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4. Climate change, vulnerability of food systems and institutional transformations in Senegal

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Abstract

This paper deals with increasing vulnerability of food systems in Senegal and argues that this is not just an outcome of climate change but its intersection with changes in institutional conditions of local tenure systems of land and land related common-pool resources (CPRs). While these systems were enabling resilience before colonial times, they were formally undermined by the change to state property and subsequent changes after independence. This also affected the property and management rights of CPRs being food producing resources, thus building the base for many types of food and food security for local people. This contribution focuses on four case studies in the Senegal River Valley, the Boundou area, Bedik Country area and the Lower-Casamance. It looks at the historical development and institutional changes of the commons and how these impact local food systems and household nutrition as well as resilience/vulnerability thereof in the context of external effects such as agro-industrial developments, conservation, and climate change. We argue that although the areas are affected differently by climate change, their resilience against these changes depend on the way land and CPR tenure is still in local ownership or not, and the failure to recognize that conservation areas are not pure nature but cultural ecosystems. While in the Senegal River as well as in the Boundou and Bedik Country area, there are restrictions due to agro-industrial and conservation developments, the Lower-Casamance seems to be still more resilient. However, this area has also undergone institutional changes, especially in social relations which undermine the maintenance of the cultural landscape. This is shaped by labour-intensive traditional rice and fishery infrastructure which cannot be maintained because of lack of family labour due to outmigration by men and youth. This underlines the argument that food vulnerability is not just an effect of climate but as well of institutional change of land tenure and social relations.

Keywords: food security, resilience, land tenure change, environmental change, crises

Introduction

This paper examines four different food systems in Senegal – *Bedik Country area*, *Lower Casamance*, *Senegal River Valley* and *Boundou area* – to show the historical evolution and institutional changes of the commons and how these impact on food security in the context of external crises such as climate change, conservation and agro-industrial developments. Food security is conceptualized as ‘physical and economic access to sufficient, safe, and nutritious food to meet the dietary needs and preferences of all people for an active and healthy life’ (FAO, 1996). It has four main dimensions – availability, accessibility, utilization, and stability – linked to external effects. The food system is generally defined as ‘the set of food-related activities and the political, socioeconomic and natural environment in which these activities take place’ (Pinstrup-Andersen and Watson, 2011). It’s comprised of food production, distribution, preparation and consumption. Maintaining or achieving a resilient food system requires

access to CPRs. Local community resilience to food insecurity provides a perspective for understanding the capacity to cope with recurrent stresses, unexpected shocks, and hazards in socio-ecological systems and, in particular, the livelihood dynamics of resource-dependent rural populations (Berkes *et al.*, 2003). This paper adopts a New Institutional Political Ecology Perspective (NIPE) (Haller, 2019), combined with an intersectional perspective. An actor-oriented approach in NI focuses on actors and looks at how external effects shape the internal bargaining power of actors and ideologies and then shapes the institutional choice (incl. institution shaping) and distributional effects regarding resources for different actors. PE focuses on resource use, access and control, i.e. on how the management of CPRs involved in specific food systems is shaped by political processes and power relations involving different actors with different levels of power. An intersectionality framework looks at how the combination of social and political identities (such as gender, age, ethnicity, status, class, religion, etc.) creates different forms of disadvantage and advantage within the food system (Cooper, 2016; Holley, 2016; Runyan, 2018; Zinn, 1996).

The data for this paper was collected between January and August 2021, using mainly qualitative methods in all the case studies such as participant observation, informal conversations, diary keeping, biographies, semi-structured interviews, and focus group activities. Participant observation is one of the core instruments as it produces experiential as well as effective positivistic knowledge. By taking part in the daily activities of local people, the aim was to help them in doing their living, which means helping them with agriculture, fishery or cattle-breeding (animal husbandry), firewood collection, and cooking (asking about specific recipes). Daily diary keeping was used to get the impressions of the livelihood strategies in each study area that they are pursuing and the social structure. Furthermore, there were open interviews and questions with elderly men and women from different social backgrounds (e.g. fishermen, pastoralists, rice farmers, and others). The interview questions were modified based on factors related to each location, but they remained consistent with the overall theme. A trained research assistant/translator aided in all interviews and discussion, which were conducted primarily in French and local languages Pulaar, Jakhanke, and Ménik. In addition, focus group activities were conducted with women since they are in charge of food preparation.

Land tenure and CPR institutional changes in Senegal – national policies on food security

In Senegal traditional land and CPR management systems, based on flexible and locally adapted systems, have first been displaced by a colonial system of private land ownership, especially in urban centres. Land and land related resources became de jure state property, however in rural areas remained de facto common property of ethnic groups. Customary rules were respected but not enforced by documented rights. However, the rural situation regarding CPR management began to change in 1935 with the establishment of many protected areas (PAs), which aimed to limit the use of natural resources. After independence in 1964, a new land regime virtually turned all land into state property, with usufruct rights of farmers. The same happened to all other natural resources (Monkam, 2009; Bruce *et al.*, 1995). Thirty years later, decentralization laws were enacted. Responsibility for managing public land was in the hands of local elites but was still state property, resulting in severe restrictions on rural management of public land. This was followed with the evolution of the country's agrarian production and food security policies. Nationalization of agricultural marketing led farmers into dependency and resulted in a quest for agricultural modernization under the Green Revolution. One of the state's responses to severe droughts was the introduction of rice cultivation. The focus of production shifted from peanuts to new rice varieties with the goal of improving food supply based on sovereignty over rice. Ironically, this led to an intensification of agricultural exportations. Increased investment in the mining sectors and agro-industrial projects followed, very often on previously communal land.

Case studies

Transformations of food systems in the context of climate change, agro-industrial developments and conservation in the Senegal River Valley

In the areas of Fanaye and the Ndiael and Nayré Reserves, resources traditionally belonged to spirits that allowed people to use them, adapted to the ecosystem of the river (floodplains), and being common property of ethnic groups (Fulani, Soninké, Maures, Wolof). The traditional agricultural system involved cropping, fishing and grazing of livestock, all symbiotic activities being oriented towards the flood. Agriculture (millet and sorghum) was rain-fed and based on *jeery* (sandy) and *waalo* (floodplains) production. This strengthened food security of the different groups, and reduced vulnerability of local food systems. However, the delta has been one of the target areas of irrigated rice production, which is done mainly in the floodplains, supported by dam construction, involving land redistribution and changes in CPR institutions. Agriculture in the *jeerys* has become difficult due to the weather changes (impacting the rains and Ndiael wetland). Millet thus became scarce in the area. The villages in the area of the reserves additionally have been affected by the establishment of the PAs as well as by an agro-industrial project (Senhuile). All changes resulted in reduced access to grazing land (drying pastures, expulsion from Ndiael reserve) especially for Fulani herders, to forest products (firewood, Arabic gum trees, fruit trees), to fish (change of ecology of the river due to dam, overfishing) and to farmland, especially for people who formerly cultivated land in the *jeerys*, unsuitable for rice cultivation. Cattle now has to be moved far away from the villages, which temporarily reduces availability of meat and milk and lead to prices increase. Even though some people within the communities have benefitted from the rice production, especially *waloo* land owners organized in farmer unions, other more marginalized groups (nomads, pastoralists, poorer, land-less people, women, especially nomadic women) face problems to secure food access. Coping strategies such as the picking of the leftover rice that drops from the machine after the harvests, working as laborers in the fields of rice cultivators, and female outmigration to Mauritania do not make up for the losses these people have experienced due to institutional transformations and climate change, nor do they enhance food security in a substantial way. On the contrary, vulnerability of already marginalized groups has increased.

Interplay between conservation, food sustainability and social capital in Bedik country area

The Bedik Country area is situated in south-east Senegal between the Niokolo-Koba National Park (NKNP) and Guinea. The national park which was established during colonial times was designated an UNESCO biosphere reserve in 1981 and listed as an endangered World Heritage Site in 2007 mainly due to grazing and poaching. In addition to the NKNP, the Bedik cultural landscape has also been considered an UNESCO World Heritage Site since 2012. According to the legends of elderly people from the investigated villages Bandafassi, Iwol and Manda-Thiès, the spirits used to allow people to use the natural resources available to them. Nevertheless, the interaction of Bedik people with their environment is nowadays severely affected by park policies in the form of restrictions on natural resource management leading to a loss of access to these cultural landscapes. Local food systems evolved from hunting and gathering to subsistence agriculture and subsequent cash crop cultivation. Despite this transition, bushmeat remains an important source of protein and hunting contributes to local food security and serves as a coping strategy particularly during the dry season. Although conservation policy claims to be participatory, the local population is either excluded from natural resource management or participation is hindered. Obstacles include a lack of comprehensive information on park legislation; strict gun and ammunition laws; and permits not adapted to local needs. This opens the door to corruption, reinforces the power dynamics characterized by the dependence of the local population on park rangers, and increases the insecurity of the communities regarding their rights. To cope with the

current food supply situation, local hunters turn into 'poachers' and 'spies'. As a result, certain activities including hunting, fishing, and gathering natural resources are done in secret. This contributes to changes in community institutions, changes in distribution patterns, and a loss of social capital, which is founded on trust and reciprocity. Various studies show that social capital improves food security by sharing knowledge and products and supports coping strategies following food-related shocks and hazards. Interactions among community members lead to a reciprocal exchange of food and information that can improve the sustainability and resilience of the local food system (Nosratabadi *et al.*, 2020). However, the lack of transparency in conservation regulations of the NKNP undermines such exchanges, to the benefit of corrupt strategies that only benefit individuals while increasing the community's overall food vulnerability.

Gains and losses of food options by conservation in the Boundou area

This case study draws from the experience of the Boundou people in Koussan (Fulbe/Fulanis) and Dide (Diakhanké/Jakhankes) villages in the dryland area of eastern Senegal. Agro-pastoralism is the main livelihood strategy especially among the Fulbe. People have subsisted today and in the past by cultivating different types of millets, peanuts, cotton, maize, and as well as the herding of cattle and other livestock. These livelihoods are subject to various external influences, such as climate shock and restrictions enforced with the area becoming a PA in 2009. One significant loss is of pasture use. People have expressed concerns about the availability and quality of fodder or pastures, as they are no longer permitted to graze within this PA and thus affecting their livestock production and, consequently, milk production. Sometimes people have to hire a herder from neighbouring villages to move their cattle far away from the villages to graze especially during the dry season. As a result, the declining forage base can therefore lead to rising household malnutrition. Another loss is the ban on hunting, which has always been part of the livelihood strategies in the past as bushmeat was the main coping strategy in the dry season. On the other side, it appears that the region has benefited from its designation as a PA. As there is free access to gather and collect wild fruits such as baobab fruits within the PA, it contributed to food security by allowing the population to access these nutritious foods when they may not have other sources of sustenance. It appeared that the rules guiding the collection of these wild fruits were not negotiated with local people. It is not clear yet how much broader local involvement was in the creation of the reserve. This question matters specially as, in the present time, especially during the dry season when there are shortfalls in agricultural crop production, a majority of the population depends on the gathering, processing, and sale of baobab fruits from woodlands. The commodification of these wild fruits brings essential cash income to many households, which can be used to purchase food, thereby improving food security.

Maintaining traditional rice production while increasing gendered workload in Casamance

In Lower-Casamance region of Oussouye, climate and environmental changes, as well as socio-economic changes (mainly migrations) have combined to transform the local rice food production and landscapes. While such rice production remains central for the Diola group studied, the number, skills and motivations of the labour force as well as the quantity and quality of arable land have undergone major changes, reshaping the landscapes and social habits. In this context, the main food production of the group, once a shared task between men and women, elder and younger, now seems to lie in the hands of few people, mainly the older women. Though the methods are still completely manual, still use the same tools (notably the *kayendo*, a ploughing shovel made of wood and iron) and do not use any mechanized process, rice production in the region should be regarded as a capacity to adapt agricultural knowledge to climate and environmental changes. This is the main reason why the rice production can carry on nowadays, even if it is facing constraints and difficulties. It is not so much climate change but internal changes of work collaboration institutions which pose a problem in the long run for food

Section 1

resilience. While there is a local discourse of rice being 'food for the soul' it is now left with the women to have a particular part to play in the conservation of the practice: they master what rice varieties can be transplanted to the lands that are more drought, more salty, drier, etc. Their knowledge is the result of what they were taught by their mother, aunts, grandmothers, but also of their daily experience of the environments, of the landscapes and of the climate. Our data shows how they transform their long-term observations, but also their beliefs and habits into agricultural practices in terms of crops selection. The local diversity of rice crops remains one of the most important adapting strategies for rice producers and is often the most efficient strategy of *adaptation* rather than one of *resistance*. The Diola farmers all said so: they cannot 'win against the sea', whose salty waters invade the rice lands. This is also the case because elderly women face the internal institutional change of not being supported by work force from other family members, especially young men and women who leave to the urban areas for school and work and elderly men also for salaried jobs. They thus leave the workload of reproducing the cultural landscapes to the elderly women. For them the only coping strategy is to try to maintain the crop diversity as they 'cannot command the rains as God, the sky, is the one that decides of it'. Thus, institutional labour changes seem to dominate this case study.

Conclusions

Climate change alone does not undermine resilience of food systems and does not trigger local populations to food insecurity. Past and present institutional transformations and changes weakening local land and CPR rights play an important role regarding the effects of external crises (such as climate change). Thus, the interplay of external crises and changes and local tenure systems is central in increasing the vulnerability of local food systems and reducing their resilience. In Senegal, land tenure changes from common to state and 'private' property in a neoliberal context in the form of the establishment of PAs. New agricultural policies and agro-investments act as a state-response to climate change, drought, and biodiversity loss and have triggered institutional changes in access to food, increasing food vulnerability, especially in marginal groups. In the *Senegal River Valley*, agro-industrial investments and the establishment of PAs initiated a neoliberal response to climate change but also initiated climate change itself, which has, in return, undermined previous commons institutions and reduced access to land and CPR, at the expense of marginalized people and women. In the *Bedik Country* climate change presents itself as increased droughts and unpredictable and shorter rainy seasons. Aside from the uncertainty of the harvest quantity, continuous wildlife migration into conservation areas is observed. This, as well as the restrictions of access to CPRs puts local population in a precarious position in terms of food resilience. On one hand, people are forced into applying corrupt coping strategies which causes institutional changes. On the other hand, this tension weakens reciprocity as a form of social capital based on trust, which leads to the undermining of coping strategies based on the reciprocal exchange of food and information, and ultimately limits the ability to resist external factors such as climate change. In the *Boundou area*, restriction of access to previous commons (pasture, wildlife and forestry) reduces resilience among Fulbes and Jakhankes during times of climate change, however, a new alternative of seasonal usage of fruits (baobab) for commercial purposes has emerged. It is uncertain whether it is reducing food vulnerability and increasing resilience of households and more marginal groups (e.g. women) or whether it does not compensate for the 'green commons grabbing'. In the *Lower Casamance area* climate change contributes to loss of land due to salinization. But it is rather the lack of workforce to maintain the rice fields and ponds which is left to the elderly women because of institutional changes in the social and work/labour relations within the households. Local rice production is extremely important but left to the weakest work force, which undermines the resilience in food production. The only coping strategy is maintaining crop diversity while unlike the other cases there is now institutional change in tenure so far.

We conclude that climate change transformations are falling on already weakened local institutional settings, which have been undermined in different ways: from tenure related issues such as colonial and neo-colonial commons grabbing (conservation and large-scale investments) to changes in social relations of sharing and of work. The latter reduces the social capital of actors – especially for the poorer groups and women – needed for resilient food production and food diversity. Not all areas are affected in the same way by these colonial, postcolonial and neoliberal tenure and social relations transformations. But these long-term historical changes nevertheless strongly weaken local common property and social institutions, which were set up to buffer situations of crisis and vulnerability. However, local actors also develop different strategies (compensation schemes, commodification of wild fruits, maintaining local crop diversity) to cope with situations of crisis and select coping strategies regarding their bargaining power, thus opposing the strategies of the state, local elites and international capitalist groups in food production and conservation businesses.

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