1 Introduction

1.1 Why this manual?

Inland valleys are of great importance to the development and intensification of agricultural production in Sub-Saharan Africa. Their total surface area is estimated at 85 million hectares or 7% of total arable land, of which only 10–15% is used for agriculture. Most inland valleys are concentrated in the inter-tropical zone where rainfall is more than 700 mm per year.

'Inland valleys' always refer to wetlands, but not all wetlands are inland valleys. In particular, the term excludes coastal wetlands (deltas, estuaries and tidal flats), lagoons and mangroves, floodplains, inland deltas, and lakes. The term 'inland valley' refers to the relatively shallow valleys that occur in the undulating plains and plateaus of Sub-Saharan Africa. They are known as '*dambos*' in eastern and central Africa, '*fadamas*' in northern Nigeria and Chad, '*bas-fonds*' or '*marigots*' in francophone African countries, and 'inland-valley swamps' in Sierra Leone.

The inland valleys are characterized by their upstream position in a drainage network. The catchment area of an inland valley includes water movement from the hillcrest (upland area) through the hydromorphic zone (with shallow groundwater table) to the inland-valley bottom.

The objective of this *Facilitator's Manual* and the accompanying *Technical Manual* is to address the food-security challenge in Sub-Saharan Africa through increased and sustainable use of this tremendous resource.

This manual focuses on integrated rice management in inland-valley lowlands. Water accumulates here during the rainy season because of rainfall, runoff and subsurface flow, leading to a recharge of the water table. Valley bottoms are often used for rice and may retain enough residual moisture to permit a second vegetable or legume crop in the dry season. The hydromorphic fringes and upland slopes and crests offer potentials for other food and cash crops, and for trees and livestock. Next to their agricultural potential, inland valleys have other important social and ecological service functions, such as water storage, drainage and maintenance of biodiversity. Thus, inland valleys constitute an extremely important agricultural and hydrological asset at local and national level.

The diversity and dynamics of growing conditions in inland valleys of Sub-Saharan Africa make it impossible to formulate standard crop management recommendations for use by farmers. Given this complexity, a bottom-up, social learning process is critical, leading to change in behavior and innovation as the outcomes of communication and social interaction. A participatory learning and action research approach among inland-valley development stakeholders (farmers, change agents, extension, research) will enable farmers to become experts in managing their inland valleys, emphasizing adaptive responses to context-specific problems and making the best use of available resources, local knowledge and decision-making, as well as research-based understanding and analysis of underlying processes.

This *Facilitator's Manual* seeks to contribute to this process, stimulating discussion within farmer communities, and with other actors in agriculture such as extension agents and fieldworkers, and building bridges between indigenous and external knowledge. The manual includes a learning curriculum for inland-valley farmers in Sub-Saharan Africa. This curriculum contains a set of modules for a team of facilitators or field agents (for instance, from a national extension service, research or NGO), modules that will help them to play their role as animators or facilitators among groups of farmers. The curriculum is based on the Participatory Learning and Action Research (PLAR) approach and addresses all the important aspects of the rice cropping calendar; it will facilitate individual and collective learning in the field or in the 'classroom.' The curriculum is the outcome of collaborative work with farmer groups in inland valleys with good and with poor water control. However, the authors do not pretend to have delivered a finished product. On the contrary, future PLAR teams that will implement some or all of the modules in this curriculum are invited and encouraged to adapt the modules to their specific local conditions and to add other modules as necessary.

The accompanying *Technical Manual* offers additional information and a range of technical options for improving rice production in inland valleys in Sub-Saharan Africa, summarized in a series of technical references.

Sustainable management of inland valleys depends on many factors. One has to consider the impact of interventions on the entire catchment area and hydrologic network. Cutting trees in the upland areas may have severe consequences for lowland rice farmers and on water-users further downstream. This manual concentrates on improved and integrated rice management in the inland-valley lowlands and is, therefore, only an entry-point to improved and integrated management of natural resources in general in inland valleys. It is expected that, in the future, new modules and references will be added on aspects that have not been addressed to date, such as options for diversification, fish-farming and maintenance of biodiversity.

1.2 Basic principles of integrated rice management (IRM)

Inland valleys are highly diverse in terms of bio-physical and socio-economic settings. Farmers have adapted to these conditions, leading to great variation in rice management practices. For this reason, it is not possible to develop technological packages that are adapted to each and every situation. Farmers are, therefore, not served with 'blanket' recommendations, that supposedly work under a wide range of environmental conditions. They rather need advice, and lots of ideas or options for improving rice production. The validity of these ideas or options has to be tested under their own specific farming conditions and farmers will possibly have to adapt them before integrating them into their own farming systems.

In the past, introduction of new technologies has had limited impact, because attention was focused on only one aspect of the cropping calendar of the farmer (e.g. fertilizer management or varietal improvement). Much better results are obtained if a more holistic approach is used, where a new

technological option is not so much introduced but rather integrated into the prevailing production system, taking into account interactions with other production factors and management practices. In this way, the technology will be adapted to its new environment. For example, a new soil-fertility management strategy may require new options for weed management. Gradually, other technological options may be integrated, eventually leading to a range of technological options that encompass the entire growth cycle, from the initial planning phase to the harvest and post-harvest stages. This process is called integrated crop management, indicating the step-wise integration of new technological options into production systems with full farmer participation, thereby raising production levels in a sustainable way. For rice, this approach has been called 'integrated rice management' (IRM).

The process described above ultimately results in baskets of integrated rice management options for different types of inland-valley and irrigated systems occurring in major rice-growing areas in Sub-Saharan Africa. As these systems are dynamic, baskets of options will be developed over time.

For this reason, the technical options need to be developed in a farming environment with the active and strong involvement of farmers in the adaptation process, particularly in low-precision systems. The technologies of major interest—which help the farmers to face their major constraints—should be integrated first. It is important to point out that IRM not only includes agronomic technologies, but also socio-economic options, e.g. improved planning of crop calendars and access to resources such as credit. IRM is based on local knowledge and practices and on farmers' decision-making, while integrating exogenous knowledge and techniques, and the scientific understanding of the underlying processes.

The *Technical Manual* sets out the different IRM options for inland-valley rice, from preparation for the growing season up to harvest and post-harvest practices, and the financial balance sheet of the growing season. IRM focuses mainly on the inland-valley lowlands. However, IRM is expected to gradually develop into improved and integrated natural-resources management (INRM) of the inland-valley system as a whole.