

Research Application Summary

Improving water management for irrigated rice production in the South-Kivu province, Democratic Republic of Congo

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Abstract

The aim of the project is to contribute to increasing rice (*Oryza sativa*) productivity by improving water management and expanding irrigated rice production in Eastern D.R. Congo. The study will identify potential rice production areas in south-Kivu province, identify plausible best water management options, and determine the drivers of their adoption. The project will be conducted by a University-based research team and will entail research activities largely conducted by two students. Two separate but related studies will be conducted as part of requirement of MSc. theses research and training. The two studies will focus on determining potential irrigated rice production areas and different water management strategies and farmers' adoption to water stresses.

Key words: Adoption, Eastern D.R. Congo, *Oryza sativa*

Résumé

L'objectif du projet est de contribuer à accroître la productivité du riz (*Oryza sativa*) en améliorant la gestion de l'eau et en augmentant la production du riz irrigué à l'Est de la R.D.Congo. L'étude permettra d'identifier les zones potentielles de production du riz dans la province du Sud-Kivu, d'identifier les meilleures options plausibles de gestion de l'eau, et de déterminer les facteurs de leur adoption. Le projet sera mené par une équipe de recherche en milieu universitaire et entraînera des activités de recherche menées en grande partie par deux étudiants. Deux études distinctes mais connexes seront menées dans le cadre de l'exigence de recherche et de formation pour des mémoires de maîtrise. Les deux études se concentreront sur la détermination des zones potentielles de production du riz irrigué et de différentes stratégies de gestion de l'eau ainsi que leur adoption par les agriculteurs pour les stress hydriques.

Mots clés: Adoption, Est de la R.D.Congo, *Oryza sativa*

Background

The Democratic Republic of Congo (D.R. Congo) has got one of the biggest hydrographic networks in the world, through which the Congo River and a lot of small rivers in all the provinces of the country pass. This network is a big asset for irrigated rice cultivation (Tollens, 2004). Currently, however, rice production is very low requiring that the D.R. Congo imports more than 100,000 tons of rice per year from Asia, and this has led to high rice prices (Tollens and Biloso, 2006), food insecurity and poverty (PAM and INS, 2008), especially since 9% of the D.R. Congo population depends on rice (NEPAD, 2006). The South-Kivu Province on its own can produce enough rice to compensate for the entire D.R. Congo importation and even generate surplus for export to the neighboring countries (Defailly, 2000). This potential needs to be exploited especially focusing on plant water requirements in rice production.

Water is the first factor in crop production (Vilain, 1997) and especially for irrigated rice (Arraudeau, 1998). IRRI (2009) predicts that 15-20 millions of hectares of farmland will suffer from water scarcity by 2025. In South-Kivu, SIM Bushi (2010) identified 30,000 ha of highland wetlands used in the dry season for producing legumes because it is hard to manage water in the wet season, yet with an adapted water management strategy and other modern technologies, it is possible to produce more than 5 tons/ha of rice in the wet season and up to 10 tons/ha in the dry season (Arraudeau, 1998). Unfortunately, the lack of knowledge on water management reduces rice yields and discourages farmers from engaging in rice production and exploiting all the available land.

The overall objective of this work is to contribute to increasing rice production in the South-Kivu province through better water management and by expanding irrigated rice production to other places. The specific objectives are to a) determine the irrigable surface according to the rivers flow and the climatic data in some critical ecosystems; b) determine suitable irrigated rice production areas in selected sub-regions of South-Kivu; c) determine the efficiency of selected water management practices in irrigated rice production areas; and e) increase farmer's skills for better water management strategies for their ecosystems

Literature Summary

NEPAD (2006) suggests that the use of inadequate water management practices is one of the major rice production constraints in D.R. Congo. Other investigations showed that in

South-Kivu most farmers do not use the optimum level of water because they are not aware of the right proportion between the flow and the irrigable surface. They sometimes use a larger land surface than the flow and some of them do not have optimum access to water and this leads to loss of yields and conflicts between farmers. Others over irrigate their rice fields, hence resulting in low yields. Hence, there is a need to develop and disseminate water management practices that can help farmers cope with water scarcity in irrigated environments (Bouman *et al.*, 2007). These practices are not yet known in South-Kivu and the rivers capacity in irrigated rice production has not yet been determined.

Thirty years ago, water irrigation was considered an unlimited resource (Ardereau, 1998). But today water is among the first resources to be managed, and irrigation cannot only decrease its quantity (Guerra *et al.*, 1998) but also have ecologic impacts (Osterbaan *et al.*, 1986). South-Kivu rivers are ecologically very important, requiring that the use of their water for irrigation be carefully managed to avoid destabilizing the ecosystem. The critical rivers that may not be used for irrigation in the near future have not yet been mapped in South-Kivu. In addition, some of the rivers may not have suitable water for irrigated rice as described by Bauder *et al.* (2011). If such rivers are used for irrigated rice production, this may reduce rice yields as farmers do not know the techniques of water management, especially to the type of water used (Klapetek, 2010). Besides, the quality of water in the rivers in South-Kivu has not yet been determined.

Study Description

This study will be conducted in south- Kivu province. Key activities to be undertaken are highlighted below.

Determining the flow for the selected rivers and deducing the irrigable surface. This will be done in different South-Kivu ecosystems (low, mean and highland) by using a removal limnometer. This will help determine the irrigable surface that the rivers can cover according to the optimum level of water in the appropriate ecosystem conditions. The study will also help determine which river has enough water to be economically useful for irrigated rice production because of the costs involved in the creation of rice fields. This study will be done from October to November 2013.

Determining water quality of selected rivers; and appropriate improvements. While evaluating the rivers' flow, samples will be taken from different points in the rivers (especially where their water can be captured for irrigation) and these samples will be analyzed to determine the water characteristics and predict its effect on rice production according to different criteria. This study will be carried out from October to November 2013.

Determining ecological consequences of using rivers' water for irrigation and usable rivers without destroying below ecosystem. Analyses will be done in the below ecosystems in order to determine the impact of the irrigation. The optimum proportion of usable water without ecological impact will be determined by comparing the collected data to the established criteria. Alternative irrigation systems will be investigated to compare their environmental impact. This study will also be conducted from October to November 2013.

Determination of potential irrigated rice production areas. Areas suitable for irrigated rice production will be identified using remote sensing techniques for the south Kivu region. Validation exercise will be conducted, a confusion matrix built, and the mapping accuracy determined. This work will include mapping viable ecosystems for irrigated rice production and identifying appropriate water management strategies for different ecosystems. Recent satellite images will be procured from Regional Centre for Mapping in Nairobi for that purpose.

Experimenting water management strategies with farmers. Existing water management strategies and practices will be identified through field survey and participatory rural appraisal (PRA) techniques. Water management strategies (alternate wetting/drying, reduction of water depth, semi-dry cultivation and aerobic rice) will be tested in order to determine with farmers the best strategies for their conditions in different ecosystems. These studies will determine the strategy that uses less labor, increases the yield and increases the irrigable surface by using less water. The study will be done for two seasons (March 2013 and March 2014).

Research Application

The study will contribute to identifying best water management practices for irrigated rice production for the study area; provide information on ecosystem management for the Lake Kivu

region; and provides detailed land evaluation (suitability both physical and economic) for irrigated rice production.

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