

**The Federal Republic of Nigeria
Federal Ministry of Power and Steel (FMPS)
Federal Ministry of Science and Technology (FMST)
Energy Commission of Nigeria (ECN)
Rural Electrification Agency (REA)**

**The Master Plan Study for Utilization of Solar Energy
in the Federal Republic of Nigeria**

Final Report

**Volume 6
Activities for Awareness Raising
for Utilization of Solar Energy**

February, 2007

**JAPAN INTERNATIONAL COOPERATION AGENCY
YACHIYO ENGINEERING CO., LTD.
RECS INTERNATIONAL INC.**

THE MASTER PLAN STUDY FOR UTILIZATION OF SOLAR ENERGY IN THE FEDERAL REPUBLIC OF NIGERIA

FINAL REPORT

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- Volume 6 Activities for Awareness Raising for Utilization of Solar Energy

PREFACE

In response to a request from the Federal Republic of Nigeria, the Government of Japan decided to conduct “The Master Plan Study for utilization of solar energy in the federal republic of Nigeria” and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA dispatched the study team headed by Mr. Mitsuhsa NISHIKAWA of Yachiyo Engineering Co., Ltd. and organized by Yachiyo Engineering Co., Ltd. and RECS International Inc. to Nigeria six times from June 2005 to February 2007.

The study team had a series of discussions with the officials concerned of the Government of Nigeria and conducted related field surveys at the study area. Upon returning to Japan, the study team conducted further studies and compiled the final results in this report.

I hope that this report will contribute to the promotion of the plan and to the enhancement of amity between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Nigeria for their close cooperation throughout the study.

February 2007

Tadashi IZAWA
Vice President
Japan International Cooperation Agency

Mr. Tadashi IZAWA
Vice President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

February 2007

Dear Sir

It is my great pleasure to submit herewith the Final Report of “The Master Plan Study for Utilization of Solar Energy in the Federal Republic of Nigeria”.

The Study Team that consists of Yachiyo Engineering Co., Ltd. and RECS International Inc. conducted field surveys including pilot projects in Nigeria over the period between June, 2005 and February, 2007 according to the contract with the Japan International Cooperation Agency (JICA).

The Study Team compiled this report, which proposes Master Plan and Action Plan for PV Rural Electrification, Action Plan for Research and Development of Solar Energy Technology, Action Plan for Awareness Raising of Solar Energy, etc, through close consultations with officials concerned of the Government of the Federal Republic of Nigeria and other authorities concerned.

On behalf of the Study Team, I would like to express my sincere appreciation to officials concerned of the Government of Nigeria and other authorities concerned for their cooperation, assistance, and heartfelt hospitality extended to the Study Team.

We are also deeply grateful to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Ministry of Economy, Trade and Industry, and the Embassy of Japan in Nigeria for their valuable suggestions and assistance during the course of the Study.

Yours faithfully,

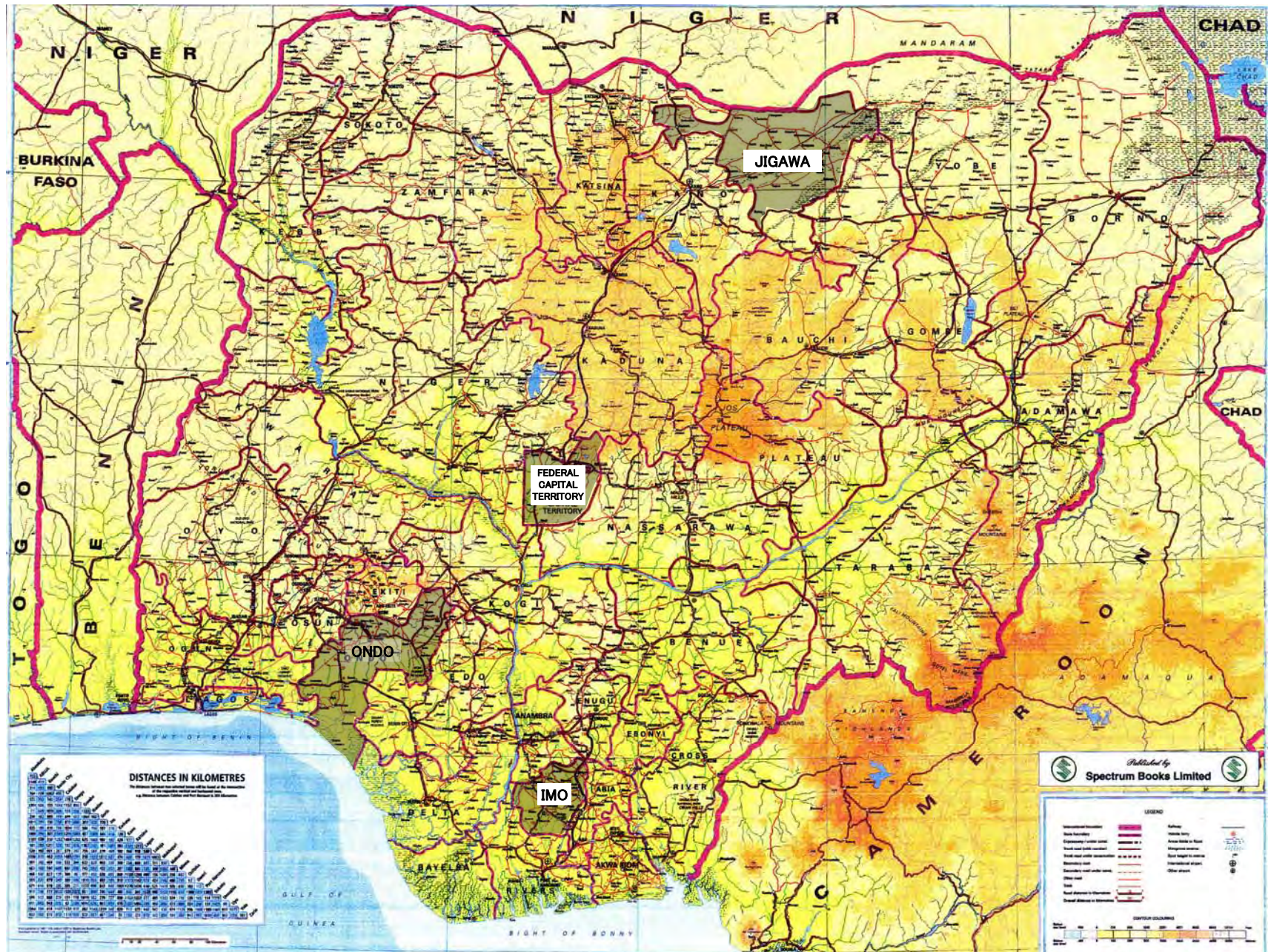
Mitsuhisa Nishikawa
Team Leader
The Master Plan Study for
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THE MASTER PLAN STUDY FOR UTILIZATION OF SOLAR ENERGY IN THE FEDERAL REPUBLIC OF NIGERIA

FINAL REPORT (VOLUME 6 ACTIVITIES FOR AWARENESS RAISING FOR UTILIZATION OF SOLAR ENERGY)

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Study Area in the Federal Republic of Nigeria

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ABBREVIATION

AC	Alternative Current
AIT	Africa Independent Television
BCS	Battery Charging Station
C/P	Counter Part
DVD	Digital Versatile Disk
ECN	Energy Commission of Nigeria
FCT	Federal Capital Territory
FCTA	Federal Capital Territory Administration
FMPS	Federal Ministry of Power and Steel
FMST	Federal Ministry of Science and Technology (Federal Ministry of Power and Steel (FMPS) was reorganized to Federal Ministry of Energy on January 2007)
FUTA	Federal University of Technology, Akure
FY	Fiscal Year
ITU	International Telecommunication Union
JAEF	Jigawa Alternative Energy Fund
JICA	Japan International Cooperation Agency
JWG	Joint Work Group
NGO	Non-Governmental Organization
NPC	National Planning Commission
NTA	Nigeria Television Authority
OJT	On the Job Training
OSEB	Ondo State Electricity Board
PR	Public Relations
PV	Photovoltaic
REA	Rural Electrification Agency
SELF	Solar Electric Light Fund
SHS	Solar Home System
TV	Television
USAID	United States Agency for International Development

Chapter 1 Organization of Seminars

1.1 Objectives

The objective of holding a series of sensitization seminars is to deepen the understanding of PV system and promote the popularization of PV system. The target participants to the seminars are in three folds i.e. government and power sector, business community and general public. The seminars are organized in the areas covered by the Study. Findings and experiences obtained through the seminars will be used for the preparation of the action plan for the promotion of public awareness on utilization of solar energy which will be a part of the products of the Study.

1.2 Summary of the Implementation

A total of twenty (20) seminars were held during the missions to Nigeria. In Jigawa State, Ondo State, Imo State and FCT, one seminar took place in the each state capital, and the rest took place in the villages selected for the pre-feasibility study and pilot project.

At the seminars in the state capitals, the presentation was made by using MS Power Point in English. After the presentation SHS and three types of solar thermal equipment were demonstrated outside the seminar hall. Question and answer session followed the demonstration. In the villages, presentation was made by using flip-chart. Demonstration, question and answer session followed. Presentation in English was translated into the local language by accompanied counterpart. In each seminar, the presentation was made mainly by a member of the study team, and the demonstration was performed mainly by the accompanied counterparts from the federal ministries.

1.3 Composition of the Seminars

The presentation was prepared in line with the objectives prior to the seminars. The contents of presentation were constantly reviewed taking team members' view, counterparts' view, and participants' reaction into consideration. The followings are the major components and topics of the seminars held in the state capitals. At the seminars in the villages, taking the level of knowledge and interest of participants into account, relatively practical topics were selected.

- Background information on energy and electrification in Nigeria
- Electrification policy in Nigeria
- Solar energy and utilization of Solar energy
- Introduction of PV systems
- Utilization of PV systems
- Introduction to actual PV system installations
- Advantages and limits of PV systems
- Comparative analysis of PV system, grid and generator
- Sustainability of PV system
- PV business models

- Some ideas about use of PV system
- Demonstration
- Question and answer

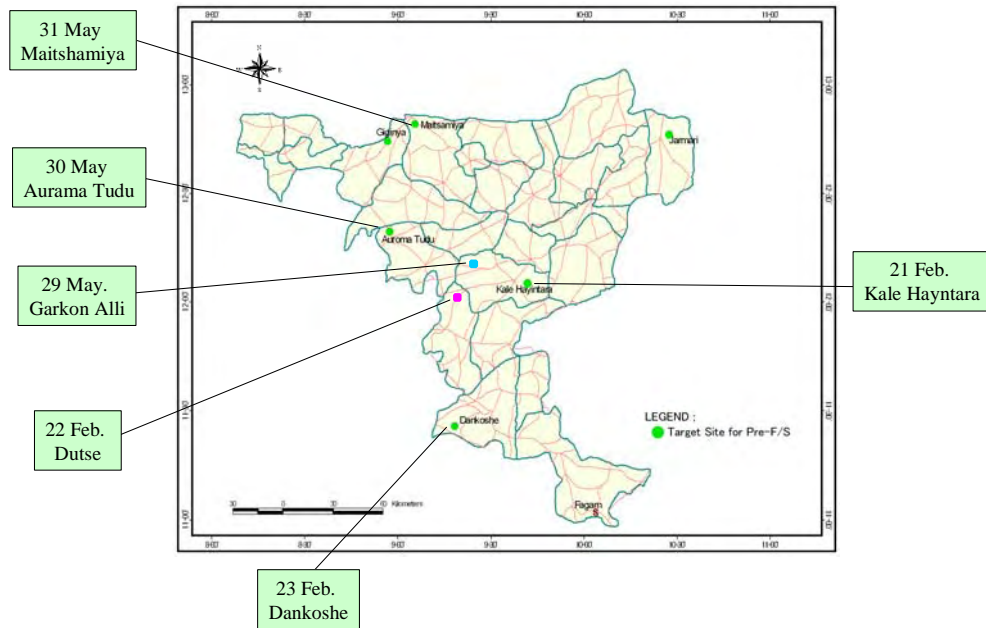
1.4 Date, Venue and Number of Participants

The following table shows the summary of 20 seminars

Table 1-1 Outline of seminars

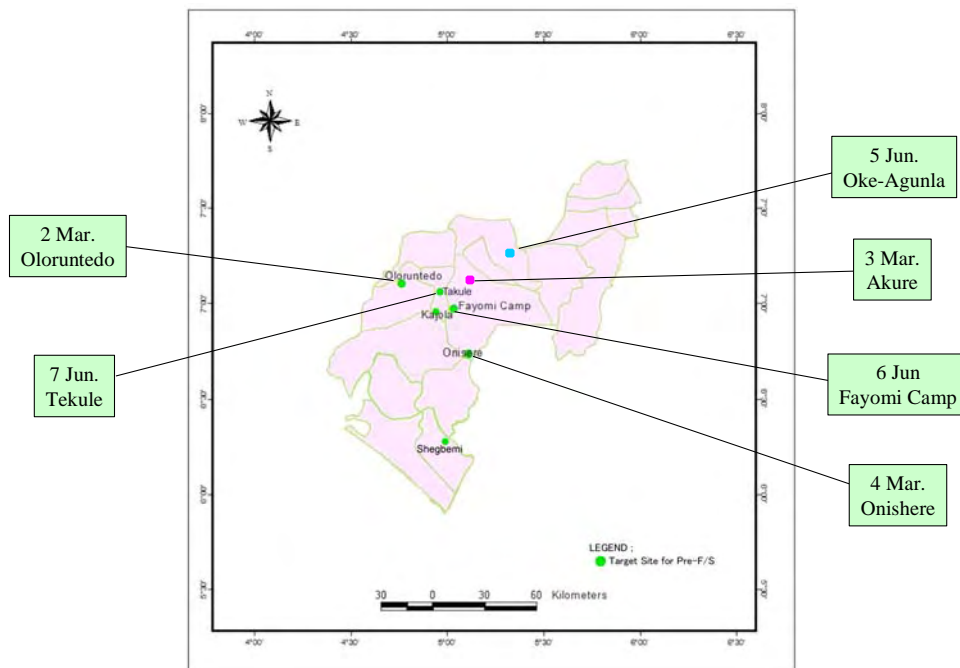
No	Date	State	City/Village	Venue	No. of Participants
1	21 Feb 06	Jigawa	Kale Hayintara	Village Square	Over 150
2	22 Feb 06	Jigawa	Dutse (State Capital)	Jigawa State Library Hall	About 80
3	23 Feb 06	Jigawa	Dankoshe	Village Square	About 80
4	02 Mar 06	Ondo	Olorunredo	Pri. School Playground	About 50
5	03 Mar 06	Ondo	Akure (State Capital)	State Electricity Board Hall	About 60
6	04 Mar 06	Ondo	Onishere	Village Square	About 110
7	06 Mar 06	Imo	Umuokpo	Pri. School Playground	About 60
8	07 Mar 06	Imo	Obibi	Pri. School Playground	About 45
9	08 Mar 06	Imo	Owerri (State Capital)	Government House Hall	About 80
10	29 May 06	Jigawa	Garkon-Alli	Village Square	About 30
11	30 May 06	Jigawa	Aurama Tudu	Village Square	About 60
12	31 May 06	Jigawa	Maitsamia	Village Square	Over 100
13	05 Jun 06	Ondo	Oke-Agunla	Village Square	About 40
14	06 Jun 06	Ondo	Fayomi Camp	Village Square	About 40
15	07 Jun 06	Ondo	Tekure	Village Square	About 80
16	09 Jun 06	Imo	Umuikoro/Opehi	Village Square	About 30
17	10 Jun 06	Imo	Obokuwu-Mbutu	Village Chief Residence	About 50
18	12 Jun 06	Imo	Mgbee	Village Hall	About 40
19	15 Jun 06	FCT	Gudun-Karia	Village Square	About 40
20	16 Jun 06	FCT	Abuja	Hotel Conference Room	About 40

Source: Study Team



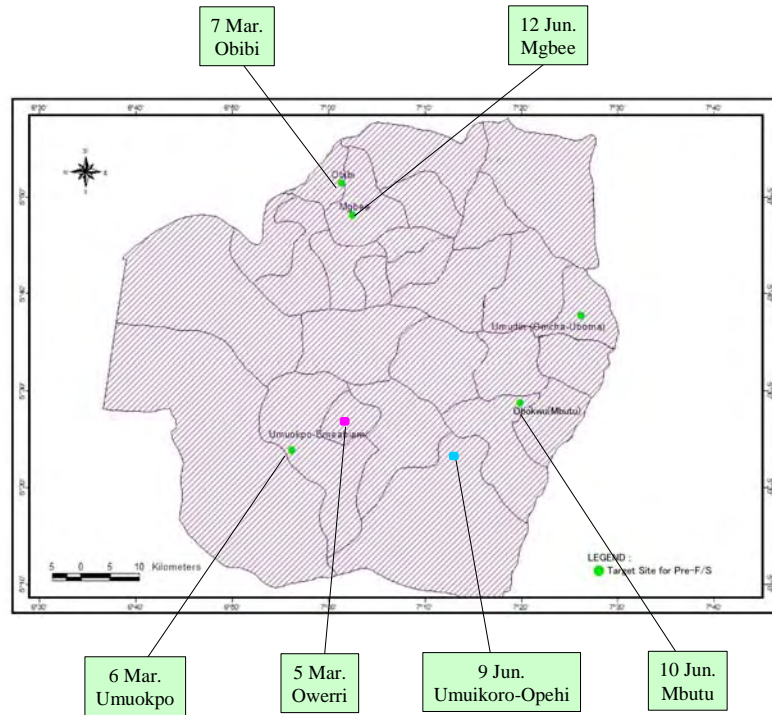
Source: Study Team

Fig. 1-1 Seminar venues in Jigawa State



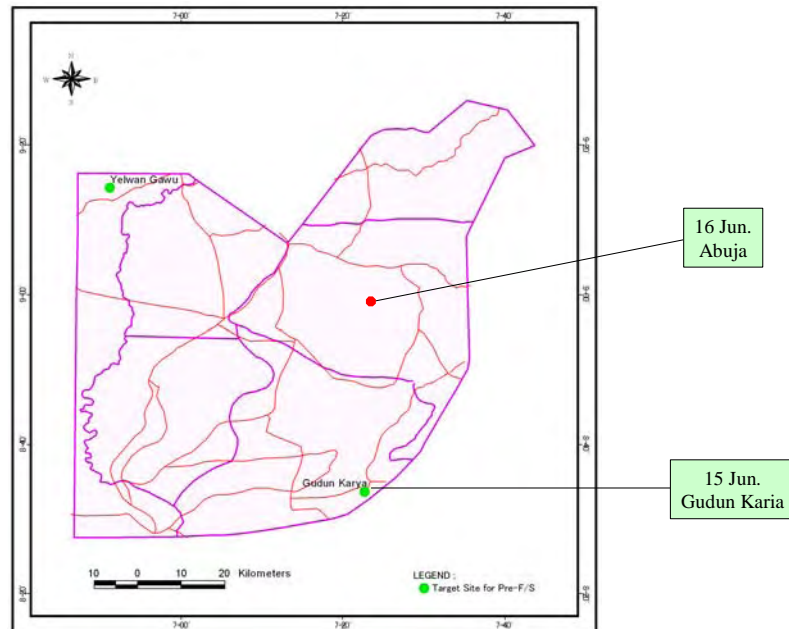
Source: Study Team

Fig. 1-2 Seminar venues in Ondo State



Source: Study Team

Fig. 1-3 Seminar venues in Imo State



Source: Study Team

Fig. 1-4 Seminar venues in Imo State

1.5 Description of Each Seminar

- (1) 21 Feb. 2006, Kale Hayintara, Jigawa State
Kale Hayintara village has estimated population of 3,650 and about 120 households. Most village inhabitants are Muslims. The seminar started at 11am and attracted more than 150 participants including village chiefs. Presentation was translated from English to Hausa by accompanied member of Jigawa Alternative Energy Fund (JAEF).
- (2) 22 Feb. 2006, Dutse (State Capital), Jigawa State
The seminar started at 11 am at Jigawa State Library Hall. JAEF Public Relation Officer chaired the seminar. There were 79 participants including JAEF Director, JAEF Executive Secretary, and Kiyawe Local Government Executive Chairman among others. Three study team members and three counterparts from the federal ministries were also present.
- (3) 23 Feb. 2006, Dankoshe, Jigawa State
Dankoshe village has an estimated population of 2,000 and about 60 households. The village is situated about 12km from main road. Most village inhabitants are Muslims. The seminar started at 11am at the village centre and attracted about 80 participants including village chiefs. Three study team members and two counterparts from the federal ministries were also present. Presentation was translated from English to Hausa by accompanied member of JAEF.
- (4) 2 Mar. 2006, Oloruntendo, Ondo State
Oloruntendo village has estimated population of 1,200 and about 200 households. The village is situated about 10km from main road. Most village inhabitants are Christians. The seminar started at noon and attracted about 50 participants including village chiefs and teachers. One study team member, two counterparts from the federal ministries and a staff of Ondo State Electricity Board (OSEB) were also present. Presentation was translated from English to Yoruba by the accompanied counterpart. SHS and the solar thermal equipments were also shown to the primary school students.
- (5) 3 Mar. 2006, Akure (State Capital), Ondo State
The seminar started at 11am. OSEB Public Relation Officer chaired the seminar. There were 57 participants including OSEB General Manager, The Commissioner for Ministry for Special Duties, OSEB Director among others. There were participants from Federal University of Technology, Akure (FUTA). The seminar was announced by a local radio station on the previous day. The seminar was video-taped by a shooting team led by a study team member in charge of the preparation of promotion TV programs.
- (6) 4 Mar. 2006, Onishere, Ondo State
Onishere village has an estimated population of 200 and about 30 households. The village is situated about 7km from main road. Most village inhabitants are Christians. The seminar started at 2:30pm and attracted about 110 participants including village chiefs. There were many female participants. Presentation was translated from English to Yoruba by the counterpart and the OSEB staff. The seminar was video-taped by the shooting team.

- (7) 6 Mar. 2006, Umuokpo, Imo State
Umuokpo village has estimated population of 3,300. The village is situated about 10km from main road. Most village inhabitants are Christians. The seminar started at 3pm and attracted about 60 participants including village chiefs and teachers. Imo State Ministry of Public Utilities & Rural Development Acting Director and his staff were also present. Presentation was translated from English to Ibo by the accompanied staff of Imo State Ministry of Public Utilities & Rural Development. The seminar was video-taped by the shooting team.
- (8) 7 Mar. 2006, Obibi, Imo State
Obibi village has estimated population of 4,000. The village is situated about 3km from main road. Most village inhabitants are Christians. The seminar started at 11.30am and attracted about 45 participants including village chiefs and teachers. Imo State Ministry of Public Utilities & Rural Development Acting Director and his staff were also present. Presentation was translated from English to Ibo by the accompanied staff of Imo State Ministry of Public Utilities & Rural Development. The seminar was video-taped by the shooting team.
- (9) 8 Mar. 2006, Owerri (State Capital), Imo State
The seminar started at noon at Imo State Government Multi Purpose Hall. Imo State Public Relation Officer chaired the seminar. There were 81 participants including Imo State Deputy Executive Governor, Commissioner for Public Utilities and Rural Development, Executive Assistant to the Governor among other prominent participants. Keynote address of Imo State Executive Governor was delivered. After the seminar the team received interview from local media. The seminar was video-taped by the shooting team.
- (10) 29 May 2006, Garkon-Alli, Jigawa State
Garkon-Alli village has estimated population of 2,000. The village is situated about 15 minutes drive from main road. Most village inhabitants are Muslims. The seminar started at 11am and attracted about 30 participants. Since SHS and public facility had been installed as a pilot project in this village, the seminar focused on the demonstration and practical instructions for the maintenance. Four members of the study team, two counterparts from FMST and FMPS, one JAEF staff were present. The seminar was video-taped by the shooting team.
- (11) 30 May 2006, Aurama Tudu, Jigawa State
Aurama Tudu village has an estimated population of 4,500. The village is situated about 12km from main road. Most village inhabitants are Muslims. The seminar started at noon at the village centre and attracted more than 60 participants including village chiefs. Three study team members, one counterpart from FMPS, and one JAEF staff were present. Presentation was translated from English to Hausa by accompanied JAEF staff. The seminar was video-taped by the shooting team.
- (12) 31 May 2006, Maitamia, Jigawa State

Maitsamia village has an estimated population of 4,000. The village is situated near Nigeria-Niger border and about two hours drive from state capital Dutse. Most village inhabitants are Muslims. The seminar started at 11.30am at the village centre and attracted more than 100 participants including village chiefs. Two study team members, one counterpart from FMPS, and one JAEF staff were present. Presentation was translated from English to Hausa by accompanied JAEF staff.

(13) 5 June 2006, Oke-Agunla, Ondo State

Oke-Agunla village has estimated households of 80. The village is situated about 30 minutes drive from state capital Akure. Most village inhabitants are Christians. The seminar started at 11am and attracted about 40 participants. Since SHS and public facility had been installed as a pilot project in this village, the seminar focused on the demonstration and practical instructions for the maintenance. One members of the study team, one counterpart from FMST and one OSEB staff were present.

(14) 6 June 2006, Fayomi Camp, Ondo State

Fayomi Camp village has estimated population of 500. The village is situated about 30km from main road. 80% of village inhabitants are Christians. The seminar started at 2.30pm and attracted about 40 participants including village chiefs. One counterpart from FMST and one OSEB staff were present. Presentation was translated from English to Yoruba by a participated villager. On the way to Fayomi Camp while filling fuel at a village, brief presentation was done to the villagers.

(15) 7 June 2006, Tekure, Ondo State

Tekure village has estimated population of 1,000. The village is situated about 60km from state capital Akure. 80% of village inhabitants are Christians. The seminar started at 2.30pm and attracted about 40 participants including village chiefs. One counterpart from FMST and one OSEB staff were present. Presentation was translated from English to Yoruba by a participated villager. On the way to Fayomi Camp while filling fuel at a village, brief presentation was done to the villagers.

(16) 9 June 2006, Umuikoro/Opehi, Imo State

Umuikoro/Opehi village has estimated households of 100. The village is situated about 30 minutes drive from state capital Owerri. Most village inhabitants are Christians. The seminar started at 11am and attracted about 30 participants. Since SHS and public facility had been installed as a pilot project in this village, the seminar focused on the demonstration and practical instructions for the maintenance. One members of the study team, one counterpart from FMST and one staff from the state government were present.

(17) 10 June 2006, Obokuwu-Mbutu, Imo State

Obokuwu-Mbutu village has estimated population of 7,000. The village is located about 7km from main road. Most village inhabitants are Christians. The seminar started at 2pm and attracted about 50 participants including village chiefs. One counterpart from FMST and one

state government staff were present. Presentation was translated from English to Ibo by the state government staff.

(18) 12 June 2006, Mgbee, Imo State

Mgbee village and other neighboring villages form a self-governing body with estimated population of 11,000 in total. The village is located about 7km from main road. Most village inhabitants are Christians. The seminar started at 1pm and attracted about 40 participants including village chiefs. One counterpart from FMST and one state government staff were present. Presentation was translated from English to Ibo by the state government staff.

(19) 15 June 2006, Gudun-Karia, FCT

Gudun-Karia village has estimated population of 1,000. The village is situated near the southern border of FCT and Nassarawa State, and 1 and a half hours drive from Abuja. The village has complex religious and ethnic mixture such as ethnicity: Gwariyama (30%), Gwarigyangye (25%), Koto (5%), Gede (15%), Mada (2%), Bassa (3%), Hausa (10%), Ibo (7%), and Yoruba (3%) and religion: Christian (60%), traditional (10%), Islam (30%). The seminar started at 1pm and attracted about 40 participants including village chiefs. Presentation was translated from English to the local language by an accompanied staff from FCTA.

(20) 16 June 2006, Abuja, FCT

The seminar started at 11am at a city hotel conference hall. During the seminar the Interim Report was explained to invited government officials from FMPS, FMST, ECN, and FCT including JWG members and direct counter-parts as well as the representative of JICA. Members of the Master Plan Study explained their respective areas. During the tea break, PR video prepared by the study team (see chapter two) was shown to the participants and drew a favorable reception.

1.6 Demonstration

At each seminar, the following solar PV and thermal systems were demonstrated. In Ondo and Imo State, demonstrations were often conducted in the afternoon because sunshine during the morning hours was generally weak.

- Solar Home System (Imported)
PV module (50W), charge controller (6A), battery (40Ah), radio, fluorescent lamp, circuit breaker
- Solar Cooker (Produced in Nigeria)
- Solar Drier (Produced in Nigeria)
- Solar Distiller (Produced in Nigeria)

Demonstration was very popular, and hence very effective especially to those audiences who lack much knowledge or interest in PV.

Fig. 1-5 below shows SHS, solar dryer, solar cooker and solar distiller which were actually

demonstrated.

			
<u>SHS (50W System)</u> 50W PV Module, Charge Controller, Battery, Radio, Fluorescent Bulb	<u>Solar Dryer</u> Air heated in the lower box passes through middle box and dry vegetable, meat etc. placed in it.	<u>Solar Cooker</u> Sunlight concentrated into a center box by reflectors cooks materials placed in it.	<u>Solar Distiller</u> Steam from heated water by sunlight put in a box is concentrated on inside glass surface and collected in a container.

Source: Study Team

Fig. 1-5 Demonstrated Equipments

1.7 Question and Answer during the Seminars

Questions are classified into four categories i.e. (1) practical and technical questions, (2) questions about the pilot projects, (3) questions about price and cost of PV system and (4) questions about Japanese aid. The questions are grouped and summarized below. Answers are also summarized in the brackets immediately after each question. Self-evident answers are not shown. Findings and points to be considered for the future awareness raising seminars are stated as "NOTE".

(1) Practical and technical questions

- Questions about function, performance, manufacturer, etc. of SHS solar dryer, solar cooker and solar distiller.
- Can PV system be used during cloudy or rainy day? ("possible" if battery is charged, PV module generates power even under weak sunshine)
- What may happen to PV system if it hails? ("ok" because the PV cells are coated)
- Where should the PV system installed? (under sunshine, e.g. on the roof, on the pole, etc.)
- Can PV system be used if the user can't read the manual? (maintenance system is to be established)
- Does PV system function even if the surface is damaged? (if damage is partial, PV module may produce reduced power, maintenance to prevent damage is more important)
- How long is the life span of PV module? (more than 20 years if properly maintained)
- Can this seminar hall be electrified by PV system directly? (AC system required, the hall is

over-designed)

- How should we protect PV system from theft and damage? (maintenance system should be established, users' awareness should be risen)

NOTE Level of knowledge and interest on PV system varies greatly from one participant to another. Contents and method of the presentation are to be carefully worked out.

(2) Questions about the pilot projects

- Questions about implementation and progress of the pilot project.
- SHS can operate only a radio and a few lights, and can it be considered as improvement? ("yes" compared to no radio no light, more power will be available depending on user's financial ability, pilot project is a part of master plan study and not electrification project)
- When my village will be PV electrified?

NOTE Objectives of the pilot projects were not fully understood in some areas. Many people expect that the Study Team will bring them PV system. Over-expectation and mis-expectation should be rectified, however, advantage should be addressed for the promotion. These rather conflicting two aspects should be balanced properly. Some questions about the pilot project reflect expectation to the Japanese aid which may be beyond our scope.

(3) Questions about the costs

- What is the price of a Solar Module? (about 40,000 to 50,000 Naira in Nigeria, see "NOTE")
- How much does it cost to electrify this seminar hall by PV system? (depending on the load)
- How can we deal with high initial costs of PV system? (see "NOTE")

NOTE Many people asked questions about cost. Answering these questions in simple words is not easy although giving them the market price or the pilot project costs is easy. Generally speaking, the initial cost of PV system is higher than that of grid connection or generator purchase from consumer's point of view. How to address this point in the seminar is an important issue. The point may be discussed from the following points of view. 1) initial cost is high but in long run it is not costly due to low running cost, 2) costs will be lowered by introduction of subsidy, tax exemption, mass production, 3) PV cost is not high, grid tariff is too low (this point may touch government policy), 4) PV has unique advantages which the others relying on fossil fuel do not have, also the following points are to be considered 5) how to deal with cheap and small generator which is very popular nowadays, 6) role of Japanese aid.

(4) Questions about the Japanese aid

- Is Japan planning PV panel mass production in Nigeria ? ("difficult" due to required technology level and market size)
- How is the level of Japanese commitment for sustainability of PV system? (master plan study, pilot projects, promotion activity, capacity development, etc are the commitments, after the handing over, Nigeria government is to commit)

NOTE Expectation to the Japanese aid is high.

- (5) Other requests and opinions heard during the seminars
- Government subsidy should be introduced for the PV popularization, as grid users are heavily subsidized.
 - Grid use is to be decongested by means of no heater use, for example.
 - PV cost is to be lowered by means of organizing demand for mass production.
 - (at a seminar in FCT village) We have already formed a village committee, we have been waiting for you.
 - (at a seminar held in primary school playground) Please show PV and thermal systems to the students as well.

Chapter 2 Production of PR Program

2.1 Purpose and Outline of PR Program

The production process of a TV or DVD program generally consists of filming outside and/or at indoor studio using video tapes (program materials), extraction of the necessary parts to reflect the plan and theme of the intended program (editing) and narration and the insertion of telops at indoor studio to provide supplementary explanations. As the recorded information can be made into a series of digital data in recent years, the more detailed development of scenes has become possible using a computer-based non-linear editor and other equipment. In short, new technologies have made it possible to convey a large amount of information to viewers.

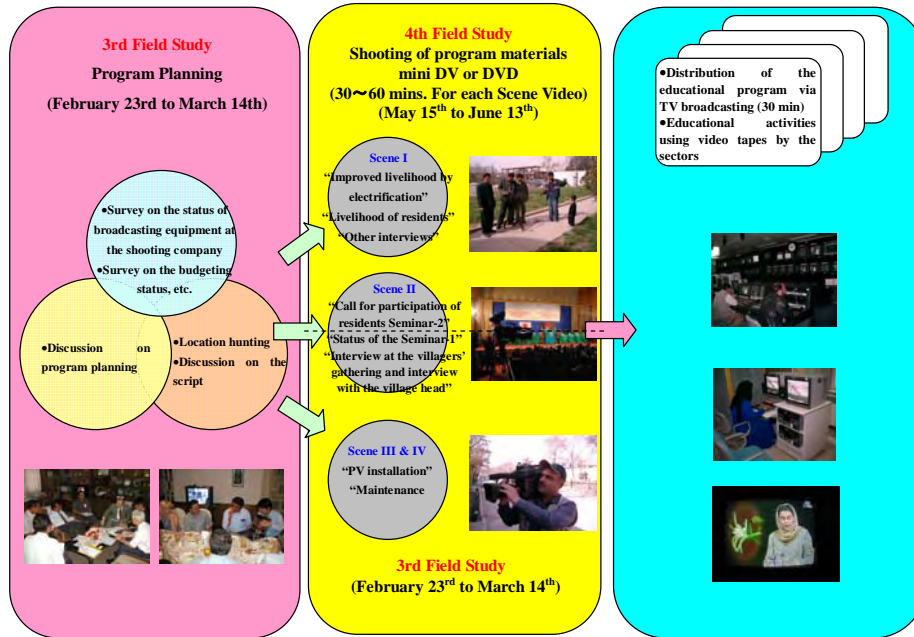
During the 3rd and 4th field studies, program materials featuring the installation situation of equipment under the Pilot Project, the situation of guidance on operation and maintenance techniques and the scenes of seminars were recorded under the guidance of the study team member responsible for Education and Extension Activities 2 (Production of a PR Program).

Guidance was provided on the planning of a program which would reflect the purpose and effect of using photovoltaic energy, the production of a scenario in line with local circumstances and the production of an actual program fully utilising the available equipment. In view of the presumed use of the program by TV stations (in states where the study sites are located) in Nigeria and the distribution of such visual media as video tape and DVD, guidance was provided to create a program which could be used for education and extension activities. It was explained to the C/Ps that the work to produce “a program in line with the actual circumstances of each state” and editing work to suit the broadcasting schedule would be conducted by the PV sector in Nigeria.

2.2 Work Flow

During the studies, discussions were held with the FMPS, ECN and FMST in Abuja on the planning of a program and scenes of local life and seminars was recorded in Ondo and Imo States. Scenes of PV panel installation were also recorded in Imo State.

Fig. 2-1 shows a flow chart from the planning of a PR program to its completion.



Source: Study Team

Fig. 2-1 Flow Chart From Planning of PR Program to Its Completion

Fig. 2-2 shows the division of work between the Japanese and Nigerian sides.

Work Description	Japan	Nigeria
1. Planning of Educational Program		
(1) Proposal on the subject of program	○	
(2) Planning and surveying with regard to shooting of materials for the program (overall schedule, contents of materials, location of shooting, documents and data, and cost estimation) (The followings are the contents of materials to be taken for the program) • Seminar • OJT at the site of installation • Livelihood of the residents	○	
(3) Discussion on planning and plans	○	○
2. Shooting of materials for the program		
(1) Request for shooting to TV stations	○	○
(2) Permission for shooting at the location		○
(3) Budget for shooting		○
3. Broadcasting and distribution via video tapes		
		○

Source: Study Team

Fig. 2-2 Division of Work between Japanese and Nigerian Sides

2.3 Program Planning and Components

The program theme and components of recording are explained below.

(1) Title: Let's Develop PV Power Generation Together

(2) Theme and Content

The program aims at explaining an electrification plan using PV panels in a simple manner for easy understanding as part of awareness raising activities related to the Master Plan Study for Utilisation of Solar Power. As electrification can be expected to improve the standard of living because of the use of electricity for lighting, water pumping, refrigerators and TVs, etc., there is a strong demand for electrification on the part of residents of non-electrified rural villages situated far from urban areas. While there are many ways to electrify daily life, including the use of a diesel power plant and the construction of a hydroelectric power station, PV power generation is said to be economical as a means of electrifying Nigeria's rural areas where residents are scattered over a wide area. The introduction of a PV power generation system by individual residents is difficult because of the heavy economic burden of initial investment and maintenance. The introduction of such a system, however, is not impossible as its introduction by local communities, such as villages, can reduce the burden on individual residents.

The PR program to be recorded under the Study assumes that local residents of non-electrified areas are the target viewers and that the main components are:

- 1) the improvement of local life by means of electrification using PV system,
- 2) appeal for viewers to participate in the building PV system,
- 3) process from the planning to the installation of PV systems (planning, survey, construction and eventual use by residents) and
- 4) operation and maintenance of the system.

The preparations for the introduction to PV system and better understanding of the system through viewing of the program will help to spread the PV project, contributing to improvement of the living conditions of residents, rectification of the regional gap and, ultimately, the formation of peaceful and stable local communities.

(3) Program Components

- 1) The recorded video materials basically consist of four components which are designed to facilitate (i) basic knowledge of electricity, (ii) understanding of the mechanism of PV power generation and handling of a PV system, and (iii) the program will urge local residents to participate in the construction of PV panels.
- 2) Under the Study, the proposal for the planning of a program was made and the video recording of various scenes was conducted in Nigeria. It will be necessary for the Nigerian side to edit the program to suit the target viewers and broadcasting time (schedule).

Table 2-1 shows the program components.

Table 2-1 Program Components (The area encircled by a bold line indicates the work conducted by the FY 2005 Study)

Component No.	I. Opening	II. Exposition	III. Development	IV. Conclusion	Spare Cuts
Contents (Sub-Title)	Better life with electricity	Appeal to take part in PV panel construction	From the planning to the installation of PV panels	Maintenance	1. Local Life
Story	Electrification enables the pumping up of groundwater and the time spent for water fetching can be diverted to study and productive activities. Access to TV and radio increases people's interest in social affairs and enables people to obtain the weather forecast and other agriculture-related information to enhance local life. This opening phase explains the configuration of the system in simple language to facilitate the introduction of a power generation system using PV panels.	Unlike thermal power generation using oil, coal and solar heat, PV panels require a lower initial investment and the fuel cost is free as the system uses solar energy. This energy can be continually used provided that residents and users conduct some tasks themselves, including saving money to replace batteries and proper maintenance of the PV panels. When residents join together to work, solar energy can be turned into electricity, benefiting local life.	This component mainly features scenes from PV panel construction sites. Interviews with people participating in the meetings and seminars are inserted to make the viewers understand the importance of participation. ① Scenes from PV panel construction sites ② Cut back scenes and still shots of the meetings and seminars on the PV power generation plan ③ Interview scenes with people who took part in the meetings and seminars for the purpose of appealing the necessity for residents' participation	Explanation of what the viewers should do after the installation of PV panels. Assists users understanding of the maintenance requirements by showing scenes of OJT.	① "Scene where electricity helps reduce such heavy household work as water fetching": interviews to find out what kinds of electrical appliances people want to use with electricity being brought into their life (one or two interviews) ② "Children studying using electric light": interviews with one or two children ③ Interviews on the planning of agricultural production (one or two farmers) ④ Use of electricity at a clinic or school (one facility) ⑤ Others
Recording Targets	1. Recording of the SELF project in Jigawa State: Solar Micro Enterprise Shop in Wawan Rafi Village ① Borehole using a PV power generation system ② Peanut oil extraction machine ③ Battery charger controller ④ Electric sewing machine ⑤ PCs (IT school) 2. Recording at Garkon-Alli Village ① Battery charging station (BCS) ② Solar home system (SHS)	1. Recording of the seminars (FY 2005 Study in Ondo and Imo States: SEB and Onishere Village, etc.) Seminars during the 4 th field survey period (seminar 2) in Garkon-Alli and Wawan Rafi Villages, etc. ① Interviews with residents on the introduction of an electricity charge (3 – 4 families in each village) ② Interviews on impressions of the use of electricity (3 – 4 families) ③ Interviews with the managers of public facilities, such as clinics and schools	1. Reporting at the pilot project sites in Ondo and Imo States ① Storage yard for construction materials ② Scenes of a SHS construction site and system configuration ③ Scenes of a battery centre construction site and system configuration ④ Scenes of a distribution line construction site and system configuration ⑤ Scenes of switchboard wiring work and system configuration 2. Interview scenes ① Interview with a counterpart engineer ("What points required attention when introducing PV panels?") ② Interviews with village heads (What types of things did you worry about?) ③ Interview with the person overseeing the Pilot Project ("What types of things did you worry about?") ④ Interviews with residents ("What did you do to help with the construction?") ⑤ Configuration of BCS	1. Pilot project sites in Ondo and Imo States ① Explanation of maintenance work required by a C/P engineer ② Cautions regarding the use of electricity (short-circuits, leakage and electric shock) given by a C/P engineer ③ Scenes of OJT 2. Scenes of improved life in villages	① Interviews on the planning of agricultural production (one or two farmers) ④ Use of electricity at a clinic or school (one facility) ⑤ Others 2. Seminars ① Interviews to obtain the impressions and opinions of people taking part (one or two participants)

Source: Study Team

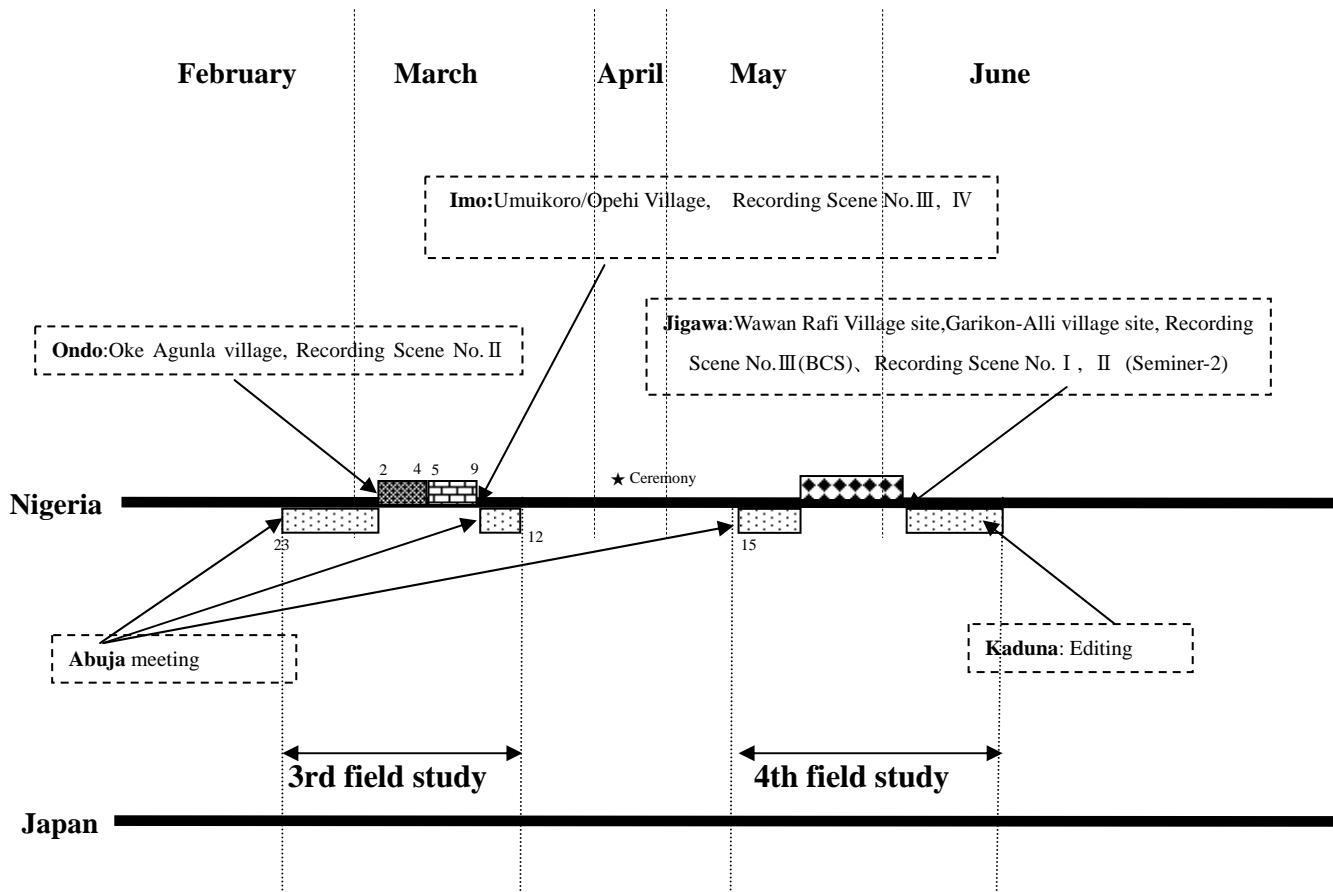
2.4 Recording and Editing of Scenes of System Operation in Pilot Project

During the 3rd field study, the program components III “From the planning to the installation of PV panels (SHS)” and IV “Maintenance” were recorded at the pilot project sites where the planned work was completed. In addition, some scenes of the meetings and seminars regarding program component II “Appeal to take part in PV panel construction” were also recorded.

During the 4th field study, the remaining scenes for program components I “Better life with electricity”, II “Appeal to take part in PV panel construction” and III “From the planning to the installation of PV panels (BCS)” were recorded.

During the 3rd and 4th field studies, night shootings of homes and streets were done to contrast the life with electricity with the one without electricity.

Fig. 2-3 shows the video recording process and movements of the study team.



Source: Study Team

Fig. 2-3 Video Recording Process

2.5 Proposals for Media to Provide Awareness Raising Program for Residents

The scenes of PV system installation sites and seminars recorded under the field studies constitute images are called “program materials”. There are several means of providing these images to the people of Nigeria, including the distribution of visual media and TV broadcasting as described below.

(1) Video/DVD

The advantage of the distribution of visual media (cassette video tape and DVD, etc.) is that the recorded images can be replayed to suit the place and time chosen by the viewer and, therefore, this type of media can be effectively used in a seminar-style viewing environment. The low cost of organizing a viewing meeting of the PR program is another advantage as only the travel cost of the presenter and copying cost of the DVD (approximately N 3,000 per copy) is required, except for initial investment in replay equipment and program production.

The language to be used for the PR program may be English as this is understood by many local residents. However, the presence of a C/P at the viewing meeting as a presenter-cum-interpreter may conduct the voice-over in Hausa, the commonly spoken language in local areas, enhancing the understanding of the project by and the educational effect on the participants.

(2) TV Broadcasting

TV broadcasting is an effective publicity medium as the wide area distribution of a large quantity of information during the broadcasting time provides the opportunity for local residents to “learn about PV power generation systems” at a low cost on the part of viewers. In general, TV commercials are said to have such seven characteristics¹ as:

- 1) persuasiveness and strong appeal,
- 2) credibility,
- 3) familiarity and sharing experience,
- 4) coerciveness,
- 5) topic of conversation,
- 6) immediate and wide effect and
- 7) close contact

Despite these advantages, it has a shortcoming in that its non-recorded nature means a lack of repeatability unlike printed materials or recorded visual media. TV broadcasting involves a relatively high production cost as well as a high broadcasting fees but the unit cost of reaching the viewers is said to be the second lowest after radio because of the wide geographical coverage. Nevertheless, it will be necessary for the PV sector to provide the funds to meet the necessary expenses.

TV broadcasting in Nigeria is provided by the Nigeria Television Authority (NTA) and several private broadcasters, such as AIT and Galaxy TV. The NTA is said to be the only body capable of nationwide broadcasting, including the target areas of the Study. The national broadcasting fee charged by the NTA for general PR programs at prime time (around the evening meal) is approximately N 750,000 (plus tax) for 30 minutes. If broadcasting is limited to a local station,

¹ Federation of Private Broadcasters, “Broadcasting Handbook”

the fee is approximately N 200,000 (plus tax) for Lagos, approximately N 65,000 (plus tax) for Ibadan, Kaduna, Benin, Port Harcourt, Enugu, Aba, Abuja, Kano, Jos, Sokoto and Maduguri and approximately N 52,000 (plus tax) for Minna, Abeokuta, Yola, Makurdi, Uyo Calabar, Ilorin, Bauch, Katsuna and Akure. The fee is approximately N 17,500 (plus tax) in the case of a simple broadcasting station of the NIA in rural areas.

Many households in Nigeria have a TV set compared to the rest of the African continent and TV programs are watched in many non-electrified villages using such power generating sources as small diesel generators. ITU (International Telecommunication Union) statistics put the diffusion rate of TV sets in Nigeria at 10.3 sets per 100 people. According to the latest Home Page of the NTA, there are 100 local stations which possess a TV transmitter in Nigeria and the national coverage is 95% with the network using satellite transmission.

(3) **Other Media**

As a means of conveying information on PV power generation in a clear and easily understandable manner, the distribution of video tape or DVD incorporating visual and sound information and TV broadcasting described above are believed to be effective. Medium-wave and FM radio broadcasting can also be used although the conveyance of information is limited to sound only. Radio broadcasting on the Internet, which has been growing in Nigeria in recent years, is also possible. Given the fact that the targets of the PV PR program are residents in rural areas, broadcasting by radio is possible although it will be difficult to fully explain the size, functions and other vital features of PV panels to listeners. Meanwhile, the use of the Internet appears to be unrealistic because of the insufficient availability of the telephone service and PCs in these areas.

2.6 Future Plan and Policies

Sample PR DVD produced during the field study was shown during the workshop held in Abuja on 16 June and received favourable reaction from the participants.

The program materials recorded during the field study can be used as "parts" to prepare PR program and TV program by C/P for awareness raising activities.

The master tape (for storage) will be digital video tape of which the quality will be little damaged by editing and which can be stored for a much longer time than analogue tape and will use the PAL system which is the TV broadcasting system used in Nigeria. DVD and VHS tape were also selected in view of the fact that the C/P can carry a player and medium to the target areas to show and explain the PR program.

Chapter 3 Observations and Findings for Action Plan

3.1 Introduction

In the previous chapters, seminars and PR program production during the field studies are reported. Although these activities i.e. seminars and PR program production in itself are awareness raising activities, our eventual goal is to prepare the awareness raising action plan for solar energy utilization taking the observations and findings obtained from the activities during the field studies into consideration. These activities include not only seminars and PR program production but also the pilot project, JWG meetings, discussions with the government officials. In this chapter, those observations and findings on the issues relating to the awareness raising such as current state, expectation, level of understanding, regional difference, etc. are described.

3.2 Expectation and Awareness

During the field studies, the study team visited and organized seminars in Jigawa state, Ondo state, Imo state and FCT. In every seminar, participants always asked about the price of solar panel, shops where they can purchase the panel, and so on. This reflects people's high expectations of electricity and solar system. On the other hand, participants especially from rural areas always asked about some very elementary questions. This reflects low level of understanding of solar system in rural areas.

In Jigawa state, there is already SELF project by USAID. Therefore interest and expectation of PV system seems relatively higher than the other states. Numbers of participants to the seminars were generally more than the other states as shown in chapter1. While the expectation is high, in rural villages however, level of understanding and knowledge of PV seems to be lower than the southern states. Numbers of female participants to the seminars were few probably due to the religious reason.

In Ondo state and Imo state, in every villages we visited there are almost always at least a few households with TV and quite often there are even small generators. When we organized seminars of course people showed interest and expectation of PV. However the level of interest did not seem to be as high as Jigawa state. In the village in FCT, some participant even expressed his opinion about the subsidies. It seems that the amount of information people have there is much more than the other states.

At the seminars held in the state capitals and Abuja, there were many participants from different sectors such as government sector, power sector, university, NGO, and so on. The participants had at least some knowledge and specific interest in PV. Generally their interests are focused on the pilot projects and Japanese aid. Some participant expressed his dissatisfaction with the available power from PV system installed in pilot project. For successful PV installation, such over-expectation should be avoided. However in order to

promote PV, advantages of PV should also be widely understood. Governmental promotive policies are also important.

3.3 State of PV Business

There were few participants to the seminars from business communities because our study area did not cover Lagos area. In other words, Nigeria's PV business is still concentrated in Lagos. Therefore for the meantime Lagos must be considered for awareness rising activities for business community. As PV becomes more popular and the PV market expands, it is expected that more business will start in various areas in the country.

Although still PV business in Nigeria is under-developed, more than 30 firms showed interest in tenders for the pilot projects. This reflects high expectation of PV business in the country. Unfortunately, the selected company's performance was not satisfactory. Delay of delivery, delay of installation, change of specification, and poor quality of installation are frequently observed. Business community and the government should address the improvement of these problems.

At the seminars, together with the SHS system, three solar thermal equipments (cooker, drier and distiller) which are all manufactured in Nigeria were demonstrated. Many participants asked about manufacturer and price. Although the demonstration received very favorable reaction, the performance of the equipment was not so appealing compared to a sample cooker we brought from Japan. R & D in collaboration with the universities and government's awareness of this point is important.

3.4 Stakeholders of Awareness Raising Activities for Solar Energy Utilization

There are many stakeholders. In short, FMPS oversees the power sector in Nigeria while FMST addresses the energy issues. Therefore the C/P's of this master plan study are FMPS, FMST and NPC which is handling the foreign aids are major stake holders. Furthermore in relation to rural electrification and solar energy, REA, state government, rural government, ECN are also deeply involved. Role and responsibility of these government bodies are to be established. In view of nature of awareness raising activities, many parties from private sectors such as general public, business community, media, NGO, etc. are also stakeholders as a target of awareness raising activities.