



DIIS REPORT

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**Achieving Sustainable
Natural Resource Management in
the Sahel after the Era of Desertification**

Markets, Property Rights, Decentralisation
and Climate Change

DIIS REPORT 2009:07

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Cover Design: Carsten Schiøler

Layout: Allan Lind Jørgensen

Printed in Denmark by Vesterkopi AS

ISBN 978-87-7605-308-6

Price: DKK 50.00 (VAT included)

DIIS publications can be downloaded

free of charge from www.diis.dk

Hardcopies can be ordered at www.diis.dk

Acknowledgements

This study was supported by a grant from the Technical Advisory Services, Danish Ministry of Foreign Affairs. An earlier version of this paper was discussed at a seminar on 6 October 2008 at the Department of Geography and Geology, University of Copenhagen, organised in collaboration with the Danish Development Research Network. Thanks are due especially to *Ole Mertz*, *Jean-Pierre Zafiryadis* and *Marianne Haahr*, who were discussants at this meeting, and to *Hanne Carus*, who also provided comments to the paper. The minutes of the meeting are available on the DDRN website www.ddrn.dk.

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Preface

Through the Danish International Development Assistance (Danida), Denmark has a long tradition of providing support to the countries in the Sahel region, starting with considerable contributions to the United Nations Sudano-Sahelian Office (UNSO) under UNDP during the 1980s and into the 1990s, but since then mainly as bilateral support to Burkina Faso and Niger and now Mali. The assistance to Burkina Faso is continuing, the assistance to Niger was increased in 2006, and in 2006 Mali was selected as a new Programme Country with agriculture and natural resource management as priority sectors. Senegal has been the focus of support to the ecological monitoring centre, Centre de Suivi Écologique. In addition, Danida has supported regional organisations under the CILLS umbrella, such as the AGHRYMET agrometeorological research and training centre in Niger. Furthermore, considerable Danish (and Danish-funded) research has been carried out within natural resources management in the Sahel, e.g. the Sahel-Sudan Environmental Research Initiative (SEREIN), PETREA and IIED's Drylands programme, while several Danida-funded ENRECA projects have contributed to capacity-building in research.

Harvesting the experience of development and research activities in the Sahel can be expected to inform the updating of the Danish development assistance programmes in the region. This forms part of regular review activities and targeted reviews like the recent 'lessons learned' exercise of the Danish assistance within natural resource management in Niger. Added to these efforts, Danida decided to commission the Department of Geography and Geology (DGG), University of Copenhagen, to undertake a study establishing an overview of the lessons learnt from Danish (and to some extent international) activities within development assistance, capacity development and research within the broad field of natural-resource management in the Sahel, focusing on Niger, Burkina Faso and Mali. The study objectives were: 1) to identify the most important operational experiences from two decades of Danish assistance to natural-resource management in the Sahel; and 2) to extract from research findings recent trends as well as key problems and drivers related to natural-resource management of relevance to development assistance. The study was coordinated by Simon Bolwig (Danish Institute for International Studies) and Kjeld Rasmussen (DGG), while its steering group consisted of Hanne Carus and Henning Nøhr (Danida), Anette Reenberg (DGG), Henrik Secher Marcussen (Department of Geography and International Development Studies, Roskilde University) and Michael Mortimore (Drylands Research, UK).

Two written outputs resulted from the study: 1) a technical report that reviews research evidence and issues relating to natural-resource management in the Sahel while making some references to operational experiences (Bolwig et al., 2008b); and 2) the present discussion paper, based on the findings of the technical report, a review of other written material and an expert-opinion survey of natural-resource management in the Sahel. The opinion survey used a short questionnaire administered by e-mail to nineteen experts on NRM in the Sahel, mainly Denmark-based consultants, but also Danida advisors, Danish NGO staff and Danish researchers. It was conducted in June–July 2008, and ten responses were received. It covered the roles in NRM of markets, the private sector, property rights and governance, as well as capacity-strengthening, research, and the ‘climate proofing’ and ‘sector orientation’ of Danish development assistance.

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Abstract

This paper provides a review of the experience gained through Danish and international research and development projects within the field of sustainable natural-resource management (NRM) over the last ten years in the Sahel. It is based on a larger background study edited by Bolwig, Rasmussen and Hansen (Bolwig et al. 2008b), supplemented with new material, including a questionnaire survey targeted at experienced Danish researchers and development professionals. It addresses economic, institutional, governance, gender and environmental aspects of sustainable NRM. The main themes emerging from the review concern: 1) the functioning of the agricultural market, the significance of market failures and the regulation of markets to mitigate adverse social and environmental impacts; 2) the relationship between NRM, land tenure security and property right regimes; 3) the complexities of modern – central and decentralised – and customary institutions involved in the NRM domain; and 4) the environmental and climate change trends observed in the past and foreseen for the future. For each theme, we review recent findings and discuss how these may (or should) affect policies of relevance to NRM. Relative to past policies and practices, these findings do suggest revisions. First, the need for a strengthened focus on market functioning and on increasing the economic and social benefits to the rural poor from participation in NRM-based value chains. Second, the need to adjust policies on land tenure (including land-titling), decentralization and NRM institution-building. Finally, national strategies and action plans for combating desertification and adapting to climate change should take account of the fact that the Sahel has generally been ‘greening’ over the last 25 years, and that the climate change outlook may not be as bleak as often presumed.

I. Introduction

The Sahel¹ is characterized by strong dependence on natural resources, and natural-resource management (NRM) remains a key issue in relation to economic and social development. In this regard, new trends, opportunities and constraints, created by changes at the regional as well as the global levels, are emerging and will (and should) influence NRM strategies, policies and development assistance programmes in the region. While poverty is still deep and widespread, economic growth has picked up in recent years: in Mali, Niger and Burkina Faso, annual GDP growth rates ranged between 3% and 8% during the period 2003-07, while all three countries experienced a consistent increase in gross national income per capita over the period 1998-2007 (World Bank, 2007).² Urban and regional markets have expanded, driven by per capita income growth and high rates of urbanisation. Urban populations in the Sahel currently grow by 4.7% per year compared to 3.7% in West Africa as a whole, while the share of the Sahelian population living in urban areas is 22%, compared to 42% in West Africa (UNFPA, 2005). Decades of declining food prices have recently given way to sharp increases, making Sahelian agriculture potentially more profitable (though input prices have also risen) while eroding urban and migrant incomes. In UEMOA,³ food prices increased by 14.6% between January 2007 and January 2008, compared to 6.9% for the consumer price index, though the former figure masks even higher increases in staple food prices, especially grains (FAO, 2008). The catastrophic droughts of the 1970s and early 1980s have been succeeded by improved average (but highly variable) rainfall. In this relation, diagnoses of widespread land degradation ('desertification') have been thrown into doubt by an observed increase (and in some regions a doubling) in vegetation indices for most of Sahel's ecosystems (Figure 1), although spatial and temporal variability have increased. Desertification narratives

¹ The 'Sahelian' countries of West Africa – Senegal, Mauritania, Mali, Burkina Faso, Niger and Chad – are located on the southern edge of the Sahara on a steep rainfall gradient from less than 100 mm to more than 800 mm of mean annual rainfall. Other countries, such as Gambia, Ghana and Nigeria, may be added to the list because they include areas that fall within agro-ecological definitions of the Sahel. In agro-ecological terms, 'the Sahel' is commonly defined as areas receiving 200–800 mm mean annual rainfall. This paper focuses on four countries: Mali, Burkina Faso, Niger and, to a lesser extent, Senegal, which have all been the focus of Danish development assistance to 'the Sahel'.

² 'GNI per capita' is reported as purchasing power parity (PPP) in current international \$ (World Development Indicators, World Bank, 2007). During 1998-2007, GNI per capita in Mali and Burkina Faso grew by 5.1% per year on average, and in Niger by 1.9% per year (in Niger growth only picked up after 2002). In 2007, GNI per capita was 1040 in Burkina Faso, 1120 in Mali and 630 in Niger. No poverty data were available in the WDI database.

³ UEMOA includes Burkina Faso, Niger, Mali and Senegal, as well as Benin, Cote d'Ivoire, Guinée-Bissau and Togo.

have likewise been challenged by a number of ‘success stories’ of sustainable intensification in different parts of the region (Bolwig et al., 2008b). Democratization and decentralization have been progressing, potentially enabling the wider participation of rural populations in shaping the framework conditions for sustainable NRM and improved livelihoods, while at the same time reshaping the role of customary institutions that have hitherto been in charge of regulating access to natural resources. The overarching poverty-reduction agenda shaping recent national development policies in the Sahel has triggered an increased focus on pro-poor development, in particular on the rights of women, young people and marginal or vulnerable groups to benefit from development on equal terms.

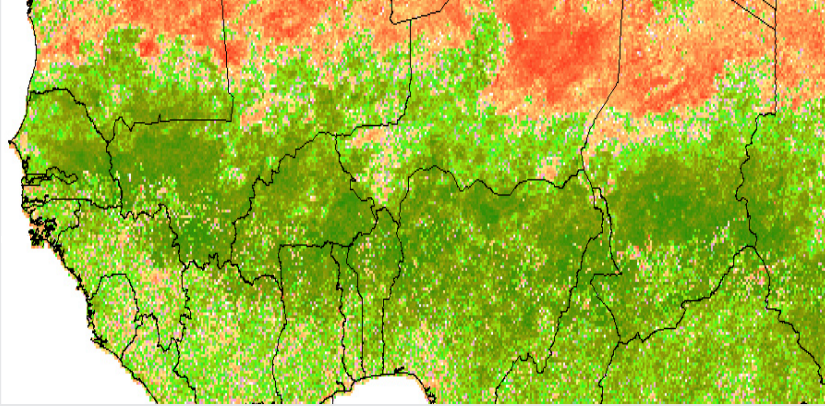
In light of this new situation, this paper discusses key factors and processes that enable or constrain pathways of sustainable and pro-poor NRM in the Sahel, and what governments, donors and NGOs might do to assist rural people in achieving more sustainable NRM while also reducing poverty and vulnerability. The aim is not to provide final answers, but to draw attention to certain issues central to NRM to help reorient policy and programme design to suit better contemporary conditions in the Sahel after the ‘era of desertification’.

The issues raised in the paper pertain to three types of interrelated ‘driver’ of sustainable NRM – economic, institutional and environmental.⁴ Section 2 concerns the first type. It discusses the role of markets in enabling and inducing sustainable NRM, and considers the potential of ‘value chain’ and ‘rural territorial development’ approaches for promoting the development of pro-poor and environmentally friendly markets. Sections 3 and 4 deal with institutional issues. Section 3 discusses issues related to the formalization of property rights to land, while Section 4 addresses contemporary issues in natural-resource governance, focusing on the ‘nesting’ of customary institutions and new local governments and on the specific problems related to river basin (water) management. Section 5, on environmental factors, focuses on the direct and indirect effects of global climate change and on issues related to land degradation. Section 6 concludes the paper.⁵

⁴ The choice of issues was informed by the findings of Bolwig et al. (2008b), the survey of experts and other experience.

⁵ Annex A presents an overview of Danida-supported NRM development-assistance projects in Burkina Faso, Mali and Niger, covering the period up to 2005. This information was not analysed.

Figure 1.
Trends in the integrated Normalized Difference Vegetation Index*,
1982–2006.



* iNDVI is an indicator of 'net primary productivity'. Green colours denote a positive trend, red colours a negative trend.

2. Markets and value chains

Sustainable agricultural development focused on small producers has for long been a cornerstone of Danish development assistance to the Sahel due in part to its great potential effects on poverty reduction, as well as to its importance for the environment.⁶ The realisation that growth in smallholder production depends strongly on a conducive economic and institutional environment, combined with a shift in focus from agriculture to rural economic development more broadly, has inspired recent initiatives to merge agricultural sector programmes with those of private-sector development and infrastructure, among other sectors and issue areas (e.g. the environment), for example, in Benin, Ghana and Uganda. In the Sahel, the Danida Agriculture Sector Programme in Burkina Faso has a strong emphasis on private-sector development, while in Mali it incorporates links for close collaboration with the Employment and SME Development Programme. In this light, we discuss here the roles of markets and value chains for sustainable natural-resource management in the Sahel.

Market development is a necessary condition for the sustainable and profitable management of natural resources. This is because markets can provide the incentives, resources and information needed for farmers and herders to invest in land and water resources. Moreover, the rural population of the Sahel are deeply integrated into markets, especially through sales of livestock and certain crops, food purchases, off-farm (migrant) labour and, in some cases, land transactions. Moreover, with increasing populations, migration, urbanization and commodity flows, in the Sahel and in West Africa as a whole, the way markets function is a critical factor affecting both rural livelihoods and the environment. In this light, policies that affect market functioning and market participation are critically important in enabling (or constraining) sustainable natural-resource management and poverty-reduction.

The Washington Consensus gives a key role to market mechanisms in economic development, but has been criticized for advocating a free-market fundamentalism⁷ that does not consider the social and environmental aspects of economic development. In line with this line of thought, four issues are debated in the following sections: (a) What development objectives can market development serve in the

⁶ Agriculture denotes here crop-farming, livestock-raising, aquaculture and fisheries.

⁷ The belief that free markets provide the greatest possible equity and prosperity, and that any interference with the market process decreases social well-being.

Sahelian context? (b) Which end-markets have the greatest potential for alleviating rural poverty and promoting sustainability in the Sahel? (c) Can markets create sustainable natural resource management pathways? (d) How are pro-poor and environmentally friendly markets enabled through policy and programme support?

Objectives of market development

Much of the debate on markets in developing countries has focused on the creation of free and efficient markets to promote economic growth through the correction of market failures. While market liberalisation and efficiency measures (e.g. market infrastructure and information systems) are certainly important, 'market policies' – regulation, public investment, private-sector support, institution-building, and trade policy – should serve broader social and environmental objectives. This implies a need for more nuanced and targeted approaches to ensure that markets in the Sahel also work to the benefit of poor and marginalised rural producers and consumers, while enabling and inducing a sustainable use of natural resources (see further below). Specifically, the objectives of market development should include:

- improving incentives for investing in sustainable natural-resource use, for example, through higher or more stable producer prices or reduced input costs;
- avoiding market-driven resource-degradation, implying the need to couple market development with gender-sensitive improvements in natural-resource property rights and governance (see the following chapters), particularly for common pool resources;
- limiting exclusionary practices and structures, for example, by improving access to marketing infrastructure (information, storage, transportation, equipment, financing etc.) for poor and marginalised groups or reducing the costs of standards compliance;
- reducing market-related risks and vulnerability, particularly through measures that help stabilize the price of food staples (ranging from macro-policies over market-integration infrastructure to village grain banks) and that reduce the pressure for livestock-owners to destock during drought years when the terms of trade swing violently against them (e.g. by increasing non-livestock forms of savings, or by improving access to dry-season pastures and water sources);⁸

⁸ It is commonly observed that in drought years grain prices soar and livestock prices plunge, which make the terms of trade swing violently against livestock-keepers and food-deficient households in general, affecting poor households especially hard while benefiting the well-off (Bolwig et al., 2008b).

- providing sustainable market opportunities for the poor, particularly through targeted efforts to broaden and improve the participation of small producers, male and female, in value chains serving urban and regional markets for food staples and high-value products (see further below), for example by addressing constraining gender norms that disadvantage women seeking new market opportunities, coupled with broader enabling policies and investments (e.g. in the areas of reducing import subsidies, feeder roads, transport equipment and trade finance);
- enabling participatory and democratic regulation of markets by ensuring private-sector (including small-producer) and civil-society participation in central and local government decision-making on markets and trade, through 'rural territorial development' approaches (see below), and by strengthening producer and trader associations, as well as consumer groups.

Which end markets?

Which end markets have the greatest potential for alleviating rural poverty and promoting sustainability in the Sahel? Most observers agree that urban and regional food markets are more important than international markets because of their lower entry barriers and high and consistent growth rates driven by urbanisation and urban income growth.

Urban and regional food markets

Urban markets for staple food grains are very large and are growing steadily with rising urban populations, particularly when urban areas across the border in coastal countries are included, e.g. as manifest in cross-border grain movements between Niger and Nigeria.⁹ Simultaneously, though much smaller in size, urban markets for high-value products (fresh fruit and vegetables, meat and dairy products, beans and pulses) are growing rapidly, driven as they are by both urbanisation and rising urban incomes. Local producers are competitive in these 'niche' markets relative to imports, and in many parts of the Sahel it has been observed that small producers are increasingly producing such products for sale (Bolwig et al., 2008b). Nonetheless, production and trade in perishable products are risky and expensive due to problems related to seasonality, storage, distribution, quality

⁹ It has been projected that, by 2020, 63% of the population in West Africa will be urban, while there will be 6000 towns and cities with more than 50,000 inhabitants and 300 cities with more than 100,000 inhabitants (Cour, 2001).

Sahelian producers are going to the market

A literature survey focusing on trends after 1990 showed signs of an increased commercialisation of production. Increased sales occurred especially for high-value farm products, i.e. livestock (fattening of sheep and goats), irrigated rice, cowpeas, fruits and vegetables, and other products (e.g. hibiscus) for urban niche markets. It was also found that farmers are increasingly managing trees for commercial firewood production.

Source: Bolwig et al. (2008b).

and food safety. For many products there are large transactions costs related to transportation, security and illegal taxes, for example, for live cattle (see box). Evidently, the development of these food markets is a key aspect of strengthened rural–urban linkages generally, and is strongly consistent with a scenario of continuing urbanization and population growth.

High economic and demographic growth in the coastal zone of West Africa presents new and expanded regional market opportunities for Sahelian food-producers. While entry barriers are higher and numerous, markets for regionally traded foods are much larger and more stable than domestic markets. Cross-border trade is especially important for livestock (see box), but also for grains, beans, pulses and fruits, for which coastal demand is also increasing fast.¹⁰ A challenge lies in identifying how the competitiveness of Sahelian producers in urban and regional markets can best be improved. Borders are perceived by economic operators in the Sahel as a major constraint to regional trade, particularly with the coastal countries (Nigeria, Ghana, and Ivory Coast). But there are also large domestic transaction costs before products reach the border (see box).

¹⁰ For example, grains are exported from northern Nigeria to southern Niger, cowpeas from Niger to Nigeria, and mango from Burkina Faso to Ivory Coast and from Mali to Mauritania.

Regional livestock exports from the Sahel

There are large-scale exports of livestock from the Sahel to the coast, where Sahelian producers enjoy cost and quality advantages. The CFA devaluation sharply increased livestock prices. Especially fattened small ruminant stock have experienced high export growth. A 250% growth in demand for livestock products is anticipated for West Africa – particularly on the coast – by 2025 due largely to a growing urban population. But reaping the full benefits of this trade depends on resolving a number of marketing constraints. For example, transporting a lorry of live cattle from Dori to the abattoir in Ouagadougou on the way to the coastal markets cost 21,225 CFA per head in 1994, of which 16% was illegal road taxes.

Source: OECD (2007), Bolwig et al. (2008b).

Restricted market opportunities for young women

The Hausa communities in southern Niger present an illustrative example of women's restricted market access. In these communities, very few women have access to the more distant markets. Particularly young married women are severely restricted in respect of market access, as they are not allowed to leave the family compound to go to the market. This group of women only have market access through their husbands or children. Some young women manage to run a business from home if their husbands or children help them, e.g. by young girls selling cakes or ground nut oil for their mothers. But the use of intermediaries affects these women's control of the business and cuts into their very tight profit margins.

Source: Diarre and Monimart (2006), IFAD (2006).

For many women, the sale of processed food crops or wild harvested products constitutes a very important contribution to their economy. Markets for these products are mostly local, but some women have managed to enter urban and regional markets too. Nevertheless, numerous factors – such as restricted mobility, lack of time due to the workload in the household, restricted access to credit from financial institutions as well as limited access to information, advice and technology and access to farmer organizations and commercial networks – all influence women's opportunities to take part in market activities. With increased market integration, these factors can also easily constrain women's ability to compete in more distant markets.

International export markets

While producing for international markets is unlikely to have broad-based effects on poverty and sustainability in the Sahel, such export production is very important for livelihoods in some areas (e.g., the peanut basin in Senegal and the cotton zones in Mali and Burkina Faso). Strengthening the links to these more advanced markets may also have broader 'learning' effects, especially regarding production technology, product standards (e.g. food-safety, organics or 'low-carbon'), secondary processing, and alternative ways of organising production and trade (e.g. contract farming or cooperatives). Moreover, increased demand for 'sustainable products' in the OECD countries has renewed the interest in export markets, while compliance with a growing number of private-sector social and environmental standards is becoming a *de facto* requirement of market access. Certification to organic and fair-trade standards is still rare in the Sahel but increasing.¹¹ Experience from East Africa shows that group certification to these standards is feasible for small farmers and can raise incomes, reduce market risks, improve food security and promote the use of organic production methods (Bolwig et al., 2009).

Can markets help create sustainable NRM pathways?

Recent studies of agricultural intensification have improved the understanding of the dynamics of NRM management in the Sahel (e.g., Mortimore and Turner, 2005; Reij et al., 2005, Reij et al., 2006). They argue that significant improvements have occurred in land management and quality in farmland areas over the

¹¹ Certified organic exports from the region include cotton, fresh mango, dried fruits and Shea butter. Fair-trade certification exists for dried mango, cotton, Shea butter, sesame and green beans.

past several decades (including during relatively dry periods) thus contradicting prevailing desertification narratives. In particular, they point to the existence of long-term development pathways through which population growth and market expansion drive land-use change by inducing and enabling farmers to intensify land management through investments and innovations. The studies suggest the importance of technology, private investments by smallholders, the adaptive capacity and economic rationality of farmers, and market demand for shaping land management. A key idea is the interactions over time between markets, the production system (including technology) and labour. Related to this is the argument that economic incentives are a prerequisite for land investments, and that such incentives are best provided through the development and appropriate regulation of markets (see below).¹²

An often neglected dynamic in the discussion of market–NRM linkages are qualitative shifts in the composition of farmland production (Bolwig et al., 2008b). A major change in *crop-farming* in parts of the Sahel is the increased production of high-value crops (vegetables, cowpeas, groundnuts, sesame and tiger nuts (*écrous de tigre*)) for the growing urban markets (enabled in some areas by improved water management), although we note that cowpeas have been grown for distant markets since the 1960s at lower volumes, while groundnuts have been diverted from export to urban markets, which offer better prices. That said, cereal grains will continue to feature in rural–urban trade, not only because of demand, but because producers can easily shift output between consumption and sale according to conditions (which contributes to their risk management). Secondly, the number of *farm trees* is increasing and providing an increasing amount of crop nutrients, fodder and food, as well as cash incomes earned through the sale of fruits, Shea nut, firewood and animal fodder. There has also been a qualitative change in *livestock-rearing*, particularly among farmers, from a focus on cattle as a long-term saving and investment (as well as a source of status and milk) towards the short-term fattening of sheep and goats destined for high-value urban markets, thus providing a regular income. Moreover, population pressure requires a greater integration of these major components in NRM strategies, while improved market incentives can enhance this process in both sustainability and income terms.

¹² The ‘success’ stories of positive land change have been criticised on methodological grounds and with respect to their limited geographical representativeness. The criticism is largely misplaced, however (see, Bolwig et al., 2008b).

In this light, improving women's economic incentives for accessing the market would be important for pro-poor development, for example, by enabling them to adopt higher value crops and products. There is a great risk, though, that men will take over profitable activities hitherto carried out by women and will out-compete them due to the relatively unfavourable access and control over resources held by women (IFAD 2006, Quisumbing and Pandofelli 2008).

There are, of course, also instances where market forces, especially when combined with corruption, insecurity of tenure or 'open access' conditions, have contributed to natural-resource degradation (see Section 3). In particular, when derived from common pool resources, the market may induce the overuse of non-timber forest products, for example, dum palm. Where property rights are private, natural resources may be conserved in the face of strong market forces. For example, in the Kano Close-Settled Zone in Nigeria, tree densities remained constant on private farmland throughout the drought cycle of the 1980s, even though selling firewood in markets was a prime source of emergency income following crop failure (Cline-Cole, 1998). Clearly, the interplay of a range of market and non-market factors can contribute to the sustainability outcome of NRM. Some examples are given in the box below.

Situations where market incentives promote sustainable NRM

- Preservation of small lakes by fisher organisations in Matameye, southern Niger.
- Preservation of oases in Goudoumaria in south-eastern Niger through sand-dune stabilization that protects date palms and cassava fields.
- Periodic markets throughout the Sahel promote sustainable income-generation for men and women from selling NTFPs from trees owned or managed privately,
- Forest products that are strongly market-integrated include firewood, Gum Arabic, Shea, honey, sand, and (potentially) biofuel (jatropha).

Situations where market conditions induce natural-resource degradation

- Unregulated or illegal extraction of firewood from common pool resources (CPRs) for commercial purposes, for example, by army personnel.
- Commercial cutting of green wood for firewood and charcoal production from CPRs, often with the help of corrupt forestry officers, was identified as a major factor of natural vegetation loss in studies from Niger, Senegal and Nigeria (Wezel and Haigis, 2000; Cline-Cole et al., 1998). In contrast, wood extraction by local communities was mentioned as a cause of 'desertification' by only 40% of the cases reviewed by Geist and Lambin (2004).
- Very unfavourable livestock–grain terms of trade during drought years induce livestock-keepers to maintain large herds, thus increasing the risk of degradation of grazing resources.

Source: Authors' expert opinion survey, Bolwig et al. (2008b).

Pro-poor and environmentally friendly market development

General market policies

Policies that support market development conventionally encompass a range of sectors, issues and geographical scales, including:

- integration infrastructure (transportation, storage, telephones, access to knowledge);
- institutional development (regulatory frameworks, trade finance and insurance, producers' and traders' associations, increased contractualisation, periodic rural markets, grades and standards, standards compliance/certification, codes of conduct);
- removal of barriers to trade (rent-seeking, illegal taxation, police harassment, fuel shortages) and to the establishment and running of businesses;
- abolition of public regulations that impede market entry or restrict competition, except for those justified on safety, environmental and consumer protection grounds;
- macro-economic price and import policies (that cease to privilege urban consumers at the expense of domestic producers).

It is evident from this list that developing markets, especially doing so in an equitable and pro-poor manner, is very resource-demanding and touches upon a wide range of economic development issues. This begs the question of what are the best (most effective and inclusive) models for supporting market development in the Sahel? In this regard, we discuss two perspectives involving 'market development' that have received increased attention in recent years: value chain development and rural territorial development.

Value chain development

Different commodities and their market value chains (*filières*) experience different kinds of market failures and require specific forms of regulation and intervention. Since it is impossible to correct all important market failures in a territory or country, it may be argued that market development is best done by targeting weak links in specific value chains (e.g. for meat or firewood). Moreover, value chains must be selected for intervention according to specific social and environmental objectives, such as raising income among herders in a particular region, conserving certain tree species in a given forest or promoting women's market participation. This approach depends on analyses of how value chains are structured and governed and of their

'horizontal' impacts on poverty, equity and the environment. Pro-poor and inclusive value-chain development in rural contexts also requires a specific methodology (see e.g. Riisgaard et al., 2008; Vermeulen et al., 2008). One advantage of the value-chain approach is that producers commonly frame their production and marketing constraints in terms of commodity-specific factors or barriers (e.g., over-regulation, illegal rent-seeking), whose removal may both improve market returns quickly and empower them to manage their resources sustainably (e.g., through producers' associations or community institutions for managing CPRs).

Value-chain interventions are often carried out without proper analysis of the inherent gender dynamics of value chains. Women typically participate in certain parts of a value chain that offer particular income-earning opportunities. Yet due to, for example, gender-specific labour roles and property rights, there is an inherent risk that, when a value chain is developed, women are excluded from the more rewarding activities. Furthermore, women's participation in value chains is often concentrated upstream (closer to production) in labour-intensive activities, where wage rates are typically lower and more unstable, while further downstream (closer to the consumers and to demand), where rewards are often higher, women tend to have a subordinate position with little opportunity for upgrading their participation.

Value-chain analyses and interventions must consider the typical roles and positions of different groups and individuals in the local society, their costs and benefits in relation to participation in the value chain, and their opportunities for upgrading within it (Bolwig et al., 2008a). All are influenced by (gender-specific) labour roles, property rights and access to resources. In particular, it is necessary to recognize that the economies and the labour markets in which value chains are embedded are gendered institutions that reflect and reinforce socially constructed gender divisions and inequalities (Barrientos, 2003).

Rural territorial development

Because market failures are highly context-specific, it can be argued that market development should be integrated into a broader territorial approach, rather than being a separate area of intervention. Rural territorial development (RTD) has public governance as its point of departure, as opposed to the private governance focus of value-chain development. RTD perspectives have been pioneered in Latin America (since the late 1990s) and southern Europe and contain elements of local economic development (LED) dating back to the 1960s, and livelihoods approaches from the early 1990s (Quan et al., 2006). RTD approaches situate localized development in

The Shea nut (Karité) value chain

The Shea nut value chain is an illustrative example of women's role in value-chain development. The Shea tree (*Vitellaria Paradoxa*) grows in savannah woodlands across the Sahel, and women have for long collected the nuts and processed them into butter used for cooking and skin care. There is thus a local market for both the almond (the cooked, dried and cracked nut) and the butter (ground and almonds turning into a yellow-white paste) that provides many women in the Sahel with an important source of income during the dry season. Urban and regional markets are emerging for Shea butter and derived products such as soap and cosmetics, and the global market for Shea has been developing rapidly in recent decades due to increased demand for Shea butter as an ingredient in chocolate (to some extent replacing cocoa butter in the case of Europe) and cosmetics. Hence, Sahelian women involved in Shea nut collection and processing can now potentially access local, regional and international markets, and their active participation in these different strands of the Shea value chain has been widely observed.

Large Shea importers like AAK (Denmark and Sweden) and Loders Croklaan (NL) increasingly buy the almonds directly from local women's groups, which to some extent bypasses local traders while providing the women with relatively high revenues. Smaller local cosmetics companies, of which several are owned by women, have also made agreements with local women's groups for the provision of either almonds or processed butter, and they often engage women in further processing on their small-scale processing plants. Profitability in these different segments is precarious, however, due to fluctuations in production costs and product prices.

There is scope for a continued strong presence of women in several segments of the Shea value chain, especially in butter and cosmetics production. But competition for raw materials from international Shea almond importers and from the international cosmetics industry can undermine the profitability of locally produced cosmetics for urban and regional markets. Generally, women's position and possibilities for upgrading in the Shea value chain are constantly being challenged.

Sources: Bolwig et al. (2008a), Barrientos et al. (2003), Pedersen (personal communication), Giron (2007).

a dynamic and wider market, policy and institutional context. This distinguishes them from 'integrated rural development', which ignores the institutional environment, and from Gestion de Terroir or GT, which focused on the local (community) level. RTD is based on the premise that territorial factors play a significant role in economic development, poverty and inequality, as well as in the management of natural resources, where 'territories' denote geographical or economic regions with a shared cultural identity and therefore some actual or potential collective development (Quan et al., 2006: 7). RTD is based on larger territorial 'units' (i.e. than the district or community) and the inclusion of urban centres in strategic planning. It also emphasises the inclusion of the private sector and civil society in decision-making. These components seem conducive for supporting market development. For example, the decentralised market information system in Mali would fit well into a RTD approach; in 1999 this system was decentralised with the creation of 22 local offices (Shepherd, n.d.).

One drawback is that RTD is quite demanding on human and organisational resources, which contrasts with the still weakly resourced local governments in the Sahel. Also, the links to 'private governance' (of, for example, agro-food value chains) are still poorly developed. On the other hand, lessons learned from GT may be used in developing RTD approaches, for example, regarding the risks of the premature institutionalization of promising approaches in formal sectoral programmes without consideration of the diversity of local contexts (Quan et al., 2006). In many communities, women, the young and marginal groups have obtained some level of voice and access to common pool resources through customary institutions, but these rights are not automatically transferred to the new modern institutions. A challenge for RTD initiatives is therefore to secure the representation and involvement of such groups in decision-making.

The steps ahead

Issues for research

- There is need for improved knowledge and analytical capacity regarding markets in the Sahel, particularly in respect of general market functioning, the terms and preconditions of participation in value chains, the value-chain 'intermediaries' linking producers with markets (Vorley and Proctor, 2007; Pali et al., 2008), and the 'horizontal' impacts of market and value-chain dynamics on different dimensions of poverty, gender, labour and the environment (Bolwig et al., 2008a).

- The capacities required to support the development of value chains are weak among NGOs, governments and development agencies in the Sahel. There are, however, an increasing number of value-chain projects in the region, e.g. on cotton, Shea, mango and sesame, through which this capacity can be strengthened. There is also a need for policy analysis that can help draw lessons from these practical experiences, especially in relation to three main areas:
- the development of models for ‘up-scaling’ (to e.g. the territorial scale) and ‘out-scaling’ (to other types of products and producers)¹³ of concrete value-chain experiences;
- the identification of key constraints amenable to policy that limit rural populations’ participation in and benefits from value chains, such as rural women’s limited investment capacity;
- the appropriate roles of government, civil society, business and international organisations in fostering value-chain development and participation.

Issues for policy

- Transactions costs in the Sahel are high for both rural–urban and regional trade in agricultural products. Policy can do much to reduce these costs and thereby improve producers’ incentives and capacities for sustainable NRM while raising and stabilising their incomes. Policy action on regional and urban markets and trade could target general areas such as market information systems (e.g. like RATIN¹⁴ in East Africa), transportation, (illegal) taxation and border-crossing procedures. But a better approach might be to focus on the specific constraints faced by Sahelian producers and traders in participating, or wishing to participate, in important urban and regional agro-food value chains, for example, the terms and preconditions faced by women in relation to specific value chains. Actions to resolve these constraints should target specific product groups, supply chains and regions while avoiding ‘one-size-fits-all’ approaches.
- A particularly critical but also weak link in agro-food value chains is the chain segment immediately downstream (direction of consumption) from the point of primary production. There is therefore a need to strengthen the capacity of agri-businesses (processors, wholesalers and exporters) and other market intermediaries (producer associations and NGOs) that link small producers with end markets. There is a related need to develop and promote pro-poor, gender-

¹³ Most value-chain work in the rural South has been on export crops grown by relatively resource-rich farmers.

¹⁴ Regional Agricultural Trade Intelligence Network (<http://www.ratin.net/>).

sensitive and inclusive business models together with the private sector (Vorley and Proctor, 2007). At the same time, the capacity for collective action among producers must be strengthened, both as a means of increasing their ability to supply the volume and quality demanded by buyers, and in order improve their negotiation power vis-à-vis buyers and/or service-providers (public or private).

- While there is no one appropriate or ideal spatial scale for policies and investments supporting the development of agricultural markets and trade in the Sahel, it is clear that market dynamics affecting NRM nearly always operate on scales larger than the territory of a community or district, that this trade often involves both rural and urban areas, and that it sometimes crosses national boundaries. Given this mismatch between administrative and economic space, there is a need to discuss and experiment with new 'public-private' governance approaches to market development that cross existing political boundaries, such as the 'rural territorial development' approaches that have been applied elsewhere in the world. Such initiatives could take as their point of departure the 'private' governance, structure, actors and spatial extent of agro-food value chains of key importance to poor producers in a given area.

3. Securing property rights to land

Why property rights?

The question of property rights to land in Africa is complex and has been widely discussed since the arrival of the early colonists. The early colonial and mission attitude was that African forms of landholding were inadequate to secure investment and economic development and could not even be conceived as property or ownership (Peters, 2007). From the late 1960s to the early 1980s, attempts to set up formal titling systems were implemented in numerous African countries. However, many of these attempts have to a large degree failed to achieve the expected economic development effects (Toulmin, 2007; Peters, 2007; Cotula, 2007). Although many of the arguments for formalising property rights were contested in the early 1990s, property rights are back on the development agenda in the Sahel. The motivation for addressing the property rights of rural populations again includes: increasing demands for access to natural resources from a growing rural population; increasing values of land in expanding urban and agricultural zones; increasing disputes over scarce resources; vanishing rangeland and woodland, as common rights are privately appropriated for farming; and the need to strengthen private incentives for investing in and conserving natural resources.

The idea that there is a causal linkage between the formalisation of property rights and economic productivity is still very much alive. It is inspired in part by Hernando de Soto (2000), who claims that formal property rights hold the key to poverty reduction by unlocking the economic potential of the poor's own informally held assets (De Soto, 2000; Nyamu-Musembi, 2006; Benjaminsen et al. 2008).¹⁵ Nevertheless, since the 1990s a trend towards recognising communal titling of customary land¹⁶ in legislations has emerged (Toulmin, 2006; Benjaminsen et al, 2008). This "new wave" of land reforms, however, still posits a framework of secure, transparent and enforceable rights as a precondition for economic growth and investment, although not necessarily equated with individualised rights (Peters, 2007; Quan, 2000). Thus

¹⁵ The influence of de Soto's work has contributed to the establishment of the High Level Commission on Legal Empowerment of the Poor, co-chaired by de Soto, and hosted jointly by the United Nations Economic Commission for Europe and the United Nations Development Programme. Formalisation programmes have been started in many countries, but not yet fully tested.

¹⁶ The literature on customary tenure systems in Africa is large, and the content of customary law diverse. However, a brief definition is 'local tenure systems which often claim legitimacy from tradition'. These systems are often referred to as 'customary', although they have been profoundly changed and adopted to decades of colonial and post-independence government interference (Cotula, 2007).

a key question in relation to poverty-reduction in the Sahel is still whether the formalisation of property rights in the form of land-titling will benefit the rural poor. In this chapter, we question and discuss some key assumptions underlying both new and old arguments for the formalisation of property rights. But first we will clarify some central concepts related to property rights.

Defining property rights

Property is not a thing but a social relation determining how a bundle of rights to use, and obligations not to use, a specific resource are distributed among people (Meinzen-Dick, 2003). Land-tenure systems regulate the ‘bundle of rights’ which include the ‘operational rights’ such as right to access and cultivate land, withdraw a produce etc., and the ‘management rights’, such as the rights to allocate and transfer land (Cotula, 2007: 11). According to the conventional view of customary tenure systems, land and other natural resources are held by clans or families, and access is based upon status and kinship. Since colonial times, customary tenure regimes were claimed not to provide adequate security of tenure for investment and economic development. In fact, for decades research has documented that individual rights are neither absent nor necessarily insecure in African customary tenure systems (Peters, 2007; Mighot-Adholla, 1994). Nevertheless, the perception that secure property right equals formal private property still prevails. It is reflected in, among others, de Soto’s (2000) notion that formal private property involves legal representation in the form of title deeds, licences, permits, contracts etc., and that legal representation should be sanctioned and protected by legitimate national governments (statutory rights). By the same token, de Soto regards customary rights as informal and inadequate to secure investment (Benjaminsen et al., 2008).

Changes in land-tenure relations

In the Sahel, customary tenure systems are often characterised by the existence of multiple users, who have access to different resources on the same land (collective rights) (Lund, 2000). In *agricultural zones*, although they vary considerably from place to place, collective rights to land typically involve the allocation of farming rights over specific plots (Cotula, 2007).

However, competition for land resources is increasing. For example, in the fast-growing peri-urban areas of Mali’s cotton zones, the high influx of people has led to a rapidly increasing population density, which, together with the commer-

cialisation of agriculture, have converted farmland and grazing areas into urban residential land. This process has created a demand for the formalisation of land titles (Benjaminsen et al., 2008). The example illustrates the processes through which customary tenure can come under pressure, particularly in urban areas and high-value agricultural zones, resulting in an increased risk of land-grabbing at the expense of poor and marginal land-holders.

In *pastoral zones*, land tenure is fundamentally different from the terms and conditions under which agricultural land and resources are held and used. Several studies show that collective rights to common rangelands and water resources are based upon negotiated, reciprocal arrangements that enable mobility. Furthermore, pastoral land is held under controlled-access tenure regimes, often in communal form. Contrary to the 'tragedy of the commons' argument advanced by Hardin (1968), most pastoral land is not 'open access' (i.e. open to all), but rather carefully managed by well-defined groups, according to a set of rules and regulations (Thébaud, 2002; Lane and Moorehead, 1995; Bolwig et al., 2008b). In Niger, Mali, Burkina Faso and Mauretania new legislation (pastoral codes) has been passed, which recognises customary tenure practises, including priority rights of herders over resources in their home areas, although these laws still have some shortcomings (Bolwig et al., 2008b). Recent research has clarified the critical relationship that exists between land and water rights in pastoral systems. For Sahelian pastoralists, control over water is decisive in enabling them to manage the speed at which pastures are grazed by livestock during the dry season (Cotula, 2006; Thébaud, 2002).

Does the formalisation of property rights benefit the poor?

Although a pluralism of rights with regard to property exists in the Sahel, the attempt to formalise them, both customary and individual, is back on the development agenda. The main arguments for formalising property rights are:

- 1) Formal property rights are needed to provide an incentive to invest in a natural resource.
- 2) The related environmental argument is that secure property rights also provide an incentive to protect natural resources with environmental value, e.g. biodiversity, soils and water.
- 3) Secure rights empower rural populations because the way they are defined determines whether people are included in or excluded from the control of a resource that is vital to their livelihoods.

- 4) Formally registered rights reduce conflicts over land during scarcity, which is a matter of growing concern.

Each of these arguments has its shortcomings, however, which we discuss below in the order listed above.

Investment incentives

The link between increased security through formal titling and increased investments and productivity is not as direct as often assumed. Several studies from Sub-Saharan Africa show that agricultural efficiency does not increase with private property rights and that factors other than land tenure constrain agricultural production more (Lund, 2000; Migot-Adholla et al., 1993). Recent studies from East Africa suggest that formal titling programmes have not improved access to credit, nor increased economic productivity through agricultural investment, although this was anticipated to be the outcome of the land-titling programmes (Nyamu-Musembi, 2006). Conversely, in Kenya and Nigeria, endogenous tenure systems provided enough security to promote investments over long periods of time (Michael Mortimore, personal communication).

In both Niger, Mali and Burkina Faso, for many collectively used natural resources, more or less formalized negotiated agreements exist (termed *conventions locals* or local by-laws), which have often been formulated through stakeholder consultations and dialogues.¹⁷ Expert-survey responses suggested that, for collectively used land, *conventions locals* between users can provide a tool to clarify and secure the different types of rights held in land before external investments in agricultural production are carried out. Suggestions have been made to improve their 'judicial stability' through local governments or on the basis of *droit privée* through the courts. An important role of local government is to ensure that certain user groups are not unfairly excluded from accessing a resource (Bolwig et al., 2008b). Whether *conventions locals* provide an operational tool for investment in agricultural production in areas where land is collectively used is a key area for research and experimentation. Meanwhile, *conventions locals* could inform national policies with respect to the popular participation of stakeholders and to the greater recognition of local tenure practises in policy frameworks.

¹⁷ Most of today's *conventions locals* were made after the late 1980s, when there was a growing interest in strengthening community-based NRM and popular participation.

Situations where the formalisation of property rights did not promote investment

- In the Nyanza district in Western Kenya seven years after formalization, only 3% of the 896 titles had been used to secure loans.
- In Ethiopia's Amhara region, only 2% of the farmers expected that that titling would facilitate access to credit.
- Situations where informal property rights were sufficient to promote investment
- In areas of successful intensification in Kenya and northern Nigeria, informal tenure systems were secure enough to encourage investments in private farm land and its improvement over the long term, despite these systems being subject to external drivers (new land law in Nigeria, 1978), misappropriation of new land, and resettlement schemes 'adjudication' in Kenya).

Sources: Authors' expert opinion survey; Nyamu-Musembi (2006).

Environmental protection and privatisation: the challenge of pastoral rangelands

The environmental argument that privatisation increases incentives to protect a natural resource resonates with Hardin's (in)famous article, 'Tragedy of the Commons' (Hardin, 1968), which has become a key argument for how natural resources are depleted and degraded under communal ownership. However, the idea that private property rights should protect natural resources is empirically contested, particularly in pastoral areas. For example, in northern Senegal, privatising commonly held rangelands did not improve environmental sustainability. After more than fifteen years, the environmental quality of the pasture located within the privatised grazing paddocks was lower than at the beginning of the project, as well as in comparison to the surrounding communal land (Bolwig et al., 2008b; Thébaud et al., 1995). Furthermore, as mentioned earlier, water is the key to the management of pastoral resources. By controlling access to water, pastoralists are able to manage the number of livestock that are watered and thereby the number of grazing animals within the water point's grazing circumference. These particular

land-tenure systems enable pastoralists to respond in a flexible and opportunistic manner to unpredictable rainfall, which in turn promotes environmental sustainability (Niamir-Fuller, 1999; Sandford, 1983, Thébaud, 2002). A key policy issue in pastoral zones is thus to take account of the pastoral tenure systems, and in particular the links between water and land management, which is crucial for the environmental sustainability of rangelands.

Empowerment and inclusion: women, titles and the commodification of land

The argument that formal titles ensure security raises the question, security for whom? In Kenya, women's claims to family property and their use rights to plots were weakened and rendered more insecure by the formalisation of customary tenure (Nyamu-Musembi, 2006).

In the Sahel, women's rights and access to land are generally determined by customary law regarding inheritance and marriage. Even though women in many parts of the region have a customary right of inheritance to natal land, these rights are often not enacted because the woman moves at marriage to live with her husband and thereby obtains access to marital land (Teklu, 2005; Tsikata, 2004). But because women's access to marital land is through user rights only, they do not have any claim to it in case of divorce (Dimitra, 2008), and often have to turn back to their family to claim inherited land, which is often appropriated by their brothers in their absence. Women are thus faced with considerable uncertainty with respect to their rights of access to land, whether through inheritance or marriage. In several communities, Islamic law now plays an important role as a supplement to or replacement of customary law, and in most interpretations of Islamic law, women's rights to inheritance are respected more clearly than in customary law. This has provided an opportunity for women to claim their rights more forcefully, but the issue remains highly contested in many local contexts.

Experiences from West Africa (e.g. Mali, Niger and the Ivory Coast) show that, when land becomes scarcer, men and family heads are often prioritised in land allocations, while women's use rights are removed. Consequently, women's livelihood options depend upon the availability of remaining land or non-agricultural sources of income (Quan, 2007). While many women carry increased responsibility for household food security (due to, e.g., general food insecurity, increased incidents of divorce and male labour migration), their access to land is consistently threatened and often worsened.

Gendered reactions to increased scarcity of land

Defeminisation of agriculture: Seclusion

In the south of Niger, women are beginning to be excluded from agriculture, as the lack of land makes it impossible to extend farmland. The practice of secluding women and thus denying them access to fields is becoming more widespread, especially among young men, who have too little land to allow them to share it with their wives. In this practice, called Kublen Gona - seclusion from fields - the social norm of seclusion, together with local perceptions of Islam, justifies this new form of 'scarcity-induced' seclusion. The general opinion among men is that secluded women do not have the right to as much land as free women, if any at all, because they do not need it, as the husband will cover his wife's needs. It is important to note, however, that there is no evidence of a general defeminisation of agriculture in the Sahel; in northern Nigeria, for example, one sees women in the fields far more frequently than, say twenty or thirty years ago.

Revived claims of inheritance rights

On the other hand, some women in southern Niger have begun gaining access to land through the application of Islamic law. In land-scarce areas, women are increasingly demanding that Islamic law replaces customary law when land is distributed. Customary law has hitherto prevented women from owning land, but it has also guaranteed them access to land through their use rights to parts of their husband's land. As long as land was sufficient and enabled them to produce enough food, most women did not claim their inheritance of their natal land. But as the marital land plot becomes smaller, or as women lose access to land because of seclusion, the traditional distribution of land is being contested and women are starting to claim their inheritance rights in accordance with Islamic law. For secluded women, inheritance is the only way to obtain access to land, which they can cultivate by hiring labour or lend to their husbands, thus obtaining access to an income of their own.

Sources: Doka and Monimart (2004), Diarre and Monimart (2006).

These dynamics are obviously complex and varied. Women experience insecurity of tenure in some social contexts and not in others, and there are considerable differences between regions, social groups, villages and families. In general, more research on gender and intra-family property relations is needed. This research should be sensitive to the possible interplay between gendered property rights, negotiation over resources within households and other factors of gender inequality, such as women's access to labour and cash (Jackson, 2003).

In general, simply focusing on formal property rights tends to downplay the many means by which local people gain and maintain access to natural resources. Often social networks and kinship ties are the most effective and flexible way of accessing land. In this context, developing private property and, in so doing, enhancing the right to exclude others will often lead to greater insecurity for those who are unable to obtain formal title. This includes vulnerable groups such as women due to gender inequalities, pastoralists due to their land-use systems, and young people and new-comers due to their low social ranking. Customary tenure systems also tend to replicate prevailing forms of discrimination, particularly against women, which can thus be strengthened by formalising customary rights.

Furthermore, in most parts of the Sahel, only the state and a few individuals with title deeds are formal landowners. To obtain a title through formal channels is still a costly and complicated process and therefore out of the reach of most rural people. Title-holders can both gain and lose; gains can be made especially in urban areas, where the value of land increases rapidly. In some zones, such as the rapidly growing peri-urban areas of Mali's cotton zones, increased population pressure and the commercialisation of agriculture have created a demand for the formalisation of land titles. Benjaminsen et al. (2008) show that obtaining full titles in areas with high land values is expensive and out of the reach of most farmers. Poor landholders often come under pressure to sell off their holdings to developers and rich landlords, thus contributing to marginalisation and inequality. In many other cases, titling programmes have allowed wealthier and more powerful groups to acquire rights at the expense of poor, displaced or female land-occupiers (Toulmin and Quan, 2000; Quan and Toulmin, 2004). In those areas where titling is in high demand, one challenge is to make titles cheap and accessible to poor farmers. Another challenge is to secure the right of secondary access to rights-holders so they do not lose their access to the land through the process of formalisation.

Insecure land rights create gendered disincentives to sustainable land management

Several examples from West Africa highlight the particular disincentives faced by women wanting to invest in improving land fertility, because doing so would entail the risk of losing access to the land due to its increased value. In the Gambia, women in one area lost usufruct rights to communal garden plots when men were encouraged to plant orchards in plots which had hitherto been irrigated and cropped by women and which had high production potential (Quisumbing and Pandofelli, 2008). In Chad, women in some areas were reluctant to plant trees in their fields or to protect the soil, fearing that the field would be taken away from them by the village chief once fertility increased (Ouoba, n.d.).

Conflict-reduction: rights and institutional competition

The fourth argument for formalising property rights is that it reduces conflicts over resources during scarcity. In the context of increased competition between users and uses, clear property rights may contribute to reducing conflicts. But clear rights cannot prevent or resolve resource-related conflicts on their own, since it requires institutional capacity to govern different interests. However, use of and control over land is subject to local competition, conflict and power constellations (Lund, 2008). Changes in the power to control resources can accentuate conflicts at the local level by stirring up not only dormant conflict between different users of land, but also intra-family disputes over inheritance to land (Quan and Toulmin, 2004; Diarre and Monimart, 2006). Therefore, formalising rights does not always reduce conflict. It is necessary to take account of both the many different possible conflicts of interest among users and the competition between various institutions in seeking to validate claims. Thus, conflict resolution and prevention are about the recognition and negotiation of conflicting interests relating to land. This aspect is also important in the formulation of the policy, legislative and regulatory frameworks that form part of resource governance.

The steps ahead

A key question in relation to poverty-reduction in the Sahel is whether the formalisation of property rights in the form of land-titling will benefit the rural poor, especially the most vulnerable groups. Tenure systems in the Sahel are complex and vary from one local context to another. Great differences exist between land-tenure systems in agricultural and pastoral zones, and between those in rural and urban areas. The way land-tenure systems evolve also varies between areas. A development agenda that includes property rights should therefore be based on a strong analytical framework that can take account of these complexities and variations. In this chapter, we have discussed four key arguments for formalising property rights to land in the Sahel. In relation to these, the following steps are suggested for the future:

Issues for research

- Formal land rights are often not required for private investment in agricultural production to take place, but less is known about how clarity (or lack thereof) of use rights in collectively used land affects investment. A key area for research and experimentation is whether *local conventions* provide an operational tool for inducing agricultural investments in collectively used land.
- We also need more research on gender-specific and intra-family land relations that takes account of the possible interplay between gendered property rights and other factors of gender inequality, such as women's access to labour, cash and other resources and their influence on decision-making within the community and the household.
- Further knowledge is also needed on how Islamic and customary rules and norms are being interpreted and used to regulate the distribution of resources, and on the possibility of using these rules and norms for the promotion of vulnerable groups' access to land and land-based resources.

Issues for policy

- National policy formulation could learn from how *local conventions* are made through the popular participation of all stakeholders. Policy frameworks should recognise the validity of local tenure practises, with emphasis on the multiple ways in which poor and marginalised people obtain rights and access so that these ways are not neglected in the process of formalising land rights, but are registered and considered legitimate rights to land.
- Private property rights may not be the best model for protecting natural resources, particularly in pastoral areas. Tenure policies relating to pastoral zones should take into account pastoral tenure systems, and in particular the links

between water and land management, which are crucial for the environmental sustainability of rangelands.

- To obtain a title through formal channels today is costly and complicated and hence out of the reach of most rural people. Where there is a strong demand for titling, as in areas with high and increasing land values (e.g. in peri-urban and irrigated zones), titling should be low-cost and accessible to the poor in order to avoid increased marginalisation and inequality. Land registration should also prevent land that has been inherited or purchased by women from being registered in their husbands' names.
- In the context of increased competition between different users and uses, clear property rights may contribute to reducing resource-related conflicts, but they cannot prevent or resolve them on their own, since this requires institutional capacity to govern different interests. When facilitating such processes, it is important that practitioners engage with a larger range of issues related to equity and management, and not just with rules. Emphasis should be shifted away from the establishment and enforcement of rights towards institutional capacity-building and process. This requires policy support for decentralised forms of securing transactions, tenure and promoting management, which are low cost and accessible to the poor and to people with only user rights. Clear property-right mechanisms must be followed by action towards improving the access of vulnerable groups to information on land rights and land laws, thereby improving their capacity to negotiate over resources.

4. Natural resource governance issues

This section discusses two contemporary issues relating to the governance of natural resources in the Sahel. The first concerns the ‘nesting’ of customary institutions and new local governments in the context of decentralisation reforms. The second issue is the specific problems related to river basin (water) management.

Customary institutions and decentralisation

Decentralisation is one of the main policy initiatives of the 1990s in the Sahel and of great importance to natural resource management (NRM).¹⁸ Decentralisation is an integral part of a wider democratisation reform and is based on the idea that enhanced participation at the local level will bring about increased democracy, sustainable development and poverty-reduction (Hetland, 2007; Zobel, 2004; Cissé et al., 2003). Moreover, decentralisation reforms have been driven by a desire to replace post-independence centralized NRM (Bolwig et al., 2008b). In the past, central government interference has caused the emergence of open-access systems and increased conflicts between government and communities over the management of common pool resources (e.g. forests, grazing lands and wetlands). In this context, trends towards decentralisation and democracy have created new and unrivalled opportunities for local participation in the control over natural resources (Benjamin, 2008; Ribot, 2004). However, the real contribution of decentralisation to sustainable NRM has been questioned by many. One criticism is that the domain of NRM has been transferred to municipalities that are often ignorant or incapable of dealing with common property resource management (Bakayoko, 2007; Djiré, 2004; Hetland, 2007). In this context, an ambiguous co-existence of customary institutions¹⁹ and local government has emerged, which strongly influences the outcome of decentralisation reforms and hence sustainable NRM (Benjamin, 2008).

¹⁸ Decentralisation has been defined as the ‘devolution of resources and powers of the central state to local or private decision making bodies’ (Ribot, 1999) implying that not only local government, but also communities, NGOs, cooperatives and the private sector can be potential decentralised players. In this paper, we speak of decentralisation in a more strictly legalistic sense as a reorganization of the state to involve local autonomous government bodies, e.g. local governments (Ouedraogo, 2003).

¹⁹ Here customary institutions refer to socially and historically entrenched self-organised rule systems that are embedded in the social and historical experiences of communities. This is different from community-based institutions designed by development agents for specific projects (Benjamin, 2008).

Customary institutions and legal pluralism

Natural-resource governance in the Sahel is characterized by legal pluralism, which implies that rights to resources are based on different sources of legitimacy, e.g. customary laws, religious laws, state and international laws (Benda-Beckmann, 2003). However, legal pluralism goes beyond the distinction between customary and formal legal frameworks, as it involves different versions and interpretations of customary laws. Legal pluralism also deals with conflicts over who is the legitimate public authority to create, maintain, remake and overrule rules. The different interpretations of legitimacy make the co-existence of local governments and customary institutions ambiguous and risk undermining the authority and performance of both. However, ambiguity also provides space for 'forum shopping' in the sense that people can choose between different legal options to validate their claims (Benda-Beckmann, 2003). The ability to negotiate and to mobilise the right social relations thus becomes indispensable in obtaining access to resources (Berry, 1993).

While ambiguity may open up space locally for decision-making, particularly in remote areas, it also constitutes a source of insecurity. For instance, women are likely losers in this battle for rights to natural resources when their ability to negotiate for the specific resource is weakened, either by cultural norms and values that exclude women from the resource, or when formal legal governance structures and processes fail to ensure their participation. The way in which the pluralism of systems of rules is resolved in the context of decentralisation is thus decisive for future state–society relations in the Sahel.

However, attempts to resolve legal pluralism in the area of natural resources face a dilemma. On the one hand, local governments are expected to be accountable and democratic, but they often lack the capacity and legitimacy to govern natural resource access and use. Moreover, in many cases decentralisation has not significantly improved participation or representation at the local level (Crook and Manor, 1998; Ouedraogo, 2003; Bakayoko, 2007; Benjamin, 2008). On the other hand, customary institutions, although often considered legitimate by local people, often reproduce prevailing forms of discrimination, exclusion and prejudice which can weaken the rights of certain castes (e.g. former slaves), migrants, economic groups (e.g. pastoralists), women and young people (Bolwig et al., 2008b). Nevertheless, customary institutions constitute a central and powerful force in rural social and economic life (although there are also many instances where customary institutions have been abandoned). Furthermore, they still play an important role in NRM, partly because, in the Sahel, neither the central state nor local governments are able to govern resource access and use effectively.

Ambiguous co-existence of customary institutions and local governments

In Mali, the new pastoral charter (Law no. 01-004) authorizes municipalities to control flood pastures. However, in the district of Douentza in central Mali, villages situated close to the Tarabé River have for generations controlled access to flood pastures through a customary system based upon negotiated reciprocal access rights and village interdependence. The system allows the neighbouring villages to exchange access to flood pastures with other vital resources such as fishery and palm trees. Meanwhile, the municipalities have enforced bans on cutting down palm trees. These bans are respected despite the lack of legal mandate of the customary chiefs. Except for a recognized role in conflict-management, the decentralisation laws do not strengthen the mandate of customary institutions in NRM. The legal framework of the municipalities does often not provide room for village rules, despite Mali's long history of customary self-governance and resistance to the state.

Source: Benjamin (2008)

Recent studies have shown that, in the Sahel, decentralisation has to a large degree failed either to integrate or to replace customary institutions relating to NRM, which continue to function in the absence of effectual formal legal frameworks (Benjamin, 2008; Ouedraogo, 2003), regardless of the fact that customary institutions are not recognised by local governments. Policy discussions on decentralisation are often confined to the issue of the transfer of competences and powers from central government to the newly established local government. The assumption is that, *if* institutional arrangements related to NRM include local governments which are representative and accountable to the local population and which hold discretionary powers over public resources, *then* the decisions they make will lead to more efficient and equitable outcomes than if central governments made those decisions (Ribot, 2004: 1). This assumption has created a tendency to keep a technical and bureaucratic focus on the transfer of power and competences as the main obstacle to decentralisation. Yet this focus ignores the inherently political nature of decentralisation and pays little attention to the relationship between local governments and customary institutions.

River-basin water-management

Sahelian countries are almost by definition characterised by water scarcity, and thus water resources are subject to increasing competition between uses: flood recession agriculture in river valleys, traditionally sustaining high population densities, generally loses out when dams are constructed to facilitate modern irrigated agriculture or for hydro-power generation. Increases in irrigated areas in the river valleys, consuming great quantities of water, threaten downstream water uses that are sometimes of greater economic value than the upstream uses. In addition, the consequent decrease in base flow causes the disappearance of wetland ecosystems in the river valleys, leading to decreases in biological diversity. Water quality is also affected by the extension of irrigation, causing elevated concentrations of nutrients and pesticides downstream (Bolwig et al., 2008b). These observations point to the need for water management at the highest relevant level – that of the entire river basin – in order to avoid inefficient water allocation that favours specific local or national interests. This applies particularly to large-scale dam projects and the expansion of irrigated agriculture.

However, research has shown that competition for water often reflects social conflicts in general, in the sense that people and water uses that tend to be ignored in society at large risk becoming marginalised in the context of water management. Even though new water governance institutions are often assumed to be accountable and transparent, they rarely pay much attention to gender concerns, in spite of the important role played by women in the management and use of water for both productive and reproductive purposes (Odgaard, 2002). Similarly, farmers, carrying out ‘traditional’ flood-recession farming, pastoralists relying on dry-season grazing in flood plains and fishermen are all at risk of being marginalised. These vulnerable groups often lack economic resources, information and access to legal institutions and therefore risk losing access to water resources, vegetation resources dependent on the unregulated river flow, and fishing grounds to which they have customary, or even constitutional and human rights. In principle, economic gains associated with improved access to water resources, e.g. by control of river flow facilitating ‘modern’ irrigated agriculture, would allow those downstream suffering from the consequent losses to be compensated. However, these groups do not possess the political power and capacity to negotiate such compensation (Ravnborg, 2004). Downstream losses may also be caused by upstream pollution, nutrients from the use of fertilizers or pesticides.

In addition to losses in traditional farming and livestock production, upstream water regulation may have environmental effects downstream, which may be ‘valued’ economically. While the valuation of natural ecosystems in themselves may be difficult,

some of the threatened ecosystem services, provided by ecosystems in the flood plains, may be highly valued. These may also include loss of current and future incomes from eco-tourism dependent on the maintenance of wetlands. Wetlands of West Africa are, among other uses, important as winter habitats for European birds.

When establishing river basin-scale institutional frameworks for the regulation of water resources, emphasis tends to be on balancing the national interests of the countries involved, and on assuring hydro-power production and the provision of water for a 'modernized' irrigation sector. These interests are, of course, important, yet the resulting top-down management tends to disfavour other relevant interests associated with traditional uses of flood plains and with current and future use of their environmental services. Little provision is made in river-basin management frameworks for responding to the views of the marginalized groups on which the losses are imposed.

The steps ahead

Issues for research

- Further knowledge is needed on how women, youth and different marginal groups in local communities articulate their right of access to natural resources in a period of co-existence between customary and new local governance institutions.

Issues for policy

- The attempts to build effective local governments that are responsive and accountable are both promising and challenging: decentralisation creates an opportunity to increase power and resources at a level that is closer to, better understood by and more easily influenced by local people. The greater proximity between decision-makers and citizens can improve information flows and facilitate participation in local priority-setting processes, thereby improving their 'quality'. However, realizing this potential requires that the complexity of legal pluralism, especially regarding the role of the customary authorities, is taken into account in decentralisation processes. Reconciling legal pluralism is not a matter of authorizing communities to continue organizing along traditional lines. There is a need for a policy framework that allows different groups of local people to articulate their needs, find innovative solutions to local problems and enhance accountability and representation at the same time. In relation to

this, because of the variety and differences in local conditions, it is essential to maintain practical, open and flexible approaches to ‘institutional nesting’ under decentralisation. Hence, to achieve synergies between customary and local governments, we need a pragmatic approach that takes existing structures as its starting point, but which also opens up space for improved participation by social groups with little influence in existing structures, such as women, young people and marginal producer groups. This should provide room for self-organization while also building links with the state through local government.

- Whether local government is (will become) more equitable than customary institutions also depends on the quality of local leadership and the availability of adequate expertise (be it local government staff, support from sector ministries, contractors etc.). In this regard, there is a need for support from foreign donors, NGOs and central government agencies. In addition, broad local capacity for dialogue and negotiation is essential for improving both NRM and livelihoods. Therefore, building the capacity of local governments must be accompanied by initiatives and policies that empower citizens and their customary institutions to participate effectively and to voice their needs and expectations. NGOs and local governments are important for the provision of such capacity to citizens.
- Customary rights are mentioned in several legal frameworks relating to NRM in the Sahel (water policies, land codes etc). However, the specific roles, mandates and responsibilities of customary institutions need to be much more clearly defined for these frameworks to be effective and inclusive. Development agencies should support policy development in this area through assistance to central and local governments as well as to NGOs.
- Danish agricultural programme support to the Sahel is in large part channelled through municipal authorities. In this respect there is a need to consider explicitly the role of customary institutions in NRM, to examine how these institutions could influence agricultural programme outcomes, and on this basis, to integrate customary institutions properly into these programmes in terms of their expected roles, responsibilities and rights to programme resources. In forest conservation, for example, instead of relying on fines, customary institutions could serve as mediators between communities and technical services, e.g. by mobilising local people for activities aimed at a sustainable use of trees that serve local livelihoods. When involving customary institutions, however, care should be taken that ‘less democratic’ chiefs do not monopolise programme activities so that the poor and politically weaker groups are excluded from participation.
- Particularly for water, since upstream uses affect downstream users, transnational institutions such as ‘river commissions’ are required to take fair and ef-

fective management responsibility, and advanced technical tools such as hydrological models must be available to such organizations. The expected increase in very intense rainfall events, causing flooding in river valleys, further adds to the necessity of establishing means of predicting river discharge (Bolwig et al., 2008b). This river-basin water-management approach is, however, top-down and caters neither for local knowledge and management institutions, nor for local autonomy in NRM, nor for democratic involvement by local communities and marginal groups in decision-making on competing water uses. Reconciliation of these two NRM approaches is very much needed in water management. The development of a hierarchical institutional framework that combines overall river basin-scale consistency and local democratic involvement should therefore be supported.

5. Land degradation and global climate change

Land degradation

In recent decades, since the droughts of the 1970s and early 1980s, land degradation (desertification) has been considered the greatest environmental threat to economic development and food security in the Sahel, and much political and environmental rhetoric still revolves around this idea. However, analysis of time-series satellite data from 1982 to date, using an index of 'greenness' as a proxy indicator of bio-productivity, seems to show that the decrease in the productivity of the vegetation, undoubtedly associated with the droughts, has been reversed, and that vegetation productivity has increased substantially over the period (Anyamba and Tucker, 2005; Eklundh and Olsson, 2003; Herrmann et al., 2005; Olsson et al., 2005) (the different possible interpretations of this finding are not discussed in detail here). In terms of policy, this 'greening of the Sahel' implies that development policies need not assume a continuous downward trend in environmental and agricultural conditions (Warren, 2005). Rather, policies should cater for making the best of improved agricultural potential, assuming that this is a correct inference and that the positive trend continues.

Land degradation has often been assumed to be the effect of the mismanagement of natural resources, whether soil nutrients (overused by cultivation), woody vegetation (overused for firewood or charcoal production) or pastures (overgrazed by pastoral herds). While examples of such over-use and mismanagement can certainly be found, not least concerning the decrease in woody cover (Wezel and Lykke, 2006), the recent 'greening of the Sahel' appears to be driven primarily by rainfall recovery following the drought cycle of the 1980s, at least when considering the Sahel as a whole. This focuses interests even more on the climate-change outlook for the Sahel.

Climate trends in the Sahel

The Sahel-Sudan has been the scene of climate variations and trends for a long time, as readily observed from geology and geomorphology and evident from historical sources and archaeological findings. The region was hit by one of the largest climatic anomalies of the twentieth century, namely a series of droughts with declining average annual rainfall which lasted from the late 1960s to the mid 1980s. A certain recovery in rainfall may be observed over the last couple of decades (Nicholson, 2005), even though a weakly developed observational network makes it difficult to assess the trend accurately. It has often been assumed that the drought was a consequence of

'global warming' and that it should therefore be expected to continue and intensify. There is little basis for this assumption, however, and current projections, reported in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 4AR) (Christensen *et al.*, 2007), do not point in any definite direction in the region (see below). This has considerable implications for development policy: national and international policies that are based on the assumption of a continued decline in rainfall (or of low levels compared to previous periods) may have to be revised. Governments in the region making assumptions of this sort include Mali (Danida, 2008a) and Burkina Faso (Danida, 2008b).

More specifically, the IPCC 4AR compares outputs from more than twenty different climate models and finds that their projections for the Sahel-Sudan point in widely different directions. It appears that models based on US research tend to suggest a drying trend, while those with a European basis tend to suggest increasing rainfall (Christensen, personal communication). Since the two groups of models each share certain characteristics – for instance, with respect to the way convective systems (which are the source of a large part of the rainfall in the region) are represented in the models – this is not surprising. There are also spatial differences in projections for the region, including a certain consensus that the westernmost part of the region will become drier.

In public debates, it is often stated that Sub-Saharan Africa (SSA) will suffer more from climate change than any other region in the world and will have the greatest difficulties in adapting to climate change. As noted above, it is uncertain whether this will apply to the Sahel: since the region is classified as semi-arid, the key climatic variable is certainly rainfall, and rainfall trends are most uncertain. It is therefore very difficult to assess the impacts of future climate change in the region and hence to suggest strategies of adaptation. The results of the climate modelling exercises do, however, offer some guidance:

- It appears that both the intensity of rainfall events and the frequency and length of dry periods in the rainy season may increase, irrespective of the projected trend in annual rainfall, due to generally increased variability and the warmer atmosphere. Adaptation to this involves a strengthening of early warning systems for both drought-related crop failure and flooding. Thus, adaptation to climate change may necessitate an enhancement of disaster preparedness, and coordination of efforts in these two domains should be ensured. Other desirable responses to increased variability in rainfall include changes in technol-

ogy (seeds, soil and water soil conservation, etc), formal and informal insurance against production failure, interventions that reduce the barriers and costs of trading food between food-surplus and food-deficit regions; these regions may change from year to year).

- The great differences among climate model outputs suggest that projections from individual models should be interpreted cautiously, and that a probabilistic rather than a deterministic approach to climate change should be adopted when developing adaptation strategies and 'climate-proofing' development projects. Currently, such caution does not characterize all actors in the region, neither governments nor NGOs and donors.

Generally the poorest populations and marginal groups are more vulnerable than others to natural disasters and crises and are therefore also impacted most by climate change. Furthermore, social vulnerability has a direct gender dimension (Carvajal-Escobar et al., 2008). Several studies indicate that more women die during and after big natural disasters in countries where their socio-economic status is low (Neumayer and Plumber, 2008). Indirect gender dimensions can also be observed during crises, as girls are withdrawn from school and the work loads of women and girls is increased, due to their tasks of collecting water and firewood, caring for the sick, etc. (Terry, 2008).

Benefiting from climate change mitigation

CDM projects

Apart from the uncertain direct effects of climate change, the Sahel will certainly be affected in numerous indirect ways. The Kyoto Protocol Annex-1 countries are eagerly looking for inexpensive ways of fulfilling their Kyoto obligations through the Clean Development Mechanism (CDM). The increasing demand for carbon credits may impact on NRM in the Sahel, where afforestation projects may be established, yet currently the extent to which this is happening is limited. As prices for carbon credits may be expected to increase in the post-Kyoto period, especially if the US joins, afforestation projects may in principle become competitive. The question of whether the Sahel will ever be able to compete with other parts of the world on the CDM market remains unresolved, however. The amount of carbon stored per unit of area above and below ground in the dry woodlands and savannas of the Sahel is quite limited compared to the values found in humid forest areas, yet the areas in question are very extensive. There are also many potential problems associated with

large-scale afforestation in the region, especially with respect to social sustainability, but there are also potential environmental benefits.

Biofuel production

Of more immediate relevance to the region may be the current expansion in the production of biofuels on the global scale, driven by the attempts of the US and Europe to reduce their dependence on oil, especially in the transport sector, and by the need for Annex-1 countries to reduce their greenhouse gas emissions. The effects are already being felt in the Sahel, both directly as a rapidly growing interest in producing feed-stock for biofuel production, and indirectly through the increase in global food prices caused partly by the use of agricultural products and farmland for biofuel production.²⁰ It is not evident that the Sahel will be able to compete with other tropical and sub-tropical regions on the bio-fuel market. Presently, bio-ethanol produced from sugarcane in Brazil and biodiesel produced from oil palms (mostly in South-East and East Asia and the Pacific) are those offering the lowest costs, while production systems in temperate regions (corn in the US and rape seed in Europe) are heavily subsidized. In the Sahel, several options are worth considering. First, vegetable oil produced from the shrub/tree *Jatropha carcus* is promoted, either for cultivation in large-scale plantations or on a small scale at village level. Secondly, 'first-generation' bio-ethanol production based on feed-stocks such as cassava and sorghum may become relevant, yet this has not yet happened to any great extent. There is scattered information on cases of 'land grabbing' by companies or individuals wishing to produce bio-diesel or bio-ethanol feed-stocks on a large scale, but little serious analysis of current developments is available. Thirdly, it may be worth waiting for the development of second-generation technologies for bio-ethanol production, since these will enable the use of agricultural and forestry residues as feed-stock.

The increasing interest in producing bio-fuel feed-stocks in the Sahel begs the question of whether it is ethically and politically acceptable to use foodstuffs and farmland for bio-fuel in a situation of widespread malnutrition, rising food prices and an increasing population? While the immediate response is likely to be negative, deeper reflections on the issue may not lead to a clear-cut answer. For instance, one could ask whether it is more ethical to produce fibre (e.g. cotton) or animal feed than biofuels? Also, when biofuel feedstock production (e.g. of cassava for bio-ethanol)

²⁰ The causes of the steep increase in food prices are being widely discussed, and the increased demand from the biofuel side may not be the most important determinant. On the other hand, it is evident that, when oil prices rise to the recent high levels (more than US\$100 per barrel in 2008), a range of bio-fuels become economically profitable, and prices of 'biomass-Joules' and 'oil-Joules' become closely linked.

replaces non-food cash crops (e.g. cotton), this does not affect local food supplies but may instead improve food security through improved income. One important aspect to be considered in this regard is whether the biofuel feedstock production will generate employment and income for the (male and female) rural population, whether through the involvement of small-scale producers or through employment creation on larger farms. Obviously no simple or universal answers can be given to such complex questions, and each case must be evaluated independently.

The sustainability of biofuel feed-stock production may also be debated as it may have considerable negative environmental impacts. It may involve unsustainable use of water resources, high use of mineral fertilizers with environmental side effects and the destruction of valuable ecosystems. In situations of competition for scarce water resources in semi-arid areas, irrigated cultivation of bio-fuel feed-stocks may well be economically inefficient as well as worsen existing inequalities in water access. This could be the case in both the Senegal and the Niger River basins. The problem of efficient and fair water management in such river basins may thus become even more acute. Finally, if feed-stock production involves high inputs of synthetic fertilizers, the use of machinery and pumped water, the net energy gain (and net CO₂ emission reduction) may be quite small or non-existent.

Energy systems and climate change

Climate change mitigation and the transformation of energy systems are two closely related issues in the 'Annex 1 countries' of the Kyoto Protocol. In the least economically developed 'non-Annex 1 countries', such as those of the Sahel, this relationship is less obvious. It may, however, be expected to become closer in the post-Kyoto period, as even LDCs may have to accept emissions caps in some form. In addition, due to the steep increase in the prices of fossil fuels, and of liquid fossil fuels in particular, there is an economic incentive to replace these with less expensive alternatives. Given the potentials of the Sahelian countries, renewable energy may well become the most attractive, especially in the longer term. Hydropower is already a very important component in the electricity sector (e.g. 81% of the electricity distributed on the national grid in Mali is hydropower), yet the potentials are somewhat limited. Solar energy systems, thermal as well as photovoltaic, for rural energy supply at village and household level are relatively widespread and have great potential. In some areas, wind power has the potential to replace expensive diesel for urban power production, especially in urban centres not connected to the national grid. Use of biomass, primarily agricultural residues, for power generation in small, de-centralised power

plants is another under-used option. Liquid bio-fuels have been discussed above. All in all, the combined effects of the global need to reduce CO₂ –emissions to mitigate climate change and the local economic incentives to reduce the use of expensive fossil fuels add up to an increased focus on the transformation of national energy systems. Development assistance, in combination with the CDM, may contribute to this transformation.

Adapting to climate change

Over the last couple of years, the interest in adaptation to climate change has been rapidly increasing, and obviously the Sahelian countries have received particular attention. There are considerable ongoing research activities, looking into past, present and future adaptation strategies. One of the observations emanating from such research indicates that, because of their social role as providers of household food security and firewood, water, etc. – often under conditions of scarce natural resources – rural women are in a strong position to observe changes and identify local adaptation measures (Röhr, 2007; Carvajal-Escobar et al., 2008). The role of women and of other social groups with particular local knowledge in finding appropriate adaptation measures should thus not be neglected.

With respect to the future, it is evident from the above that adaptation is a difficult issue, as the direction of change of the key variable, rainfall, remains uncertain. As discussed in relation to the issue of land degradation, policies and adaptive measures should not be based on assumptions of decreasing rainfall but should rather be flexible and cater for the possibility of a positive trend. Irrespective of the direction of change of rainfall, however, it is clear that both drought periods during the rainy season and episodes of high intensity rainfall, causing flooding, are likely to become more frequent and violent. This implies that policies should be designed to reduce the risk to human life, infrastructure and crops and livestock caused by increased risks of flooding in river valleys. Human use of floodplains has become more intensive in recent decades, not least during the 1970s and 1980s, when rainfall was generally low.

In order to adapt efficiently to changes in rainfall patterns, land use may need to be changed. If rainfall increases generally, it will be possible and economically attractive to extend cultivation further to the north into areas presently used for grazing, while grazing areas may also be extended to the north. But as land tenure and user rights gradually become more formalized and secure, the possibility of adapting flexibly to

rainfall change may be reduced. Mobile pastoral systems are particularly at risk. Also, national borders may reduce this flexibility.

The steps ahead

Issues for research

- The 'greening of the Sahel', as observed from satellite data, needs to be better understood. What changes on the ground have taken place, what implications are there for both agricultural areas and natural ecosystems, and what are their causes? The age-old debate on the relative importance of bio-physical and 'human' factors must be resolved in order to generate proper policy recommendations.
- Future climate change will be of immense importance to the Sahel, and the need to reduce the uncertainty concerning rainfall trends is great, as well as to improve seasonal forecasting capabilities. This involves basic climatic research efforts to understand the processes better and to represent them adequately in both global and regional climate models.
- With respect to local mitigation activities, the potential competition for land, labour and water between food and biofuels need to be studied further in order to establish whether and where biofuel feed-stock (e.g. Jatropha, sugar cane and cassava) production is more profitable for farmers than food-crop production, taking into account both revenues and risks.

Issues for policy

- While awaiting climate-change research that will lead to more reliable predictions of rainfall trends, adaptation actions in the Sahel region should be of a generic kind, making few assumptions concerning the size and direction of trends. This points in the direction of actions that do not differ greatly from those recommended in relation to poverty-reduction and promotion of sustainable natural-resource management. Given that, irrespective of the size and direction of changes in annual average temperature or rainfall, there is reason to expect that extreme events will become more frequent and more extreme, adaptation actions should focus on preparedness to cope with climatic disasters, whether prolonged drought periods in the monsoon season or large floods.
- Concerning mitigation activities, three issues need to be raised. First, if biofuels turn out to be an attractive option, what are the major factors controlling this development, and to what extent are they susceptible to policy intervention?

This involves also the question of whether food production for Sahelian people will be disadvantaged owing to Northern political and economic interests in biofuel production. Secondly, the economic and political preconditions for 'green CDM' to have any significant effect in the Sahel need to be studied in more detail: what prices for carbon credits are required for tree-planting and other 'green CDM' activities to become economically attractive, and what environmental and social consequences would this have? Thirdly, growing global demand for energy and increasing prices of fossil fuels are likely to cause an increased interest in renewable energy sources within the Sahel. The potential for replacing fossil fuels with renewable energy with financing through the CDM should be considered. Post-Kyoto commitments, in whatever form they may take, are likely to strengthen this trend, as are further increases in fossil energy prices. There is a need to understand better the options available to the Sahelian countries, as well as the risks encountered in the process. These risks include those associated with the expansion of biofuel production (mentioned above) as well as those related to greater reliance on hydropower.

6. Conclusions

This paper has discussed selected issues of concern to sustainable and pro-poor natural-resource management in the Sahel in the context of the current changes in key NRM drivers of relevance to policy – markets and value chains, property rights, decentralised governance, and global climate change. The aim was to contribute to the search for new policy directions, rather than provide definite answers or recommendations.

Markets in the Sahel have numerous imperfections, which in particular affect poor and marginalised groups, who are often forced to buy food or sell their products on unfavourable terms. And while market participation is inherently risky, the rural poor in the Sahel are both more exposed to market risks and less able to mitigate or recover from them than most other people. Market participation may thus lead to the loss of income and assets and create disincentives for investing in or conserving natural resources. At the same time, it is clear that Sahelian resource-users are deeply integrated into markets for food and (own) agricultural products, as well as for labour and land, and that disengaging from markets is not a viable strategy for escaping from poverty, nor a way to improve NRM. Indeed, in some places market development has been a key driver of sustainable and profitable agricultural intensification. Urbanisation and income growth now appear to be replicating such favourable conditions in many parts of the Sahel and to be inducing major shifts in the composition and destination of rural production. That said, not enough is known about how rural–urban linkages play out in different parts of the region, nor about how different social groups take part in market development and what effect this has on securing and improving their livelihoods.

But market development poses great challenges for policy: because markets operate largely outside the public domain and sometimes cross national boundaries (i.e. they are not easily ‘governed’); because building the supporting infrastructure and institutions is expensive and involves coordination among many ‘sectors’; and because increasing access and competition may go against the interests of powerful groups in society. In this context, creating more efficient, more inclusive and environmentally friendlier markets in the Sahel will require new and more targeted approaches. One such approach – value-chain development – focuses on the economic relationships between market actors (‘private governance’), while recent work also explicitly considers poverty and environmental aspects. One challenge is to build up the links to ‘public

governance' (e.g. the role of local government). Another approach – rural territorial development (RTD) – takes public governance as its point of departure. It is based on larger territorial 'units' than the district, or the community that is the focus of *Gestion de Terroir* approaches, as well as the inclusion of urban centres in strategic planning. It also emphasises the inclusion of the private sector and civil society in decision-making. These components seem conducive to supporting market development. One drawback is that RTD is quite demanding on human and organisational resources, while the links to 'private governance' are still poorly developed.

A key issue for poverty-reduction in the Sahel is whether the formalisation of property rights in the form of land-titling and the registration of water rights benefits vulnerable groups. It has been shown that possessing formal land and water rights does not necessarily lead to increased investment, environmental protection, empowerment and conflict reduction. The focus on formal rights tends to ignore the various sources through which poor and marginalized people, as well as women, obtain (or lose) rights to resources. In order to clarify rights, it is useful to take as one's point of departure people's own experiences in negotiating access to and control over natural resources and to learn from them. In the context of increased competition, clear property rights to water and land cannot prevent or resolve conflicts on their own: institutional capacity is also required to govern the multiple interests in water and land. Particularly in the case of river-basin management, large-scale 'river commissions' with the capacity to manage scarce water resources and conflicting interests, and with appropriate representation of all different social groups affected, are needed to avoid inefficient and unequal water allocation. However, the top-down approach inherent in river-basin management might increase the distance from rural people. Thus, the challenge consists in integrating local autonomy and democratic involvement in these hierarchical institutional frameworks.

Trends towards decentralization and democratic reforms have created new opportunities for local participation in the control of natural resources. The greater proximity between decision-making and resource-use can improve information flows and facilitate participation in local priority-setting processes, as well as improving their quality. However, the democratic benefits of decentralization have been questioned. Current policy debates have a tendency to focus on the technical aspects of transferring powers from the central state to local governments while ignoring the relationships between the latter and other parts of local society. In this regard, an ambiguous co-existence of customary institutions and local government has emerged that strongly influences the outcome of decentralisation reforms and hence sustainable NRM. Decentralisa-

tion has to a large degree failed either to integrate or replace customary institutions relating to NRM, which continue to function in the absence of effective formal legal frameworks. Realizing the potential of decentralisation requires that the complexity of legal pluralism, especially regarding the role of customary authorities, is taken into account, and that the way in which these authorities include or exclude the interests of marginal and vulnerable groups is being assessed. A policy framework is needed that allows local people to articulate their needs and to find innovative solutions to local problems while also enhancing accountability and representation.

With respect to environmental change and global climate change, it is clear that the 'land degradation narrative', typical of the last three decades, and the 'adaptation to climate change rhetoric', now dominating the headlines, must both be taken with a grain of salt: while land degradation in the Sahel may certainly be a problem in specific places at specific times, it is not the all-dominating trend/problem; similarly, the prospects for climate change are extremely uncertain for the Sahel. Thus, realities are far more nuanced than is often assumed, and policies should be revised to reflect this. This implies that 'combating desertification' and 'adapting to climate change' require policies and actions that are not fundamentally different from those found with either 'pro-poor and sustainable NRM' or the aim of reducing vulnerability to environmental hazards.

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Annex A. Danish-funded development assistance projects to NRM in the Sahel

This overview covers Burkina Faso, Niger and Mali up to the year 2005.

Table A.I. Burkina Faso

Project name (English)	Project name (French or Danish)	Period	Project type	Funds*	Project focus**	Implementing organisation
Regional plan for the Sahel region of Burkina Faso (to improve NRM)	Schéma régionale d'aménagement du terroir	2004-2005	Sector programme sub component	N.A.	Planning of NRM	Danida and Government of Burkina Faso
Danish Support Programme for the Development of the Agricultural Sector in Burkina Faso. Final Programme report.	Programme d'Appui Danois au Développement du Secteur Agricole Burkinabe. Rapport de Clôture de programme	2000-2006	Sector programme	Budget: DKK 326.30 million in the period 2000-2004 (the actual period did not end until 2006)	*NRM *Micro credits *Support private initiatives *Institutional support to the sector *Improve living conditions of rural population	*Danida *Ministry of Agriculture, Hydraulics and Fisheries *Ministry of Economy and Development *Ministry of Finance and Budget
Danish Support Programme for the Development of the Agricultural Sector in Burkina Faso. Sub Component concerning NRM.	Programme d'Appui Danois au Développement du Secteur Agricole Burkinabe. Composante A: gestion des ressources naturelles (PADDAB I)	2000-2006	Sector programme sub component	Budget: DKK 207.40 million Actual: DKK 214.71 million	*NRM in Seno/Yagha *Rural development in Boulgou	*Danish ministry of Foreign Affairs, Danida *Ministry of Agriculture, Hydraulics and Fisheries
Danish Support Programme for the Development of the Agricultural Sector in Burkina Faso. Sub Component concerning rural credits	Programme d'Appui Danois au Développement du Secteur Agricole Burkinabe (PADDAB). Composante B: Credit rural	2000-2006	Sector programme sub component	Budget: FCFA 4.133 billion Used as of Dec. 25th 2005: FCFA 3.285 billion Danida contribution: DKK 46.9 million.	*Micro financing	*Danida *Ministry of Agriculture, Hydraulics and Fisheries, Government of Burkina Faso *Ministry of Finance and Budget
Danish Support Programme for the Development of the Agricultural Sector in Burkina Faso. Report on capitalization of PADDAB I.	Programme d'Appui Danois au Développement du Secteur Agricole au Burkina Faso. Rapport de Capitalisation du PADDAB I	2000-2004	?	FCFA 31 billion	*NRM in Seno and Yagha (PGRNSY) *Rural Development in Boulgou (PDRB) *Local development in Komondjari (PDLK)	Danida
Support Programme for Agricultural Development in Burkina Faso, phase II (PADAB 2006-2011)	Programme d'Appui au Développement de l'Agriculture du Burkina Faso, Phase II (PADAB II 2006-2011)	2006-2011	?	DKK 284.9 million.	*Improving institutional capacity *Decentralized rural development *Increase the population's access to financing	*Danida *Ministry of Agriculture, Hydraulics and Fisheries, Government of Burkina Faso *Ministry of Finance and Budget
Sector programme support to water sector in Burkina Faso	Sektorprogrammet støtte til vandsektoren i Burkina Faso	1997-2004	Sector programme	DKK 423.60 million (SPS funds), DKK 2.92 million (project funds)	*Water and sanitation *Sustainable management of water resources	Danida, Ministry of Agriculture, Water and Hydraulics
Sector Support for Water and Sanitation	Vand- og sanitetssektorstøtte, Fase II, (PADSEA II)	2005-2009	Sector support	DKK 337.60 million	*Water and sanitation *Water Supply *Integrated Water Resource Management	Danida, Ministry of Agriculture, Hydraulics and Fisheries

Project name (English)	Project name (French or Danish)	Period	Project type	Funds*	Project focus**	Implementing organisation
Village water in Boulgou, Kouritenga and Ganzourgou, PHIVES, phase 2	Landsbyvand i Boulgou, Kouritenga og Ganzourgou, PHIVES, fase 2	1998-2004	?	DKK 117.15 million	*Water and sanitation *New wells	Danida, Ministry of Water and Environment, Ministry of Agriculture, Hydraulics and Fisheries Resources
Sector Programme Support to agricultural sector in Burkina Faso	Sektorprogramstøtte til landbrugssektoren i Burkina Faso	2000-2005	Sector programme	DKK 362.3 million	*NRM *Capacity building *Institutional support to Ministry of Agriculture, M. of Economy and M. of Development	Danida and Ministry of Finance
Sector Programme for Agricultural Sector	Landbrugssektorprogram, Fase II	2005-2011	Sector Programme	DKK 274.9/284.9 million (Country framework/total)	*Capacity building of Agricultural M. *Development of sustainable agricultural production	Danida, Ministry of Agriculture, Hydraulics and Fisheries
Sector Programme Support for Energy in Burkina Faso	Sektorprogrammet for energi i Burkina Faso	2000-2006 (Plan was only 2000-2004)	Sector Programme	DKK 315.00 million. Some reports says DKK 360 million.	Sustainable use of firewood through better use of existing forests	Danida and Ministry of Finance
Phasing Out Support to the Energy Sector	Udfasning af støtte til energisektoren	2005-2008	?	DKK 40 million.	Establish mechanisms to use the Kyoto Protocol	Danida and Ministry of Energy
Interdisciplinary environmental research	Tværfaglig miljøforskning	1994-2005	?	DKK 12.20 million	Education concerning collection and analysis of environmentally related data	*Danida *RUC *Université Polytechnique de Bobo-Dioulasso *Université de Ouagadougou *KU
Construction without timber in the provinces Soum and Oudalan	Convention de Cooperation entre Development Workshop et L'Ambassade Royale de Danemark à Ouagadougou concernant le projet de construction sans bois dans les provinces du Soum et de l'Oudalan	3 years	?	FCFA 181.32 million, from which FCFA 129.90 million from Danida. Further, FCFA 63.23 million from the Embassy of the United Kingdom.	*Reduce pressure on natural resources *Development of local economy *Develop local capacity to respond to habitat needs in a developing environment	*Danida
Plantation with essential local fruits/vegetables	Plantation d'essences fruitières locales	2003	?	DKK 29,402	Facilitate development of the sort of vegetables used in the traditional medicines	*Association Clairé *Danida
Institutional support to the SP/CONAGES (2nd phase)	Institutionel støtte til SP/CONAGES (2. fase)	Dec. 1996- Dec. 1997	Standard project, environmental sector	DKK 838.513	Improve the management of the environment and the natural resources through the SP/CONAGES's activities	*Danida *SP/CONAGE

* It is the last known figure that is used, i.e. if there are figures for the project in 2003, 2004 and 2005, the figure from 2005 is used. And it is the projected, not the actual figure, that is used.
 ** Only those components relevant for NRM are included. Other activities in the projects are left out for this purpose.
 Source: Based on 'Ar-sberetninger for Danida Projekter i Burkina Faso 2003-2005'

Table A2. Niger

Project name (English)	Project name (French or Danish)	Period	Project type	Funds*	Project focus **	Implementing organisation
NGO based Agricultural Projects in Niger	Ngo-baserede landbrugsprojekter i Niger	1998-2008	?	DKK 130.69 million	*Support for NRM in Mainé Soroa * Plan for action concerning land rights *Support for NRM in the municipalities *Support for Farmers along the Kamandougou River	Danida and Ministry of Finance
Water Project in Diffa and Zinder	Vandprojekt i Diffa og Zinder	2001 -2006	?	DKK 90 million	*Improve the infrastructure for drinking water for villagers and pastoralists	Danida and Ministry for Water Supply and Environment
Support for Construction of Houses without the use of wood	Støtte til konstruktion af huse uden træ	1992-2002	?	DKK 30.17 million	*Minimize the amount of wood used for building houses	Danida and International Union for Conservation and Nature (IUCN)
Support Programme for the population in Air-Ténéré concerning sustainable NRM. Governing the voluntary social work in the Air-Ténéré reserve (MOSRAT)	Programme d'appui aux populations de l'Air-Ténéré pour la gestion durable de leurs ressources naturelles. Maîtrise d'oeuvre sociale dans la réserve de l'Air-Ténéré (MOSRAT)	2001 -2005	?	CHF 4.39 million from DDC DKK 1996 million from Danida	Objective no. 4: Better knowledge of tendencies and efforts in the global ecosystem on a regional level	DDC and DANIDA
Support Project for conjoint Management of the Sylvo Resources of the Sylvo Pastoralists (PAGCRSP)	Projet Appui à la Gestion Conjointe des Ressources Sylvo-Pastorales (PAGCRSP)	2001 -2003	?	* FCFA 414.555.975 * DKK 4714 million.	*Decentralized management of the resources of sylvo pastoralist community in the agro-pastoralist zone * Develop national strategy to help facilitate process towards decentralized management of the resources of the sylvo pastoralist community	*SOS Sahel International GRAC-GRN *Danida
Support Project for conjoint Management of the Sylvo Resources of the Sylvo Pastoralists (PAGCRSP II)	Projet Appui à la Gestion Conjointe des Ressources Sylvo-Pastorales (PAGCRSP II)		?	?		*Ministry of Animal Resources *Ministry of Hydraulics, Environment and Fight Against Desertification
File on Support Project concerning support to secure land tenure, phase II.	Dossier de Projet Appui à la Sécurisation Foncière, Phase II	2005-2007		FCFA 199.80 million	Creation and diffusion of information to the different users of the natural resources in the Mirrah Department	*Mirrah Departement
Food security through development of gardening	Fødevarerikthed gennem udvikling af havebrug	2001 -2004	Project concerning support to NGO and personnel, Single Project, Alliance Programme	DKK 2.04 million	*Increase of production of vegetables to improve food security * Construction of wells * Loans to women's micro projects	Caritas Danmark

Project name (English)	Project name (French or Danish)	Period	Project type	Funds*	Project focus **	Implementing organisation
Danish Support Project for Rural Development in the regions of Zinder and Diffa, Phase II	Projet d'Appui Danois au Développement Rural dans les régions de Zinder et de Diffa, Phase II	2003-2008	?	?	Report is an overview of the activities of the working group. The environmental aspects of the sub-projects must be accounted for.	Foreign Ministry of Denmark, Danida
Danish Support for Rural Development (ADDR II) Zinder/Diffa. Support Project for NRM.	Appui Danois au Développement Rural (ADDR II) Zinder/Diffa. Projet d'Appui à la Gestion des Ressources Naturelles.	2003-2008	?	FCFA 1,312,988,000	**Improve agricultural production and forest production in the project zone	**NGO Karkara * AFVP
Study of the Result of Danish Support for the agricultural sector (ADDR I and ADDR II) and the Hydraulics Sector in the regions of Zinder and Diffa.	Étude de capitalisation de l'appui danois au secteur agricole (ADDR I et ADDR II) et au secteur hydraulique dans les régions de Zinder et de Diffa	1991-2005	Project?	DKK 317 million	**Agricultural Development **Sanitation **Rural Hydraulics	Danida
Support Programme for the Sector for Water Hygiene and Sanitation (PASEHA)	Programme d'Appui au Secteur Eau, Hygiène et Assainissement	2007-2009	Sector Programme	DKK 104.4 million from Danida, DKK 980,000 from the Government of Niger	Improve access in a sustainable way to drinking water and sanitation and thereby improve hygiene for rural and semi urban population	**Danida **Ministry of Hydraulics, Environment and Fight Against Desertification
Support Project concerning Rural Financial Systems (PASFR ADDR II). Definition of criteria for retrocession of the lines of credit on the level of the mutual savings and credits N'Gada.	Projet d'Appui aux Systèmes Financiers Ruraux (PASFR ADDR II). Définition des Critères de la Retrocession des Lignes de Credit au Niveau de la Mutuelle d'Épargne et de Credit N'Gada	1998-2002	?	?	**Micro financing	**NGO Karkara **DED **Danida
Rural Timber Markets in Niger: Challenges and Perspectives Results of the Danish Support to the Domestic Energy Strategy in Niger 1989-2003.	Les Marchés ruraux de bois au Niger: défis et perspectives. Bilan de l'appui danois à la Stratégie Énergie Domestique du Niger. 1989-2003	1989-2003	?	?	Evaluation of the Rural Timber Markets in Niger	**Danida **International Institute for Environment and Development
Support Project concerning agricultural producers in Komadougou (PAPAK)	Projet d'Appui aux producteurs Agricoles de la Komadougou (PAPAK)	2003-2006	Project	?	Changes in the structure in agricultural production in favour of irrigated production and a sustainable NRM securing the living conditions of the populations	**ONG Karkara **Service allemand de développement (German support programme)

**) It is the last known figure that is used, i.e. if there are figures for the project in 2003, 2004 and 2005, the figure from 2005 is used. And if it is the projected, not the actual figure, that is used.
 **) Only those components relevant for NRM are included. Other activities in the projects are left out for this purpose.
 Source: Based on 'Arshereinger for Danida. Projekter i Burkina Faso 2003-2005'.

Table A3. Mali

Project name (English)	Project name (French or Danish)	Period	Project type	Funds*	Project focus**	Implementing organisation
Support Programme for Sector for Drinking Water, Sanitation and Water Resources (PASEPARE), Phase I	Programme d'Appui au Secteur Eau Potable, Assainissement et Ressources en Eau (PASEPARE), Phase I	2006-2009	?	DKK 65 million.	Reduction of poverty by improving equal access to drinking water, sanitation and education in hygiene, integrated management of water resources and a more efficient management of investments in the sector	Foreign Ministry of Denmark, Danida, and Government of Mali, Ministry for Mines, Energy and Water
Integrated solar energy in Mali villages, Mali	Integreret solenergi i Maliske landsbyer, Mali	2000-2004	Project for NGO cooperation	DKK 2.36 million (all from Danida)	*Sustainability *Creation of a knowledge base for solar electricity in Mali	Nordvestjysk Folkecenter for Vedvarende Energi
YERE YIRIWA: Building capacity for dialogue for combat poverty in the decentralized rural South Mali	YERE YIRIWA: Opbygning af dialogkapacitet til udfrydelse af fattigdom i det decentraliserede rurale Sydmail	2006-2009	Project	DKK 4.95 million	Capacity building for a decentralized development process – projects will be carried out with consideration for environmental effects, and environmentally sound technologies and practices will be used wherever possible	MFC (Mali Folkecenter) and Danida?

*) It is the last known figure that is used, i.e. if there are figures for the project in 2003, 2004 and 2005, the figure from 2005 is used. And it is the projected, not the actual figure, that is used.
 **) Only those components relevant for NRM are included. Other activities in the projects are left out for this purpose.
 Source: Based on 'Årsberetninger for Danida Projekter i Burkina Faso 2003-2005'.