - Food crops

The results of surveys conducted on 50 farmers in the area show the following densities for the main crops in equivalent monoculture in a field with associated crops:

Associated Crops	Largest densities - Number of plants/ha	%	Smallest densities - Number of plants/ha	%
Peanut	94,000	91	103,000	93.9
Maize	2,600	2.5	2,000	1.8
Plantain	2,300	2	1,800	1.6
Cassava	3,300	3	2,600	2.4
Cocoyam (macabo), sweet potato	450	0.5	320	0.3
Others	950	1		

(Others included: Yams, various vegetables)

###### - Cacao trees

The densities of the region vary between 780 and 3,288 trees per hectare. However, the most predominant density observed during the survey is 2,650 trees/ha, while the standard density recommended by the agencies concerned is 1,600 trees/ha.

##### 1.4.6.2 Yield

As the field surveys could not provide reliable data on the yield, it is considered that the data obtained from the general agricultural census (RGA) in 1984 are applicable to the study area.

Species	Production per hectare, equivalent density (kg)
Maize - 1st cycle	1,463
- 2nd cycle	1,440
Groundnuts - 1st cycle	713
- 2nd cycle	888
Cassava	850
Plantain	10,000
Banana	21,791
Palm oil	747 liters
Cocoyam	2,773
Cacao	273

#### 1.4.6.3 Areas and productions of cacao plantations

According to the data of 1987/1988 provided by SODECAO, each active male worker took care of 0.5 ha of cacao plantation. In the study area, there were 363 plantations with a total area of 181.5 ha of which 148 ha were under actual production by 153 planters under guidance, i.e. an average area of 1.186 ha per planter. The production recorded by the guidance and marketing agencies for the same period was 36.4 tons. According to these data, 54% of households would be engaged in cacao cultivation, thus the area cultivated per planter would be 1.2 ha and the average production would be 268 kg/planter/year (277 kg/ha for good category and 225 kg/ha for all mixed categories).

However, a systematic investigation on the affected cacao plantations made in the entire impact area in October 1992 has given a total of 53.2 ha for 96 plantations belonging to 82 owners, i.e. an average area of 0.648 ha per owner. Besides, the results of agro-economic surveys on 50 farmers revealed that:

- 14 family heads own a plantation with an average area of 0.9 ha;
- 27 family heads own two plantations with an average area of 0.75 ha each;
- 9 family heads own three plantations with an average area of 0.5 ha each.

The calculated average area per farm is 1.32 ha, which is nearly equal to the figure given by SODECAO. However, many of these plantations are being poorly maintained or even abandoned due to the drop of cacao price.

Taking into account the number of households in the impact area (281) and assuming that only 54% of them will continue to produce cacao, the actual production would be 41 tons of all mixed grades over an area of 148 ha.

#### 1.4.6.4 Areas of fruit crops and productions

Considering the number of family heads (318) and the number of plants per farm indicated in SEDA's survey, we can calculate the number of plants of the different fruits trees and palm trees as well as their productions as shown below.

Species	Average number of trees/family	Total number of trees	Production per plant	Total annual production
Palm tree (regimes)	9.1	2,557	210 kg	511 tons
Avocado tree	3.4	955	35 kg	33.2 tons
Banana tree	31.7	8,627	5 kg	43 tons
Coconut tree	0.5	140	85 nuts	11,942 nuts
Citrus fruit tree	2.1	590	30 kg	18 tons
Kola tree	0.7	197	700 nuts	138,000 nuts
Mango tree	3.1	871	100 kg	87 tons
Sago tree	2.2	700	100 kg	70 tons

#### 1.4.6.5 Areas of food crops

The following table shows the average cultivated areas per year according to the results of survey on 38 women who cultivate two to three parcels on an average:

Hamlets	Area in ha	Number of women surveyed	Average area/woman
Melen I	1.4100	4	0.35
Abem	2.0090	6	0.33
Allen II	4.5500	5	0.91
Aloum I	3.6000	3	1.2
Njo'o Yop II	1.4100	2	0.7
NHemeyong	1.4000	2	0.7
Nsebito	1.1265	4	0.56
Ntebezok	1.9000	2	0.85
Nyabessan	4.2630	8	0.53
Oding	1.4440	2	0.72
<b>Total</b>	<b>23.2125</b>	<b>38</b>	<b>0.61</b>

The average annual food crops production area is 0.61 ha per farm.

Table No. 2 in page 74 of the preliminary report gave the number of persons involved in food crops: They are mainly married women and female heads of families. The total number is estimated at 307, which corresponds to 184 ha for the whole area cultivated each year.

If all the cultivated parcels are taken into account at the same time, i.e. three per year, an area of about 594 hectares can be retained for the entire area.

#### 1.4.6.6 Work time

The details on work time for farm operations as recorded during the field surveys are given in the Appendix on Agriculture.

The survey results are summarized as follows:

- **Man:** 185 to 210 working days per year, that is 4.2 to 6.0 hours a day depending on the degree of hardness of the work.
- **Woman:** She works 197 to 270 days a year in farm operations, at a varying daily duration of 5.8 to 6.0 hours. It is during the ploughing operation that the woman does the hardest of rural works.

#### 1.4.6.7 Food productions

Based on the densities of the main food crops as well as the yields, the food crops productions per ha at various cycles are estimated as shown in the following table:

Associated Food Crops	R.E.D.	All-Year Fields (1 ha)			1-Year Fields		2-Year Fields	
		1st Cycle %	nd Cycl %	Total Prod./Yr. (kg)	Land Occupation (%)	Total Prod./Yr. (kg)	Land Occupation (%)	Total Prod./Yr. (kg)
Groundnuts	800	45	90	87				
Maize	1,400	3	3	87				
Squash	3,000	45		1,350				
Others	3,000	1	1	30	5	150		
Cocoyam	2,770	1	1	28	5	139		
Plantain	10,000	2	2	200	30	3,000	10	1,000
Cassava	10,000	3	3	225	35	2,975	15	1,275

Remark: R.E.D: Yield in equivalent pure crops per ha (kg);

For annual crops, the yields in equivalent pure crops are the average figures;

The land occupation % by crop is the figure for each cycle.

The figures indicated in the above table are estimated based on the following assumptions:

- 1) In the first cycle all the crops are planted and, at the end of the cycle, only groundnuts, cucumber and maize are harvested.
- 2) Maize is cultivated in the second cycle on the same area.
- 3) In the second cycle groundnuts are cultivated on the area of the first cycle and on the area allotted for cucumber.
- 4) The third cycle resumes at the harvesting of the long-cycle crops.

In total, the balance of food productions in all fields (excluding home garden products) and picking products from oil palm trees is summarized as follows:



	Total Annual Production in the Project Area (ton)	Average Annual Production Per Capita (kg) (5.7 persons/ Family On average)
Groundnuts	199	125
Maize	16	10
Squash (cucumber)	249	156
Cocoyam	62	39
Plantain	774	484
Cassava	831	520
Palm trees (regimes)	511	320
Palm oil	14,600 liters	9
Palm wine	64,000 liters	40 liters
Others	66	32

#### 1.4.7 Guidance for Production

Four years ago, the agricultural extension services (especially for cacao) were ensured by SODECAO (Société de Développement du Cacao). With its qualified staff who lived in the villages, SODECAO used to teach the peasants modern farm practices; modern items for the fight against phytosanitary unhealthiness and for the creation of new farms (wheel barrows, pickaxes, pulverizers, farm scissors, plastic sachets, selected pods...) were offered free of charge or at a token price to encourage farming. In addition to this structure were agricultural post agents of Nyabessan who depended on the District Delegation of Agriculture for Ma'an.

Today SODECAO has called back its agents and has set up a supply store of materials in Ebolowa. There the prices are on the increase each year. The agriculture post at Nyabessan still exist but the only agent who is there has no working means. Farmers struggle on their own with the prime objective to produce for survival.

Yet much has been done and merits to be vulgarized in this ecological zone.

#### 1.4.8 Assessment of Research and Future Perspectives

The Institute of Agronomic Research (IRA) of the Ministry of Scientific and Technical Research (MINREST) intervenes in the study zone through its research programs which can be spelt out in this manner:

- Cereals
- Tuber and starchy roots
- Vegetable crops
- Bananas and plantains
- Fruits and pineapples
- Food technology
- Production systems
- Pedology
- Stimulant plants
- Oleaginous (oily plants)
- Latex plants
- Textile plants
- Forest

## - Botanical research

The agro-ecological zone belongs to the Yaounde Center and the Research Station is at NKOEVONE (Yaounde) situated at 145 km northeast of the study area.

Some research results and farming techniques applied to these species have been obtained. These can be popularized now through extension services. The relevant data are given in the Appendix on Agriculture.

In fact, the surveys confirm that these results hardly reach the peasants who continue to use less productive varieties and old farming techniques.

Other research works are still under way and it is feared that their results also may not become useful to the farmers in the area if active extension services are not carried out simultaneously.

### **1.4.9 Small-Scale Stock Farming**

#### **1.4.9.1 Animal Population**

In the zone of study, animal breeding is limited to small livestock; cow meat is bought right at Ebolowa and rarely a Ma'an during end of year festivities. Animals reared are pigs, fowls, goats and sheep.

Livestock is not important, each home regularly has 1 goat, 1 sheep, 5 fowls, 2 pigs. According field investigation results, 43% of the homes of the region have a livestock sizable as stated above; this bring a rough total of about 120 goats, 120 sheep, 600 fowls and 240 pigs.

#### **1.4.9.2 Type of breeding and its role in the agricultural system**

Here, it is the traditional type of rearing based on the straying of the animals. No enclosure is built.

These animals are reserved for family eventualities (feasts, marriage, presents, etc...) and for sales in order to solve certain financial problems (illnesses of the family members, school fees for children, etc.); the average income calculated after the field investigation for each breeder family is 20,627 F.CFA/year to serve the immediate financial needs.

Some conflicts may exist between farming and breeding in a few hamlets and the villages solve these conflicts by creating crop farms quite far from inhabited villages.

This traditional breeding does not only suffer from the mediocrity of the local animals, but also from the high pressure of fish and wild animals on the market.

Technical guidance is not provided for this type of stock farming because the Ma'an Zootechnical Center is being under a chronic lack of working means.

## **1.5 FISHING**

### **1.5.1 Hydro-biology**

#### **1.5.1.1 Methodology**

Certain parameters were measured in the field by the study team, namely:

- transparency by the help of a Secchi disc,
- temperature and oxygen by the help of an oxymeter, YSL SB model
- conductivity by the help of a conductor, Kent El 5013 model.

Results of the analysis and samplings conducted on each stream by the Hydrological Research Center - IRGM) of Yaounde were used.

#### 1.5.1.2 Results

The first findings show that the waters of the Ntem and its tributaries are well stirred and muddy over the larger part of the watershed. Transparency, varying from 40 to 90 cm is significant to that effect.

The waters are the "clear" type with yellow to green color, with an important development of phytoplankton. The suspended matters are lower in the Ntem (18.8 mg/l) compared to its two tributaries.

Temperature has a high value in the Ntem (25°C). In Biwome and Ndjo'o the temperature is 22°C. This difference could be due to the more important plant coverage in these two tributaries. No matter the river, it does not change in relation to the depth. The pH of water is slightly acid.

The waters are relatively poor in mineral salts. However we notice a high level in the two tributaries. Explanation for this phenomenon would be the richness in vegetation, since this organic matter is transformed into mineral salts. Since this process consumes oxygen, this equally explains the lower amount of dissolved oxygen in the Biwome and Ndjo'o. The hydro-biological characteristics of the three rivers are shown in the Appendix on Fishing.

### 1.5.2 Ichthyological Fauna

#### 1.5.2.1 Methodology

Identification of fishes was done every morning besides the fishermen while analyzing their catches. Fishing was done by the help of sleeping nets, hoop nets and line nets. For each fish, the scientific name was determined and also the size with an ichtymeter.

A representative sample of the fish is then bought for reproduction studies and alimentation regime. For these reasons samplings of the stomach and the gonads of each fish are removed. An on the spot exercise is done to determine the maturity and sex of the fish. The stomach, on the contrary is conserved in a cold store 5%, for future determination of the preys. This is done in the laboratory under a binocular lens.

#### 1.5.2.2 Results

The ichthyological fauna of the Ntem, Biwome and Ndjo'o seems to be abundant and varied. Analysis of the catches besides the fishermen during the limited time spent in the field, permitted to count more than 125 individuals. They belong to 10 families and 15 species. (See the table below) Bagridae make up the most important (30% of the catches). The *Auchenoglanis* sp. species is the most popular. Its flesh is highly appreciated by the local population. The size is between 17 cm to 28 cm with two respective models 20 cm and 26-27 cm.

The second important family in number is that of Characidae (26%). The *Brycinus* sp. species are the most available. Their size varies from 12 cm to 27 cm (fig 2) ; after this we have :

- Mochokidae (20%) with the *Synodontis* sp specie
- Citharinidae (13%)
- Mormyridae, Clariidae, Cichlidae etc.

The other species often met, according to investigations are : *Distochodus* sp. *Pollymyrus* sp, *Hepsetus* sp.

The fauna composition of catches is as follows:

Family	Scientific Name	Local Name (MVAYE)	Feeding Regim	Percentage (%)
Bagridae	<i>Auchenoglanis</i> sp			
	<i>Auchenoglanis</i> sp ballayi	Ndo'o	Entomophagous	30
Clariidae	<i>Clarias camerunensis</i>	Ngoo	Omnivorous	1
Mormyridae	<i>Mormyrops</i> sp <i>Mormyrus tapirus</i>	Mbabozok	Ichthyophagous	4
Cithariniade	<i>Citharinus</i> sp	Fia'a	Microphagous	13
Characidae	<i>Brycinus Kingsleyae</i>	Nkeme	Entomophagous	
	<i>Brycinus macrolepidotus</i>	Nkos	Phantonophagous	26
	<i>Brycinus</i> sp		Omnivorous	
	<i>Phenacogrammus urotaenia</i>	Nva'keme		
Cichlodaee	<i>Tilapia</i> sp	Efila	Omnivorous	3
	<i>Hemichromis</i> sp	Efaabum		
Mochokidae	<i>Synodontis</i> sp	Ngongo	Microphagous filterer	20
Schilbeidae	<i>Eutropius grenfelli</i>	Okei	Entomophagous Ichthyophagous	2
Cyprinidae	<i>Barbus</i> sp	Nkpwa Lingi	Omnivorous	1

The *Malapterus electricus* specie (electric fish) introduced some three years ago in the region seems to be developing with ease. Its growing important preponderance in the catches is a worry to the fishermen. Its flesh is less appreciated and its electric discharge (220 - 230 V) is a danger for the fishermen and other fishes.

Analysis of the stomach content of the main species has enabled to show the importance of food from aerial milieu, from forest trees (See Appendices). The *Auchenoglanis* sp and the *Brycinus* sp consume mainly insects.

An inspection of the gonads has permitted to notice a large temporal dispersion of the period of sexual maturity for the two species mentioned above. A study during the year would permit to determine with precision their reproduction period. Meanwhile the partial remarks recorded seem to show that these fish reproduce during high waters (Oct. - Nov.). Most of the fish found were young ones.

Longitudinal movements from upstream to downstream and vice versa were being effected by the most current species, but at this stage we cannot reduce whether these migrations are relate to reproduction. They may be linked to the quest of food. These migrations are however limited by natural obstacles constituted by the falls in Ntem.

Growth studies could not be carried out due to the limited number of individual fish collected.

### **1.5.3 Fishermen**

#### **1.5.3.1 Methodology: Survey on fishermen**

These investigations aim at knowing the typology of the fisherman and the state of fishing of the Ntem and its tributaries namely Biwome and Ndjo'o. To this effect, a series of investigations has been carried out in the villages of the future impact zone of the Memve Ele dam. During this exercise, 40 questionnaires were wet out. We tried to meet at least 5 fishermen per village and to visit all the villages and hamlets where fishermen dwell.

Lastly we met with the Ma'an authorities who have some influence over the fishermen and their activities notably; the Sub-District Officer of Ma'an, the District Service in charged with waters and forests and those of the Ministry of Livestock, Fish and animal industries (MINEPIA).

#### **1.5.3.2 General characteristics**

At the end of scrutinizing the questionnaires, the first remarks were as follows:

- Place of fishing: Ntem, Biwomé, Ndjo'o;
- Average age of fisherman: 42 years;
- Number of fishermen in the impact zone: 147, of those 40 including 11 professionals fish regularly;
- Fishing season: dry season (Dec. - Feb.); flooding season (Oct. - Nov.);
- Number of fishing days per week: 4 days for regular and professional fishermen;
- Number of fishing days per month: 16 days;
- Production per fishing day/regular fisherman: 7 kg per fishing day, or 600 kg per regular fisherman per year.
- Total production of the impact zone: 24 tons for a water area of 1,000 ha.

#### **1.5.3.3 Typology of fishermen**

The average high age of the fishermen (42 years) shows that the youths show little interest in the fishing activity. The Mvaye and the Ntoumou, population living in the study zone are by tradition fishermen. Most of the fishermen interrogated say they practice this activity since childhood.

The major activity of the population remains agriculture. However, with the economic recession and notably the poor sale of cacao, fishing and hunting are becoming more and more important in their activities.

The scrutiny of the questionnaires, analyzed from the point of view of time put in for fishing, helps to classify the fishermen in three categories:

- fishermen-farmers or hunters
- seasonal fishermen
- occasional fishermen

i) Fishermen-farmers or hunters

They form the majority of regular fishermen (estimated to be 40). They carry out the fishing activity all year long out of their daily agricultural and hunting activities. They also do traditional livestock of poultry (fowls, ducks etc.) and of sheep.

ii) Seasonal fishermen

They practice this activity intensively, during dry season (Dec. - Feb.) and during high waters, during which times they catches are important. They spend some days and even weeks in fishing camps chosen according to fishing riches.

The majority of fishermen in this category is formed by fishermen-farmers who give up agricultural activities at this period. To these people are added those villagers who come to fish during these periods only because they are attracted by the important incomes.

iii) Occasional fishermen

This group is mainly composed of students and pupils on holidays who do fishing during their free time. The practice of fishing by women is marginal and is limited only to the setting of nets in the streams.

During our mission no permanent or professional fishermen were counted or recorded. According to the agro-economic survey, however, they total 11.

Fishermen of all categories account for 30% of the active male population.

#### 1.5.4 Production Means

According to investigations carried out, the average equipment of fisherman-farmer is as follows:

- a monoxyle canoe of 3.5 m long;
- 10 sleeping nets of about 10 m each.
- a fishing rod
- 12 fixed pegs
- a trawl line

##### 1.5.4.1 Canoes

These are monoxyles and monoplace canoes of 3 to 4 m long and 0.7 m large. They are carved out by the fisherman himself from an umbrella tree (*Musanga Cecropoids*), and propelled by a paddle of about 3 m long. The duration of usage varies from 2 to 3 years depending on the frequency of fishing. Every fisherman owns a canoe. 20% of them say they

possess 3 with one berthed at each of the rivers (Ntem, Biwome, or Ndjo'o). The average price of a canoe is estimated at 6,000F CFA.

#### 1.5.4.2 Sleeping nets

They are mesh nets made of light nylon, of 8 to 15 m long and 2 m high. The fishermen use floats in the form of raffia bamboo and stones for ballasts.

Nets are stretched in the evening either across the bed or along the bank following the speed of wave, or either across the flooded grassland. A visit is made to the nets the following morning around 6 o'clock. The net can be on the same spot for up to two weeks if the catch is good. On the contrary, it is displaced to a place suspected of being favorable.

81% of fishermen have sleeping nets. Each fisherman has a bundle of nets on average. 20% of the fishermen have more than 2 bundles of nets. A bundle of net of 90 m costs 6,500 F.CFA at Ebolowa. A meter of hemp rope costs 150 F CFA.

The duration of usage varies from 4 months to 1 year in relation to the abundance or absence of the vegetal wastes in the fishing zones and the frequency of fishing.

#### 1.5.4.3 Hand lines

This is a rod of 2 to 4 m at the end of which there is a cord of 4 to 5 m bearing one or two hooks.

51% of fishermen questioned say they have one each.

#### 1.5.4.4 Lines with fixed pegs

Pegs of 1 to 1.50 m are driven in the river channel. On each peg there is a cord of 1.5 m attached to a baited hook. This type of fishing is done in the night and in the day. The fisherman watches its position. The trapped fish moves the peg as it struggles to run away; the fisherman then lifts the peg to catch it.

22% of the fishermen have more than 60 pegs.

#### 1.5.4.5 Trawl lines

These are fishing lines of 30 to 50 m long. At every 50 cm there is a 50 cm long leader with a hook at its extremity. These are set in the evening and lifted up in the next morning at 6 o'clock.

In all cases the hooks are baited with fish, earthworms or ants.

The line equipment can be used for 6 months to 1 year if they are not carried away by large fish.

24% of fishermen have 1 to 4 large trawl lines.

#### 1.5.4.6 Castnets

The use of castnets is less popular. 14% of fishermen say they have this type of net. This is a tackle of 3 to 5 m high with a diameter at the base of 3 to 4 m. It is used in less profound areas of the river. It can stay for an average duration of 5 years.

#### 1.5.4.7 Barriers

Their low usage is a good thing, because this disposition catches all sorts of fish whereby there is destruction of the whole stock. 14% of fishermen build them; fishing by barrier is a group activity that requires the contribution of members of a family or friends. The fishermen associate themselves (10 or 5 persons) to build them. Its construction requires to block the minor bed of the river before the high water with the help of tree branches and pegs planted perpendicularly to the wave, with a casting ladle made either of nets or branches situated at about 50 cm to the bottom. A barrier can stay about a year.

#### 1.5.4.8 Hoop nets

These are fishing tackles fabricated in an artisanal manner by the fisherman. These are constructed out of bamboo rachis and have a conical form of 1 to 1.50 m long. The diameter of the hedge of the cone is 30 to 40 cm. Its entrance is in the form of a funnel. It can stay for 2 to 3 months and costs about 300 F.CFA each. 8% of the fishermen have it.

### 1.5.5 Method of Operation and Production

Generally, fishing is nocturnal. It consists of setting the sleeping hooks in the evening and visiting them in the morning at 6 o'clock. The same method is applied for large nets and fixed pegs.

The most active fishing consists of using castnets and hand rods. This is done during the day.

The most popular fished species have been described above. The catches are sold fresh in the morning. In case the fisherman does not sell all his catch, he smokes it in a corner of the kitchen. In fishing camps the whole catch is smoked.

The smoking technique consists of preparing the fish, put them on smoke (light fire) on the tray arranged with the help of gratings or bamboo, the dimension of which is 1.5 m long and 1 m large. The height is about 1 m. The smoking duration varies from 2 to 4 days according to the size of the fish and the intensity of fire.

Smoking is quite traditional, by the way the fish is prepared (washing only), and by the type of trays used. However the smoked fish is appreciated. Modernization of smoking would consist of using salt or vinegar during preparation of the fish and the replacement of the tray by a "chokor" oven.

Drying under the sun is not practiced due to high humidity. Cold conservation (freezing) does not exist since this requires important financial backing which the fisherman lacks.

According to the results of surveys conducted in the Campo district, within the framework of the ORSTROM/CNRS's Food Anthropology Project (Provisional Report cited in bibliography in Appendix 1), the daily fish consumption per capita of the population in the Mvaye forest area is estimated at about 40 g, part of which is purchased in local markets. Assuming that the consumption per capita in the continental area of the study zone is 30 g, and considering that the 11 major fishermen export 70% of their catch to outside areas, the total annual volume of fish production amounts to nearly 24 tons from a water area of 1,000 ha formed by the Ndjo'o, Biwoume and Ntem rivers.



### **1.5.6 Marketing and Revenue**

In general, the fishing products are sold in the village, fresh or smoked. The fisherman would hardly go out of his village or the market to sell his fish because of administrative worries.

Sometimes the villagers receive the visits of intermediary merchants (Bayam - Selam) who buy essentially smoked fish as well as games. They resell the products at Ebolowa and Ambam.

The following prices are practiced:

- 500 F.CFA for a heap of fresh fish (1kg);
- 500 F.CFA for a heap of smoked fish, an equivalent to 1kg of fresh fish. We notice that smoked fish has no added value.

During fishing season, production per fisherman varies from 3 to 10 kg of fish per day. It is about 0 to 3 kg/day in poor season. Generally, and according to our investigations, average daily production is about 5.2 kg no matter the season.

The quantity reserved for self consumption varies from 1 to 2 kg/fisherman/day according to the size of his family. 3.2 kg would be the daily production sold by a fisherman.

Taking into consideration the fishing season of 5 months per year and 4 fishing days per week for a regular fisherman, his annual production is estimated at 600 kg, out of which 435 kg are sold and the remainder consumed. He therefore receives an income of 217,000 F.CFA a year.

### **1.5.7 Condition of Exploitation of Stocks and Problems Related to Fishing**

Based on the field investigations, we can say that the condition of piscicultural stocks in the Ntem and its tributaries are satisfactory. In fact no fisherman has pointed out any decrease in stocks. However, studies of changes in the populations of the main species exploited should be constantly carried out in line with the fishing in the reservoir in order to regularly grasp the level of exploitation.

As far as related problems to fishing at the present stage of exploitation, the following points can be stressed:

- Administrative harassment (road block, control etc.) for the fishermen and bayam sellam (secondhand sellers) who go to Ma'an and to Ebolowa with their products;
- Far distance of selling centers for fishing materials; Fishermen must either go to Kribi or Ebolowa to have their material;
- No adequate shelters in fishing camps. In the bush camps, there are enormous mosquitoes (excess bites). The use of mosquito nets would extend the fishing duration;
- Poor state of the principal road and the enclavement of fan fishing zones;
- Traditional fishing system demanding an improvement upon the techniques
- The mesh of nets used are mostly small dimension. This has a negative consequence with the young fish. Analysis of catches and of gonads have shown an important proportion of which that have not reach their first sexual maturity.
- Commercialization of fish at the present stage of stock exploitation is satisfactory since the majority of the catches is sold on the spot. For a larger production, there would be sales problems except there is frequent visits of secondhand sellers in the villages and camps;