

1. General description of the Model Project to Combat Desertification and evaluation of its results

1-1 History and aim of the project

The United Nations Convention to Combat Desertification, adopted in 1994 and put into force in 1996, attaches importance to the use of technologies suitable to local conditions in its implementation.

With particular interest in the technology of the "subsurface dam", which has been developed operationally in Japan, the Ministry of the Environment of Japan conducted the "Model Project to Combat Desertification" to examine, from the viewpoint of both hardware and software, the applicability of this technology under local conditions for the effective exploitation and use of groundwater resources that is invaluable in desertified areas.

In arid and semi-arid areas where desertification continues, surface water and deep groundwater has been focused on in the exploitation of water resources.

In general, surface water is exploited by means of "surface dams". However, a surface dam implies the submergence of a vast land area, and consequently raises problems such as the destruction of environment and the forced migration of the local people. In addition, if it is constructed in flat peneplain in arid or semi-arid areas, the reservoir area of the surface dam, which is large compared with its depth, makes the evaporation rate very rapid. Thus, it cannot work as a "water storage dam" in the dry season when the need for water is the greatest in the year.

In addition, the exploitation of deep groundwater raises a sustainability problem due to its limited volume. There can also be a problem of salinization when the salt concentration of the groundwater is high. In addition, the exploitation of deep groundwater, which is usually conducted point by point, tends to result in the concentration of population and livestock animals, and consequently to accelerate desertification.

To avoid these problems inherent in the exploitation of surface water or deep groundwater, it is necessary to consider the possibility of the exploitation of shallow groundwater, which exists at a shallow depth under ground and flows at a relatively high rate. To exploit shallow groundwater, "subsurface dams" have aroused interest recently. They are the facilities that retain and store groundwater using a dam body. In Japan, this technology is being developed as a new means to exploit water resources in isolated islands that have no large river. In comparison with the surface dam, the subsurface dam has the advantages of having no submerged land area and no risk of collapse because it is constructed under ground. In arid areas, there may be other advantages such as low water loss by evaporation, and less risk of the proliferation of parasites. However, a subsurface dam is accompanied by difficulties in site selection that require an accurate grasp of the hydrogeologic conditions. It is also handicapped by its low effectiveness in water storage, because water is stored in pores in geological strata.

In this project, we chose a subsurface dam for storing shallow groundwater as a means of exploiting water resources in arid and semi-arid areas, and decided to verify its applicability under local conditions in West Africa suffering from chronic drought.

1-2 Execution of the project

This project was carried out from 1995 to March 2003.

(1) Selection of the site country

The United Nations Convention to Combat Desertification notes that serious drought and

desertification has tragic consequences, particularly in Africa.

In this project, Burkina Faso was selected from the Sahel region as a country that meets the following conditions:

- 1) A country seriously affected by desertification
- 2) A country with relatively large areas with aquifers of shallow groundwater
- 3) A country whose political situation is stable

(2) Survey to select the project site, from 1995 to 1996

The interpretation of satellite images and aero-photographs, as well as preliminary exploration, was carried out at 35 sites in the central and the northern part of Burkina Faso, which are areas affected by desertification, to narrow the possible sites for the project. On the basis of the results of electric soundings, test drillings, observations of groundwater level and socio-economic research, Nare Village, Tougouri District, Nametenga Province was finally selected for the project site of the subsurface dam.

(3) Construction of facilities for the demonstration study of a subsurface dam, from 1997 to 1998

Construction of the subsurface dam was carried out during the dry season from November 1997 to June 1998, on the Kolongo River in Nare Village.

Thereafter, during the dry season after October 1998, water-pumping and supply facilities, a small-scale surface dam with water gates, wells for groundwater observation, a pilot farm and other facilities were set up.

(4) Conduct of relevant demonstration studies, from 1999 to 2000

Along with the observation of the water storage state, the following studies were carried out to examine effective groundwater usage and its impact on the environment (in particular, on vegetation):

- Observation of groundwater
- Meteorological observation (mainly of rainfall)
- Observation of rate of streamflow
- Agricultural pilot studies
- Vegetation research

(5) Additional observations, from 2001 to March 2003

In the initial plan, the duration of this project was 6 years (1995 to 2000). However, as the rising speed of groundwater level was lower than expected, it was necessary to continue the observation to verify the effectiveness of the subsurface dam. The project was thus prolonged for 2 years, and the observation of groundwater and rainfall was continued.

(6) Completion of the project

The project was finished in March 2003 with positive results. The Permanent Secretariat of the National Council for the Environment and Sustainable Development (S.P.CONEDD) of Burkina Faso requested that the facilities for the demonstration studies be left to improve and develop the living conditions of the local people. This request was accepted with the hope that these facilities will continue to contribute to combating desertification and to the sustainable development of Nare Village and the whole of Burkina Faso.

1-3 Organizational framework of the project

This model project to combat desertification was carried out under the organizational framework shown in Fig. 1.1.