

Summary of Terminal Evaluation Results

I. Outline of the Project		
Country : Republic of Namibia		Project title : Flood- and drought-adaptive cropping systems to conserve water environments in semi-arid regions
Issue/Sector : Agriculture		Cooperation scheme : Technical Cooperation Projects (SATREPS)
Division in charge : Rural Development Department		Total cost : 420,545 Thousand Yen (September 2016)
Period of Cooperation	From February 28, 2012 to February 27, 2017 (5 years)	Partner Country's Implementing Organization : (1) Responsible organization: Directorate of National Research, Science, Technology and Innovation, Ministry of Education (2) Implementing organization: Faculty of Agriculture and Natural Resources, University of Namibia
		Supporting Organization in Japan : Kinki University, Nagoya University, Tohoku University, Ryukoku University, and University of Shiga Prefecture etc.
1. Background of the Project		
<p>Harmonization between development and environment conservation is one of the universal issues in the 21st century. Especially for the semi-arid areas in Africa, there is risk for the rapidly disordered development without any consideration for the environment. On the other hand, periodic serious drought and deluge caused by heavy rains frequently affect semi-arid areas of Sub-Sahara Africa in recent years. Millions of people suffered and experienced shortage of food by the heavy rains from 2006 to 2007, for example. It is the new challenges for the change of global environment that to cope with such contradistinctive water conditions.</p> <p>Namibia is located in the Southern Africa with the area of 824,000 km². The population is about 2,147,000 with its Gross National Income (GNI) per capita of 4,270 USD (World Development Indicator (WDI)), World Bank, 2011). With its rich mineral resources, the economic growth marked 4.5% a year on average from 1990 to 2008 (WDI, 2011). Although Namibia is categorized as Upper Middle Income country, the nation is one of the least equitable countries as shown by a Gini coefficient of 0.74 (UNDP, 2007).</p> <p>A quarter of the nation lives in north central Namibia, where most of people are subsistence farmers cropping pearl millet and farming livestock. The annual precipitation in the area is about 400 mm, but flood water from the Angolan plateau creates vast seasonal wetland utmost of about 800,000 ha during rainy season. The amount of flood water has been widely changing in the last ten years, which causes serious deluge or drought to the area. Currently, the water resource of the seasonal wetland is not utilized for cropping but mainly for grazing. The reasons for the limited used of the water resource are: the national sanctuary for the wild animals, unstable flood intensity, etc. However, there is risk for the destruction of this vulnerable water environment if irrelevant large-scale development plan would have targeted to the area.</p> <p>Therefore, the Government of Namibia has requested the technical cooperation project under the framework of science and technology cooperation program. To respond to the request, a project titled " Flood- and drought-adaptive cropping systems to conserve water environments in semi-arid regions" (the Project) is being implemented from February 2012 to February 2017 (5 years).</p>		
2. Project Overview		
<p>This Project aims to develop "Flood- and drought-adaptive cropping system" which can sustainably preserve water resources and cope with the yearly fluctuation of flood and drought. This system is going to be developed through trials in the field of crop science, development studies, hydrology and integrated study of Agricultural and Social Science. The project is also expected to contribute to adaption to climate changes.</p>		
(1) Overall Goal		
<ol style="list-style-type: none"> 1. "Flood- and drought-adaptive cropping systems" are disseminated in north-central Namibia to contribute to the food security and cash income of local farmers. 2. "Flood- and drought-adaptive cropping systems" are considered in the northeastern area of Namibia of high rainfall as well as in neighboring countries. 		
(2) Project Purpose		
<p>"Flood- and drought-adaptive cropping systems" are developed which can sustainably preserve the water environment of semi-arid region.</p>		

(3) Outputs		
1) [Crop Science] The rice-based mixed cropping system, which is adaptable to the yearly fluctuation of flooding and drought as well as water-saving, is proposed.		
2) [Development Studies] The methods to understand the change of attitudes and perception by farmers, and socio - economic impacts on farmers through introduction of the rice-based mixed cropping system are established.		
3) [Hydrology] The possible area of mixed-cropping field that does not modify the water environment of seasonal wetlands is estimated based on the water budget/water source analysis.		
4) [Integrated Study of Agricultural and Social Science] The cropping systems proposed by the project are integrated through field activities.		
(4) Inputs		
Japanese side : Total cost: 420,545 Thousand Yen. Japanese Expert: 2 long-term experts and 20 short-term experts in total, Trainees received in Japan: 28 persons for the country-specific trainings, 3 persons for doctor and master course, and 16 persons for short-term training, Provision of equipment: approx. US\$967,000, Local cost expenditure: approx. US\$787,000.		
Namibian side : Counterpart 12 persons (at the terminal evaluation), Local Cost: around US\$73,765 dollar, Provision of land and facilities: crop experiment fields, office spaces for Japanese researchers and expert, green house, laboratories, and store house etc.		
II. Evaluation Team		
Members of Japanese Evaluation Team	1) Leader: Ms. Ayumu OHSHIMA , Director, Agricultural and Rural Development Group 2, Rural Development Department, JICA 2) Cooperation Planning: Ms. Makiko ASAOKA, Deputy Director, Agricultural and Rural Development Group 2, Rural Development Department, JICA 3) Science and Technology Evaluation: Dr. Makie KOKUBUN, Research Supervisor, Japan Science and Technology Agency (JST)/ Professor Emeritus, Tohoku University 4) Science and Technology Evaluation: Dr. Kensuke KODAIRA, Associate Research Supervisor, JST 5) Evaluation Analysis: Mr. Isao DOJUN, Consultant, Chuo Kaihatsu Corporation	
Members of Namibian Evaluation Team	1) Leader: Prof. Edosa OMOREGIE, Professor, Department of Fisheries and Aquatic Science, Sam Nujoma Campus, University of Namibia (UNAM) 2) Member: Prof. Nelago INDONGO, Director, Multidisciplinary Research Center (MRC), University of Namibia (UNAM)	
Period of Evaluation	From August 13, 2016 to September 3, 2016	Type of Evaluation: Terminal
III. Results of Evaluation		
1. Project Performance		
Output 1: [Crop Science] The rice-based mixed cropping system, which is adaptable to the yearly fluctuation of flooding and drought as well as water-saving, is proposed.		
Degree of achievement: moderately high		
Achievement: Research activities to develop techniques to deal with flooding and drought conditions as well as water-saving progressed steadily throughout the Project term. The results of the analysis on the research activities have been summarized in various papers and submitted to domestic and/or international journals. The results of analysis have also been presented at many academic conferences/seminars in Japan and Namibia. The project team is proposing the rice-based mixed cropping systems consisting of six cultivation techniques. Mixed seedling technique in particular has been scientifically verified to have comparative advantage on yield on experimental basis, although it is yet to be verified at farmers' field level.		
Output 2: [Development Studies] The methods to understand the change of attitudes and perception by farmers, and socio - economic impacts on farmers through introduction of the rice-based mixed cropping system are established.		
Degree of achievement: moderately high		
Achievement: There were seven different methods, namely, 1) farm sketch, 2) hand-held GPS survey, 3) taking aerial photos by UAV, 4) questionnaire survey, 5) summarizing village monograph, 6) landscape analysis, and 7) workshops that were applied to analyze and understand the socio-economic conditions and farm operation of farmers who participate in conducting field demonstration or voluntary trials. There are methods to understand the subjective perception of the farmers such as 1), 4), and 5) and more objective ways		

to clarify the situation with precise data and information on farming practices such as 2) and 3). Appropriate combination of both methods was found to be effective to grasp farmers' perception and reality. As a result of the research activities, papers were submitted to domestic and/or international journals and additional papers will be submitted. The results of the research activities were presented at many academic conferences/seminars in Japan and Namibia.

Output 3: [Hydrology] The possible area of mixed-cropping field that does not modify the water environment of seasonal wetlands is estimated based on the water budget/water source analysis.

Degree of achievement: high

Achievement: Various kinds of data analyzed revealed that the possible area for introducing mixed-cropping, that would not modify the water environment of the seasonal wetlands, could be from 3 to 7% of the land in the Cuvelai System Seasonal Wetlands. The results of the analysis of the research activities have been summarized as various papers and submitted to domestic and/or international journals. The results of analysis were also presented at academic conferences/seminars in Japan and Namibia.

Output 4: [Integrated Study of Agricultural and Social Science] The cropping systems proposed by the project are integrated through field activities.

Degree of achievement: moderate

Achievement: The results of the research activities in the respective areas of Crop science, Development Studies and Hydrology have been shared among the Namibian counterparts, Japanese researchers, extension officers, and farmers etc. Among 111 volunteer farmers who carried out rice-based mixed cropping in 2015/16 cropping season, 32 farmers were able to get rice harvest at their wetlands. Pearl millet and sorghum were harvested by 30 and 27 farmers respectively. Broadly speaking, one-quarter of volunteer farmers obtained some amount of harvest even during the severe drought year with the national emergency declaration. A paper based on the detailed analysis of the economic impact of rice-based mix cropping systems will be submitted to peer-reviewed journal by the March 2017.

Project Purpose: "Flood- and drought-adaptive cropping systems" are developed which can sustainably preserve the water environment of semi-arid region.

Degree of achievement: moderately high

Achievement: Various research activities have progressed well in the areas of crop sciences, development studies, hydrology, and integrated study on agricultural and social sciences, as well as various papers have been written and presentations for conferences/seminars have been made. Various leaflets for farmers/extension officers were developed using the research results. The draft guidelines for a "Flood- and drought-adaptive cropping systems" have been produced and these guidelines will be finalized within 2016. Regarding the rice-based mixed cropping techniques which are to be disseminated to the farmers, mixed seedling in particular has been scientifically verified to have comparative advantage on yield on experimental basis. At farmers' field level, however, adaptability of rice-based mixed cropping techniques is difficult to be verified by the project completion due to drought or semi-drought since the Project has started.

2. Summary of Evaluation Results

(1) Relevance: high.

The relevance of the Project is considered to be high from the following viewpoints.

- 1) conformity with needs for increasing crop production in seasonal wetlands in north-central Namibia is high.
- 2) relevance to the national policies of Namibia which shows agriculture as the priority issues of the economic sector and the strong promotion of rice production.
- 3) conformity to the assistance policy of Japan to Namibia, which states the contribution to the improvement of the present living standard and the reduction of poverty in the rural area, is high.
- 4) holistic approach based on the areas of Crop Science, Development Studies and Hydrology taken by the Project was appropriate.
- 5) comparative advantage of technical cooperation by Japan which has long history in rice research, socio-economic analysis and hydrological analysis.

(2) Effectiveness: moderately high.

The degree of development of the "Flood- and drought-adaptive cropping systems" which can sustainably preserve the water environment of the semi-arid region is experimentally established. On the other hand, the project team could not collect sufficient data due to severe drought for verifying the rice-based mixed cropping systems at the farmer's fields. According to the economic survey, however, 32 farmers out of 111 farmers have adopted and harvested rice even in severe drought condition, which partly supports the effectiveness of the

proposed mixed cropping systems. Also, the logical flow from each of the four outputs, such as Crop Science, Development Study, Hydrology and Integrated Study of Agricultural and Social Science to the project purpose as to develop the “Flood- and drought-adaptive cropping systems” was appropriate.

(3) Efficiency: moderate.

The efficiency of the Project is considered to be moderate from the following viewpoints.

- 1) dispatch of Japanese researchers was mostly appropriate in terms of number of persons, expertise and research capacity, etc.
- 2) most of the agricultural machinery, measuring and laboratory equipment and materials provided have been well utilized, however, some such as dry oven, incubator and rice milling machines were observed to be not in full use because of the delay in arrival or due to low production of rice caused by severe drought.
- 3) though there have not been observed any negative effect to the smooth implementation of the project activities, several counterparts including six personnels who have participated the training in Japan turnover mainly due to study leave.

(4) Impact: likely to be moderately high.

Part of the Overall Goal is likely to be achieved, especially in regard with the food security of the farmers. There were several positive impacts observed and negative impact was not observed.

1) Prospect of achieving the Overall Goal

The overall goals are set as follows:

1. “Flood- and drought-adaptive cropping systems” are disseminated in north-central Namibia to contribute to the food security and cash income of local farmers.
2. “Flood- and drought-adaptive cropping systems” are considered in the northeastern area of Namibia of high rainfall as well as in neighboring countries.

UNAM and MAWF have made efforts to obtain budget for the next financial year (from April 2017 to March 2018). Workshops for farmers will be held at 12 locations in five regions and field days will be held five times. Therefore, it is expected that field days and workshops on the rice-based mixed cropping techniques will be held periodically after the completion of the Project in north-central and north-east of Namibia. When more local farmers introduce/adopt these techniques, it is expected to contribute to food security of local farmers. As for implementation of regional research conference together with neighboring countries on “Flood- and drought-adaptive cropping systems”, it is difficult to prospect whether such conference can be held within a few years after the completion of the Project. Also, the Terminal Evaluation Team cannot assess at this moment that the rice-based mixed cropping systems to be introduced in neighboring countries in a short period of time.

2) Other Positive Impacts Observed

- a) Farmers’ strong interests on rice cultivation and rice-based mixed cropping were observed.
- b) Joint use of community’s seasonal wetland was observed.
- c) UNAM have made a proposal for research on new rice product.
- d) Lecturers at UNAM Ogongo Campus have increased motivation for carrying out research activities.

(5) Sustainability: likely to be moderately high.

1) Policy aspect

Sustainable increase of agriculture production and productivity, food security, and income increase are regarded important in “Vision 2030”, which is the national development strategy of the Government of Namibia. In addition, one of the overall goals of the Namibia Agriculture Policy for 2015 clearly shows 1) to develop and diversify agricultural production, 2) to promote agricultural research and adaptation of appropriate technology, and 3) to promote the sustainable utilization of resources for agricultural production to contribute and support disaster preparedness. Therefore, it is expected that the outcomes of the Project will be disseminated to wider areas with support by UNAM, MAWF, and regional governments.

2) Institutional and Financial Aspects

A joint budgetary proposal by UNAM and MAWF for the next financial year (from April 2017 to March 2018) was prepared and submitted for disseminating rice-based cropping systems and continuing a part of research activities which were conducted under the Project. Target areas for dissemination proposed by the plan are the north-central Namibia and Kavango region. Financial and institutional sustainability (on effective utilization and dissemination of the outcomes of the Project) can be considered relatively high, considering the progress the budget allocation.

3) Technical aspect

The Namibian counterparts are mainly lecturers and technicians of the Ogongo campus of the Faculty of Agriculture and Natural Resources of UNAM. Research skills of the Namibian counterparts have been strengthened through project activities such as joint research activities with Japanese researchers, short-term and long-term trainings in Japan, preparation of papers for submitting academic journals and proceedings for academic conferences/seminars. Their knowledge and skills enhanced under the Project will be utilized for academic activities at UNAM. Technical sustainability is expected to be secured.

As for the effective use and maintenance of the provided machinery and equipment, most of them are still new and severemalfuction or problem has not occurred. However, it is preferable that more staff members of UNAM need to be trained to acquire knowledge and skills on operation and maintenance of tractors, hand power tillers, milling machines, UAVs etc.

3. Factors that promoted realization of effects

(1) Factors concerning to the implementation process

None

(2) Factors concerning to the implementation process

- 1) Enthusiasm of Namibian and Japanese researchers brought useful research outcomes.
- 2) Research activities parallel to learning at doctoral level promoted the effective implementation of the project activities.
- 3) Improved communication with the project team has contributed to prepare publications (academic papers) in more collaborative and organized manner.

4. Factors that impeded realization of effects

(1) Factors concerning to planning

None

(2) Factors concerning to the implementation process

- 1) Severe drought became a limiting factor in obtaining expected research results.

5. Conclusion

This Project is in line with the policies and strategies of the Government of Namibia and is based on the needs for increasing the agricultural productivity in seasonal wetlands in north-central Namibia. The Project purpose is likely to be achieved and despite the four-year consecutive trend of low rainfall has given negative effect, the Terminal Evaluation Team has confirmed that the Project produced good research results and the guidelines for “Flood- and drought- adaptive cropping systems” is established on experimental basis. Positive impacts are observed such as most of the farmers, who experienced rice-based mixed cropping and rice cropping, keep higher interest on cropping at seasonal small wetlands and they have willingness to continue it. Furthermore, since UNAM and MAWF have allocated budget for continuous research and dissemination activities at at certain amount and that capacity of UNAM counterparts has been improved, sustainability of the project is likely to be high (however, effective utilization and operation and maintenance of the provided machinery and equipment are necessary). According to the above results, it is concluded that the Project will be completed in February 2017 as scheduled.

6. Recommendations

6-1. Recommended Actions to be taken by the Project Teams (Namibian counterparts and Japanese researchers) in the Remaining Cooperation Period (up to February 2017)

- (1) Reviewing and refining the Guidelines to suit the target users by the Project Teams
- (2) Discussion on the research and dissemination activities by UNAM and MAWF to be continued after the completion of the Project
- (3) Reviewing and revising the Inventory list of JICA provided machineries and equipment, and estimating the cost of operation and maintenance of these machineries and equipment
- (4) Amendment of the PDM (revising the “Objectively Verifiable Indicator 2” from “holding regional research conference with neighbouring countries” to “sharing information with neighboring countries”)

6-2. Recommended Actions to be taken by the Namibian Authorities Concerned

- (1) Preparation of a detailed implementation plan for UNAM's research activities and dissemination activities
- (2) Enhanced partnership and clear demarcation of roles and responsibilities between UNAM and MAWF/regional governments for further dissemination of the rice-based mixed cropping systems.
- (3) Drawing a utilization plan of machineries and equipment provided by the Project and continuously securement of budgetary allocation for maintenance of machineries and equipment including refresher training for technicians.

7. Lessons Learned

- (1) Though low rainfall during the project period significantly affected crop cultivation at the farmers' small wetlands, discussions between the stakeholders about the achievement level of the outputs during the five year project period were not enough. For the future projects, when serious external factors hinder the project implementation, it is desirable that JICA and JST have closer and prompt communication with the Project to seek for alternative measures to address the situation.
- (2) Periodical meetings both in Namibia and in Japan were conducted with the team leader's close communication in preparation and yearly plans and research results in each study area were shared at these meetings. These information sharings have contributed to the Namibian partners to obtaine how to manage effectively in the international collaborative project with several research institutes. In the future research projects, these know-hows are expected to be utilized for some other projects/programs.