

POLICY BRIEF



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COMBINING AGROECOLOGICAL INTENSIFICATION OPTIONS THROUGH FARMERS' NETWORKS TO OPTIMISE PRODUCTIVITY IN THE CLIMATE CHANGE CONTEXT OF NIGER

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KEY FACTS

Combining options for agroecological intensification offers an avenue for smallholder farmers to address the adverse impacts of climate change in the Sahelian Zone of Niger.

KEY MESSAGES

- ✚ Government, research and development institutions and farmers' organisations should prioritise characterising family farms before establishing or widely disseminating innovations for farmers to adapt to the adverse impacts of climate change.
- ✚ To fill the lack of methodological approach between scientists and farmers, government, research institutions and farmers' federations should strive to co-building an integrative and transdisciplinary trial design for implementing the combined agroecological intensification options in the context of local family farms.
- ✚ Ministry of Agriculture, through government, research institutes and other sponsors, need to be engaged in supporting farmers to use climate-resilient cowpea varieties that are adapted to the diversified local contexts for increased crop productivity and smallholder farmers' livelihoods in the Sahelian low input millet-based- cropping system.



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INTRODUCTION

Adaptation to climate change is of vital importance to the farmers of Niger, who are highly exposed to various types of risks (climatic, economic, health and even security). Yet, food security remains a critical concern in West Africa, with about 70% of the rural population, mostly smallholder farmers, constantly food insecure in this changing climate context (FEWSNET, 2019). Moreover, one of the main bottlenecks of the farming systems in sub-Saharan Africa is that conventional agricultural research tends to be top-down (Rebecca Nelson, 2016) and isolated from smallholder farmers and their local ecological, economic, and social realities. As a result, farmers often find the products of the research, from seed varieties and tools to policy recommendations that could be more relevant, relevant, and functional (Coe et al., 2019). As a consequence, these challenges continue strengthening food insecurity in West Africa despite significant investment in agricultural production, and hence agroecological intensification option offers an avenue for smallholder farmers to increase crop productivity (Rebecca Nelson, 2016; Taylor et al., 2011). However, the diversity of management practices in family farming, including intercropping, pest and soil fertility management, makes it difficult to find standard options that will fit smallholder farmers' needs and possibilities. Thus, insights are needed on the potential impacts of the innovative combination of options for agroecological intensification on household food self-sufficiency and adaptation to climate change. Therefore, a PhD thesis project conducted at the

University of Sciences and Technologies of Bamako in partnership with the IPR/IFRA institute in Mali, funded by the German Federal Ministry of Education and Research (BMBF) through the West Africa Science Service Centre on Climate Change and Adapted Land Use (WASCAL) explored innovative combinations of options for agroecological intensification in the Niger low-input millet-based cropping systems with legumes (cowpea) for increased productivity at low cost for subsistence farming systems. The study first used a baseline survey to explore potential AEI options in the field research contexts. Second, an integrative and inclusive pilot trial design was co-built through four main steps for identifying the most promising combined AEI options in local contexts. And decentralised trials were also used to test a set of dual-purpose cowpea varieties across the fifteen selected study locations. The study showed that family farms were mainly characterised by the presence of the main field (98%) led by the head and the presence of female field(s) (78%) led by the women, and they highly rely on rain-fed agriculture. About 12 potential AEIs were identified. In contrast, the integrative trial design indicated that farmers preferred combining decomposed organic manure with the intercropping options and any of the two dual-purpose cowpea varieties compared to the remaining combined options. And the assessment of the performance of a range of climate-resilient cowpea varieties under different local contexts revealed that the selected cowpea genotypes significantly ($p \leq 0.05$) yielded better than the control varieties concerning

pod and haulm yields in ten study locations out of fifteen.

KEY MESSAGES

1) Government, research and development institutions and farmers' organisations should prioritise characterising family farms before establishing or widely disseminating innovations for farmers to adapt to the adverse impacts of climate change.

Family farms are crucial for food security and nutrition in West Africa. However, farming systems in family farms are highly complex and diverse as a consequence of (i) diverse coping strategies and opportunities, (ii) socio-economic situations and (iii) heterogeneous biophysical contexts. Given this, it is challenging to design and promote sustainable intensification options that consider such complexity, i.e., finding the right balance between the detailed description of farming systems and broad recommendations. Considering this diversity is essential to avoid recommending adaptive strategies/practices that do not match family farms' needs and contexts. The possible way out is to characterise the family farms based on their resource endowment biophysical heterogeneity of the local contexts. The farm typologies should follow the characterisation to tailor a set of AEI options and/or a basket of options and their adoption rate by not only resource endowment but also considering key ecological drivers (soil fertility

decrease, weed pressure). Therefore, with the help of scientists and farmer federations, the government should plan how to intervene effectively for the characterisation of family farms before disseminating technologies or innovations in the diversified local contexts of Niger.

2) To fill the lack of methodological approach between scientists and farmers, government, research institutions and farmers' federations should strive to co-building an integrative and transdisciplinary trial design for implementing the combined agroecological intensification options in the context of local family farms

The diagnosis of the existing participatory research projects on agroecology in Niger revealed an urgent need to strengthen synergy and adopt a more integrative approach. Despite the success of each project in implementing some of the specific principles of agroecology, the implementation of these principles remains fragmented. Further, the need for a methodological approach integrating the experiences of researchers (from different disciplines) and farmers is a challenge.

A pilot integrative trial design was co-built and tested in Niger through four steps to implement this integrative trial design: (i) Defining the AEI options, (ii) Establishing the combined AEI options based on the options defined in step 1, (iii) Defining a statistical experimental set-up of the selected combined AEI options and (iv) Implementing the trial by supporting & documenting the adaptation to local

constraints without undermining the experimental design. Results showed that integrative trial design filled the gap of the need for methodology integrating scientific and local knowledge. And the promising combined AEI options that increase crop productivity and farmers' livelihoods were identified. Therefore, government and scientists should upscale this integrative trial design at the territory level to determine the promising combined AEI options that will adapt to each local context.

3) Ministry of Agriculture, through government, research institutes and other sponsors, need to be engaged in supporting farmers to use climate-resilient cowpea varieties that are adapted to the diversified local contexts for increased crop productivity and smallholder farmers' livelihoods in the Sahelian low input millet-based- cropping system.

Farmers in the Sahel often cultivate local cowpea varieties that are very low-yielding with a long-life cycle and are sensitive to drought. Yet, smallholder farmers need help to afford improved varieties due to their expensiveness and less participation during these varieties' creation. Thanks to the participatory varietal selection and participatory breeding of dual-purpose cowpea varieties under different local contexts of the smallholder farmers in Niger conducted by the CowpeaSquare project. This study assessed the performance of a range of cowpea varieties/genotypes selected through the breeding as mentioned earlier approaches using decentralised trials across fifteen

study locations. Results showed that the selected cowpea genotypes significantly performed better than the control varieties. Despite the performance of these cowpea genotypes, government, research development institutions, and farmers' federations should be engaged in upscaling the decentralised trials to ensure the full adoption by farmers of the dual-purpose cowpea varieties that are adapted to their local contexts. Thus, strengthening the careful consideration of farmers' perceptions and participation at all stages is critical to achieving food security and nutrition under the changing climate context of Niger.

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ACKNOWLEDGMENT

This work was fully funded by the Federal Ministry of Education and Research of Germany (BMBF) through the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL).

I am most grateful for the CowpeaSquare project for providing seeds and logistic

support. Many thanks to farmers, technicians and the two farmers' federations (Fuma Gaskiya& Mooriben) for facilitating the data collection.