

# Problems of Training Konni Producers in the Context of Reforming the Management of Hydroagricultural Developments: Challenges, Issues and Perspectives

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## Abstract

Following the reform of the governance of irrigation schemes in Niger, producer cooperatives are encountering real difficulties in ensuring effective and efficient management of irrigation water, infrastructure maintenance and renewal of hydromechanical equipment. The objective of this research is to analyze the issues and challenges of capacity building for Konni producers in the context of AHA management reform in Niger. The methodological approach adopted is based on documentary research and field surveys with all the actors directly concerned with the management of the Konni irrigated perimeter. A total of 448 people were interviewed in all the localities selected. Direct observation and interview are the two field data collection techniques adopted. The data collected was processed and on the basis of the established diagnosis, the training needs were identified. The results show that there are several experiences in terms of training and capacity building of actors in charge of the management of irrigation systems at the Konni AHA level. However, the sustainability of the perimeter is threatened by various crises. The main themes that founded the first training were related to the mobilization, transport and distribution of irrigation water, operation and maintenance, and setting and collection of the fee. In view of the expectations of operators, future issues and challenges, the training modules are increasingly oriented towards social management, the integration of gender in management and environmental impacts. Even if technical progress is possible, the real lever is organizational and requires the professionalization of irrigators. This process requires a new pedagogical approach aimed at irrigators.

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## Keywords

Konni (Niger), Irrigation Schemes, Training, Management, Producers

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## 1. Introduction

The reform of the irrigation sector in Niger is a global approach of the state, due to the observation that Hydro-Agricultural Developments (AHAs) are inexorably deteriorating. The National Hydro-Agricultural Development Office (ONAHA) is the main technical instrument of this policy and has seen its missions profoundly modified to adapt to new challenges. Thus, in 2016, the Ministry of Agriculture, which supervises ONAHA, and the Ministry of Hydraulics, drafted and adopted three decrees forming the legal arsenal to allow better water management of irrigation on hydro-agricultural developments: Order No. 063/MAGEL/HL/A of September 29, 2016 specifying the procedures for the creation, missions, organization and operation of Associations of Water Users Irrigation (AUEI) on irrigation schemes; Order No. 064/MAG/EL/SG approving the standard operating contract on the management of water and irrigation infrastructure and equipment on irrigated areas; Order No. 065 which relates to the standard ONAHA-Cooperatives operating contract.

The new organization thus consecrated by this reform makes a clear distinction between the management of water and the infrastructure of the facilities henceforth assumed by the AUEIs, with the other functions of production and marketing formerly ensured by the cooperatives. With the support of ONAHA, AUEIs began to be installed throughout the country, 21 were created in 2018 with funding from development partners such as the World Bank, AfDB, BOAD, Cooperation German, AREVA, and MCC [1] (2019: p. 11). In this process, ONAHA provides support in terms of training new cooperative organizations, in particular the AUEIs and cooperative societies. The transfer must be done gradually and be accompanied by training and skills development. The first experiences of support for farmers largely entrusted management and maintenance training to NGOs or consulting firms [2] (2001: p. 7). At the Office du Niger in Mali, training units have been created, and producer groups have organized themselves for the production and marketing of crops [3] (2016: p. 4).

Diagnostic studies of the functioning of AHAs have clearly shown that farmers' leaders and farmers' organizations have not been prepared to take on the technical and financial functions entrusted to them [1] (2019: p. 10). Several challenges emerged, highlighting the lack of capacity in almost all producer organizations: poor levels of communication, transparency and accountability; inappropriate governance systems and structure and non-compliance with agreed procedures; weak abilities and/or willingness to overcome ethnic, political and social divisions; low levels of education and limited ability and capacity of members to demand transparency from their leaders; lack of experience in negotiat-

ing with external actors; poor representation of women and young people [4] (2016: pp. 22-23). This led to the deterioration of poorly maintained irrigation equipment and the continual indebtedness of the cooperatives. The efficiency of irrigation has fallen sharply and, over the years, the areas exploited have been gradually reduced due to the lack of adequate water supply. The organizational and technical management of the cooperatives strongly hinders the results of the development. In fact, the training of users is also a priority, whether in the management of groups and the organization of maintenance (routine maintenance to be carried out with the greatest care because it prevents other disasters), or in rehabilitation techniques [5] (2008: p. 6).

Like other AHAs in Niger, Konni lives with acuteness the constraints linked to the insufficiency caused by climatic, technical and anthropic factors. Indeed, the Konni perimeter was initially designed to irrigate an area of 1200 ha during the dry season. This area has been reduced from year to year and over the past 10 years, the areas irrigated in the dry season have fluctuated between 190 and 570 ha, for an average of around 450 ha irrigated. Over the past five years, the number of growers and GMPs without access to irrigation water has increased dramatically. This is why, according to [6] (2021: p. 12), agricultural and rural training is urgently needed.

It emerges from the findings that to deal with the difficulties faced by cooperatives in ensuring effective and efficient management of irrigation water, maintenance of infrastructure and renewal of hydromechanical equipment, new reforms have been carried out by the State through the strengthening of ONAHA's powers and the creation of AUEIs and cooperative societies governed by OHADA directives. The objective of these reforms is to rethink the mode of operation and management of AHAs. Thus, it is necessary to ensure the operationalization of the reform of the irrigation sector and more specifically to set up an operational, efficient, sustainable and autonomous AUEI on the AHA of Konni. A group of operators who are able to ensure the sustainability and profitability of the water infrastructure made available to them, and the collection of water fees through sustained support from ONAHA. The question then arises as to what are the issues, challenges and prospects of training producers for better management of Konni's AHA? The objective of this research is to analyze the issues and challenges of capacity building for Konni producers in the context of AHA management reform in Niger. The first step is to take stock of the training needs of the AUEI, then explore the content of the training program and finally determine the conditions and methods for implementing the training modules, responding to the needs expressed by producers.

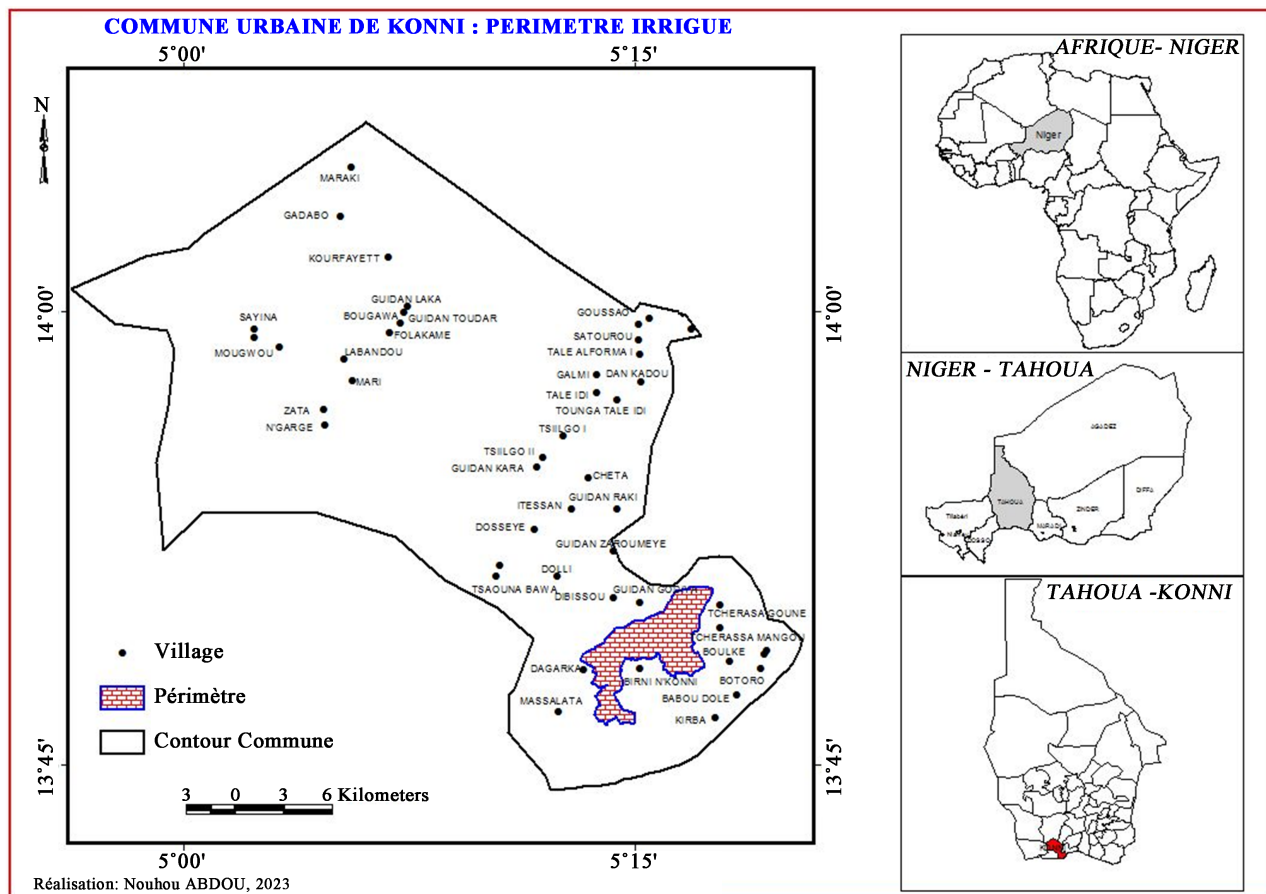
## 2. Presentation of the Study Framework

Niger is a country located in West Africa, largely desert since 2/3 of its surface area (1,267,000 km<sup>2</sup>) is located in the Saharan zone. The geo-climatic and edaphic characteristics not allowing the establishment of intensive agriculture,

the Nigerien authorities opted very early, since independence in 1960, for the development of the country's water resources and the development of agriculture irrigated in order to promote the food self-sufficiency of the population. This explains the existence of the Konni irrigated perimeter as shown in **Figure 1**.

The Konni perimeter was carried out in two periods: 1972-1976 and 1982-1984 (extension phase). The theoretical area initially was 3000 ha with the possibility of developing 2452 ha in the wet season and 1200 ha in the dry season. The life-time of the structure was estimated at its design at 100 years, the current rehabilitation takes place 30 years after construction. This is partly due to poor perimeter management and a lack of infrastructure maintenance. The Konni AHA is of the gravity type with a system in two main parts (**Figure 2**):

- The water mobilization and transfer zone composed of two dams including Mozagué with an initial volume of 30 million m<sup>3</sup> and Zongo with 12 million m<sup>3</sup>. These two dams are linked to the Tcherassa buffer reserve with an initial volume of 2.5 million m<sup>3</sup> and 1.4 to 1.5 million m<sup>3</sup> today, by a large intake channel of 15 km, then the main channel conveys water to the service area at Konni further downstream;



Source: Republic of Niger, 2018 (p. 38).

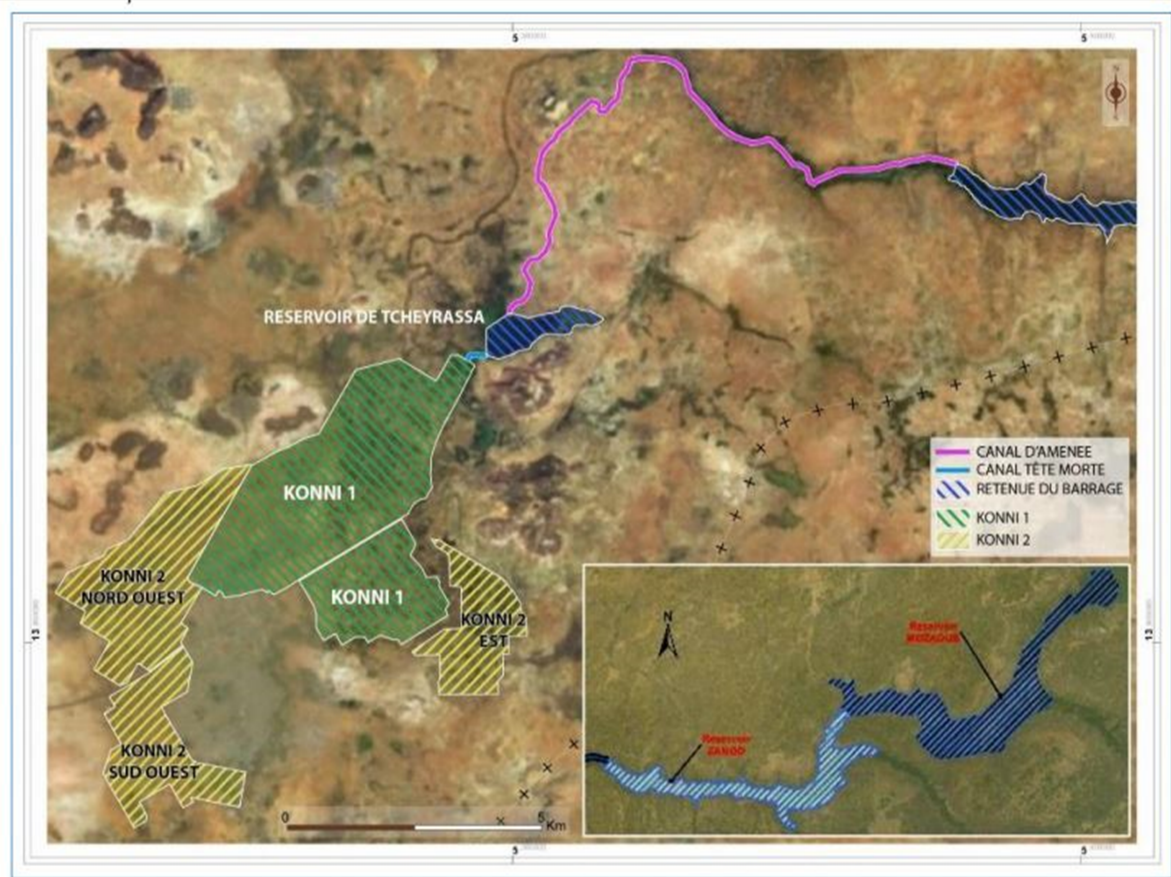
**Figure 1.** Map of the hydro-agricultural development of Konni in the urban commune of Konni.



- The service area, for its part, is made up of four main canals ABC and D, 23 secondary canals and tertiary ones with a parcel unit of 0.75 ha (**Figure 2**).

The population of Konni is mainly rural, characterized by a strong youth potential implying a great demand for various social services: employment, health, leisure, education, protection, etc. The main economic activities practiced by the populations are agriculture, livestock, fishing and trade. But there are also crafts, industry and services. Agriculture is both rainfed and irrigated. When it was created, production was done in two seasons: in the wet season and in the dry season with the main speculations being cotton, corn, wheat and sorghum. The choice of crops is changing in particular due to the lack of water on part of the perimeter in the dry season. The Konni perimeter now produces polyculture in the dry season of many crops that do not require water (sorghum, millet, etc.). The proximity of Nigeria also makes it possible to sell specific speculations such as anise.

Animal husbandry is of three types: agro-pastoralism, sedentary animal husbandry and peasant fattening mainly exercised by women. Fishing is practiced at the dams (Mozagué and Zongo Nadabar) and ponds (Tcherassa Goune, Dossey, Folakam).



Source: Republic of Niger, 2018 (p. 38).

**Figure 2.** Location map of Konni irrigation perimeter and infrastructure.

In terms of capacity building for producers and their organizations, the State and the Technical and Financial Partners have financed training activities in the area of governance and in the operation and maintenance of irrigation infrastructure and equipment. These were piecemeal training sessions that were not part of a comprehensive and coherent capacity-building plan. These trainings, which were done in a dispersed way, were generally provided either by ONAHA, or by civil society organizations (NGOs and associations) without a real monitoring and capitalization plan.

### 3. Data and Methods

The research is of a qualitative nature and focused on the perceptions of the various actors concerned by hydro-agricultural developments in Konni. The data used in this research are those collected during documentary research and field surveys on the irrigated perimeter of Konni. Attention was paid to existing experiences in terms of training and capacity building of actors in charge of the management of irrigation systems at the Konni AHA level.

The key actors on which this research is based are: administrative and customary authorities; technical services; ONAHA agents (Head of branch, Director of Perimeter); the leaders of the union of cooperatives, cooperatives and GMPs; managers; the water workers, men, women and young operators at the AHA level; and non-development operators. The actors were asked about the sustainable and efficient management of water at the Konni AHA level in relation to: their current and future role within the AUEI; their interests and expectations for sustainable water management; the challenges to be met; the current and required capacities to play its role properly; real skills needs; the necessary conditions for effective and efficient management of the irrigation system.

The fieldwork took place in several phases. At first, it was a question of questioning the leaders of the two cooperatives of the AHA of Konni, the members of the GMPs of four villages (Dagarka, Dibissou, Tsérassa Mango and Tserassa Gouna) on the description and analysis of their roles in the current dynamics. In a second step, the field of investigation was broadened in order to deepen the study by identifying the causes of the shortcomings that characterize the actors in their roles of management of the irrigation system and to meet the challenges to be overcome by the future AUEI actors. Stakeholder meetings, field visits and interviews and focus groups took place in the following localities: Konni, Dagarka, Massalata, Boulké, Mounwadata, Mozagué, Tsérassa, Tsernaoua. Thus, the main target actors at this stage are: the ONAHA agents, the managers and staff of the two cooperatives, the managers of the GMPs, the technical services, the communal authorities of Konni and Tsernaoua, the canton chief of Konni, the operators (men, women and young people), permanent secretaries of land commissions (departmental, communal). A total of 448 people were interviewed in all the localities selected.

Direct observation and interview are the two field data collection techniques

adopted. The structured individual interviews concerned the administration of questionnaires to operators. Semi-structured interviews based on an interview guide were carried out with institutional actors and managers of operating structures (GMP, cooperatives). The focus groups were carried out with the operators (men, women, young people), at the rate of one focus group per locality, for the cross-referencing of the information collected individually.

The various information collected was analyzed and processed on the computer with the Sphinx software. Based on the results of the in-depth study around the dynamics of the current irrigation system management and the data on the required capacities (expectations, functions, roles and responsibilities assigned), the gaps have been identified and constitute the needs for training. These needs served as a basis for identifying the essential training modules for the actors of the target AUEI and were envisaged by the actors themselves.

## 4. Results and Analysis

### 4.1. Diagnosis of the Training Needs of Producers

Training “needs” or “demands” are the result of a construction process, which requires time and a specific methodology to achieve a shared vision of the context and the problems encountered by farmers [6] (2021: p. 13).

#### 4.1.1. Problems of the Current Management of Water and the Irrigation System

In order to develop a participatory diagnosis, the problem of water management and the major challenges to be met were identified on the basis of targeted interviews and focus groups carried out during fieldwork.

- *Mobilization, transport and distribution of irrigation water*

The early drying up of water at the Mozagué and Zongo dams and the Térassa reserve, and the drop in the volume of water accumulated in the outlet zone, constitute the main concerns of producers on the Konni perimeter, in meaning that the possibilities of irrigating their plots are reduced and sometimes non-existent. Thus, it is necessary to retain a lack of control in the evaluation of the availability of water from the dams and the reserve, due to the lack of adequate measuring equipment and poor estimates of the flow over the entire course of the water irrigation, which influences irrigation planning in time and space.

- *Exploitation of water at the Konni AHA level*

The low availability of water makes it impossible to irrigate all the plots of the development. This is why a management strategy based on the available volume of water and its flow along the system has been instituted. It consists of irrigating by farm district, with a distribution of irrigation days. But some constraints remain: insufficient access to water, inputs and supervision; damage to the countryside caused by wandering animals; the difficulty of surveillance and coordination between the operators of the system due to the lack of adequate means of communication and movement; the insistence of operators outside the perimeters to use irrigation water without participating in the maintenance of the infra-

structures despite the multiple arrests and seizures of the equipment used.

- *Care and maintenance*

The assessment of upkeep and maintenance needs is carried out by the irrigation manager. He plans and monitors maintenance operations, this usually takes place at the start of each campaign. The lifetime of the structure having been set at 100 years at the time of construction, has been reduced to less than thirty years of operation. We are witnessing a degradation of infrastructure, this denotes poor management due in part to the insufficiency of compliance with the designer's instructions by the operators (bad behavior of users, acts of vandalism), insufficient monitoring and upkeep and maintenance actions.

- *Royalty management*

Admittedly, on the Konni perimeter, there is a culture of payment of the fee, but the collection rate remains insufficient due to the delay in payment. More and more, voices are raised to challenge the payment of the fee, especially during the wet season, when there is no additional irrigation, and the high cost of the fee. Similarly, contributors are concerned about the management of these royalties.

- *Consideration of gender and environmental impact*

It emerges from the analysis of the situation, the weak numerical representation of women and young people on the AHA and their absence in the office of the cooperatives. This state of affairs can be explained by social reasons mentioned by the people interviewed during the focus groups. Similarly, the actors currently in charge of the management of the irrigation system and the development of the plots pay very little attention to the environmental question, apart from the silting up of the dams and the reservoir. However, the interest shown by farmers in the use of chemical phytosanitary products and mineral fertilizers must challenge them, especially since these structures are colonized by invasive plants.

#### **4.1.2. Issues and Challenges for Sustainable Management of the Irrigation System**

The different actors involved play roles at different levels: mobilization, transport and distribution of irrigation water; operation and maintenance; setting and collection of the fee. The imperative of sustainable management of irrigation water presupposes for the actors interviewed:

- Water availability and access for all to water for their uses and in a timely manner;
- Meeting the water needs of current and future generations;
- Taking into account all the operators within the scope;
- The profitability of the production chains;
- The involvement of all actors in the management of the irrigation system.

These perceptions are in accordance with the notion of Integrated Water Resources Management (IWRM) defined in Ordinance 2010-09 of April 1, 2010 on the Water Code, which provides in its Article 2: "IWRM is a process which pro-

motes the development and coordinated management of water, land and related resources with a view to equitably maximizing the resulting economic and social welfare, without compromising the sustainability of vital ecosystems”. **Table 1** presents a summary of stakeholders’ expectations.

The sustainability of the AHAs presupposes the profitability of the production sectors, actions to improve the environment of the sectors are also measures which should enable better functioning of the perimeters in the long term (**Table 1**). With regard to the management of fees and amortization, we often observe in practice a mismatch between the real costs of maintenance and renewal of equipment; a deficit in the management of royalties and in particular of the portion reserved for the depreciation of equipment. The importance of the management and transparency of association accounts is an element to be improved in the current organization. Training is needed so that all farmers can follow the management of their association and internal and external control mechanisms must be put in place.

## 4.2. Status of Konni’s AHA Grower Training Programs

### 4.2.1. Capacity Building of AUEI Actors and Staff

Anxious to strengthen the capacities of new AUEI actors to assume their roles as soon as they are installed, a capacity-building program was developed in March 2020 through a participatory study to identify training needs. Thus, twenty-eight modules were selected. Depending on the actors targeted by the modules, there are 14 general modules that target operators and their delegates, and 14 specific modules primarily target executives who are members of statutory bodies (Management Committee, Control Committee, Dispute Settlement Committee) and employees (Manager, accountants and water workers).

- *Capacity building of the delegates of the hydraulic districts*

The delegates of the hydraulic districts are elected by the operators of the AHA of Konni and among these operators. Being operators of the AHA, they

**Table 1.** Expectations, interests and challenges for Konni actors.

Interests	Expectations	Challenges
<ul style="list-style-type: none"> <li>• Better control of the use of available water;</li> <li>• Water is available for irrigators;</li> <li>• The organs of the AUEI function;</li> <li>• Regular maintenance of the canals is ensured;</li> <li>• Transparency in the management of AUEI resources.</li> </ul>	<ul style="list-style-type: none"> <li>• The water needs of the development are covered;</li> <li>• Access to irrigation water in sufficient quantity and over time;</li> <li>• The infrastructure of the irrigation system is rehabilitated and maintained;</li> <li>• Other water sources are promoted;</li> <li>• More infrastructure monitoring to minimize losses at dams and canals;</li> <li>• Acts of vandalism are minimized;</li> <li>• Better control of agricultural areas and production;</li> <li>• No arrears in the payment of water workers;</li> <li>• Better compliance with the instructions of the irrigation manager.</li> </ul>	<ul style="list-style-type: none"> <li>• The use of water by users is rational;</li> <li>• Consideration of all users in the management of the irrigation system;</li> <li>• The royalty is accepted and collected at 100%;</li> <li>• All the elect play their roles;</li> <li>• Equity in the distribution of water between producers;</li> <li>• The cooperatives and the AUEI coexist well.</li> </ul>



know how it works but do not have any theoretical knowledge. A high rate of illiteracy has been identified in this target group. The 8 training modules given to the delegates of the hydraulic districts, were oriented towards the understanding, the values and the facilitation of the functioning of the AUEI on the one hand, and the management of irrigation water on the other hand.

- *Capacity building of the management committee*

The members of the management committee are AHA operators and are often former members of the cooperatives. They are familiar with the operation of the AHA and have a good understanding of its management. They have a level of education higher than that of the delegates of the hydraulic districts but need reinforcement on the theoretical knowledge and their practical applications. The content of the modules intended for the management committee has been adapted in order to popularize notions that may be complex. Practical examples or everyday life have been integrated and the modules have been given in Hausa. In all, 18 training modules were delivered to the AUEI Management Committee. The training modules provided to the management committee were oriented towards the acquisition of skills in the management of an AUEI, and the mastery of the operation and maintenance of irrigation systems and water management irrigation.

- *Capacity building of the control committee and the dispute resolution committee*

The members of these two committees are all operators of the AHA and are therefore familiar with the operation of the AHA. They need reinforcement on theoretical knowledge and its practical applications to carry out the missions assigned to them. Indeed, 8 training modules were delivered to the AUEI Oversight Committee and 5 to the Dispute Resolution Committee.

- *Strengthening the capacities of the water workers*

Acute agents are 17 in number, and are recruited by the AUEI and placed under the responsibility of the president of the AUEI. They have been trained in the management and maintenance of hydraulic infrastructures and have experience of the Konni irrigated perimeter but need reinforcement in their theoretical knowledge and practical applications. 6 training modules were given to the aquadiiers.

#### **4.2.2. Products of the Training Sessions**

In total, from June 2020 to mid-March 2021, forty-four training sessions were organized for the benefit of AUEI actors. Numbering 115 people, the AUEI delegates were concerned by 24 sessions, 17 sessions targeted the members of the management committee, 8 for the members of the control committee, 5 for the members of the dispute resolution committee, 17 sessions involved the water workers, the manager took part in 5 training sessions, and the accountant in 4 sessions.

It should be noted that the agents (Head of branch, Directors of perimeters and the person in charge of Monitoring and Evaluation of the branch of Konni)



took part in nearly 32 training sessions, that is to say a rate of participation of 73%.

In total, 1,103 AUEI actors, including women, took part in classroom training, compared to 1231 targeted participants, representing an average penetration rate of 90%. However, taking into account the results of the feedback sessions, i.e. 1341 operators including 95 women affected, the penetration rate calculated for all operators (4500 operators) of the Konni AHA is 54.3%. These different training sessions were rather well appreciated by the participating actors (**Figure 3**).

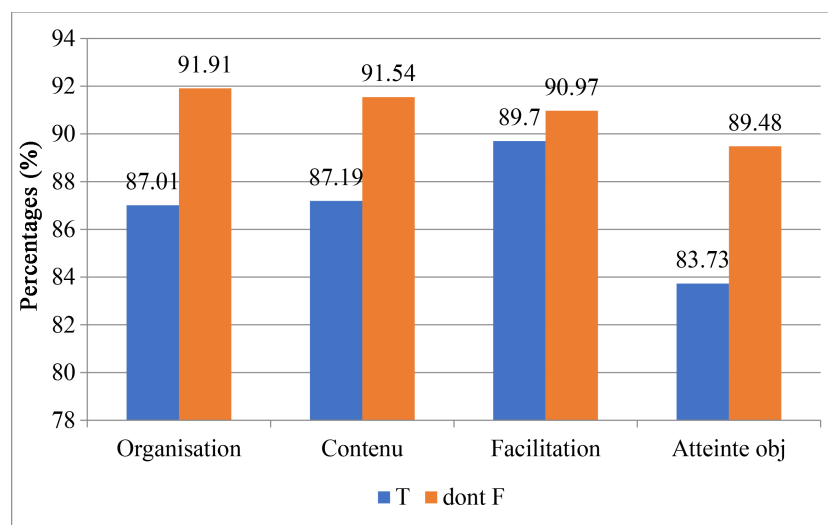
De analysis of the results of evaluation of the training by the participants, it emerges from the participants in general and in particular the women a fairly good satisfaction rate, as shown in **Figure 3**.

### 4.3. Prospects for Capacity Building of WUAs: Training Program and Notional Content

The development of training content most often results from a compromise between the concerns and expectations expressed by the producers on the one hand and the expectations expressed by the reforms. For a training offer to be relevant, it must recognize the knowledge and skills that pre-exist the deployment of the training offer [6] (2021: p. 13).

#### 4.3.1. Identification of Target Groups

To set up a sustainable management of the Konni irrigated perimeter, it is necessary to improve the dialogue between the actors and the dissemination of the existing information, organized in a training process. The actors must understand the stakes, the differentiated logics of the users and the decision-making which allow a sustainable management of this common heritage. The analysis of the documentation combined with the interviews held during the fieldwork made it possible to identify ten main target groups that could be taken into account in the training (**Table 2**).



**Figure 3.** Average participants satisfied with training.

**Table 2.** Target groups identified for training actions.

Targets	Categories	Estimated workforce
Target 1	AUEI delegates	115
Target 2	Women farmers	210
Target 3	Elected members of the management committee	12
Target 4	Delegates of the hydraulic sectors	115
Target 5	Control committee members	03
Target 6	Dispute resolution committee members	05
Target 7	Irrigation manager	02
Target 8	Perimeter director	02
Target 9	Aguadiers	17
Target 10	AUEI manager	1

It should be noted about Target 1 that the AUEI delegates will be trained by the leaders of the operators so that the knowledge is then transmitted to the field. Concerning the AUEI, the leaders identified are the delegates designated for each of the hydraulic districts, i.e. 115 people. This training action would thus make it possible to enhance previous work by comparing it to the reality experienced by the various actors [7] (2004: p. 5).

#### 4.3.2. Analysis of the Current and Required Capacities of the Actors for a Sustainable Management of the Irrigation System

Irrigation involves infrastructure and technical actions, but also social institutions to manage and organize these technical actions and resolve conflicts. To better play their roles in the future dynamics of sustainable management of the irrigation system, the stakeholders must adopt certain traits/attitudes/behaviours and minimize certain constraints and weaknesses that may reduce their ability to perform the functions properly required (Table 3).

Reforms within the framework of the governance of AHAs sometimes led too quickly to the transfer of certain functions to farmers or the private sector, leading to difficulties, at least temporary, of management, supply of inputs and marketing of products. It is necessary to rehabilitate the perimeters before transferring them to the operators. Cooperatives do not always offer the necessary management transparency. Training is needed so that all producers can monitor the management of their association, and internal and external control mechanisms must be put in place. Thus, the sustainability of irrigated systems depends on the professionalization of producers, cooperatives and sectors. This requires a significant commitment and greater accountability of irrigators to face the challenges of self-management.

#### 4.3.3. Content and Modality of the AUEI Training Program

Based on the established diagnosis, several modules (thirty) have been identified

**Table 3.** Analysis of current and required capacities of some production actors for sustainable management of the irrigation system.

Operational actors	Issues related to participation in the management of the irrigation system	Irrigation management	Required traits, attitudes, behaviors and values
Members of the management committee	Low representation of women and youth in office; Degradation of irrigation system infrastructure; Low fee collection; Occurrence of conflicts; Low financial capacity of cooperatives.	Decision making; Execution; Mobilization, Motivation and Sanction; Interactor relationship management; Organization; Planning.	Team spirit, listening spirit, integrity, ability to analyze, impartial, available, representative, because chosen by an assembly
Aguadiers	Part-time employee and paid by the task; Lack of training; Operator impatience; Lack of means of transport; communication.	Technical and physical; Communication; Surveillance; Monitoring and control.	Physical capacity, punctuality, impartial, vigilant, love of work
Operators	Early cessation of irrigation; Low coverage of water supply areas; Strong pressure from other users on the waters of the dams and the reserve; Wandering animals in the AHA; Theft of harvested products; Lack of transparency in management; High rate of illiteracy; Insufficient equity in the provision of plots; Poor forecast of water availability at dams.	Production; User.	Open, available, disciplined, attentive, respect for commitment and the word given, honest, respect for the common good, sociable

for the training of AUEI actors. Only a few are presented here (Table 4). These trainings target the ten categories of actors identified. Table 4 presents some training modules.

For Modules 3, 4 and 5, the targets of which are operators (men, women and young people) and members of the AUEI, it should be noted that the emphasis is also placed on the exploitation of local groundwater for the supplementary irrigation of cereals and market gardening in the dry season. The main problems of lowland development concern relations with herders, from whom farmers take away good pastures in the dry season.

In addition, as stipulated in the contents of the different modules, cooperatives and farmers are accustomed to practices that no longer meet the requirements of reform and sustainability of irrigation systems. It is therefore necessary either to train them or to back them up with specialized support services. According to Modules 2 and 4 addressed to operators and members of the AUEI, it will be a question of making the developments more sustainable. This can be achieved by developing maintenance procedures and training farmers and service providers.

## 5. Discussion

Following the launch of the Kandadji program implementation work and the

**Table 4.** Content of some training modules mentioned by producers.

Module title	Content (points to be covered)
Module 1: Associative Life, legal and institutional framework of the AUEI	<ul style="list-style-type: none"> <li>• Genesis on AHA management in Niger</li> <li>• Organization and functioning of the AUEI</li> <li>• Values and principles of community life</li> <li>• Institutional actors and their attributions</li> </ul>
Module 2: Responsibility of operators in the organization and compliance with the application of the water turn in the AHA service area	<ul style="list-style-type: none"> <li>• Presentation of the irrigation network</li> <li>• Organization of hydraulic districts</li> <li>• Water tower strategies and mechanics</li> <li>• Operation and maintenance</li> </ul>
Module 3: Agricultural speculations and their water needs	<ul style="list-style-type: none"> <li>• Critical periods and impacts on production</li> <li>• Choice of speculation according to water availability and irrigation periods</li> <li>• Technologies for controlling the water-saving contribution of crops</li> </ul>
Module 4: Ethics and protection of public infrastructure at the AHA level	<ul style="list-style-type: none"> <li>• Principles and values of sociability and good citizenship</li> <li>• Respect for public heritage</li> <li>• Offenses and Sanctions in the Management and Use of Public Assets (AHA)</li> <li>• Financing mechanisms for public infrastructure and recurrent costs at AHA level</li> </ul>
Module 5: Protection of water resources in irrigation systems and conservation actions	<ul style="list-style-type: none"> <li>• Natural and artificial water mobilization</li> <li>• Identification and analysis of threat factors for water mobilization structures</li> <li>• Techniques for the conservation and protection of water resources</li> <li>• Environmental impacts of irrigation</li> </ul>
Module 6: Conflict prevention and management	<ul style="list-style-type: none"> <li>• Issues and challenges related to conflicts on AHA</li> <li>• Role of actors in the prevention and management of conflicts on AHA</li> <li>• Recourse mechanisms in case of conflicts</li> </ul>
Module 7: Gender and participation in the sustainable and inclusive management of the irrigation system	<ul style="list-style-type: none"> <li>• Definition of the concept and associated terms</li> <li>• Issues and challenges related to inclusive participation in the sustainable management of the irrigation system</li> <li>• Values and principles to promote for a better consideration of gender</li> </ul>
Module 8: Servicing and maintenance techniques of the irrigation network	<ul style="list-style-type: none"> <li>• Assessment of servicing and maintenance needs</li> <li>• Servicing and maintenance techniques</li> <li>• Planning of upkeep and maintenance activities</li> </ul>
Module 9: Management of gravity-type irrigation networks	<ul style="list-style-type: none"> <li>• Management of gravity irrigation systems</li> <li>• Water control equipment/technologies</li> <li>• Water forecasting and planning available</li> </ul>
Module 10: Integrated management of natural and developed water resources	<ul style="list-style-type: none"> <li>• Legal and regulatory frameworks for IWRM</li> <li>• Role of users in the preservation of the resource</li> <li>• Principles and values of IWRM</li> <li>• IWRM Planning Procedure on AHA</li> </ul>

implementation of the AHA governance reform in Niger, the imperative of training the various actors became apparent. The analysis of existing training programs has shown that the AUEI being a new structure (2016), and few of these struc-

tures having been created (23 to date), specific training programs for AUEI are rare. Those that come closest to it are those dispensed by ONAHA and which are financially and time limited. The programs provided to members of cooperatives are also interesting, particularly with regard to the management of structures. The existence of the various programs in the field demonstrates a local desire to strengthen and develop its skills.

To achieve the ambitious objectives of this reform, the Sustainable Management of the Irrigation System sub-activity has planned a program to build the capacities of stakeholders in irrigated areas. This training plan incorporates the issue of governance, management and accountability. In this, the example of Konni goes beyond previous agricultural development projects, such as those in the Anambé basin (Senegal), Sélingué (Mali) and Bagré (Burkina-Faso). Recent programs have included technical training for producers on specific crops and on specific aspects of the value chain. However, they did not include support for organizational strengthening to ensure good governance and good management ([8], 2014: p. 34; [9], 2013: p. 22; [10], 2013: p. 46).

However, according to [2] (2001: p. 5), all the developments in West Africa took little account, on the one hand, of the environmental problems inside the perimeters, and on the other hand, took little account of the phenomena of social inequalities, as well as the role of women in the production and marketing process. This underlines the relevance of the choice of training modules for this purpose in the context of this research.

The analysis of the means of subsistence of the producers in the perimeters of Konni shows that there are still many difficulties [4] (2016: p. 10), made the same observations in several West African countries where farmers are faced with cultural difficulties in the field, problems related to water management, access to land, access and cost of agricultural labor, as well as the institutional and governance issues associated in particular with the relations of producers with the managers of the schemes.

The approaches that involve involving farmers so that they can express their expectations with regard to training require significant resources, but also guarantee the relevance of the training content that will be developed [6] (2021: p. 13). The inventory of training needs expressed by Konni producers essentially concerns the management of irrigation water at the AHA level, the upkeep and maintenance of infrastructure, the management of the fee, the consideration of gender and environmental impact. These results confirm those of [4] (2016: p. 11) and [11] (2015: p. 26), who had obtained the same results for the assessment of agricultural advice needs of producers in Bagré Burkina-Faso.

In addition, the results showed that the vulnerable classes are often excluded from the agricultural financing mechanisms set up for the acquisition of irrigation equipment, because of the conditions for obtaining financing. The criteria for access to plots, which highlight the capacity for development, in fact, excludes most producers who are poorly endowed with human, physical or financial resources. These results, which confirm the conclusions of [12] (2014: p. 16), jus-

tify the integration of aspects related to female leadership and the inclusion of gender in the training modules of Konni producers. Because according to [5] (2008: p. 10), the social management of water considers that an irrigation system is a technical and social construction for which the irrigators collectively define the standards of access and distribution of water, as well as the rights and obligations that all must comply with in order to maintain access to the water resource. Each of these aspects which aims at the social appropriation of sustainable management is also part of a program of learning/acquisition of the necessary knowledge.

The main areas of skills developed as part of the continuous training of Konni producers cover a wide spectrum ranging from technical and scientific know-how and knowledge to the development of self-confidence and leadership, including digital skills and development of reasoning and analytical skills, time management, etc. This adopted approach confirms the work of [6] (2021: p. 13), in Sub-Saharan Africa. The pedagogical methods implemented prove to be decisive in favoring the participation of producers through adapted support and animation techniques and a learning process that allows the development of their capacities for analysis, observation, experimentation and by ricochet effect, promotes the development of self-confidence and the taking of initiatives.

## 6. Closing

The issue of the training of AHA producers in Konni addresses all aspects relating to the operation and sustainability of hydro-agricultural facilities. It requires a multidisciplinary approach integrating the technical, economic, agronomic, sociological, environmental and institutional dimensions of the developments and their management. In short, the development of a training program and capacity-building plan for Konni producers requires a detailed identification of the needs and target populations due to a diagnosis and then a very strong awareness phase to mobilize all actors. This training plan can only be a co-construction with ONAHA which is the supervisory structure in the management of the perimeters. The development of the main training modules which are the heart of the training program and the capacity-building plan could be extended to the various AUEI bodies.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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