JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF HYDRAULIC
MINISTRY OF MINES AND ENERGY
CENTRAL AFRICAN REPUBLIC

THE STUDY ON GROUNDWATER DEVELOPMENT IN BANGUI CITY IN THE CENTRAL AFRICAN REPUBLIC

VOLUME 2 SUPPORTING REPORT

DECEMBER 1999

KYOWA ENGINEERING CONSULTANTS CO., LTD.
YACHIYO ENGINEERING CO., LTD.

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1. SOCIOECONOMIC SURVEY

1. Socioeconomic survey

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1-1. ANALYSIS OF INTERVIEW SURVEY ON WATER UTILIZATION

(1) Outline of the Survey

The questionnaire survey conducted in the Study comprised of the two components;

- Interviews with Chiefs
- Questionnaire Survey to Households

The areas for the survey consist of;

- margins of the area with water supply by SODECA
- urban areas without water supply by SODECA
- peri-urban area

The most number of samples is concentrated in the areas of the above b). The numbers of samples in household survey by name of the area are as follows:

Table 1 Number of Interviewed Samples

	Samples
Study Area	200
- Bimbo	20
- Fatima	30
- Boeing	30
- Mamadou-Mbaiki	30
- Combattant	20
- Ngola	20
- Peri-urban (Rural)	50

(2) Preliminary Analysis

The results of the survey were submitted to the Study Team from sub-contracted local consultants with some data processing. However, the submitted results may contain errors, unclear or doubtful points and some important data are missing in the file. Since political disturbance occurred, check with the originals and discussion with the local consultants, as scheduled in February 1997, could not be carried out. The analysis made below is inevitably preliminary or provisional for the re-start of the Study. The data treated are summarized and attached in Appendix A.4 a).

(3) Summary of Result of the Questionnaire Survey to Households

1) Water Source

a) Most of the households have one traditional well. Piped water supply is scarce (15% at highest in Mamadou-Mbaiki).

b) No kiosque is found in Ngola and peri-urban areas.

c) Nearly 40% of the water sources for drinking water are kiosques and 40% from traditional well of their own or neighbors.
d) For cooking, 15% are from kiosks and 70% from traditional wells.
e) For other purposes, water from traditional wells is dominant.
f) 60% of the wells are available through a year.

2) Carrying Water
a) Most of the people (women or girls, in most cases), carry water on their head.
b) Average distance to carry for drinking water is 250 m, and 100 m to 150 m for other purposes.
c) Most of the people carry water with large stockpots or basins.

3) Quantity of Water Consumption
a) Average consumption of drinking water is around 30 liter/household (4 liter /person).
b) 3 liter/person for cooking, each 10 liter/person for shower and laundry.

4) Manner of Water Use
a) The habit of boiling drinking water is very scarce (less than 5%).
b) More than 70% of the households keep water in open containers.

5) Consciousness on Water
a) 40% of the people think neighboring house connection, kiosque and house connection are the most convenient water source.
b) 90% of the households are ready to invest water supply.
c) 60% of the people think their wells produce enough quantity. 50% satisfy the water quality of the wells.
d) Parasite and Diarrhea are recognized as water-born diseases by most of the people.
e) Almost 200 cases of suffering Parasite or Diarrhea in the last six months are reported in 200 samples.

6) Conditions of Household
a) Average member for one household is 8. Aerial variation is little, except fewer members (around 6) in peri-urban area.
b) Nearly 35% of the household are settled in non-formal occupation. In peri-urban area, 50% are non-formal.
c) More than half of the houses are traditional ones (made of mud and roofed with wood or grasses). Modernized houses (hard houses made of bricks or concrete) are scarce.
d) Most of the households have one latrine.

e) Electricity connections are scarce (17% at highest in Mamadou-Mbaiki).
f) Many of the data on income and expenditure of households are missing or destroyed.
g) Average expense for health treatment for a household is around F.CFA 1,500/month

7) Money Saving
a) Tontines are spreading (nearly half in Bimbo and Boeing, around 30% in Combattant and peri-urban, around 40% in other area), while saving in banks is less frequent (around 20% at highest in Fatima and Combattant).
b) Contribution for a month is more than F.CFA 3,000 in 80% of the households. Average contribution is high in Mamadou-Mbaiki (F.CFA 9,000) and Combattant (F.CFA 5,000), while F.CFA 1,000 in Ngola and F.CFA 2,000 in the peri-urban area.

8) Domestic Animal Breeding
a) 40% of the households have domestic animals.
b) Chickens, goats and pigs are dominant. No pig is found in Ngola.

(4) Summary of Result of the Interview Survey with Chiefs

1) Social Characteristics of the Area
a) Ethnicity; Nearly half of the people are Gabaya, followed by Sara, Banda, Ngbaka and Nbandi. Other ethnic groups are few.

2) Water and Sanitation
a) Most of their water supply depends on wells.
b) 90% of the chiefs respond that water supply is far sufficient.
c) Nearly half of the chiefs satisfy the quality of water for consumption, while 30% do not satisfy and 20% responded that their water supply systems are lost.
d) Most of the people use traditional latrines without roof very frequently, while improved ones with roof are rare or less frequently used.
e) Most of the districts do not have sewers.
f) Most of the people share water with neighbors.
g) Women and girls have most access to water.
h) Parasite is recognized as danger of use of water from shallow well by nearly 80% of the chiefs.
i) Problem of the districts; lack of drinking water (15%), lack of electricity, street and school (15% each)

3) Community Activities

a) Various types of association of the districts prevail, which may show a strong inter-relationship among the member of the districts.

b) The activities are also various, mainly road construction, market sanitation, digging gutters, weed cleaning, or building schools, churches or latrines.

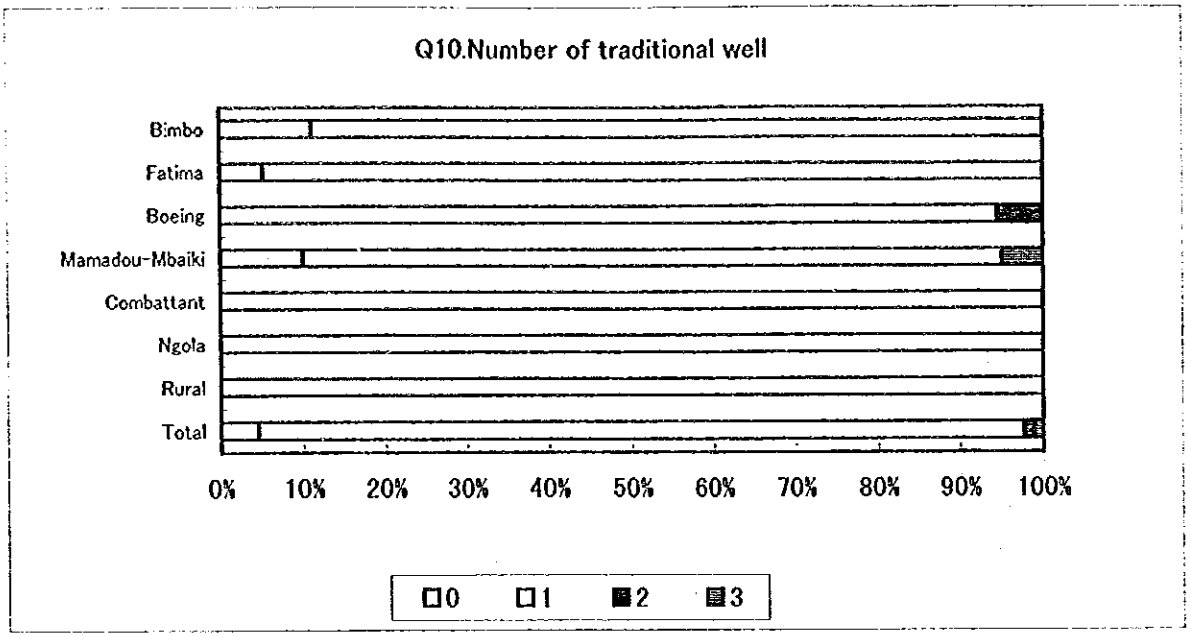
c) Organization for maintenance is managed under the leadership of the chiefs in early 20% of the districts, in 20% by responsible person, in 20% group management, while 40% of the organizations have been lost.

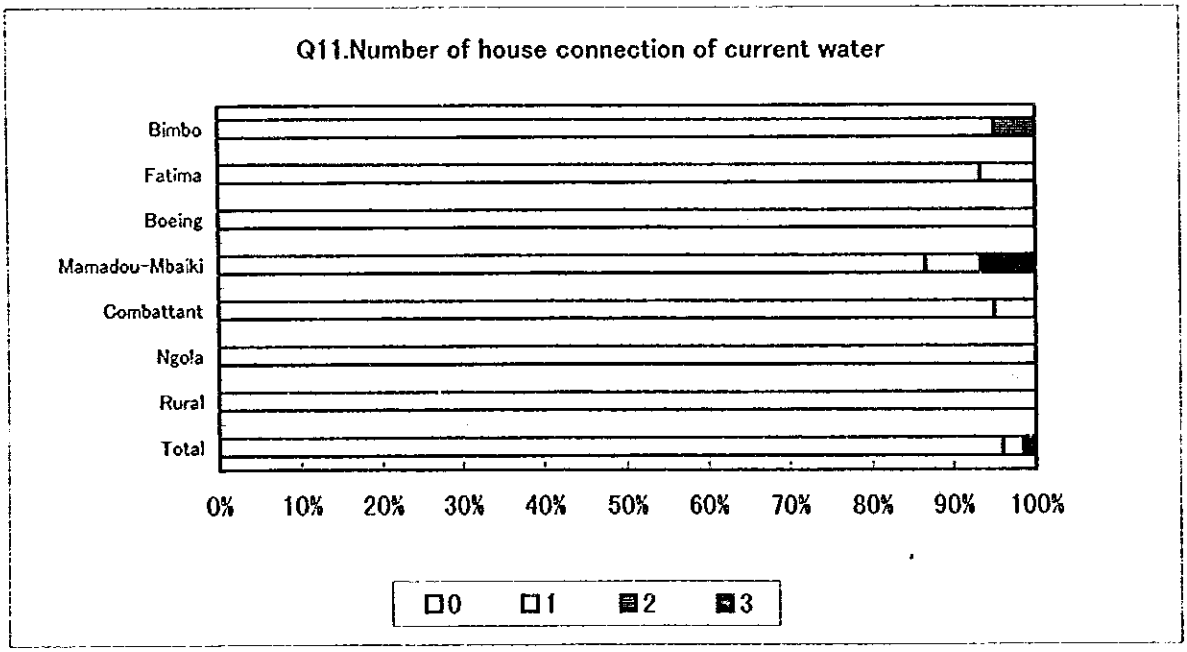
d) In nearly 60% of the districts, labor contribution is found for the maintenance of works.

e) 65 % of the districts have cash account for the maintenance.

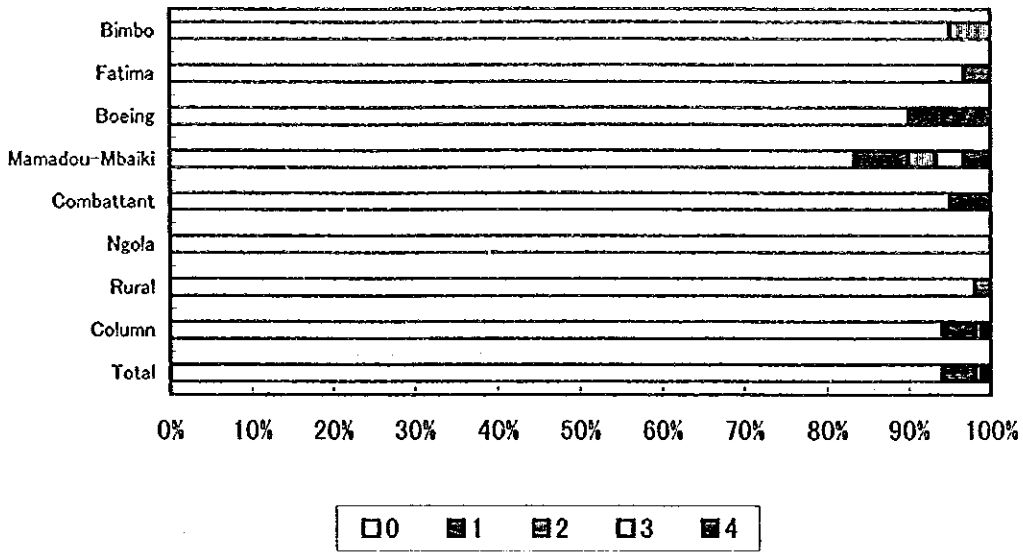
f) 70 % of the contributions are made by cash and the rest by material contribution.

g) In majority, the contribution per member reaches F.CFA 300 - 1,000/month (?).

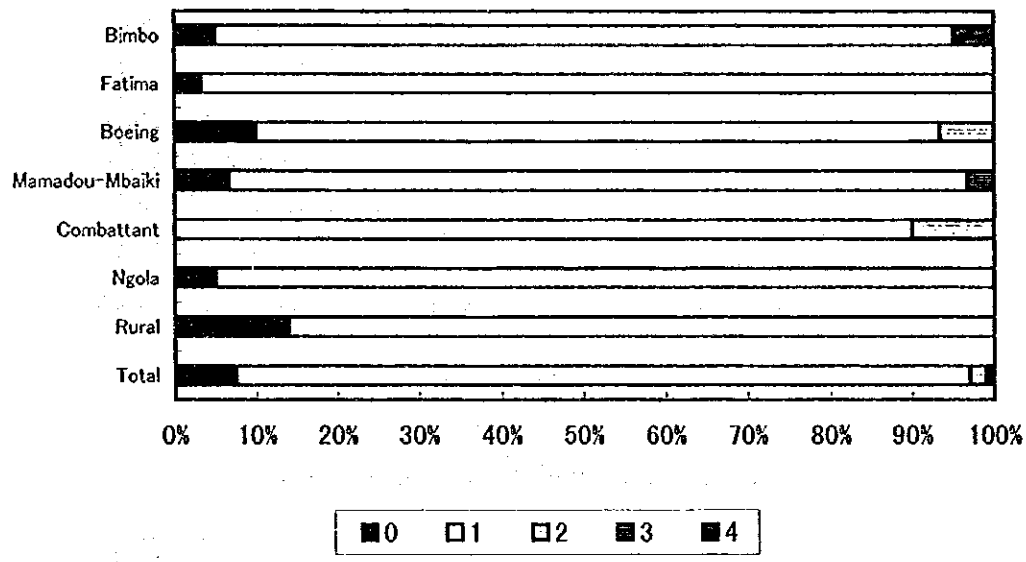

Q10.Number of traditional well
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rural
Total
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
0
1
2
3

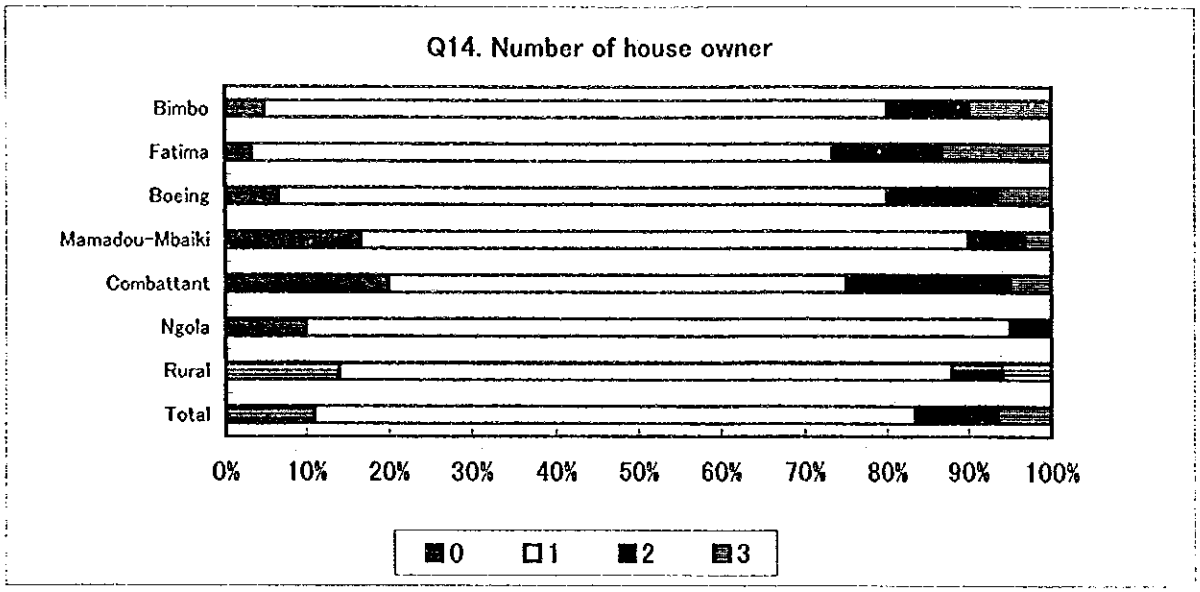

Q11.Number of house connection of current water
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rural
Total
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
0
1
2
3

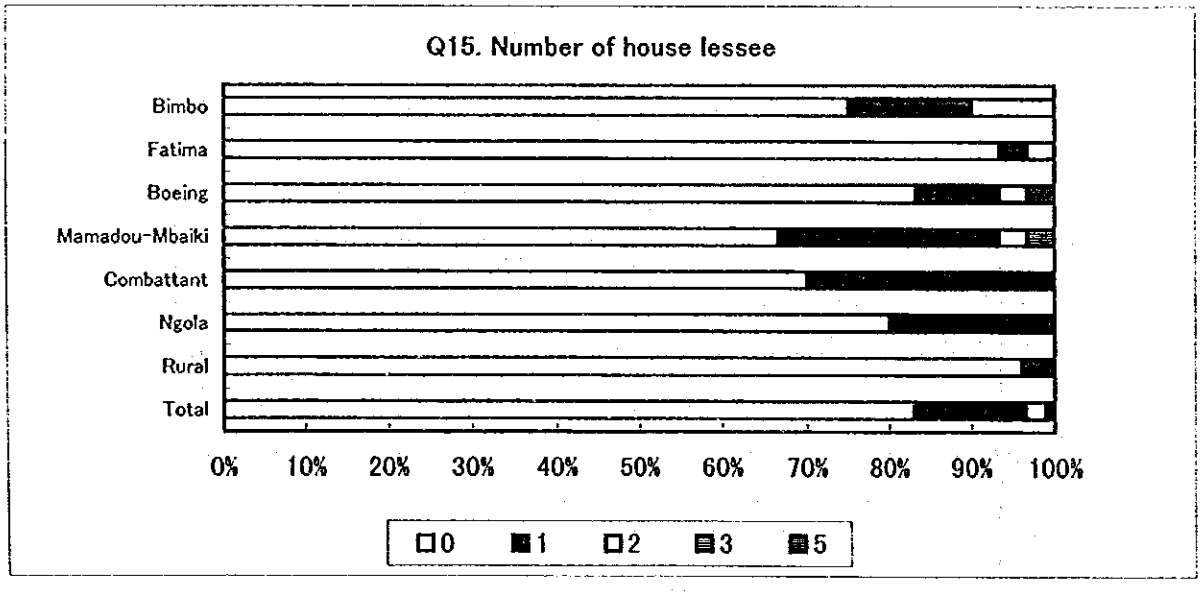
Q12. Number of electric connection

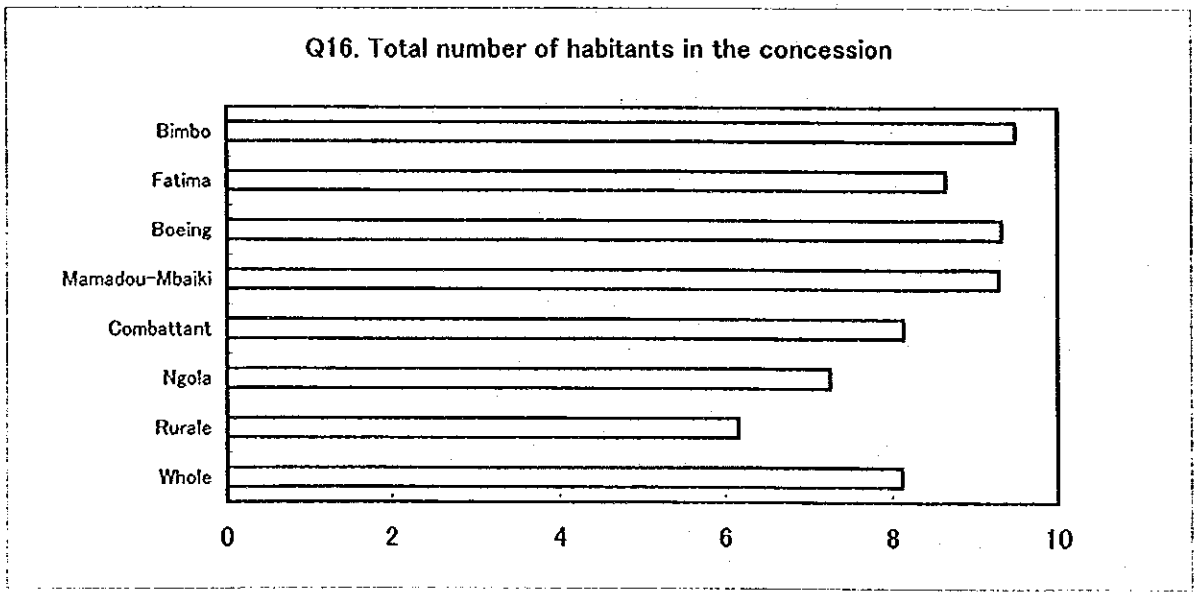


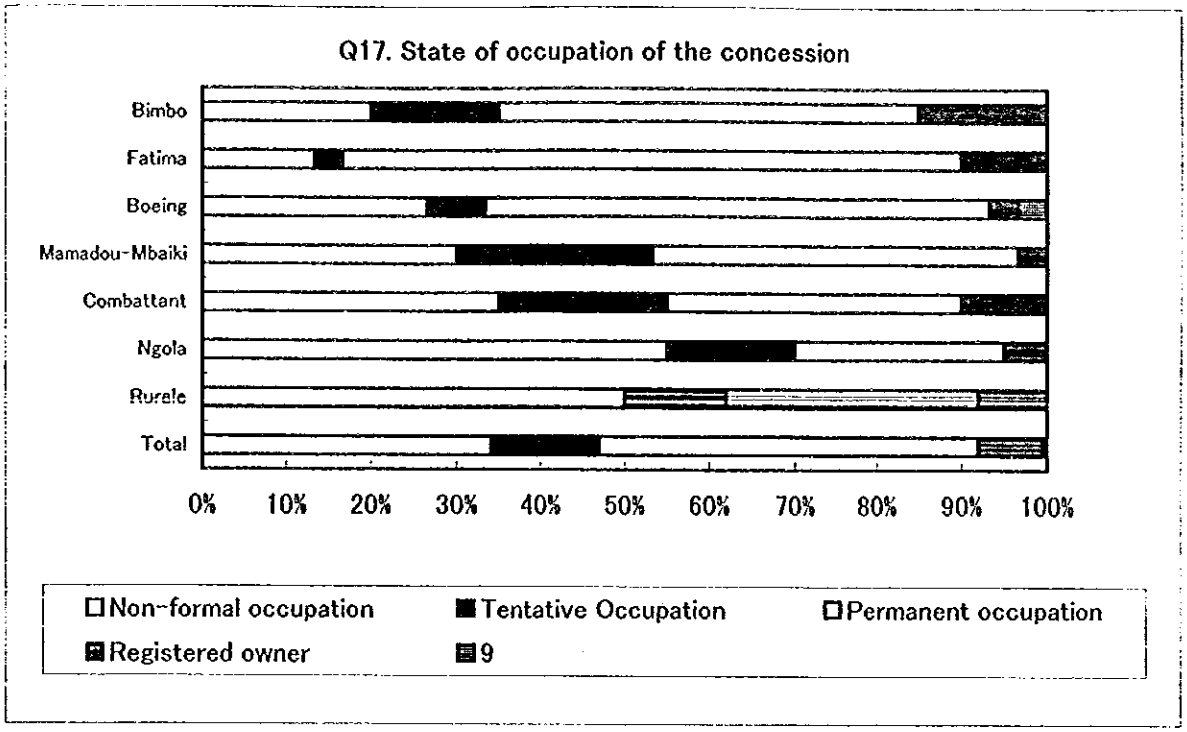
Q13. Number of latrine

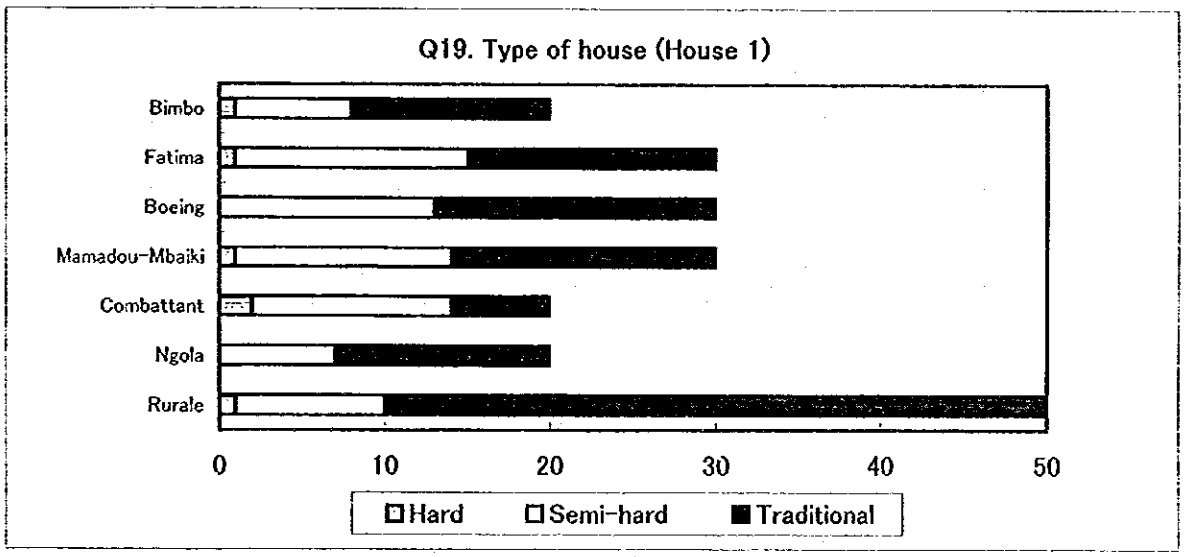


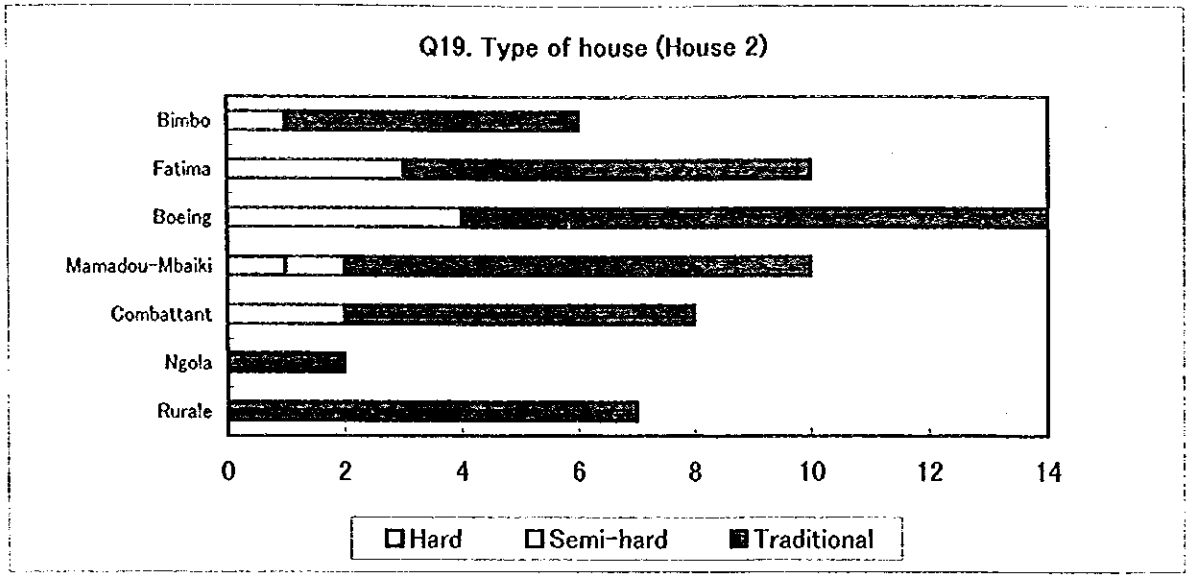

Q14. Number of house owner
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rural
Total
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
0
1
2
3

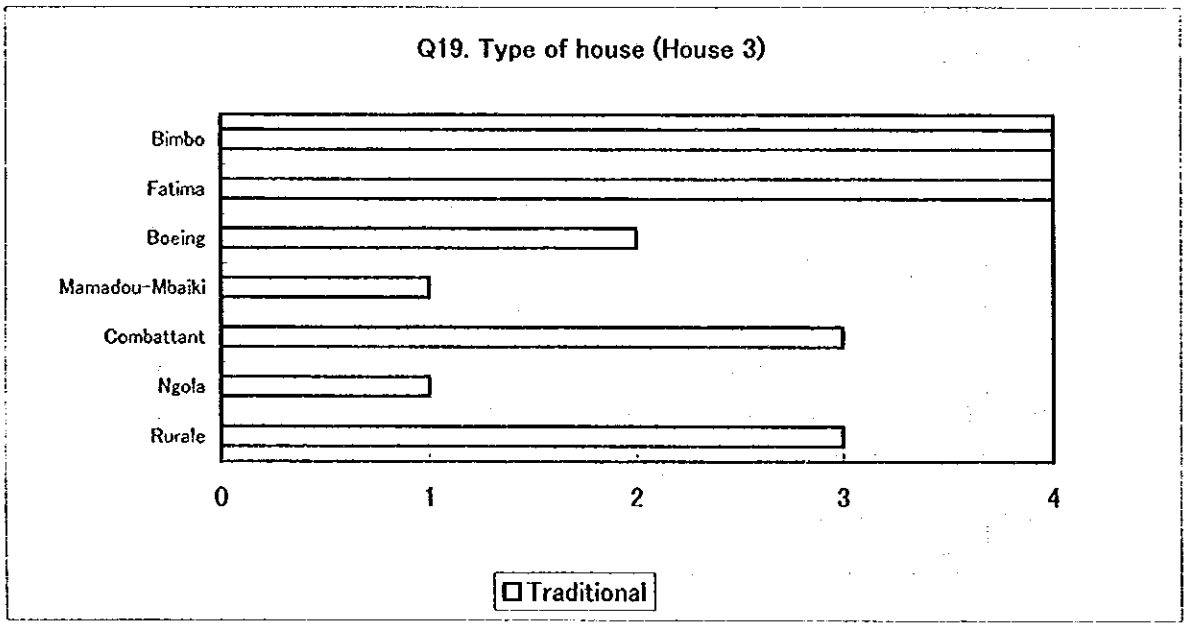

Q15. Number of house lessee
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rural
Total
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
0
1
2
3
5

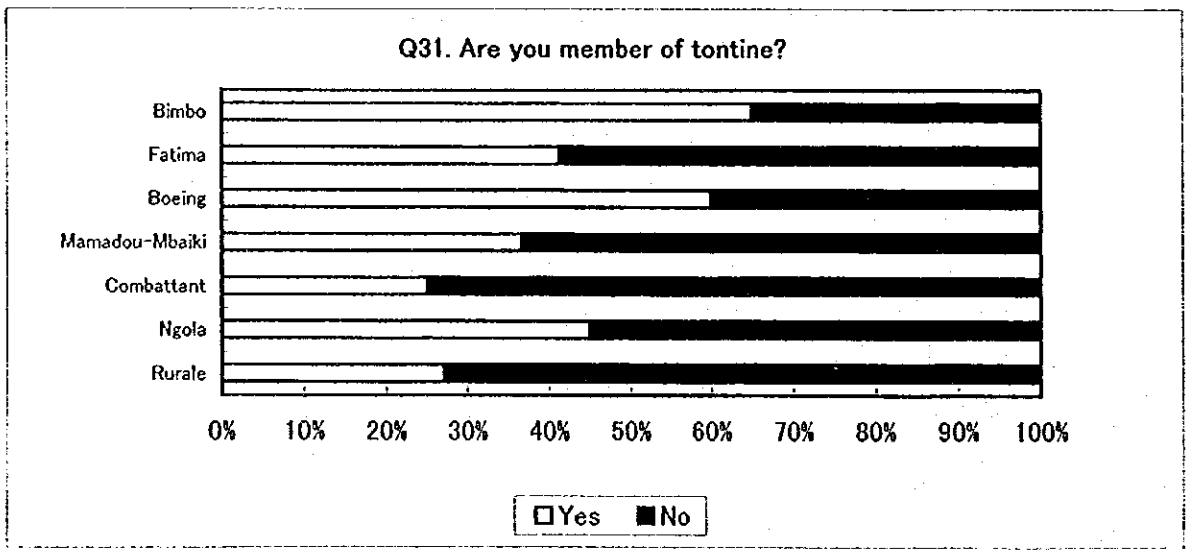

Q16. Total number of habitants in the concession
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
Whole
0
2
4
6
8
10

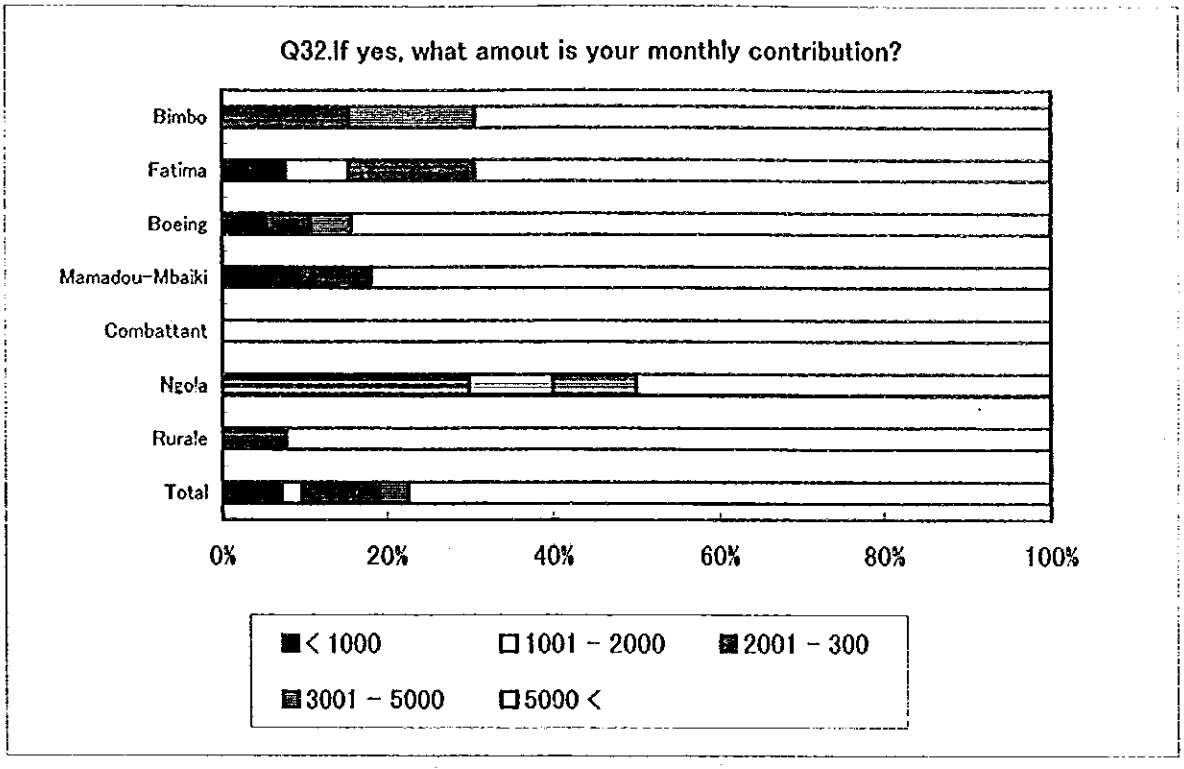

Q17. State of occupation of the concession
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
Total
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Non-formal occupation
Tentative Occupation
Permanent occupation
Registered owner
9

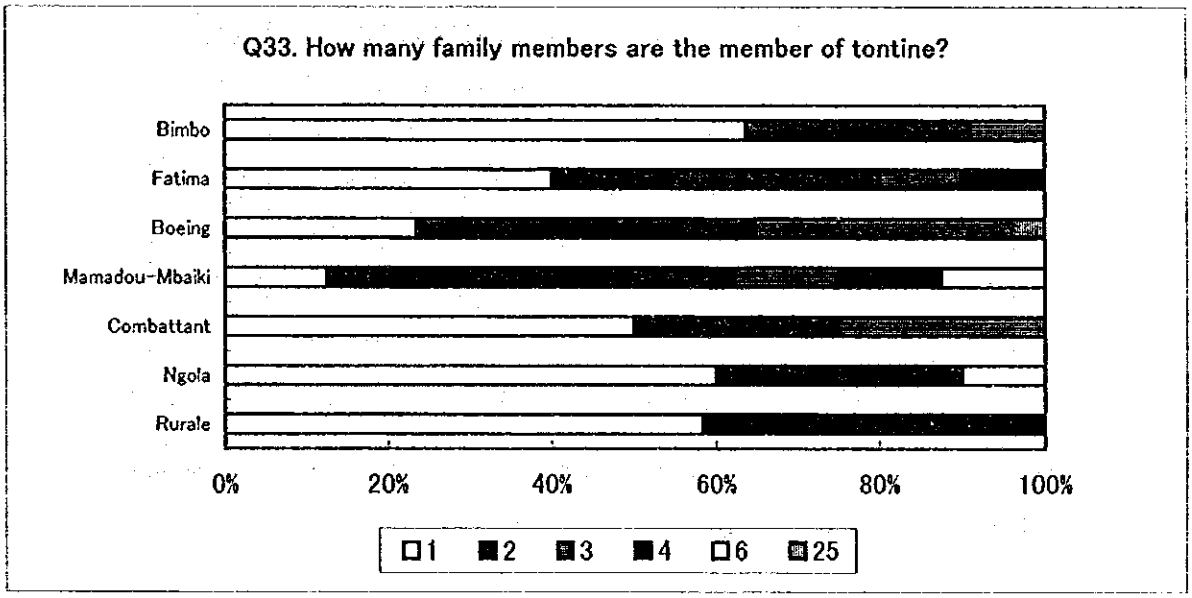

Q19. Type of house (House 1)
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
0
10
20
30
40
50
Hard
Semi-hard
Traditional


Q19. Type of house (House 2)
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
0
2
4
6
8
10
12
14
Hard
Semi-hard
Traditional

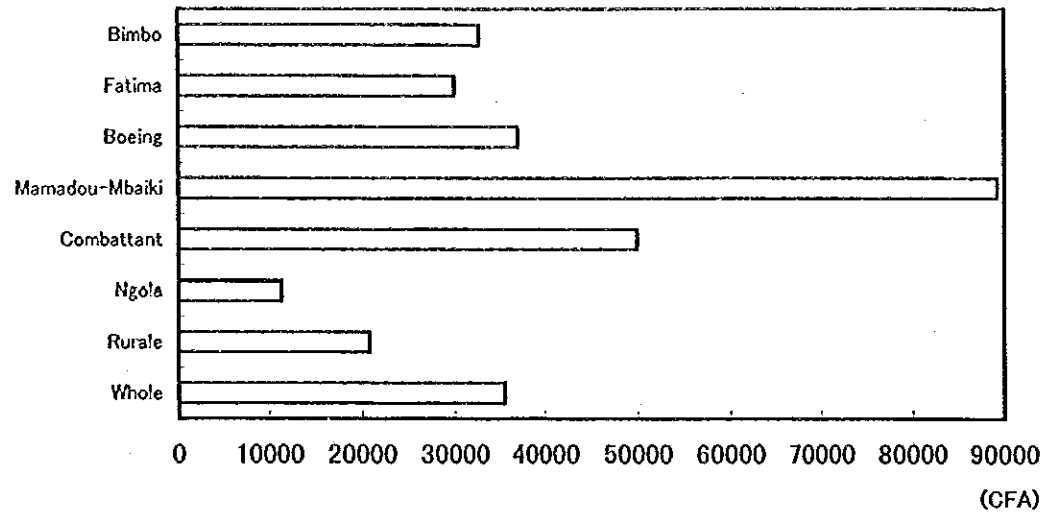

Q19. Type of house (House 3)
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
0
1
2
3
4
Traditional


Q31. Are you member of tontine?
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Yes
No

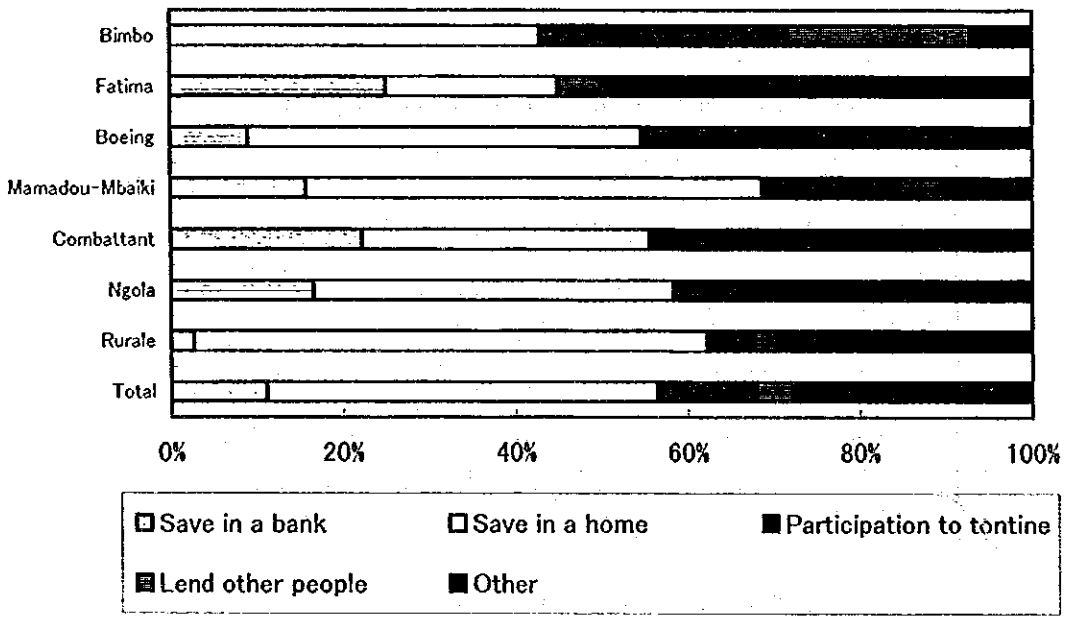

Q32.If yes, what amout is your monthly contribution?
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
Total
0%
20%
40%
60%
80%
100%
< 1000
1001 - 2000
2001 - 300
3001 - 5000
5000 <


Q33. How many family members are the member of tontine?
Bimbo
Fatima
Boeing
Mamadou-Mbaiki
Combattant
Ngola
Rurale
0%
20%
40%
60%
80%
100%
1
2
3
4
6
25

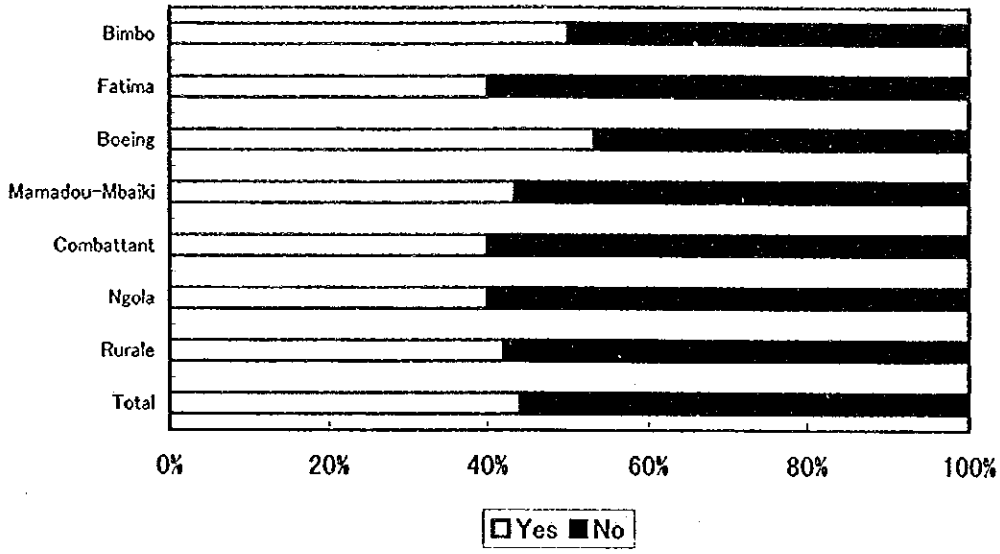
Q34.How much do you estimate their monthly contribution?



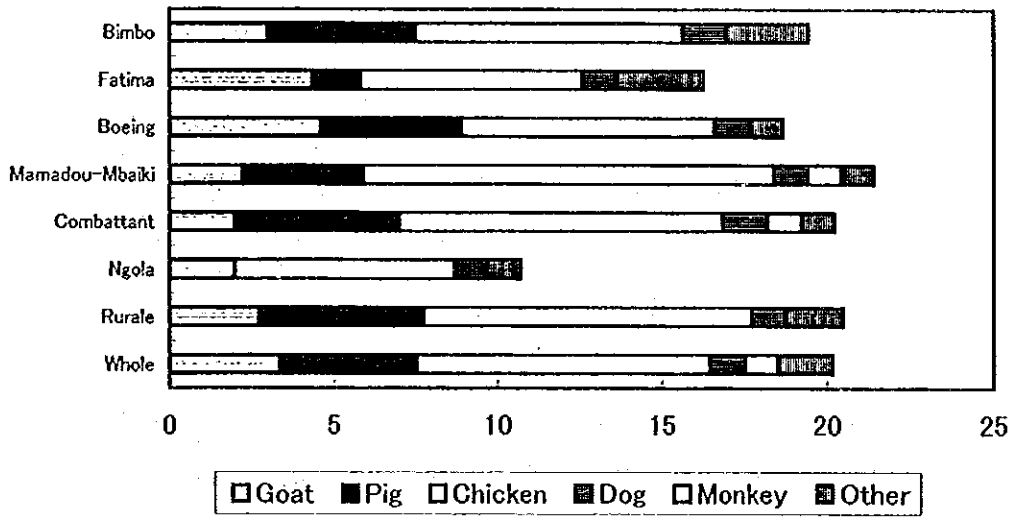
Q35. How do you save the money?



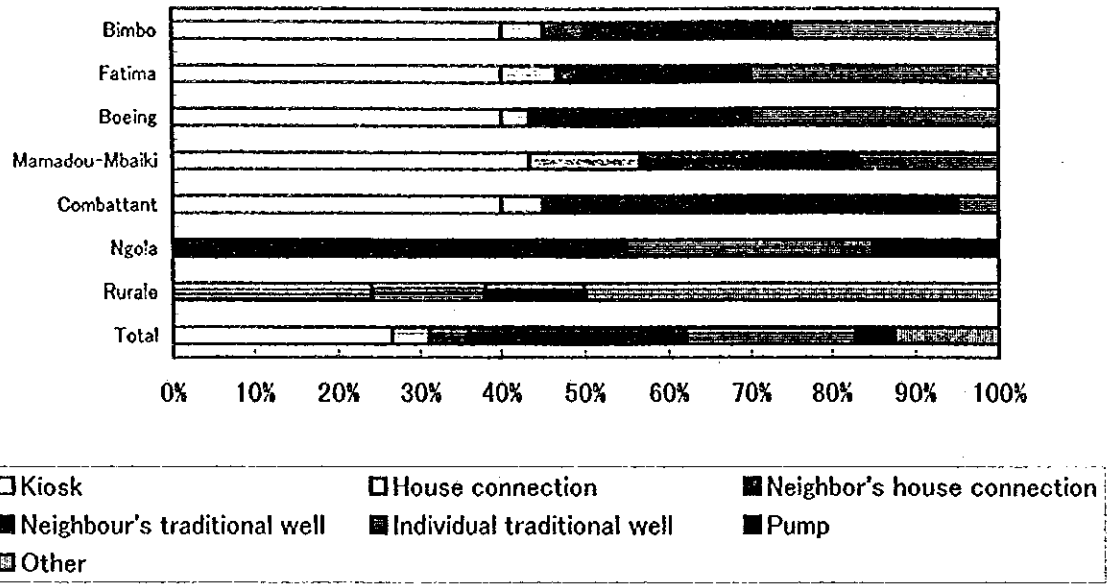
Q37. Do you have domestic animals?



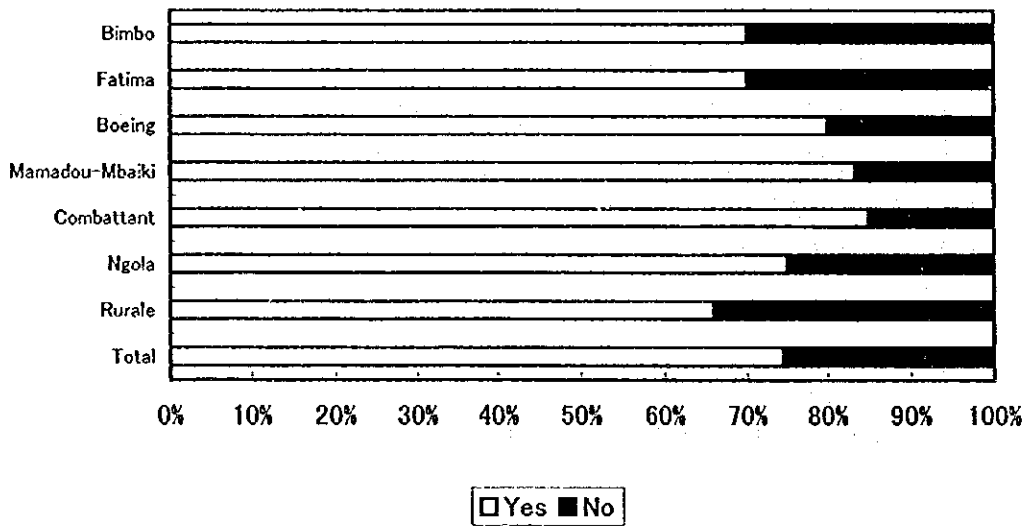
Q38. If yes, how many animals do you havve?



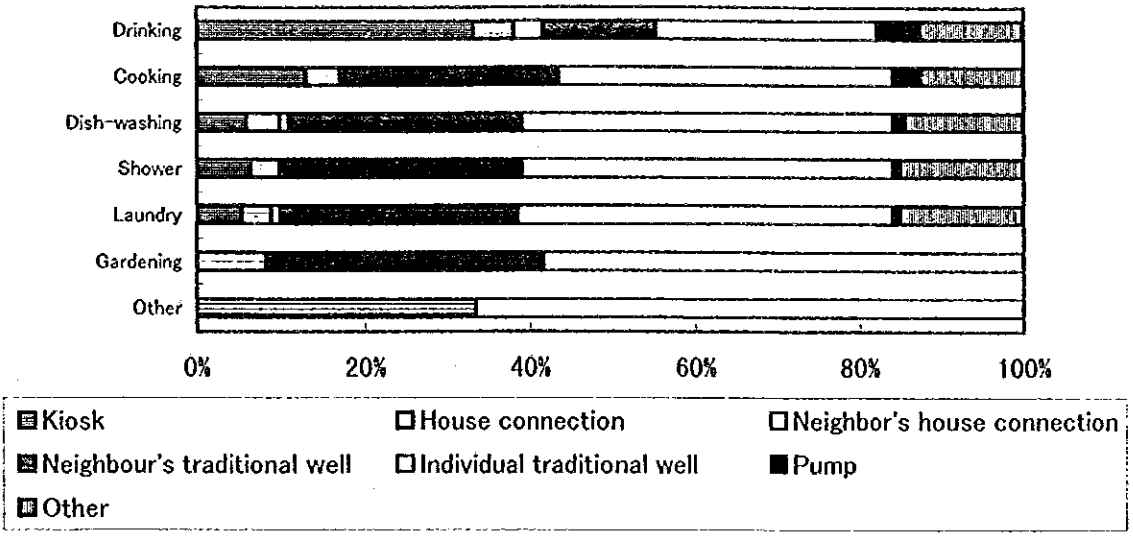
Q39. Which is your water supply source?



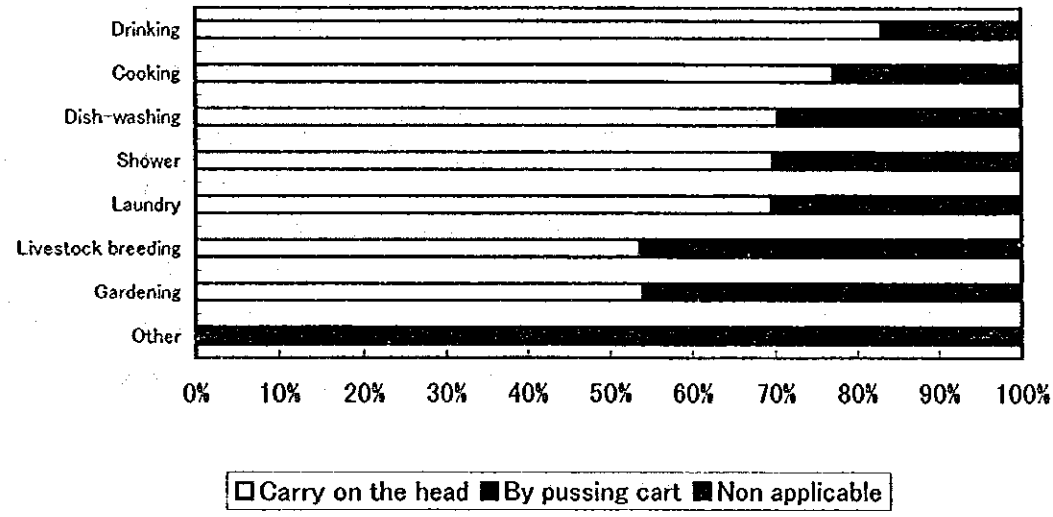
Q40. Do you think there is a difference between the water of deep well and shallow well?



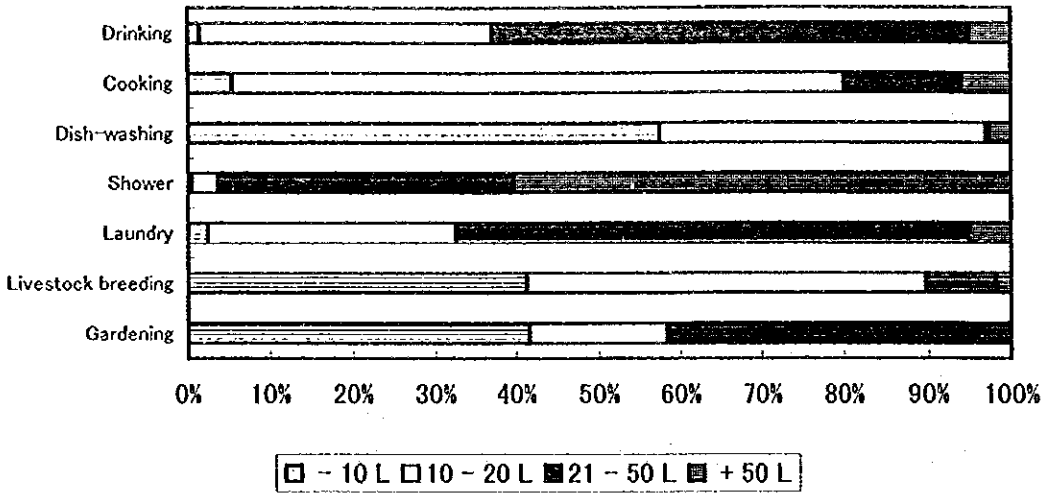
Q42. Water source by type of use



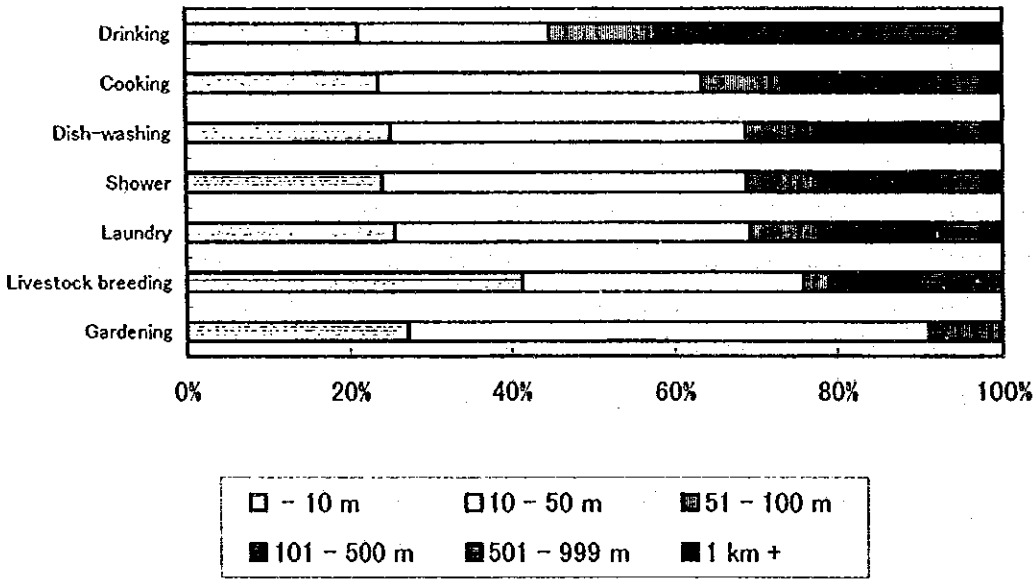
Q42. Means to carry water by type of use

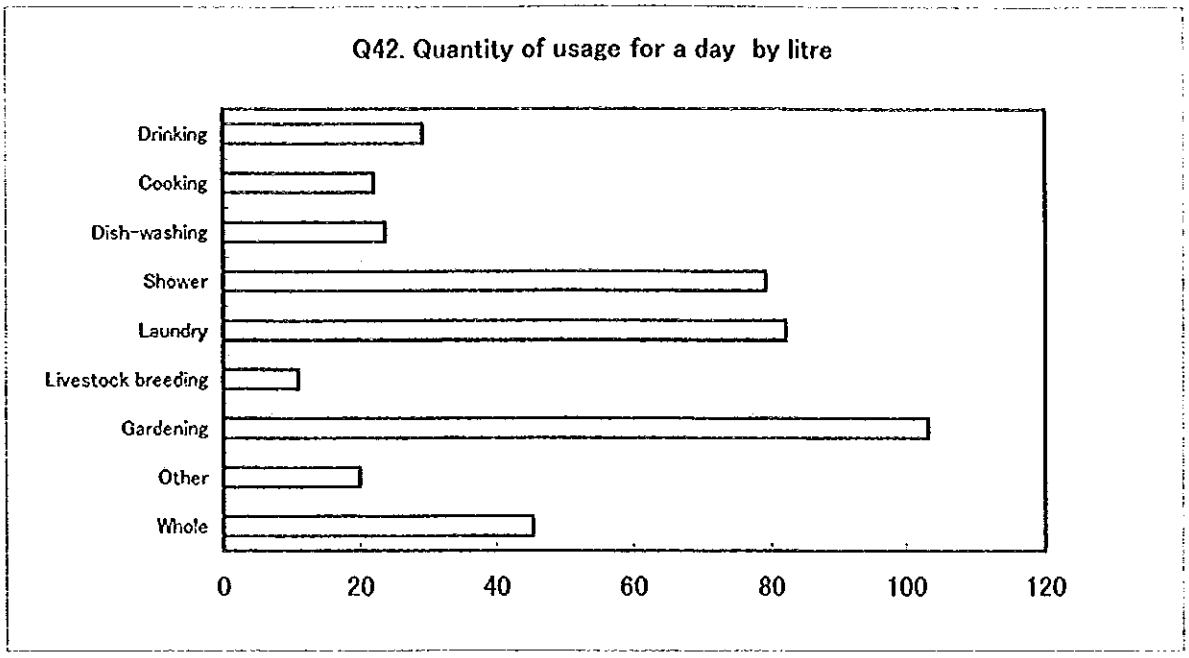


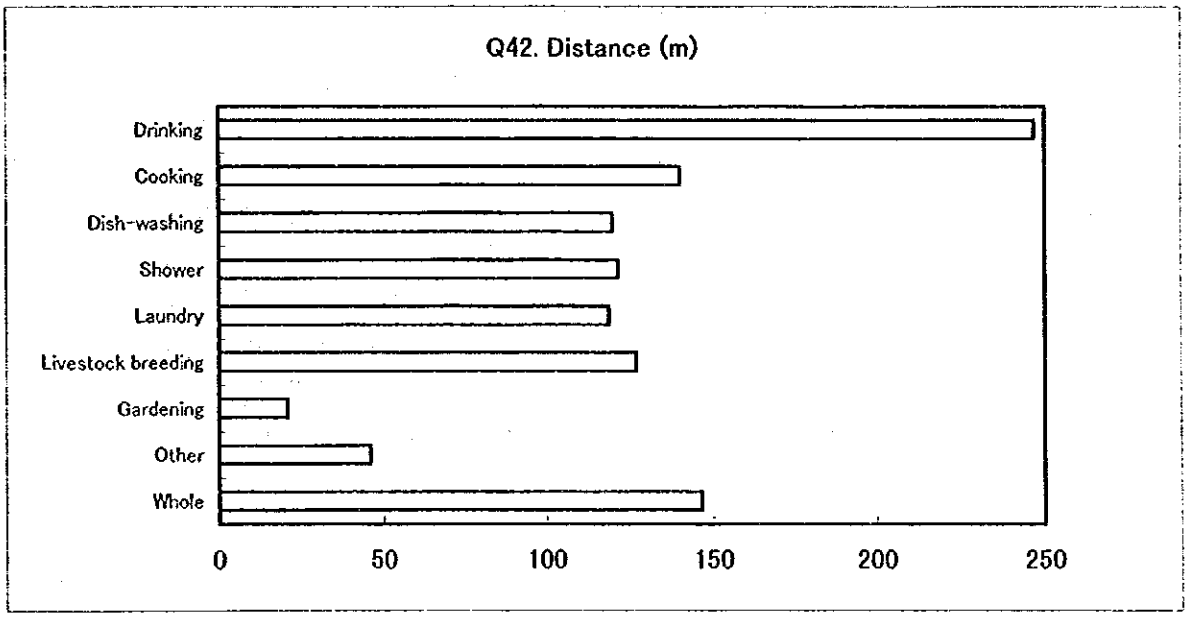
Q42. Consumption of water by type of use



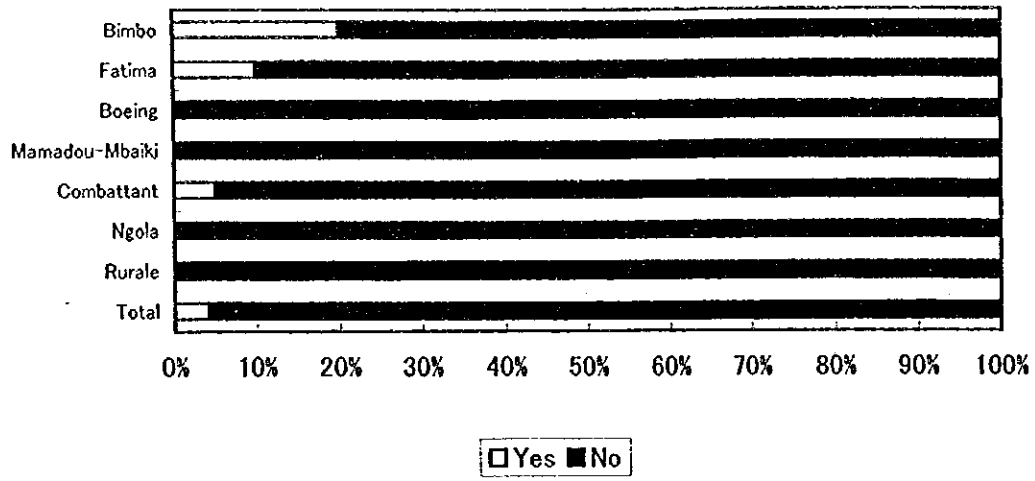
Q42. Distance to carry water by type of use



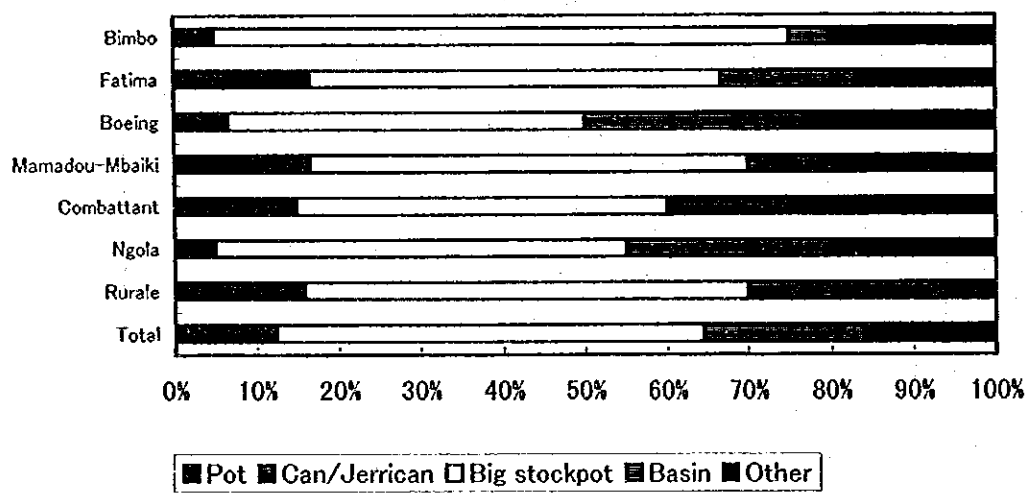

Q42. Quantity of usage for a day by litre
Drinking
Cooking
Dish-washing
Shower
Laundry
Livestock breeding
Gardening
Other
Whole
0
20
40
60
80
100
120


Q42. Distance (m)
Drinking
Cooking
Dish-washing
Shower
Laundry
Livestock breeding
Gardening
Other
Whole
0
50
100
150
200
250

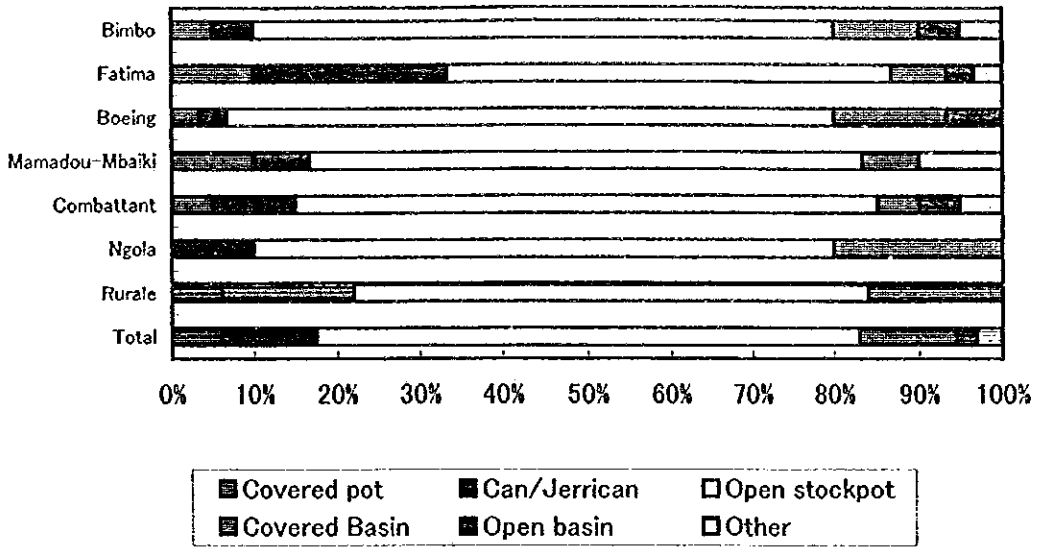
Q43. Are you in the habit of boiling the drinking water?



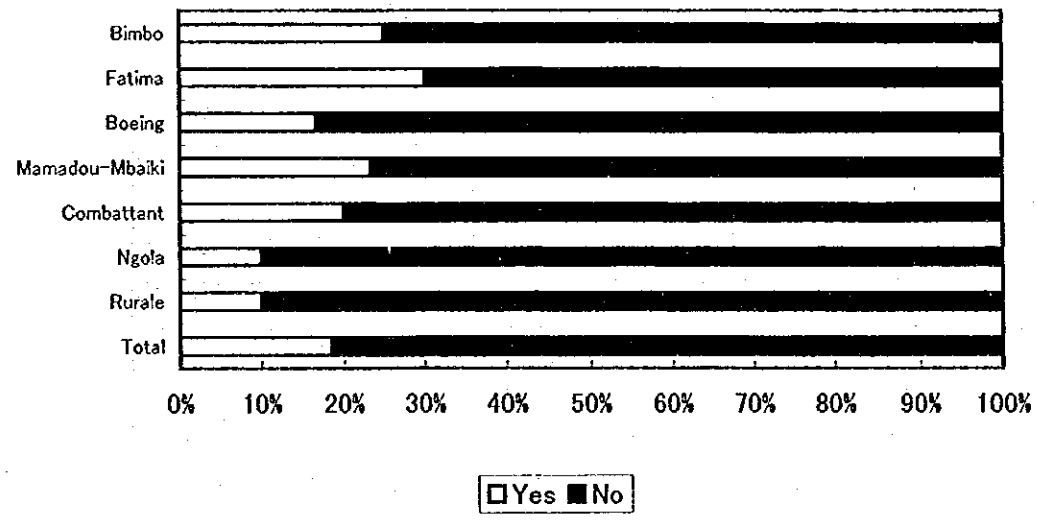
Q44. What conteiner do you use to bring the water?



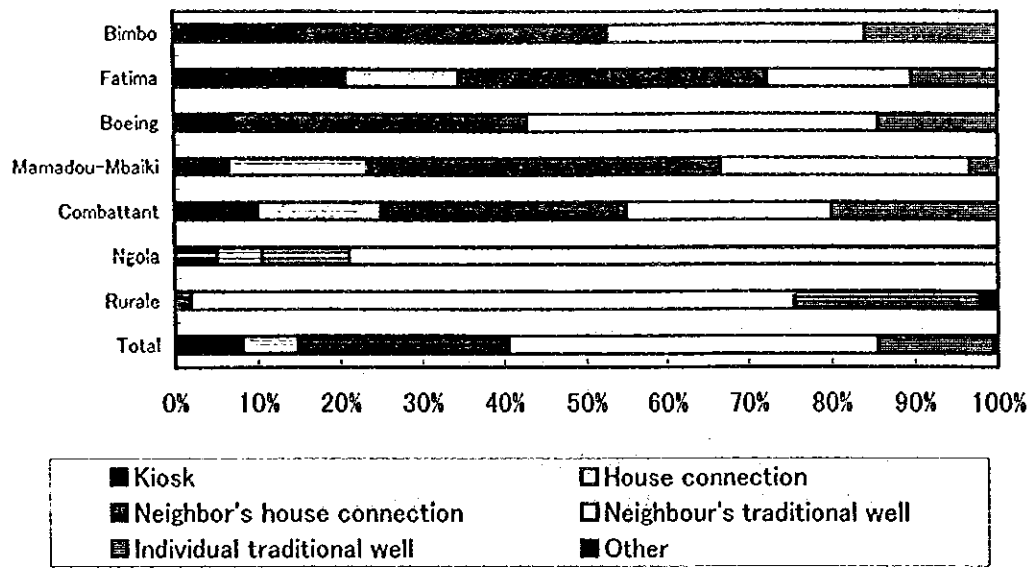
Q45. What container do you use to keep the water?



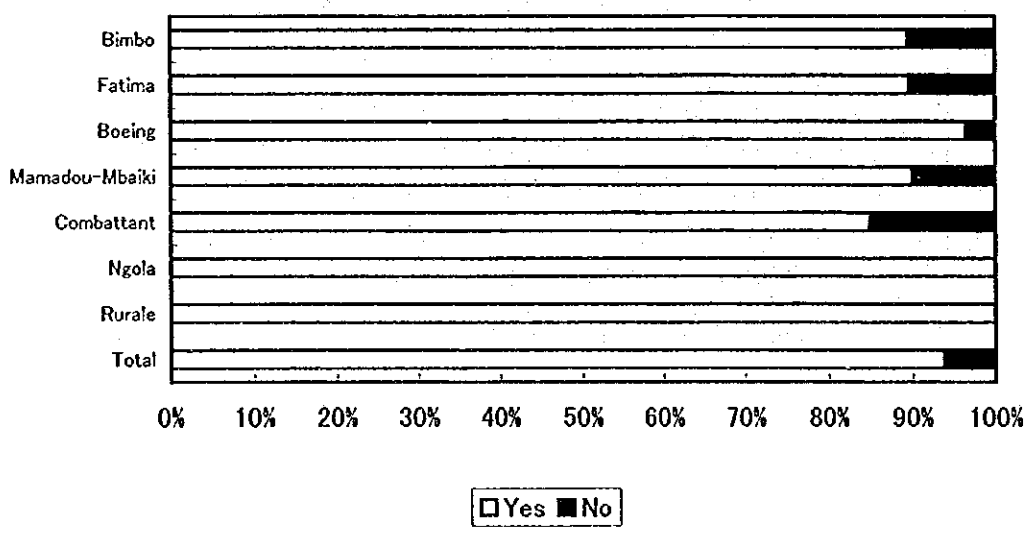
Q46. Are you satisfied with the actual water supply condition?



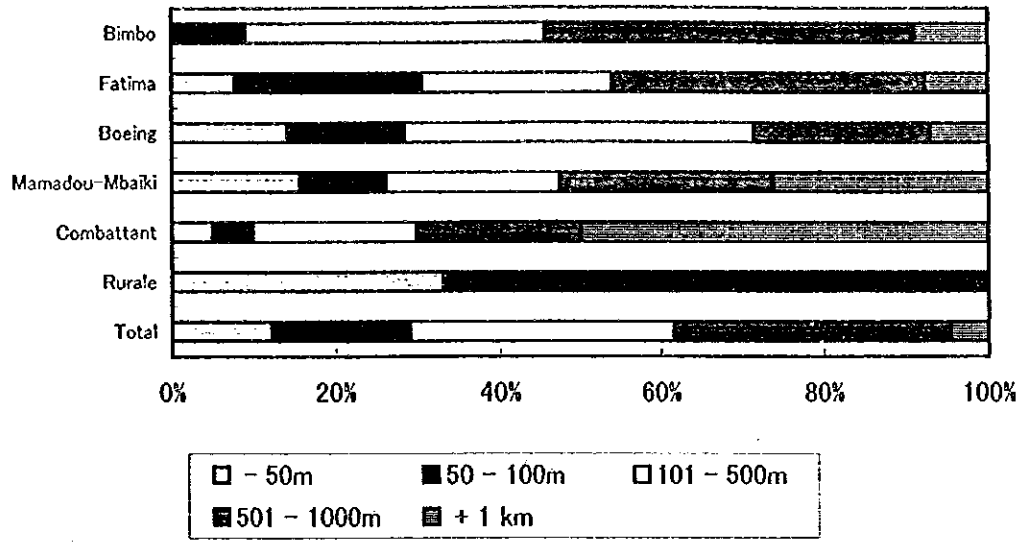
Q47. What source is the most convenient for your family's demand?



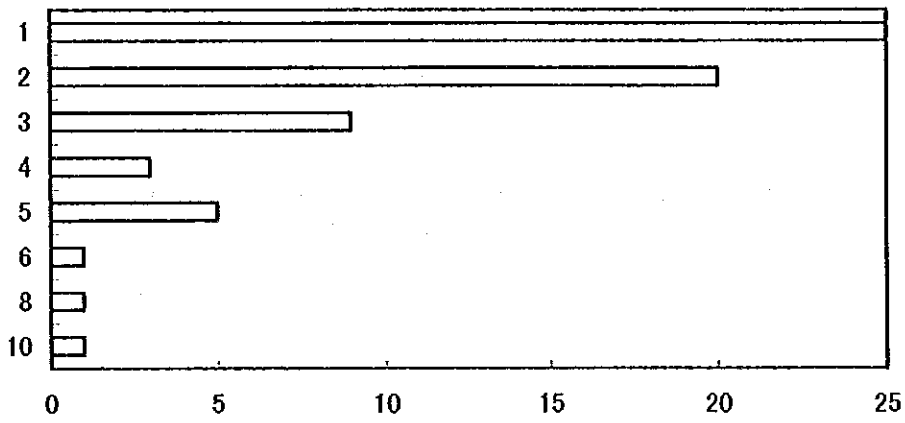
Q49. Are you ready to invest, some amount money to have water epuiment that you wish?



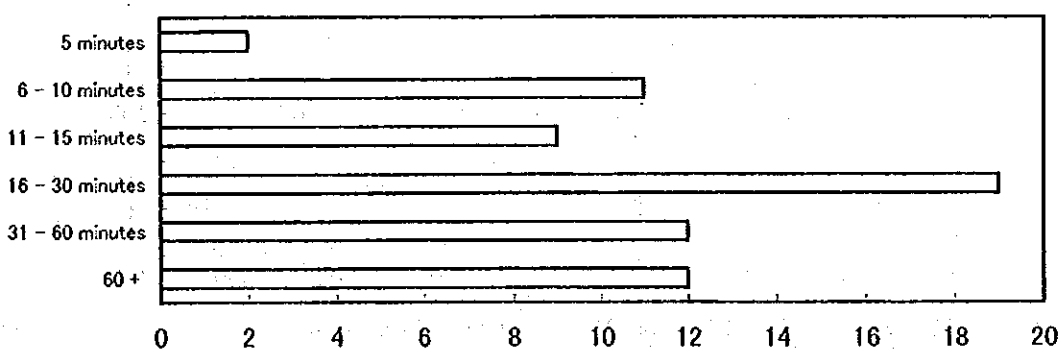
Q67. How far to the Kiosk from your house?



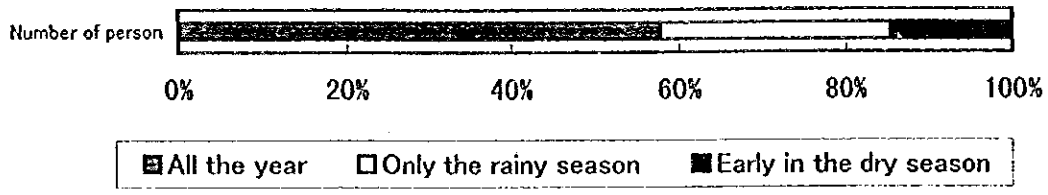
Q68.How oftern do your family go to the kiosk per day?



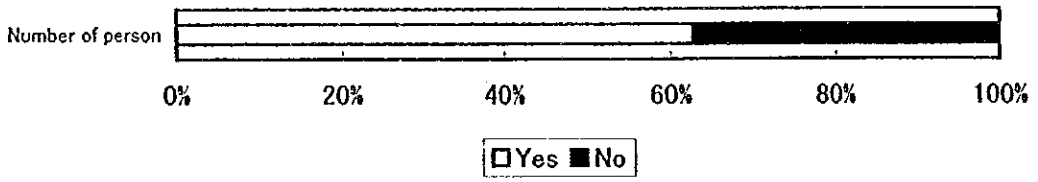
Q69. How many minutes does it take to go to and return from the kiosk?



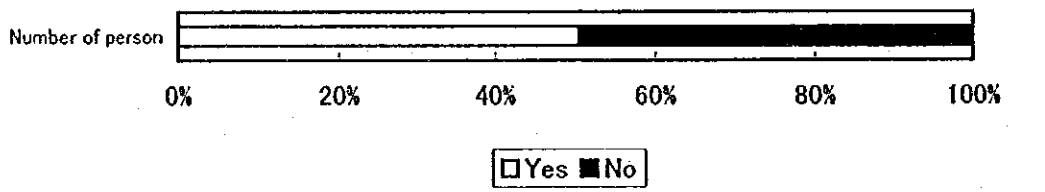
Q75. pssibility of water use of your well



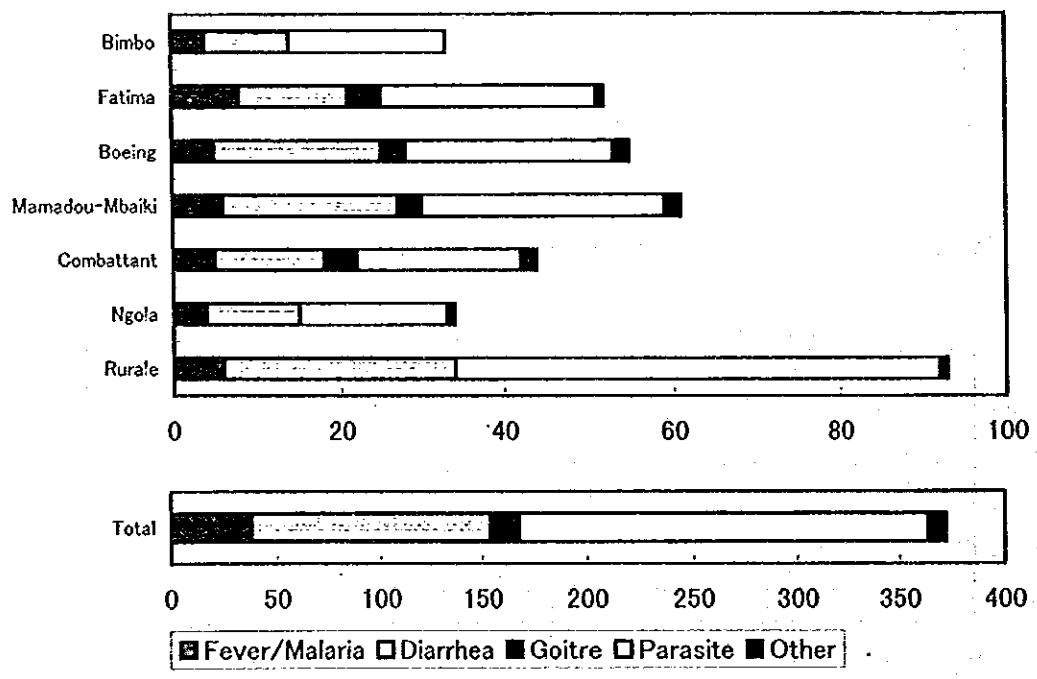
Q77. Does the well you use produce suggicient quantity?



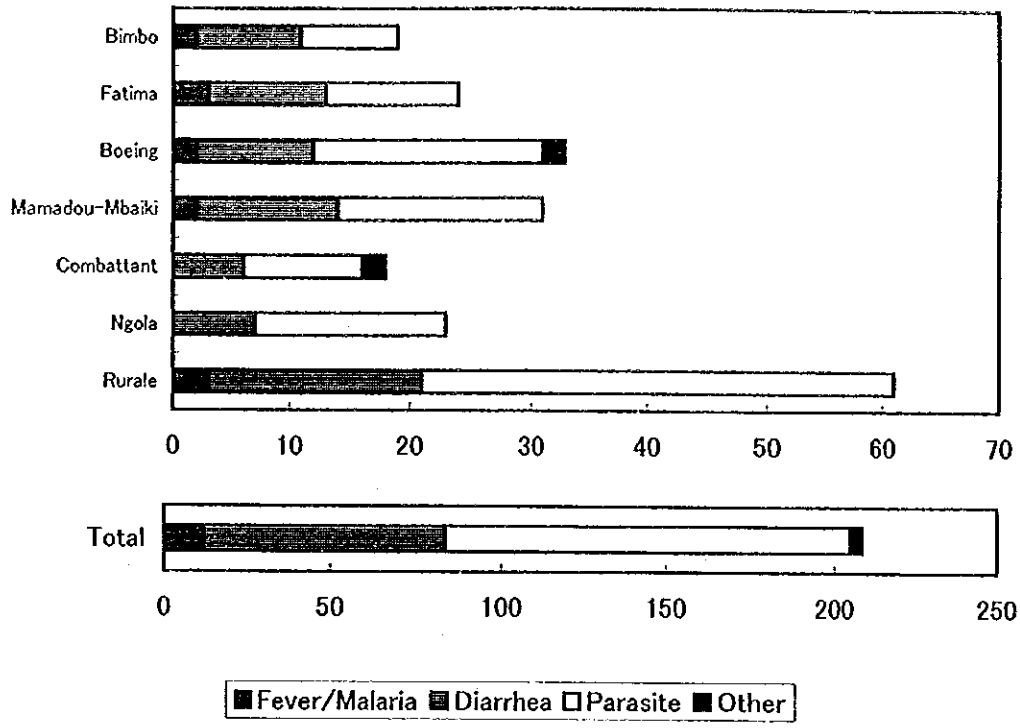
Q78. Are you satisfied with the quality?



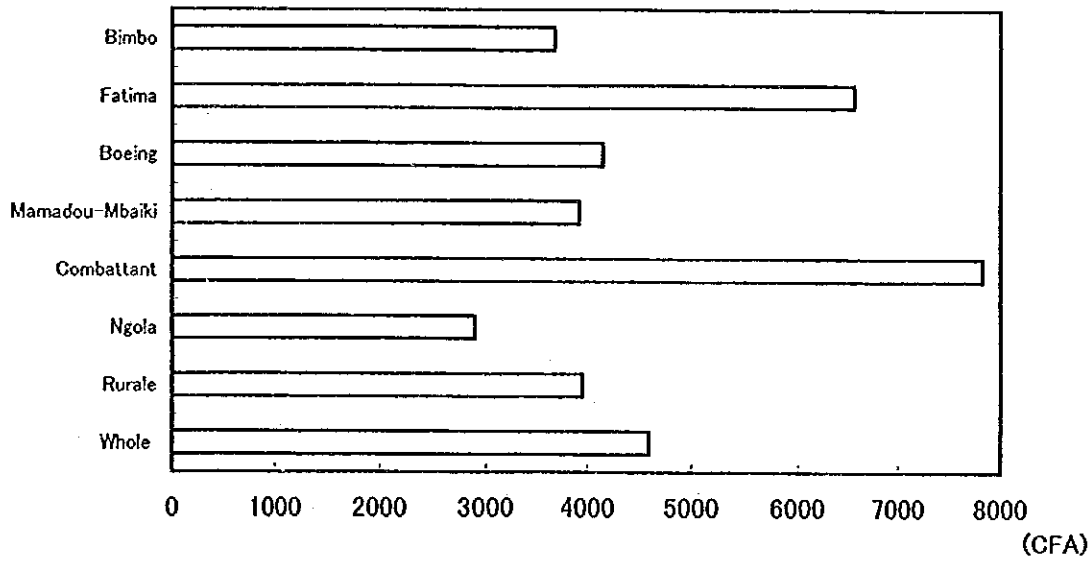
Q101. It is said that some disease may infect with water, which cases do you know?



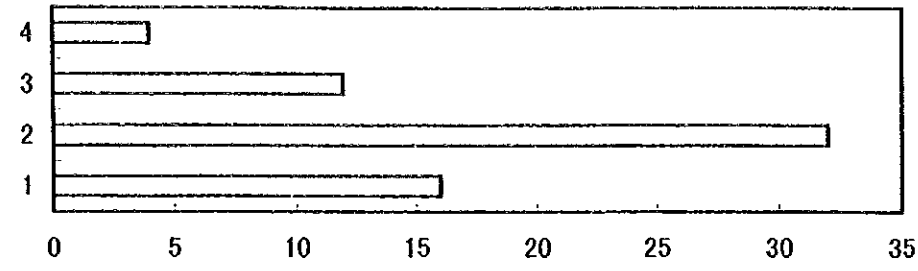
Q102. What type(s) of water born disease(s) did it infect among the residents of the compound in the last six(6) months?



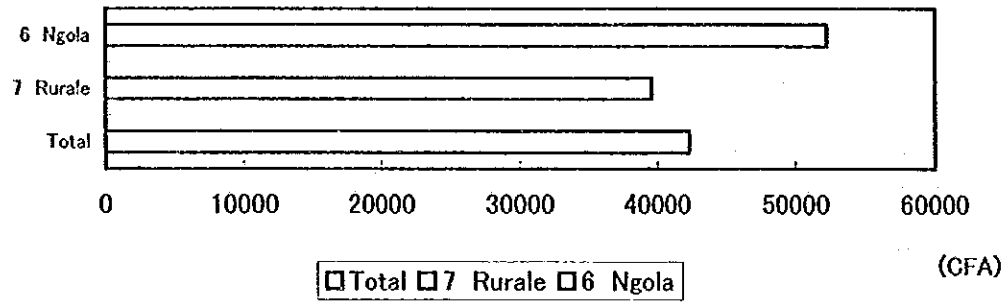
Q103. How much do you expence of health treatment for you and your family in the last three months?

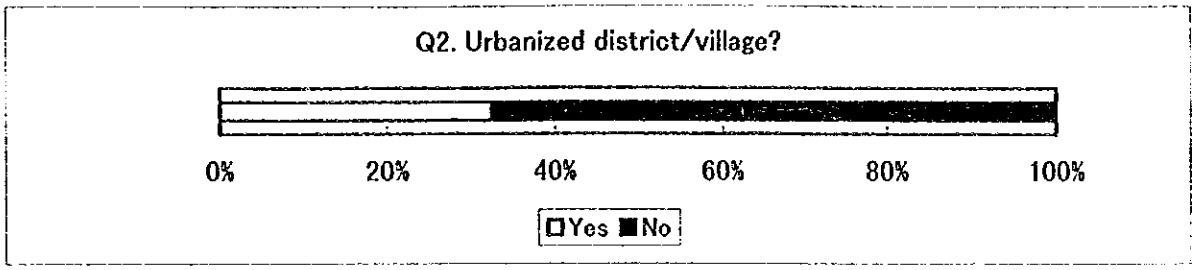


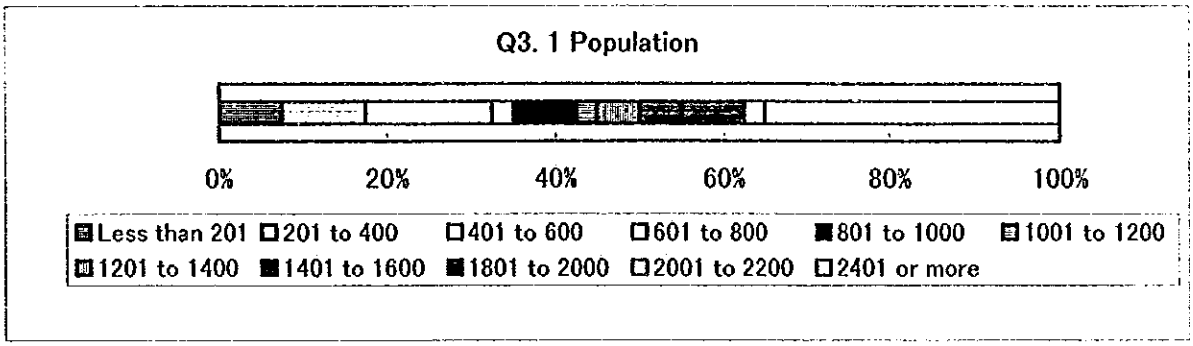
Q111. How many persons do contribute to the budget of the family?

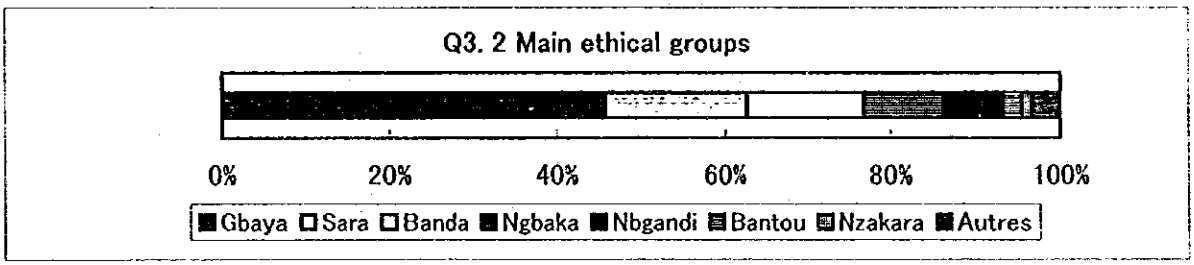


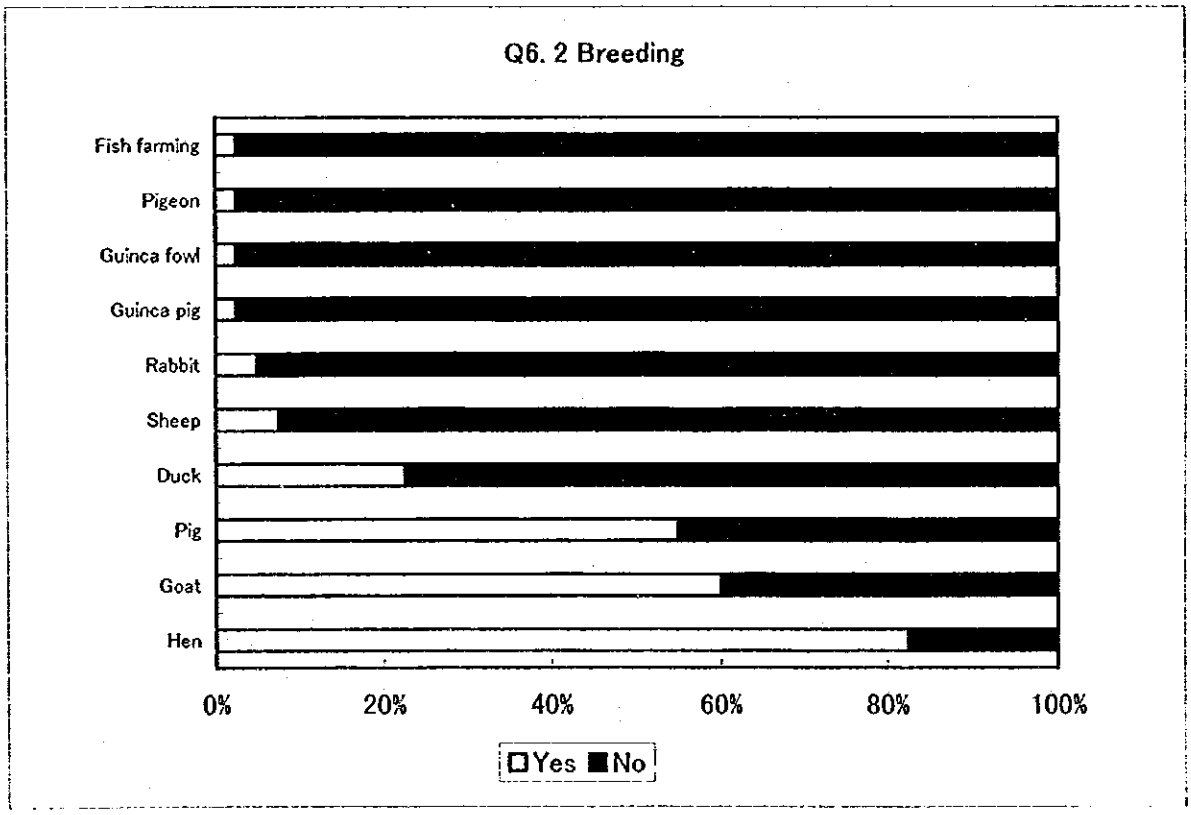
Q112. What is the manner of in-come for monthly family expense?

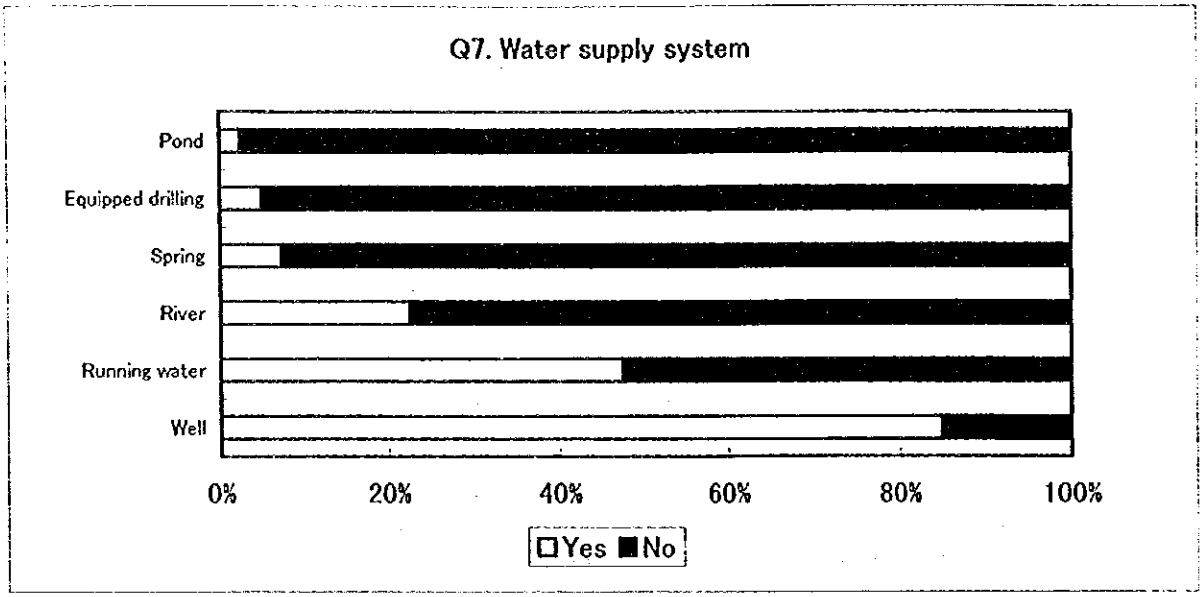


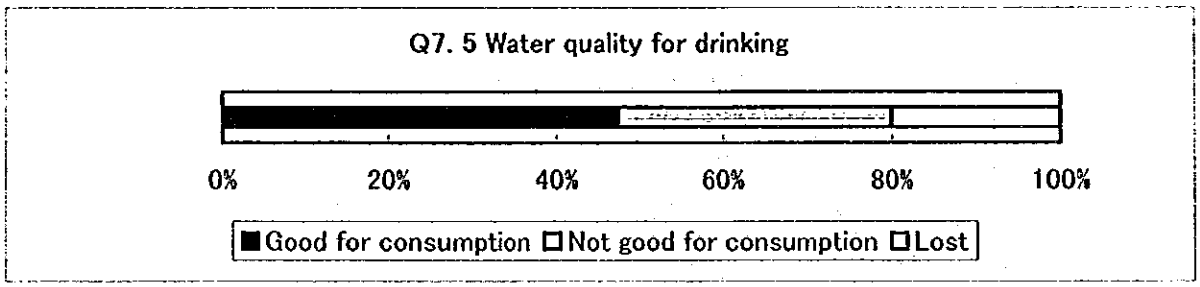

Q2. Urbanized district/village?
0%
20%
40%
60%
80%
100%
Yes
No

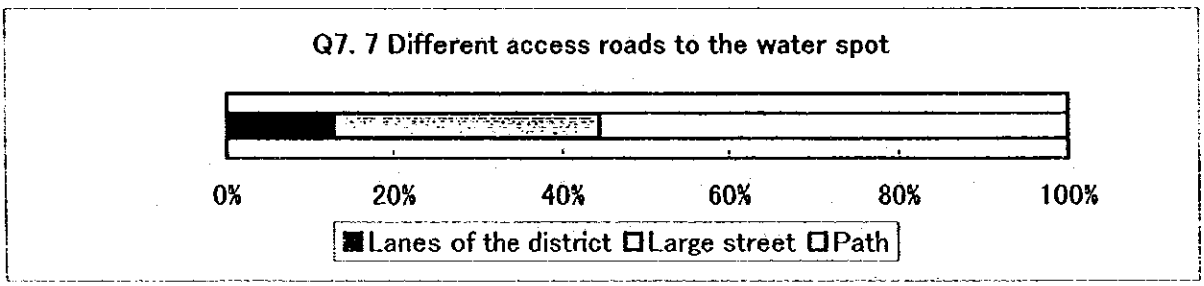

Q3. 1 Population
0%
20%
40%
60%
80%
100%
Less than 201
201 to 400
401 to 600
601 to 800
801 to 1000
1001 to 1200
1201 to 1400
1401 to 1600
1801 to 2000
2001 to 2200
2401 or more

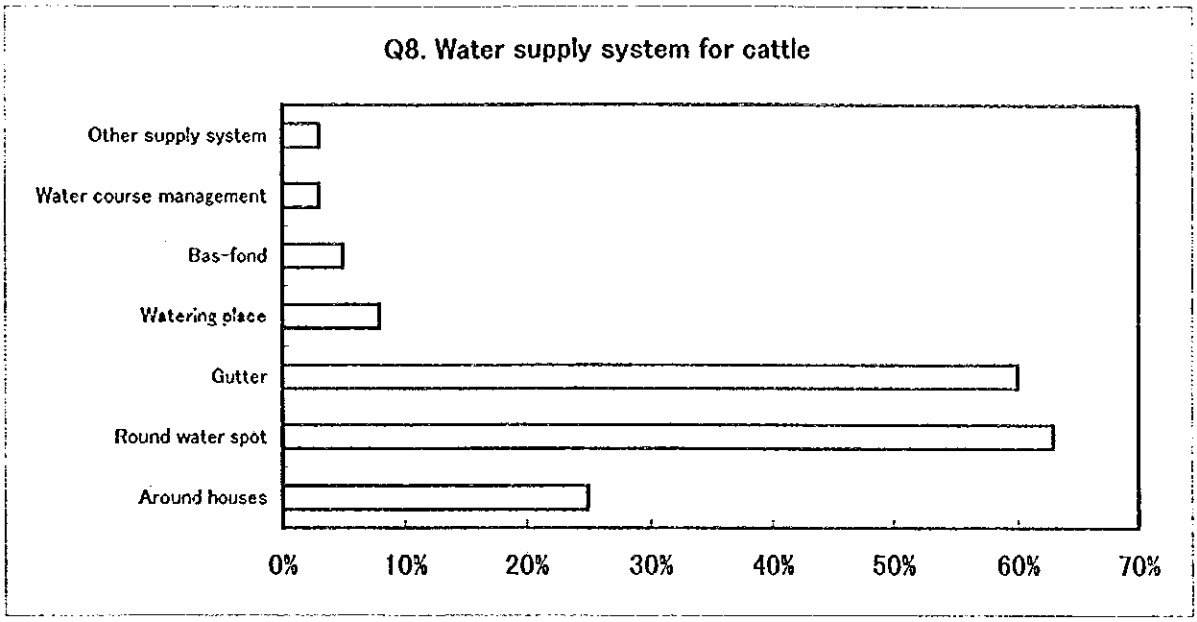

Q3. 2 Main ethical groups
0%
20%
40%
60%
80%
100%
Gbaya
Sara
Banda
Ngbaka
Nbgandi
Bantou
Nzakara
Autres

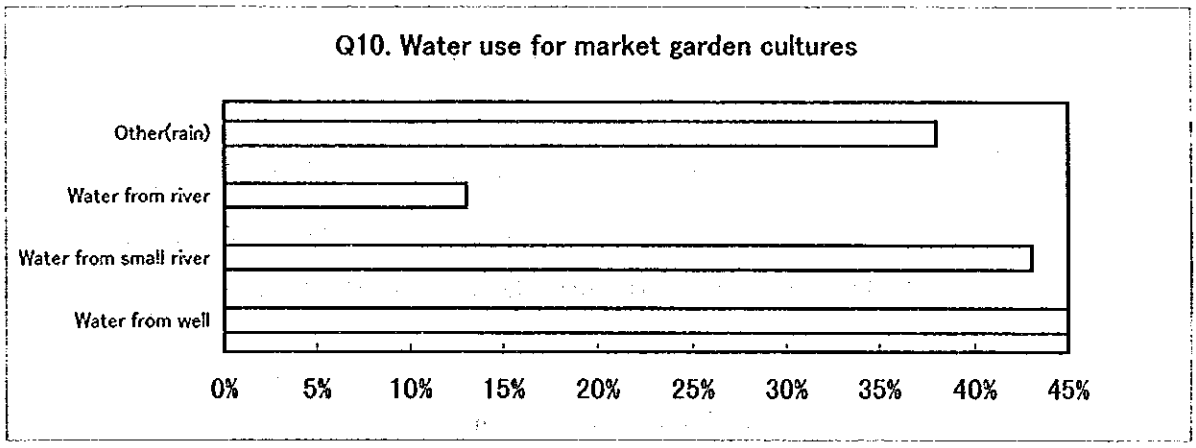

Q6. 2 Breeding
Fish farming
Pigeon
Guinea fowl
Guinea pig
Rabbit
Sheep
Duck
Pig
Goat
Hen
0%
20%
40%
60%
80%
100%
Yes
No

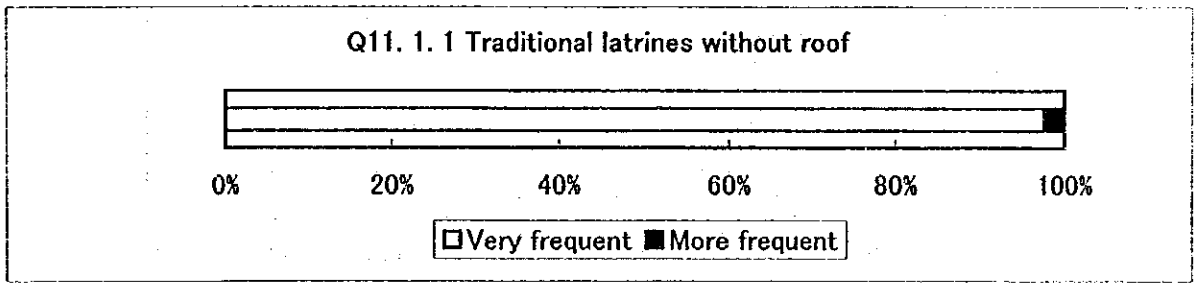

Q7. Water supply system
Pond
Equipped drilling
Spring
River
Running water
Well
0%
20%
40%
60%
80%
100%
Yes
No

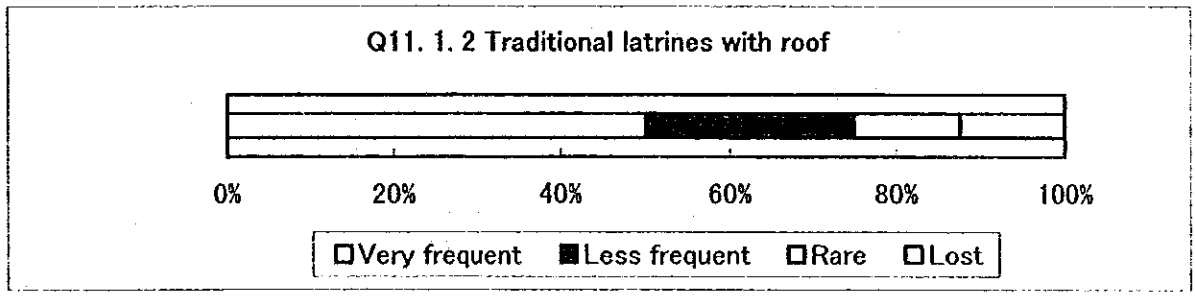

Q7. 5 Water quality for drinking
0%
20%
40%
60%
80%
100%
Good for consumption
Not good for consumption
Lost

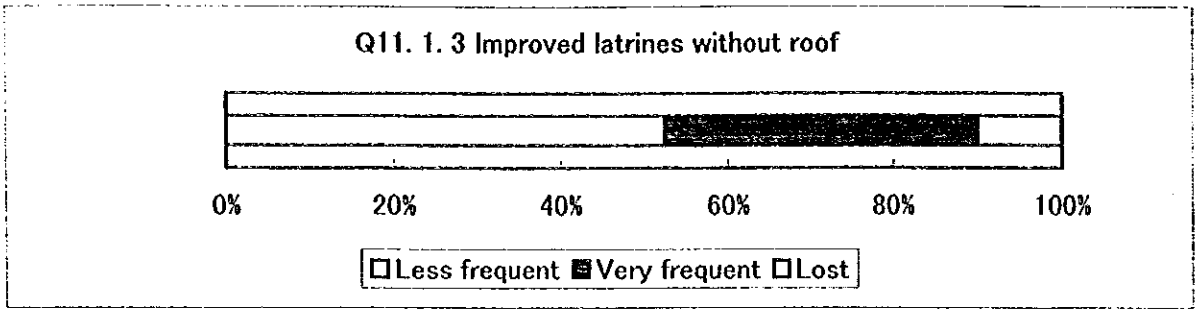

Q7. 7 Different access roads to the water spot
0%
20%
40%
60%
80%
100%
Lanes of the district
Large street
Path

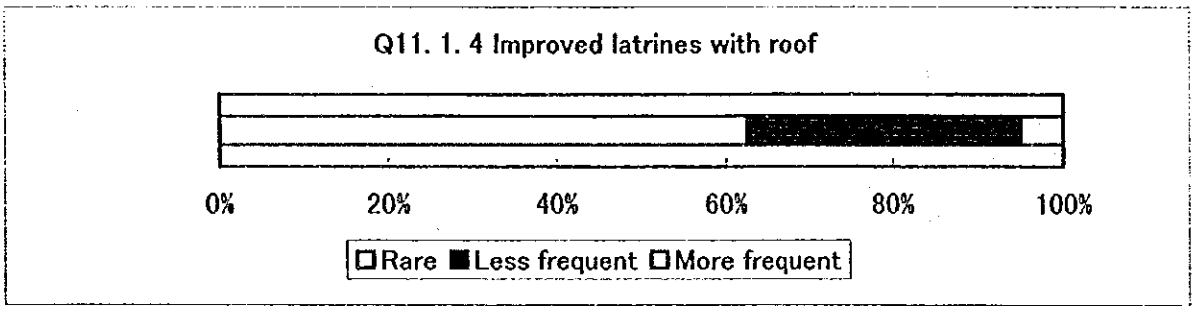

Q8. Water supply system for cattle
Other supply system
Water course management
Bas-fond
Watering place
Gutter
Round water spot
Around houses
0%
10%
20%
30%
40%
50%
60%
70%

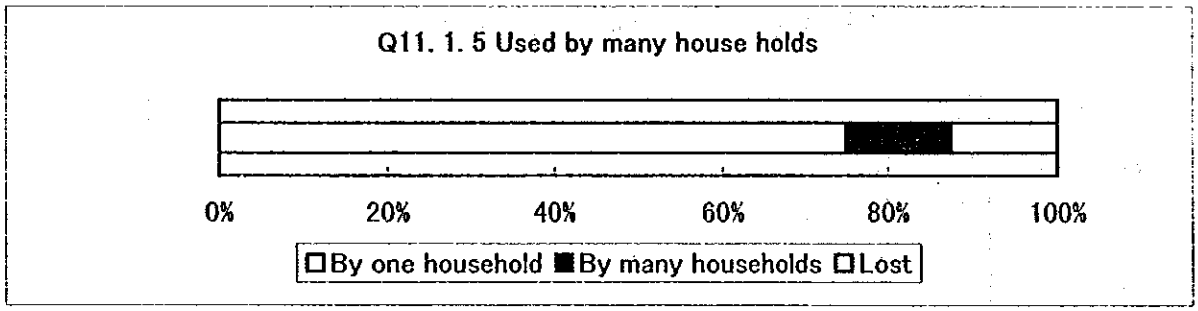

Q10. Water use for market garden cultures
Other(rain)
Water from river
Water from small river
Water from well
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%

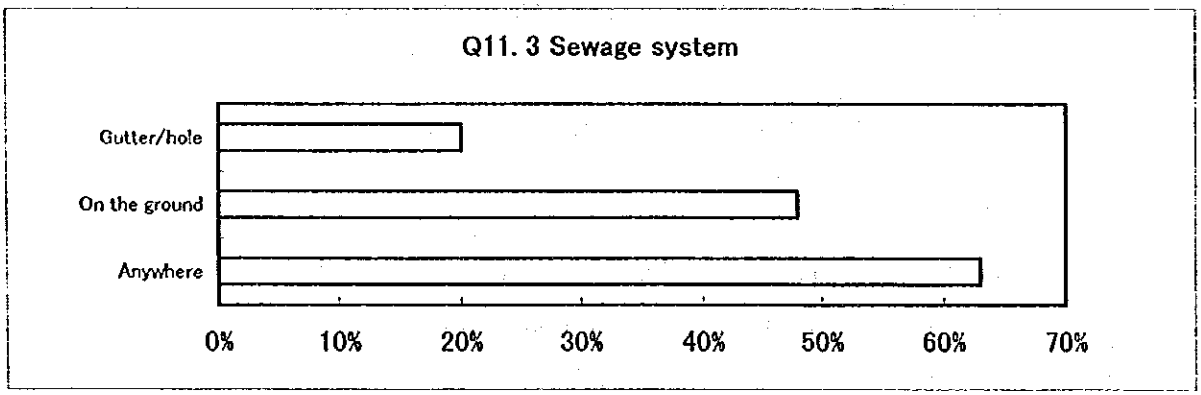

Q11. 1. 1 Traditional latrines without roof
0%
20%
40%
60%
80%
100%
Very frequent
More frequent


Q11. 1. 2 Traditional latrines with roof
0%
20%
40%
60%
80%
100%
Very frequent
Less frequent
Rare
Lost

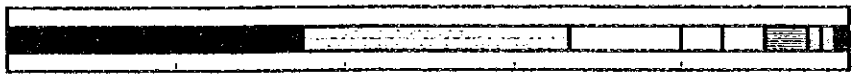

Q11. 1. 3 Improved latrines without roof
0%
20%
40%
60%
80%
100%
Less frequent
Very frequent
Lost


Q11. 1. 4 Improved latrines with roof
0%
20%
40%
60%
80%
100%
Rare
Less frequent
More frequent


Q11. 1. 5 Used by many house holds
0%
20%
40%
60%
80%
100%
By one household
By many households
Lost


Q11. 3 Sewage system
Gutter/hole
On the ground
Anywhere
0%
10%
20%
30%
40%
50%
60%
70%

Q12. 1. 1 Type of the association of the district

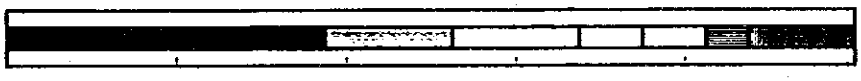


- Religious association
- Inter help association
- District grouping committee
- Auto : promotional association
- Craft association
- Sport association
- Agro-breeding grouping
- Village hydranlie committee
- Educate association
- Association for students parents

Q12. 1. 2 Size of the associations

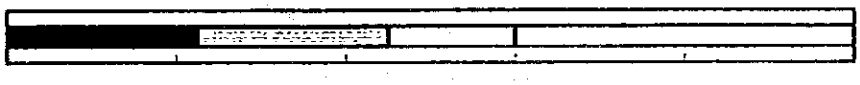
- 10 to 20 members
- 21 to 30 members
- 31 to 40 members
- 41 to 50 members
- More than 50 members
- Lost

12. 2. 1 Type of community works implemented



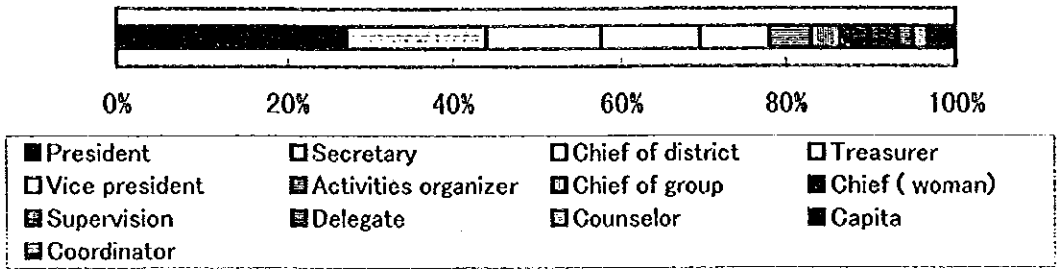
- Quartering work of the roads
- Market sanitation
- Construction centre de sante
- Repeat of gutters
- Weed cleaning of the paths
- Building school
- Building church
- Building latrines
- Lost

Q12. 2. 2 Community works organization for maintenance

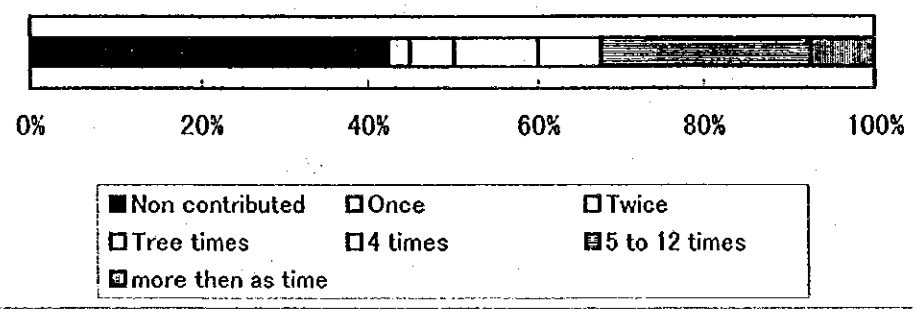


- Under instruction of the cliff of district
- Under instruction of the group
- Under instruction of the responsible
- Lost

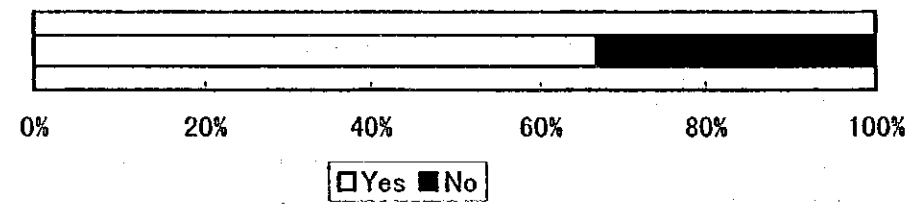
Q12. 2. 3 Responsible for the community works for maintenance



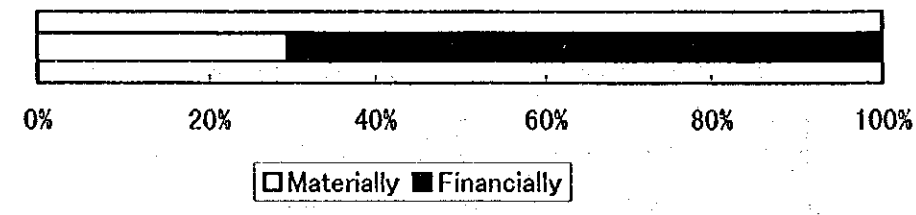
Q12. 2. 4 Frequency of contribution to actions for maintenance



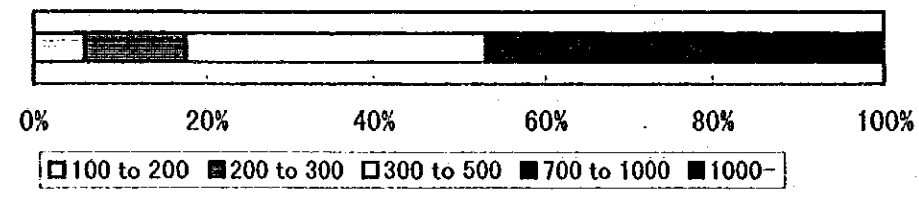
Q12. 3. 1 Habing cash desk



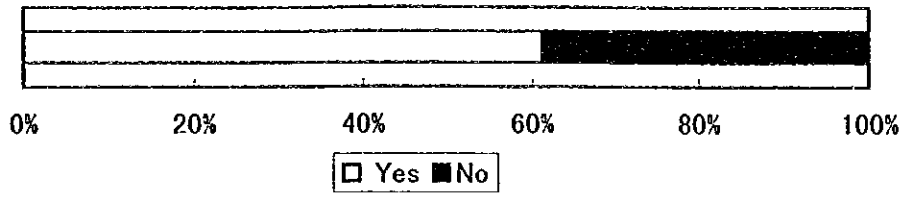
Q12. 3. 2 Supply system of the cash desk



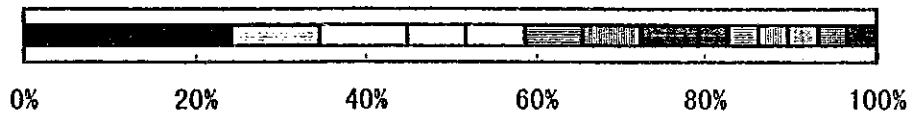
Q12. 3. 3 Amount of contribution per member (F.CFA)



Q12. 3. 4 Recovery matters met

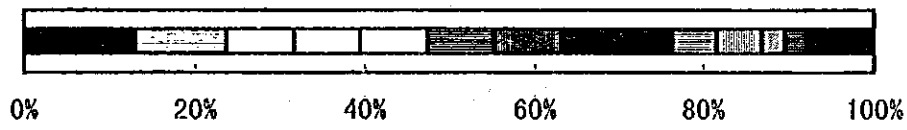


Q12. 3. 5 Realization of associations



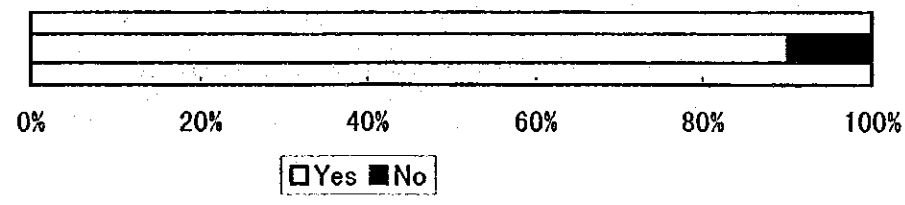
Help to the afflicted members	Building health center
Building	Purchasing sport equipment
Access roads	Purchasing benches
Building school	Constitution de stock de lianes
Tontine	Purchasing bench works
Medical help	Breeding and fowl
Purchasing tractor	Purchasing motor pump

Q12. 3. 7 The associations future plan

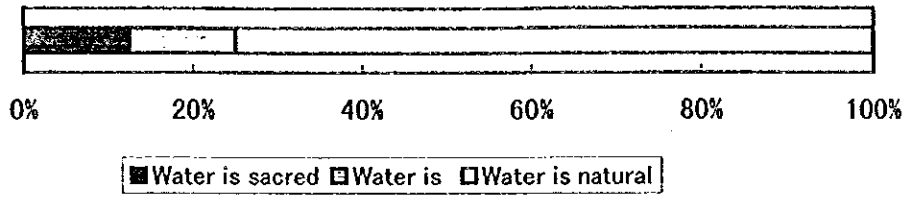


Building a heath center	Urbanization of the district
Building market	Training of young girls
Building a church	Promotion of sport
Truck farming culture	Building a drugstore
Building	Water supply
Breeding	Building a school
Purchasing music equipment's	Video-thec
Fish farming	Hangar

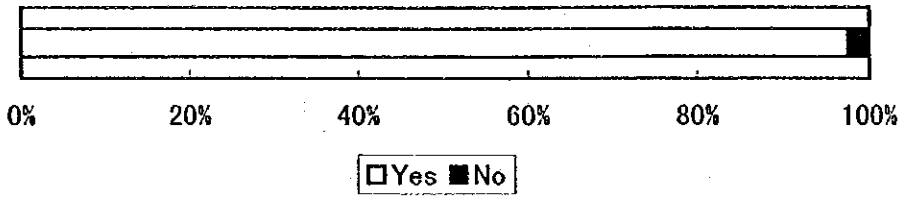
Q13. 5 Cruel lack of water in the district



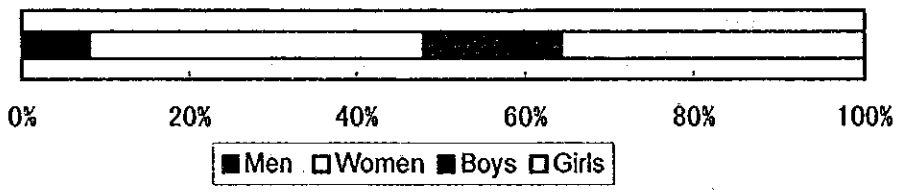
Q13. 6 Relationship between water and custom



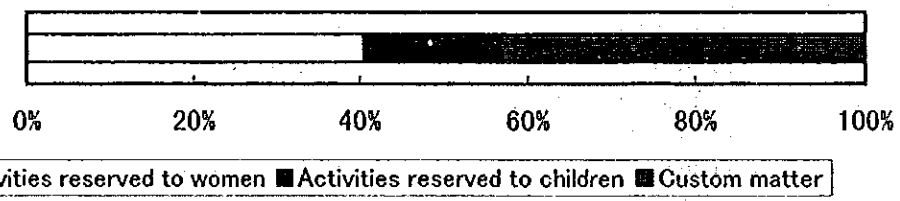
Q13. 7 Habit of sharing water



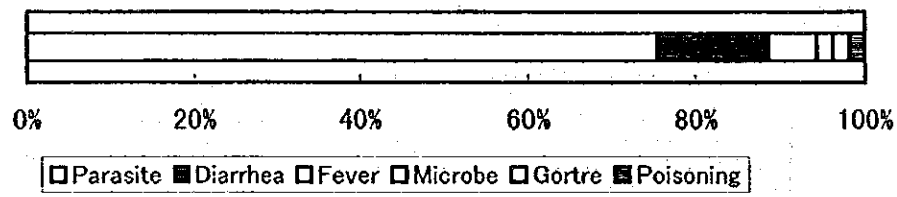
Q13. 9 Parsons habing more access to water



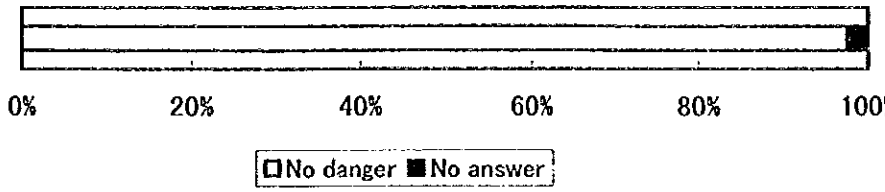
Q13. 10 Access limited



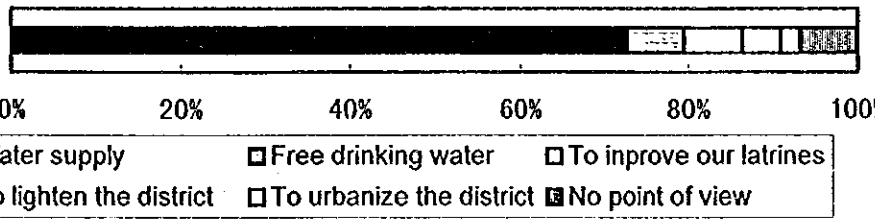
Q13. 14 Dangers related to the cunsumption of water from well



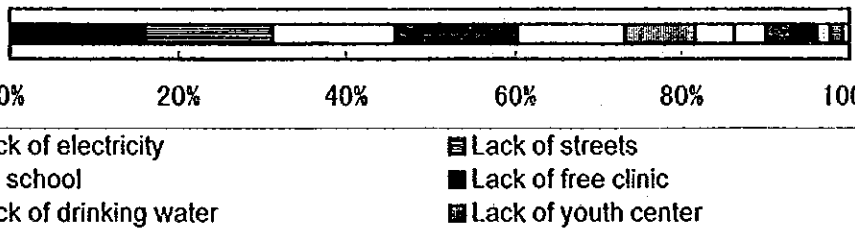
Q13. 15 Dangers related to the comsumption of water from well



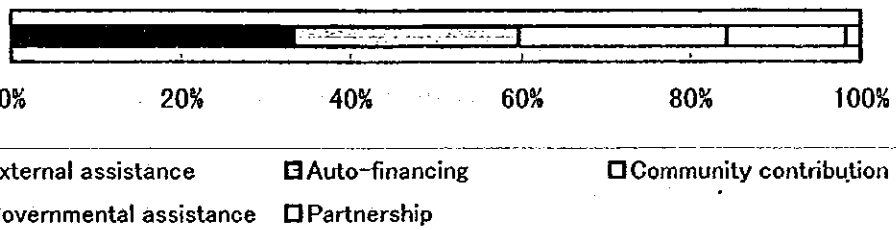
Q14. 3 Exceptiion from ground water supply project



Q14. 4 Major problems of the district



Q14. 5 How to think to resolve



1-2. RRA STUDY IN THE PROJECT AREA

1.Introduction

RRA study was done in GABABIRI, one of community in F/S area. The community has rather mixed occupational groups compare to rural areas, because it is in sub-urban area. However the majority of people are involved in agricultural activities.

In this study ,separate women and men farmers' group to be Gender sensitive did RRA.

2.Work Shop Plan

Attendance	Community Member (10-20)
Objective	To get known the inside view of the community needs of potable water
Activities	1. Daily Activity Profile 2. Resource Map 3. Institutional Gram 4. Seasonal Calendar
Staff	JICA mission team Project Staff
Time schedule	Day 1-2. Staff guidance Day 3-5. Field work Day 6. Follow up
Tools	1. Daily Activity Profile • To understand daily life of women and men 2. Resource Map To understand the resources • Product and by-product • Who access, owns , get benefits (use of money) 3. Institutional Gram • To understand community resource (such as school, co-operative

etc.)and outside resource (such as hospital, bank etc)

4. Seasonal Calendar

- To understand seasonal related problem

3.The Points of the RRA (Rapid Rural Appraisal) Result in one of the communities in study area

Daily Activities Profile: it is very clear women's activities are much more complicated, and they are busy in the field and domestic works. Men are busy mostly in the production works.

Resource Map: It indicates women have complicated resources management. Typically, selling traditional drink is women's work.. They are also very active to sell agricultural product at 'small market' nearby their house if a little left after their consumption and if much are left they go to 'big market' further. Women discussed that these money they earned, they could use freely.

They have almost no income from out side of their household. Migration work out side of community is not common.

Seasonal Calendar: both women and men mentioned that getting water is more difficult in the dry season. However women were more aware of this problem since they were in charge of domestic water supply. Women mention that difficulty comes through not only the amount of water is short but also the water level is so low that they need to get water from deep inside of the wells and it consumes a lot of energy. Women are also more sensitive about availability of fire wood. This is also task for women. Men are more seasonally sensitive only about sickness. However they are concerning about malalya because this is the most serious sickness for them.

Women indicate cash income is more in the rainy season, because agricultural products were more, however their workload is much more in the field . In other hand, men have more wage works from non-agricultural activities in the dry season.

Institutional Grams: women feel that social services including kiosques and health centres are all very far away but they are very important. They discussed that they disparately need health and potable water service despite they have traditional alternative services, which they find less trusted and worse than modern ones.

Men's view indicates that men's activities in the community are more comprehensive. They can also indicate what are the most important and powerful institution in community.

Both indicate that electricity supply is important but far away.

Only women indicate petrol stations are important but far away. Because women are in charge of fuel supply.

1-3. COMMUNITY ACTIVITIES IN THE PROJECT AREA

The F/S area is newly developed area without proper social services, and local institutions are less established yet. However there are some community activities. According to the result of the questioner in1996, about 75 % of the interviewee in F/S area answered that they were involved in co-operative activities. However activities are limited to construction and maintenance work of social infrastructures and women participation is very rare (15% answered 'participated') .

(1) Type of the organisation in the district

Around Bangui, some type of community based organisations are found. According to the questioner to district chiefs in 1996, religious organisations and district organisation committees are most of them. Their activities are mainly construction and maintenance of social infrastructures such as health centres, churches schools and roads and social help. They are followed by occupational organisations such as farmers unions or craft man unions. Their main activity is co-operative purchase of production equipment.

There are a few local NGO but they are coming up.

(2) Type of community works

According to the results of the questioner in1996, community works are limited to physical works, such as construction and maintenance of social infrastructures (health centres, churches, schools) and latrines for individual house. These works are organised by district chiefs (38%), local group leaders (38%) or authorities (24%). It means that community works are mostly organised by community autonomously. More than half of the interviewees answered that they have accountants for these activities. Contribution is done materially (29 %) and financially (71%). Most of the cases (79%), the contribution per member is less than cfa 1000, a few cases exceed cfa 1000, it seems that cfa 1000 is already heavy contribution for them. More than half of them think their investment meets the benefit.

(3) Tontine

Financial co-operation activities among the population mostly for women. Every month, member of the tontine contribute certain amount of money and each month one of members can use whole contribution. If there are 10 members in a tontine, after 10 months everyone get once finance. This system is developed in Cameroon, in CAR it is also wide spread. But there is few successful tontines. The questioner in 1996, indicates 60-65 % of the people in Bimbo and Boeing areas are

joining Tontine. Their monthly contribution is mostly more than cfa 5000. They can use about cfa 35000 per person on term.

This kind of activity is a possibility to activate community in the project.

(4) Awareness of safe water

Whether people buy water from the new system or not depends heavily on the value they put on safe water. Therefore it is very important to raise awareness of safe water through sanitation education or other extension activities.

The present awareness situation of safe water in the target area is examined in the questioners in 1996 and 1999. Following are the results of these questioners.

70% to 80 % of the interviewee in the F/S area answer that the quality differs between the water from deep wells and shallow wells. There is also relatively high rate of awareness about water related diseases. (45%-57% are aware of parasite risk, 30%-36% are aware of diarrhoea risk and 10%-13% are aware of malaria risk). There is a tendency that people go farther to get drinking and cooking water, this is the evidence that people are aware of the importance of safe water. Together with high willingness to pay, their awareness and demand for safe water is already high. This indicate the important potential for extension activities of safe water in F/S area. The project must encourage people to use safe water and meanwhile give them correct information about sanitation/ hygiene such as use of chloride (locally called Javel), wells' contamination sources, importance of proper drainage and so on.

However most of them answered if they choose water source, they will choose closest one for convenience (like traditional well nearby or neighbours' house connection) therefore the project must carefully consider the location of kiosques for public interest.

(5) Water usage and production

About half of the interviewee in the F/S area answered that they have domestic animals. Chickens, pigs and goats are most common animals, which require little input because people leave them at large. People give a little attention to give water or feed to animal. Only 38% of them give water to animal (mainly water from traditional wells). Gardening is common however it is rain fed. Irrigation is very rare and limited.

If they get extra water from the new water supply system, there is a possibility to use more water for production activities, especially for animal husbandry. It will make the productivity higher than now. Further information service for these activities will be required.

1-4. NGO ACTIVITIES IN CAR

There are some active local NGOs in CAR. Most of them get fund from abroad. Among them, Africare and Caretus are big and have good reputations. They get also technical assistance from expatriates regularly. There is also Catholic mission active with community development. International NGO, MSF (Medecins sans Frontier) has started activities in April 1999.

CAR government changed the low concerning NGO in April 1999 to encourage their activities, through this action, more local NGO may come up.

In this study, it is mainly examined community based activities of these NGOs .

MSF focuses community based management in their activities. They have management specialist to train the people in this aspect. Their programme is just started however it is instructive.

Africare has also community based activities. Maternal Care project is one of their activities, in which they trained inter media persons to run community based dispensary. They had also farmers co-operation programme, in which they supported marketing and crop extension activities.

Caretus runs sanitation/ hygiene promotion programme directly. Caretus agents are directly involved in extension activities, for example portable water use, improvement of water place, promotion to contact SNE/ SODECA for portable water. The programme is also concerning IEC (Information Education Communication), which focuses on Nutrition, AIDS, STD, Water. They have also other programmes such as running health centre in rural area and traditional nurses training. Last programme fit the interest to local population, since they feel traditional nurses are very close to their life but they do not trust their skill as much as modern ones. (cf. RRA result) Through the training, traditional nurses can get more skill and trust , and they can effectively use their new skill in the communities.

Africare and Caretus have platform activities around Bangui and Bimbo area apart from the projects they directly run. They use local organisations, such as farmers groups, women's groups. They give advice, necessary training and fund. These local organisations run their own project by themselves. The problem is that these organisations misuse fund often, the financial control is most difficult point of the platform activities.

Catholic mission has long history of activities in CAR mainly in the field of health and education. They are also trying to involve people in community development activities. However management is still heavily under control of the foreign mission and their local committees.

From these studies, it is interesting to find that local NGOs such as Africare and Caretus are positive about community based programmes, and some foreign agents are not so much. Despite the short project history in CAR, MSF has not very positive feeling about community based management. One way or another, they have a little prejudice over the community based management in CAR. Other small foreign agent which has been longer in CAR, have different opinions similar to local NGOs. The problem is not community based management itself but the strategy they take. A lot of cases, essential training for community based management such as leadership training, book keeping training, conflict management training and etc. are not done to realise new management system. In fact, Africare and Caretus have been introducing such training earlier. If the cases are learn from them, community based management is not only theoretically good but also practical.

Interview Sheets

Africare
8 June
Interviewee TIKOUZOU Timothee
Type of the project 1. Ouham/ Ouham-pende
Farmer's Help 1987-92 Crop generation
Marketing
2..Mambere-kadei
Maternal prenatal, postnatal health promotion project, now going on
Targeting 40 village
Village committee will run village dispensary
For each 2-3 village Africare train inter media person to support committee

3. Mboki
Sudanese refugee project 1994-1998
Well 200
Hospital 60-80 bed 2 doctor 30 nurse-8despensary free of charge-
Sanitation /Hygiene 20 extension worker extension and education
Agriculture Crop production for self-sufficiency
Micro-enterprise

4.Platform activities around Bangui
ADF (African Development Fund) used to support, they gave training of project management, and subject matter, 1996 stopped now Africare took over all activities

EMF Women support baby feeding project
GAPSK Farmer's Group support
Advise
Seed distribution
Irrigation extension
Farmer's group was existing for marketing activities

Caretus

16 June

Interviewee: Brother Jean-Baptiste MOSSOUMO (co-ordinator, sociologist)

Type of the project: Rural Development
1. Economic Promotion
2. Health
3. Gender

Objective: To improve condition of life
To make self-sufficiency

Target group: Local organisation exist at least 2 years

Project Activities

ECONOMIC PTOMOTION
1.Giving different Training
Leadership Training
2.Cooperatio Setting
Marketing
Animal Husbandry with appropriate technology
Credit
4. Micro-business
Handcraft
Support to Brick maker

HEALTH
1. Primary Health Care
- Caretus Agents are directly involved in extension activities for example portable water use, improvement of water place, promotion to contact SNE/ SODECA for portable water
- Running health centre in rural area
- Traditional nurses training
- IEC focuses on Nutrition, AIDS, STD, Water

GENDER
1. Awareness raising to gender issue
2. Encourage people to involve women in decision making procedure
3. Equal opportunity to women in all project

Activities in Bimbo area
1. Working with local NGO
2. Training to Traditional Nurses

Project Staff: 6 agent
2 Agriculture technician
2 Agronomist
1 Public Nurses
1 Midwife

Budget			
	Expenditure	Project cost	cfa 53,094,000
		Overhead Cost	cfa122,521,218
	Income for Project	Local contribution	cfa 4,262,500
		Bilance (Dutch NGO)	cfa 60,000,000

MSF

Interviewed with Mr. DUMONT (Chief of Mission)
Mr.CARRERAS (Finance and Administration)

Type of the project	1 . Rescue project in RDC (Congo) **2. Maternity project in CAR**
Objective	Reducing Motility at the time of delivery (Motility rate 100,000 - 977 CAR 100,000- 6 Spain
Activities	1. Training of Midwives and Nurse (Technical) 2. Training of management committee 3. Rehabilitation of infrastructure
Target Group	CHC Begua Kastor Bimbo
Period	3 years Phase 1+2 leads phase 3

Midwives Training , Lack of Knowledge, Motivation

Problem of Community Management in CAR

1. CAR No sense of Community
2. Concept is good , but it doesn't count the reality of the people in CAR not 100% people go to buy water, not 100% of people have money to pay.
3. Power of Decision - They have only right to meke decision concerning management, and still under strong pressure of local politic. However they can use the fund for salary up to 30% of the benefit.

Strategy - Management clear transparent
Motivation Good to do through the community, it will benefit in the future
'Don't eat the wheat, it will benefit in the future'

It is just started. In April 99

Community Health Centre

10 June	
Interviewee	Marie-Elisabeth PICARD (District Nurse)
Type of the project	Running Community Health Centre Under Ministry of Health but no input from them
Activities	Nutrition improvement for children age 0-5 , all people will pay fl 1000 for 3 months get treatment. Education for mothers (Material from PAM in Cameroon)
Staff	Doctor Assistant Doctor 2 Nurse 1 Assistant 10
Staff Training	Sometimes Technical Training is done by French Expatriate
Committee	Management is done by Church organisation half Expatriate half local . In 1983, they decided to specialise treatment of malnutrition
Problem they face	They can not do follow-up activities or promotion activities, because of shortage of manpower and fund Water related diseases as worm are major problem

* This project is funded by French Catholic Mission

2. GEOPHYSICAL PROSPECTING

2. Geophysical Prospecting

Table of Contents

1. Hydrogeological Investigation

Electromagnetic (VLF-EM method) Survey

(1) Specifications of the electromagnetic survey

(i) Instrument

MODEL: EM-16 (Made of Canada GEONICS company)

(ii) Survey amount

- 500m in survey line length, 10m of measurement point interval, 20 survey lines (GE-1-9,11,13-20)
- 550m in survey line length, 10m of measurement point interval, 1 survey line (GE10)
- 700m in survey line length, 10m of measurement point interval, 1 survey line (GE12)

(iii) Used VLF transmission stations

a) Code: NAA (Cutler, USA), Frequency of VLF source: 17.8KHz

b) Code: GBR(Rugby, UK), Frequency of VLF source: 16.0KHz

(2) Survey method

The VLF-EM(very low frequency electro-magnetic) method is an electromagnetic method using VLF band waves. Originally, the VLF method was developed for locating submarines. The low-frequency field used is sent out from a military radio transmitter. The VLF-EM method is well suited for water prospecting in fracture zones. At a vertical conductor such as a fracture zone, the primary VLF magnetic field makes an electric current in the conductive body. Then the secondary magnetic field caused by the induction current appears in a vertical direction, and the VLF anomaly indication can be measured on the ground-surface as a vertical component of the vector magnetic field.

To confirm the lineaments which had been extracted by the interpretation of aerial photographs, the VLF-EM method electromagnetic prospecting was executed in 22 survey lines shown in Fig.2-1. To cross the lineament of the NNW-SSE trending faults (See Fig.2-2) which developed on the east side and the west side of the Study area, the survey lines were arranged. The west side of the survey line was made a starting point and the measurement was done toward the east in each survey line. However, only in survey line GE-14, the measurement was done from the north side to the south.

VLF anomaly indication is presented by a modification of the original data curve. To recognize the anomaly indication easily, a filtering method is used. After filtering the original data, a filtered anomaly indication represents the conductor as a peak of high positive anomaly.

(3) Results of the Electromagnetic survey

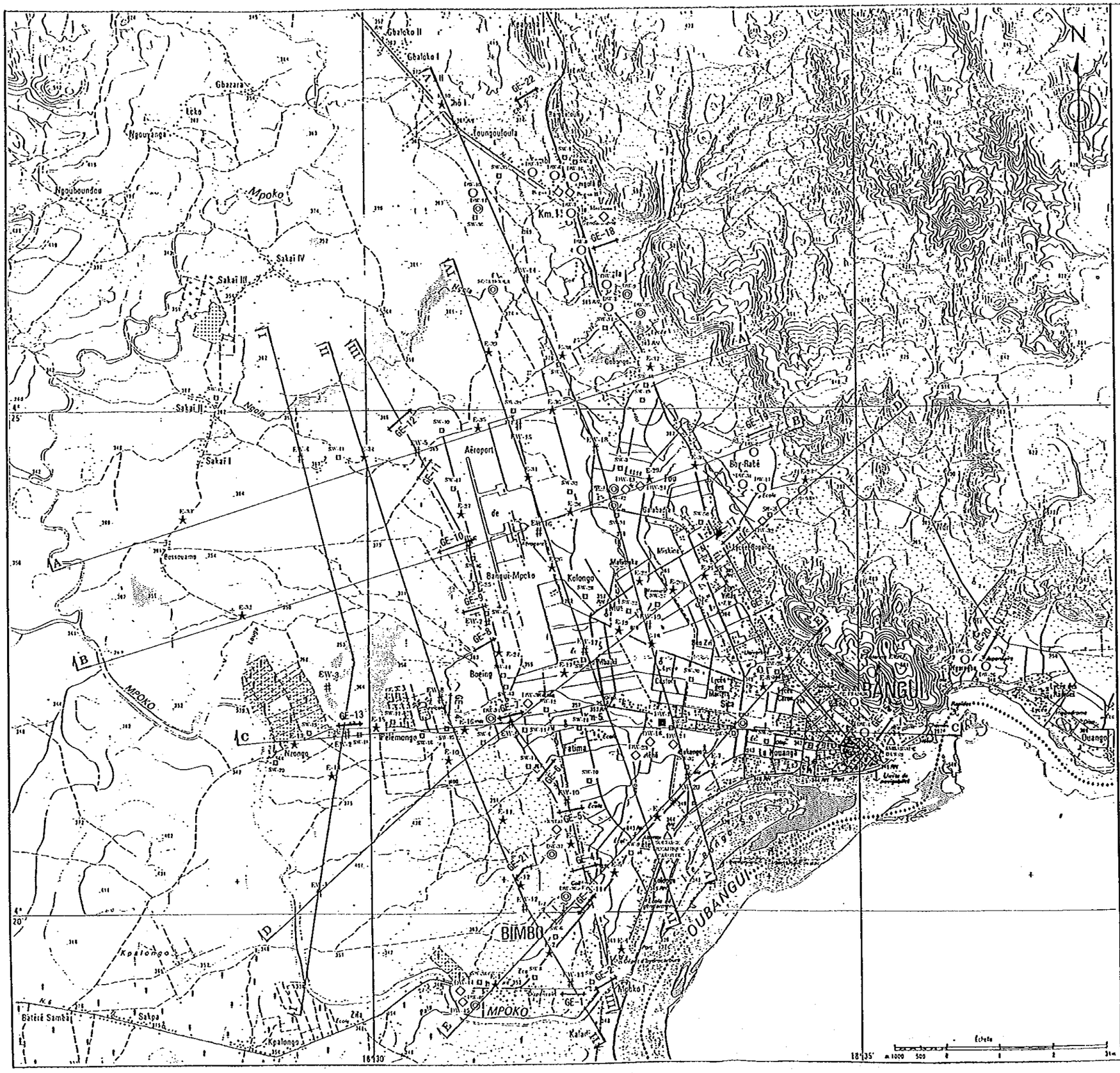
The VLF-EM measurement results are shown in Fig.2-3 . Survey line GE-15・ 20 and GE-22 were measured by arranging lines on two lineaments which ran in the east side of the Study area. As a result, strong anomaly was detected in five survey lines (line GE-16, 17, 18, 19 and GE-22). This suggests the existence of the fracture zone and its continuity. However, because the measurement condition was bad and the extraction of an anomaly point was difficult in the line GE-15 and line GE-20, the extension to the Oubangui river of the fracture zone cannot be confirmed.

In survey line GE-1・ GE-12 and GE-21 arranged on the lineaments which run in the west side of the Study area, weak or strong anomalies are admitted in survey line GE-8, 9, 10, 11, and GE-12 and a continuous extension of the fracture zone can be guessed. However, because the measurement condition is bad in survey line GE-1-GE-7 located in the southern part of the lineament, anomaly which suggests existence of the fracture zone is not detected. Therefore, its continuity to the Mpoko river cannot be confirmed. In survey line GE-21, strong anomaly was detected that deduces existence of a fracture zone corresponding to the fault.

Moreover, storing and week anomalies were detected in survey line GE-14 by which the spring water point was crossed.

(4) Finding

Fracture zones inferred by this VLF-EM survey are shown in Fig. 2-4. On two lineaments located in the east side of the Study area, anomalies which suggest the existence of the fracture zone were detected and the continuities of two faults were confirmed from the north end of the Study area to the central town of Bangui. Moreover, on the lineament in the west side of the Study area, the continuity of the fracture zone was confirmed within a northern part of the lineament. In addition, an anomaly thought to have reflected peculiar geological structure was detected at the spring point of survey line GE-14.



LEGEND

Existing Well

1. Deep well
   - a. Working ◎ (With Electric Submergible Pump) / ○ (With Manual Pump)
   - b. Abandoned ◇
   - c. Observation Well ■
2. Shallow Well (Dug Well) □
3. Soil Investigation Boring △

Hydrogeological Investigation Plan

1. Exploration Well #
2. Electorical Sounding ★
3. Electro-magnetic Survey +—+
4. Profile Line ⌐

Fig. 2-1 Location of Survey Lines for Electromagnetic Prospecting

LEGEND

Hl : Hill
Pd : Piedmont
Al : Alluvial Plain
Pl : Plateau

: Depression
Origin and Cause
R----Ancient river course
S----Spring
E----Artificial excavation (borrow site)
F?---Fault ?
U----Unknown

clear unclear : Lineament

 Fig. 2- 2 Location of Assumed lineament

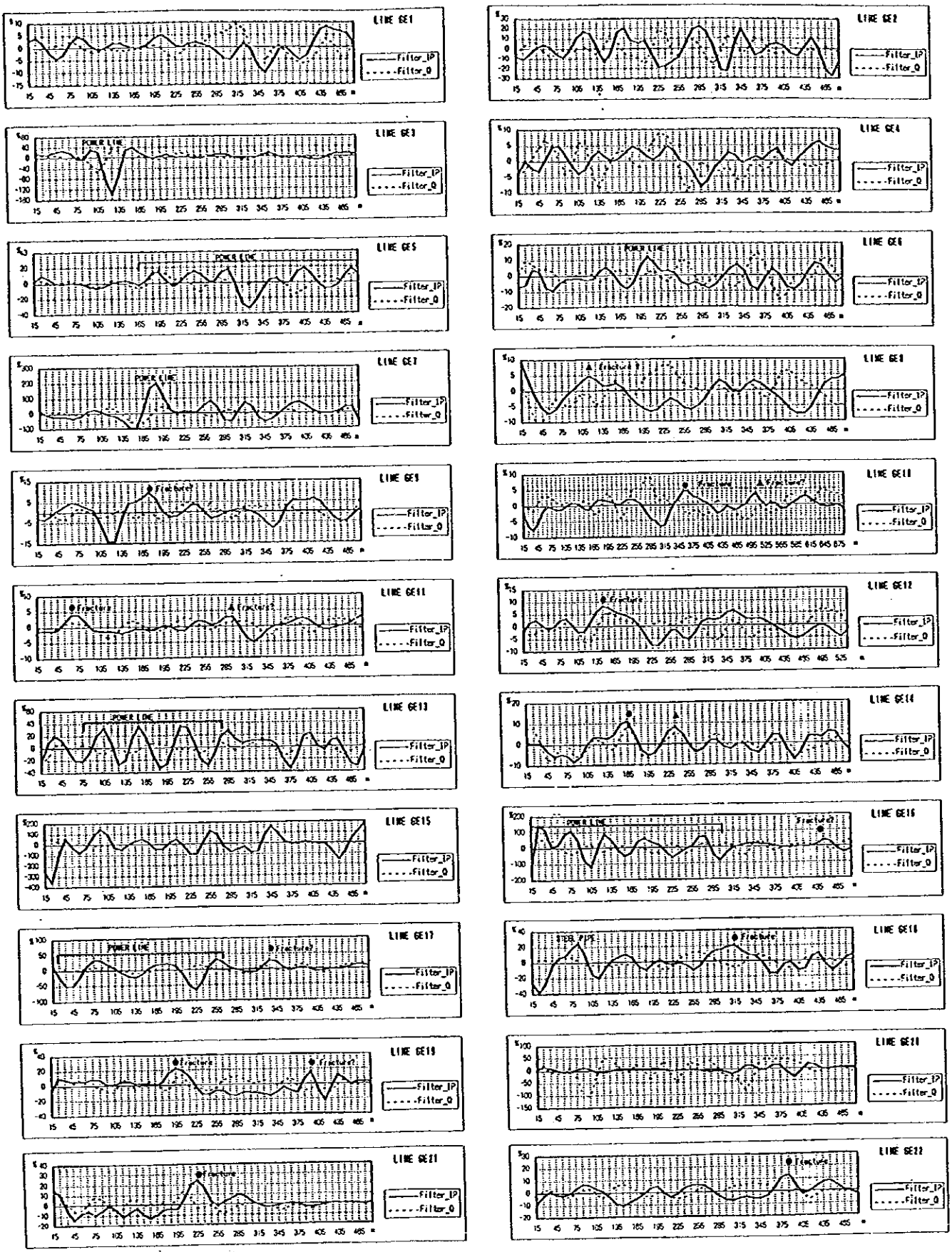
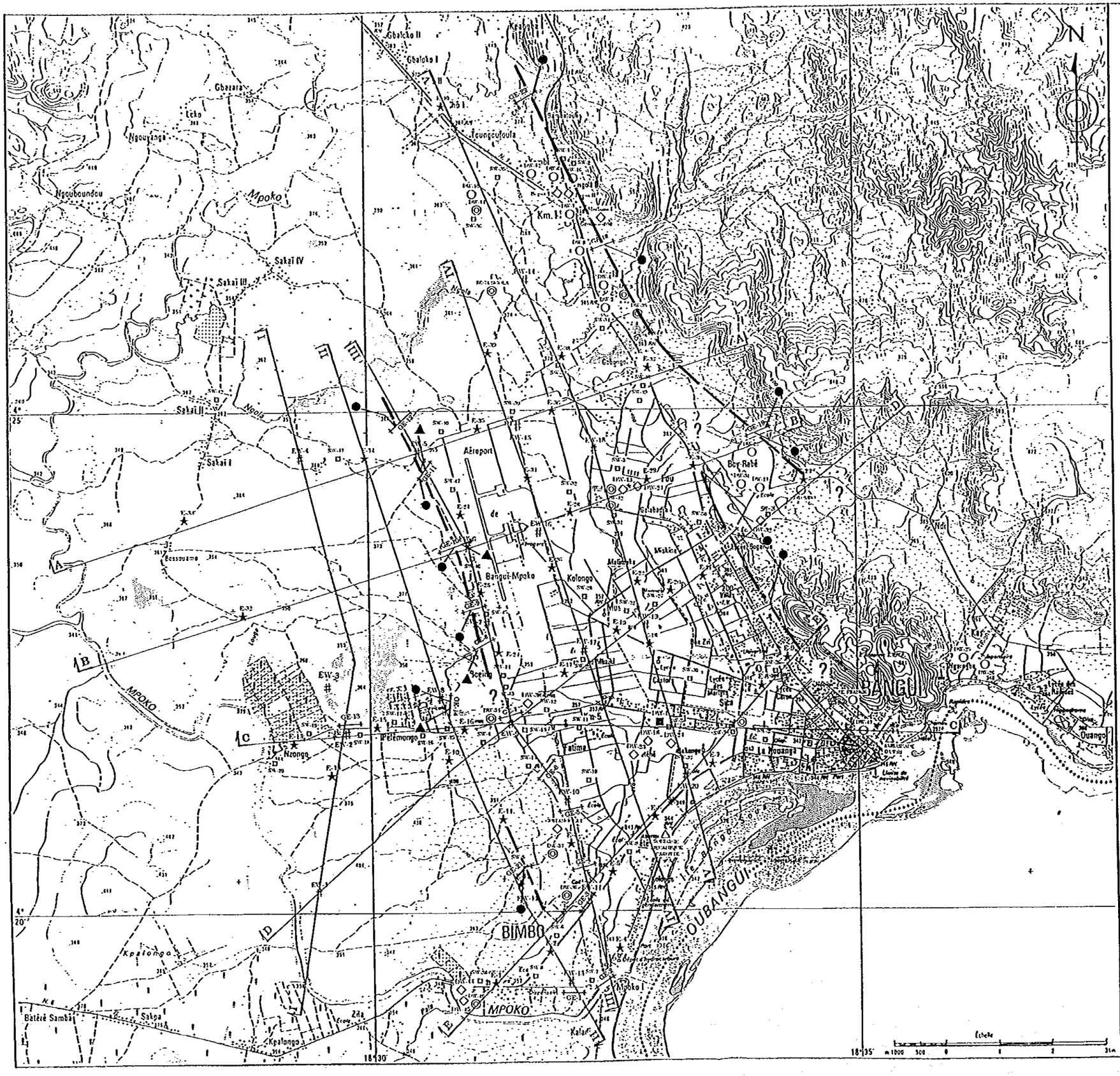


Fig. 2-3 VLF-EM Inphase and Quadrature Profiles



LEGEND

Existing Well

1. Deep well
   - a. Working ◎ (With Electric Submergible Pump) / ○ (With Manual Pump)
   - b. Abandoned ◇
   - c. Observation Well ■
2. Shallow Well (Dug Well) □
3. Soil Investigation Boring △

Hydrogeological Investigation Plan

1. Exploration Well #
2. Electorical Sounding ★
3. Electro-magnetic Survey ● Strong Anomaly / ▲ Weak Anomaly
4. Profile Line
5. Fracture Zone estimated by VLF-EM Survey

Fig. 2-4 Fcture Zones Inferred by VLF-EM Survey

2. Electrical Resistivity Sounding

Electrical resistivity sounding were carried out by JICA STUDY TEAM in cooperation with the Water Department during October and November 1996 in Bangui city.

2.1 Purpose of the Electrical Resistivity Sounding

Purpose of the resistivity survey is to make clear hydrogeological structure of the study area through electrical characteristics of ground. Information obtained from resistivity sounding at first hand is as follows.

a) Thickness and electrical resistivity of the surface soil

b) Thickness and electrical resistivity of Alluvial - Diluvial sediments

c) Thickness and electrical resistivity of Tertiary sediments

d) Depth and electrical resistivity of Basement rocks

2.2 Outline of Electrical Resistivity Sounding

Outline of the resistivity sounding of this study is as follows.

Observation Points

Observation points are shown in Fig.2-5. Total number of the observation points is 42.

Electrode Configuration Method

Schlumberger configuration method was employed in this study.

Half Spacing Sequence of Outer (AB/2) and Inner (MN/2) Electrodes

Half Spacing Sequence of outer (AB/2) and inner (MN/2) electrodes is shown in Table 2.1.

Table 2.1 AB/2 and MN/2 (m)

AB/2	3	5	7	10	10	14	14	19	27	37	37	52	52
MN/2	1	1	1	1	2.8	1	2.8	2.8	2.8	2.8	10.4	2.8	10.4
AB/2	72	100	140	140	190	190	270	350	420	420	500	500	600
MN/2	10.4	10.4	10.4	38	10.4	38	38	38	38	100	38	100	100

Outer electrode (AB/2) was expanded up to 350m at the most of observation points, and

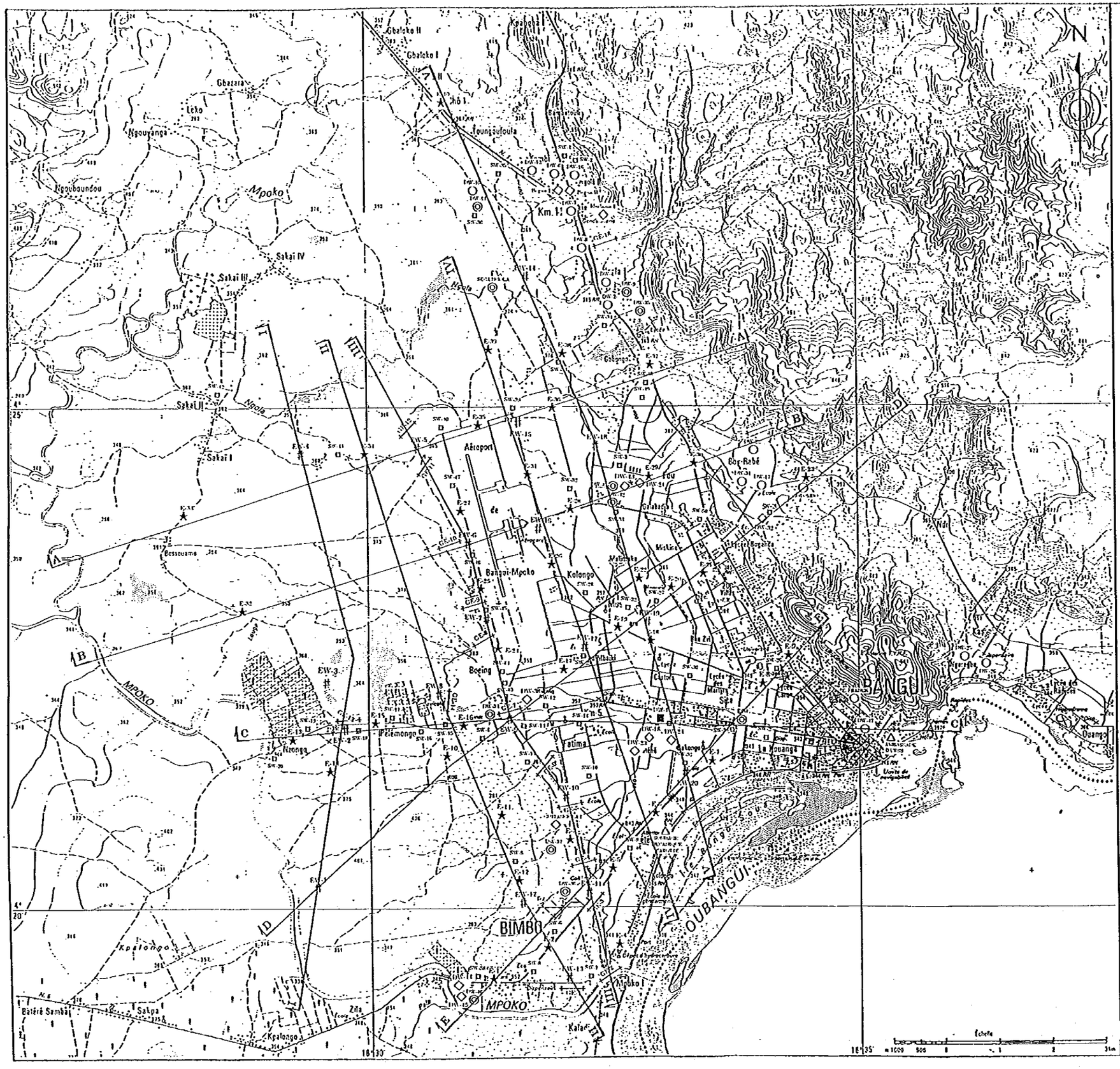
expanded up to less than 600m at some points when it was needed.

Instrument for Electrical Resistivity Sounding

Instrument used for this sounding is Macohm Model 2115 by OYO.

Method for Analysis

Result of resistivity sounding in the field was analyzed by linear filter method (Gosh 1971, Johansen 1975) using a personal computer. Initial solutions obtained by linear filter method were modified by nonlinear least-square method to obtain the most optimum solutions from initial ones.



2-10 Fig. 2- 5 Location of Observation Points

2.3 Result of Resistivity Sounding

Observation condition of the resistivity sounding in the field was good in the most of the observation points and smooth VES(Vertical electrical sounding) curves were obtained. Result of field observation and analyzed models for all the observation points are shown in Fig.2-6 and 2-7. Rsistivity profile of ground is shown in Fig.2-8 and 2-9.

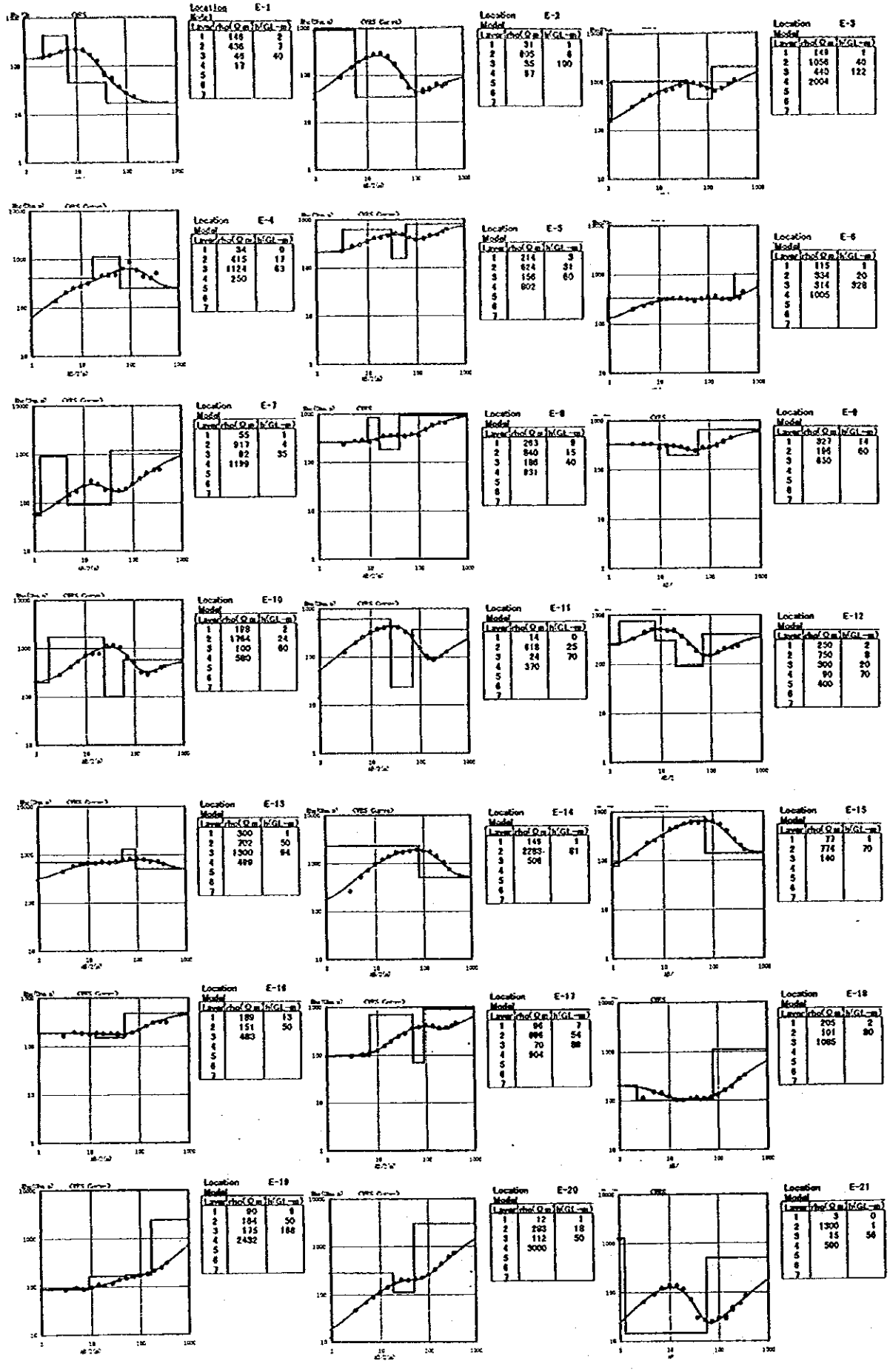


Fig. 2-6 VES Curve (1)

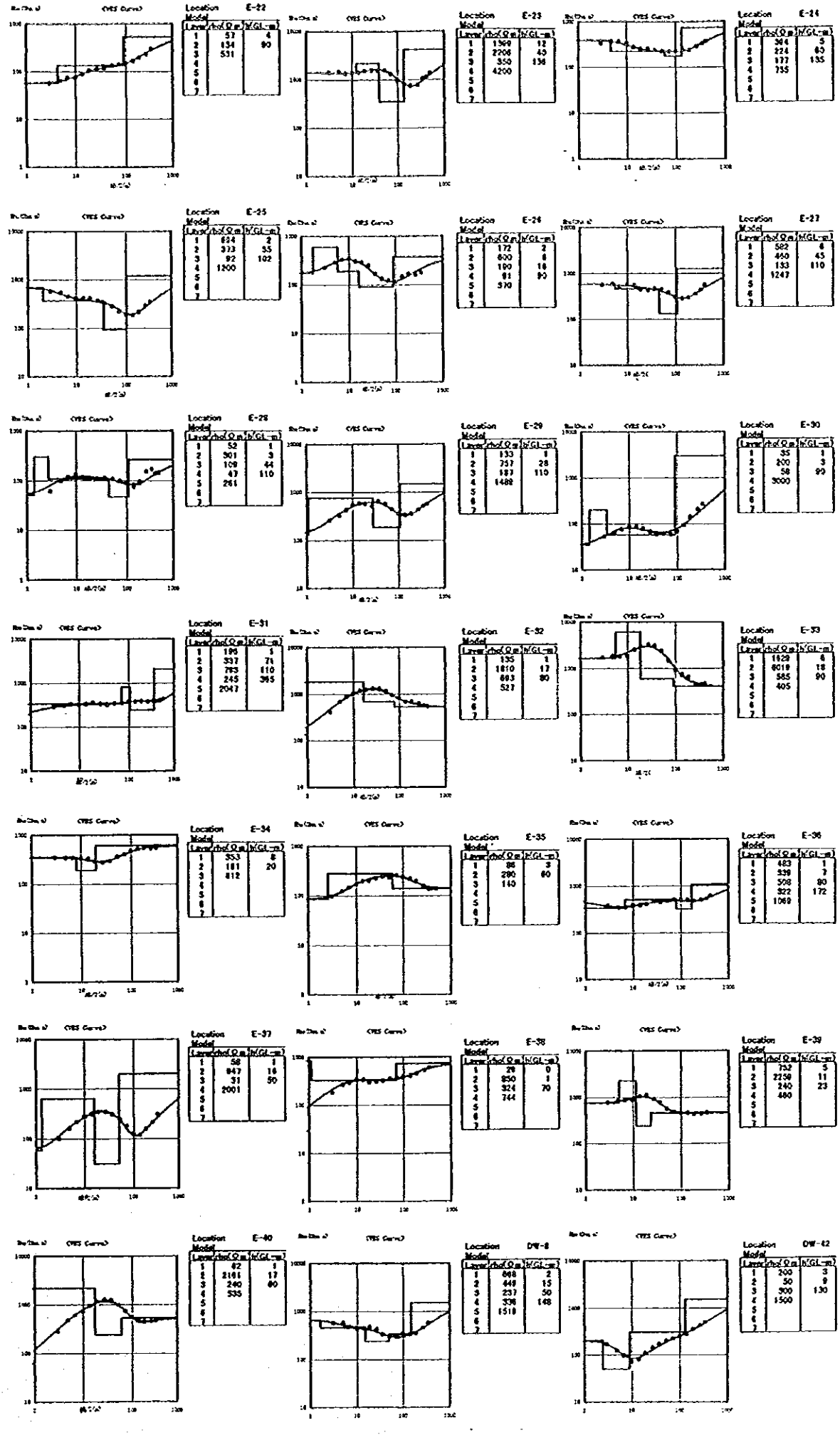


Fig. 2-7 VES Curve (2)

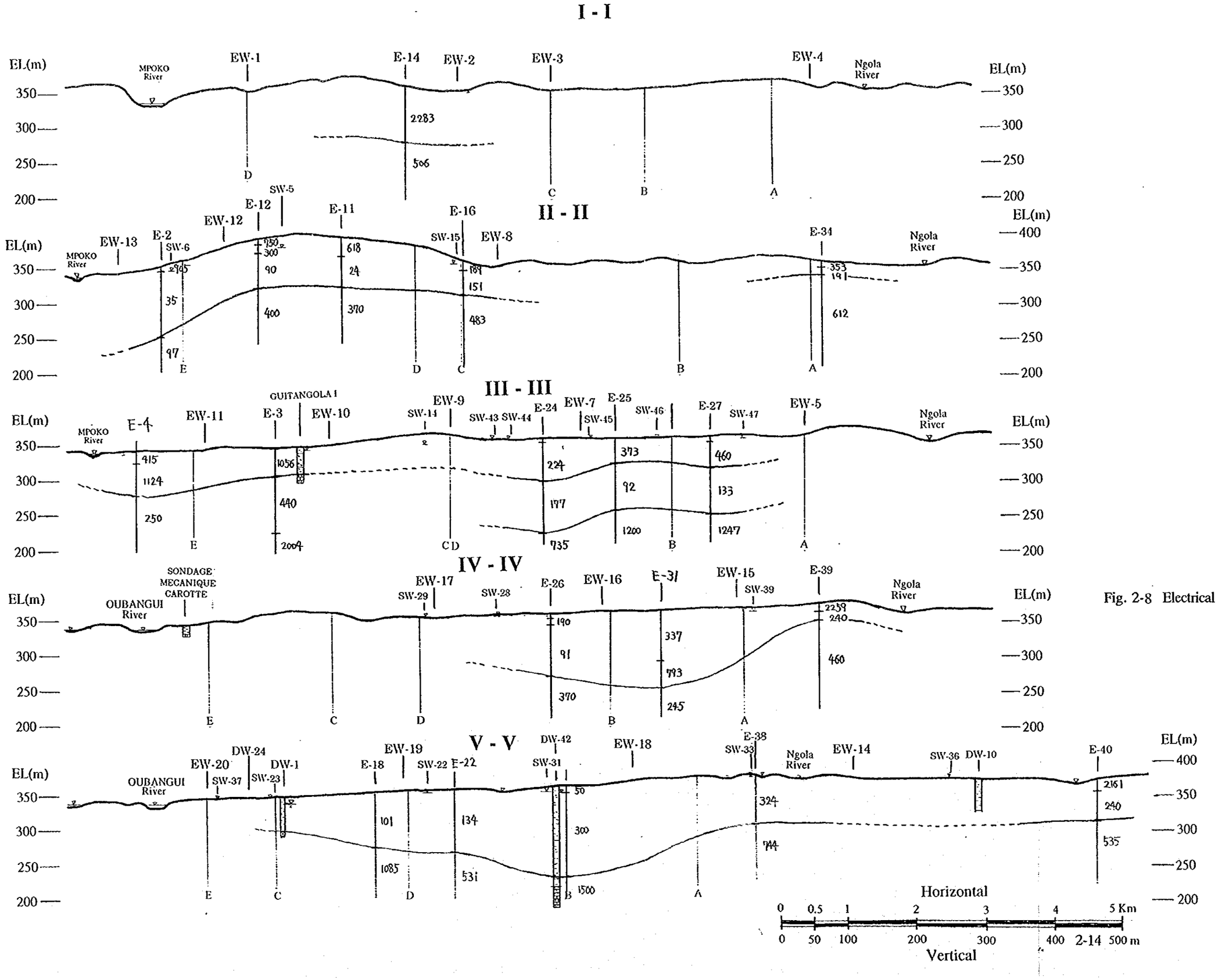


Fig. 2-8 Electrical Resistivity Profile (1)

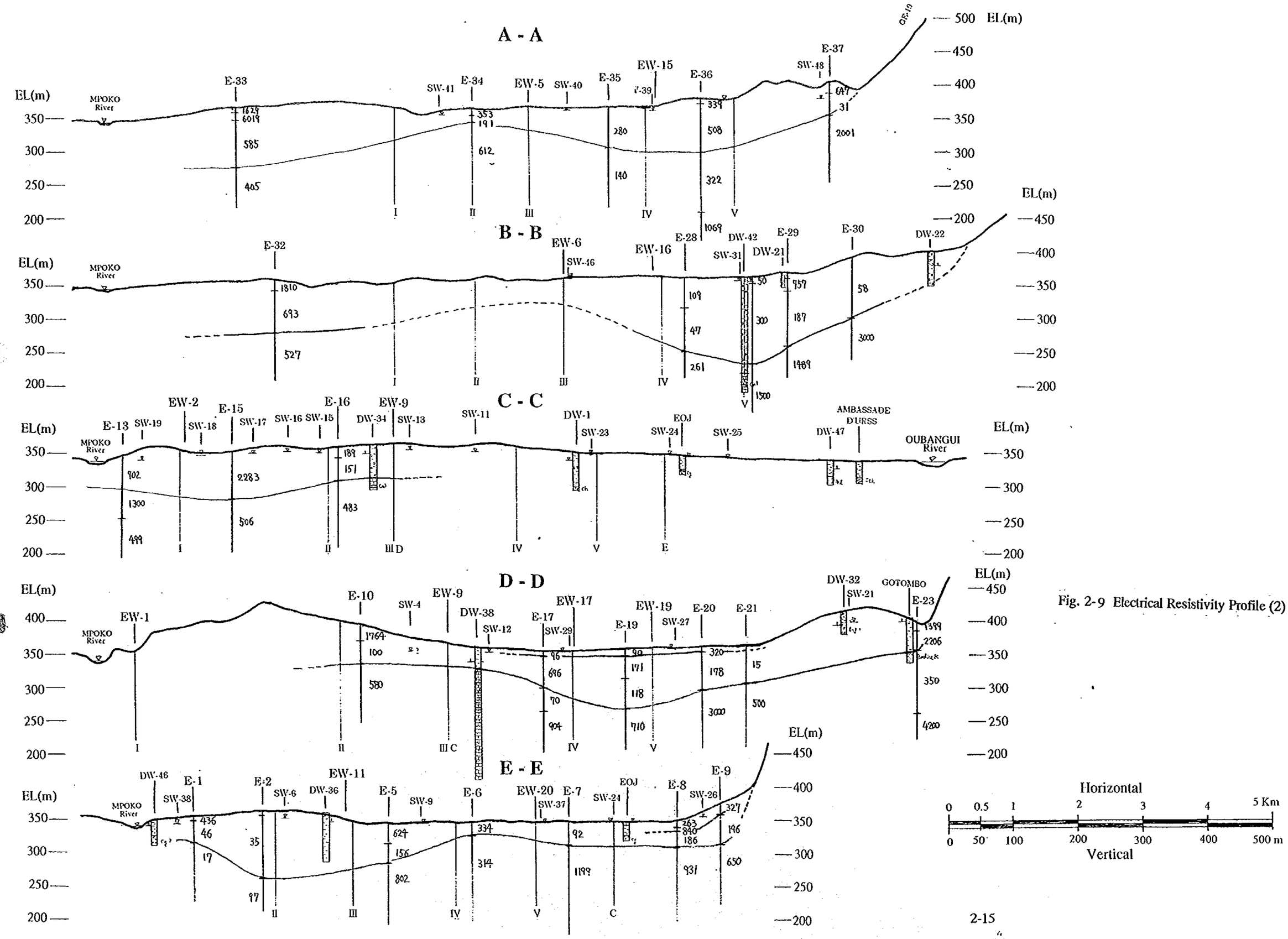


Fig. 2-9 Electrical Resistivity Profile (2)

(1) Resistivity structure

Resistivity structure is interpreted as four (4) - layer structure at the most observation points in the study area. Outline of the resistivity structure is summarized in Table2.2.

Table 2.2 Outline of Resistivity Structure

Layer	Geology	Resistivity value	Thickness/Depth
First layer	Surface soil	Resistivity (ρ_1) ranges 7-1629 Ωm, is usually < 400 Ωm. The majority is <200 Ωm.	Thickness of the layer is usually < 3m. Average is 1.7m. The majority is < 1m.
Second layer	Alluvial - Diluvial sediments	Resistivity (ρ_2) ranges 50-6019 Ωm, is usually < 1000 Ωm.	Thickness of the layer is usually < 25m. Average is 13m. The majority is < 5m.
Third layer	Tertiary rock	Resistivity (ρ_3) ranges 15-2283 Ωm, is usually < 400 Ωm. The majority is < 200 Ωm.	Thickness of the layer ranges wide 10 - 130m. Average is 55m
Fourth layer	Basement rock	Resistivity (ρ_4) ranges 92-4200 Ωm, is usually < 1300 Ωm. The majority is 200-600 Ωm.	Depth of the layer ranges wide 20 - 148m. Average is 70m

Resistivity profile (2-8, 2-9) shows vertical distribution of resistivity values and boundary between Tertiary rock and Basement rocks.

(2) Type of VES Curve

VES curves obtained in this study are classified into 6 types as shown in Fig.2-10.

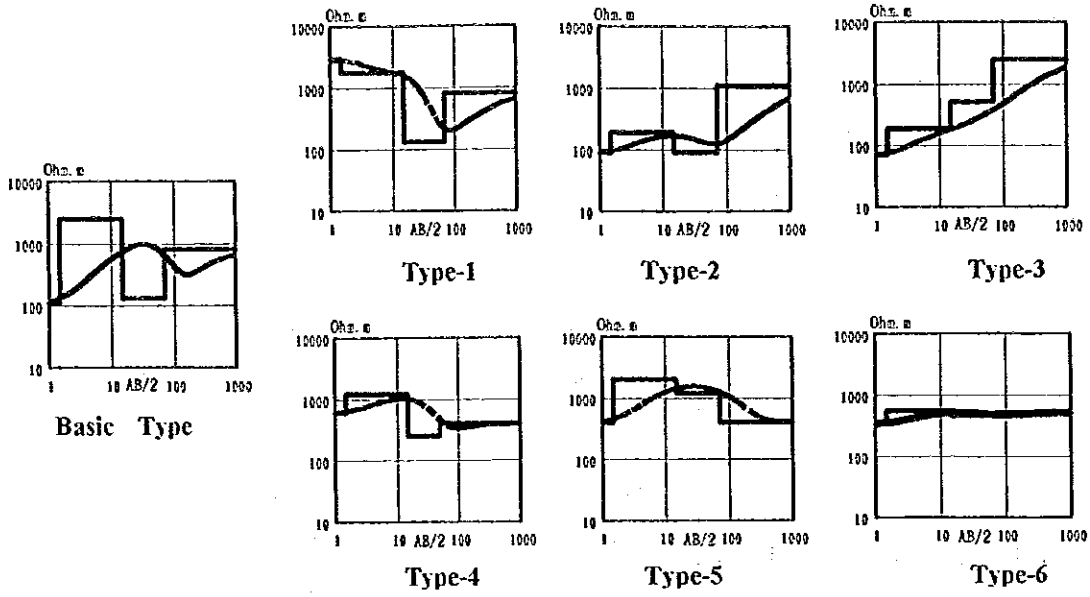


Fig.2-10 Type of VES Curve

Information obtained VES curve shown in Fig.2.6 is as follows.

- VES curves shown in Fig.2.6 are interpreted as 4-layer structure.
- Variety in VES curve appearance results from heterogeneity of layers.
- Though the first layer and the second layer has great influence on appearance of VES curve, these layers are not so important in hydrogeological view point.
- The 3rd layer corresponds to Tertiary rock and the 4th layer to Basement rock. These layers are important in hydrogeological view point.
- Relation between the 3rd layer (ρ_3) and the 4th layer(ρ_4) is always $\rho_4 >= \rho_3$ except Type 5 VES curve shown in Fig.2.6.

(3) Material of Aquifer

Properties of aquifer materials are closely related to resistivity of layer. Type of materials constituting aquifers are roughly judged by its' resistivity.

<u>Tertiary Rock</u>

Resistivity of Tertiary rock ranges wide from 15 to 2283(Ωm). But it is usually ‹ 400(Ω

m) because tertiary rock is mainly composed of silty materials. Higher resistivity indicates the existence of sandy or gravely materials, lower resistivity indicates the existence of clayey and silty materials.

Basement Rock

Resistivity of Basement Rock ranges wide from 92 to 4200(Ωm), through it is usually less than 1300(Ωm). Basement rocks are composed of limestone, schist and quartzite in the study area. Resistivity by rock type is assumed from existing borehole data as shown in Table2.3. The existing borehole data are very few poor, therefore, it is impossible to judge rock type only from resistivity shown in Table2.3. In addition, it makes the judgment difficult that resistivity varies wide depending on weathering condition.

Table 2.3 Resistivity by rock type based on existing borehole data

Rock Type	Resistivity (Ωm)	Note
Quartzite	350-4200	Weathered rock shows low resistivity, fresh rock shows high resistivity.
Schist	535-2000	
limestone	260-2000	

Basement rock has different resistivity in each place as shown in Fig.2-7, 2-8 due to heterogeneity of Basement geology. But it seems that resistivity of basement rock has better continuity in north-south direction than that in east-west direction. This suggest that boundaries between different rock types may be parallel to north-south direction in the study area.