

Smart-valleys

A low-cost land and water development technology to improve water control and rice yield in inland valleys



Introduction

Smart-valleys is a participatory approach for land and water management in inland valleys. This approach enables farmers to improve water control at low cost by using simple means to design and construct drainage axes for siting irrigation canals and to create bunded and leveled fields according to the topological conditions. The Smart-valleys approach is suitable for rainfed lowlands, particularly inland valleys where poor water control is a major constraint to rice production. The approach can be used by individuals or farmers' organizations, by companies aiming to invest in rice cultivation in inland valleys, by national governments and their extension agents, and by private service providers aiming to support farmers in improving water control in inland valleys. From 2012 to 2020, the Smart-valleys approach was adopted by 14,027 rice farmers on 241 sites covering a total area of 161 ha. Adoption of the Smart-valleys approach increased farmers' yields by 0.9–2.4 t/ha, farmers' net income by US\$ 267–1157/ha. Yield stability, assessed using the coefficient of variation (CV) of yields (lower CV indicates higher yield stability), increased by 2–11% compared to non-adopters. Increases in yield and yield stability conferred through adoption of Smart-valleys were greater in areas of higher rainfall.



Before (top) and after (below) implementation of Smart-valleys

How to use Smart-valleys

The approach consists of three phases: selection, development and management of inland valleys. The approach begins with a site selection process, which includes exploration to identify potential sites based on rice value in the local area, land tenure, market opportunity, physical accessibility, availability of water resources and suitable soils (mixture of clay, sand and silt). If a site is deemed suitable, development starts with farmer meetings to coordinate cooperative lowland development. Working with field technicians, and following the land topography, farmers collectively design and construct a system of drainage canals, irrigation infrastructure, and bunded and leveled fields, thereby improving water control. The third phase of the approach (management of the Smart-valleys) entails farmers maintaining, adapting and extending the Smart-valleys site to achieve long-term performance.

Step 1: Exploration

- Exploration of lowlands (both cultivated and uncultivated) and shortlisting of a (limited) number of lowland sites that have the (mainly biophysical) potential (slope < 2%, soil with mixture of clay, sand and silt, easily accessible water source if possible) to be considered.

Step 2: Identification/prospection

- Organization of village meetings to evaluate farmers' motivation in lowland development, and land tenure issues.
- Prospection of the lowland sites together with the farmers to supplement, verify and confirm (or refute) the information obtained during the village meeting.

Step 3: Validation

- ▶ Meeting with farmers to determine if the site – from the organizational point of view – is suitable for development
- ▶ The decision to develop the site or not.

Step 4: Village planning and organization meeting

- ▶ Meeting with the villagers to discuss how to get organized and come to an agreement on a specific program of activity.

Step 5: Land preparation

- ▶ Clearing the field but leaving trees intact.

Step 6: Lowland development plan design

- ▶ Design a lowland development plan based on a basic map (sketch) prepared in close collaboration with the users of the lowland.

Step 7: Implementation of the development plan

- ▶ Implement the inland valley development plan by using pegs of different colors: red for bunds bordering the site, blue for main canals, green for secondary bunds, and green and blue combined for secondary canals that will enable more accurate management of water on the plots, yellow for trees, termite mounds, water sources and other sections that should be preserved.

Step 8: Maintenance, adaptation and extension

- ▶ Organize an evaluation of Smart-valleys that will enable an assessment of the operations and the results obtained, and subsequently decide on the possible maintenance, adaptations and extensions to carry out. Train farmers on good agricultural practices for sustainable rice cultivation.



Additional information

Arouna A and Akpa AKA 2019. Water management technology for adaptation to climate change in rice production: Evidence of Smart-valley approach in West Africa. In: Sarkar A, Sensarma S and vanLoon G eds. *Sustainable solutions for food security*. Springer, Cham. https://doi.org/10.1007/978-3-319-77878-5_11

Dossou-Yovo ER, Devkota KP, Akpoti K, Danvi A, Duku C and Zwart SJ. 2022. Thirty years of water management research for rice in sub-Saharan Africa: Achievement and perspective. *Field Crop Research*, 283: art. 108548.

The manual on Smart-valleys is accessible via: www.africarice.org/_files/ugd/0839e4_a267f09770a04a6e9873246b90dbfcfd.pdf

A video on Smart-valleys is available at: www.youtube.com/watch?v=MCZjOorBmiM

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