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Proceedings of the 16th Danish Sahel Workshop, 5-6 January 2004

Edited by
Anne Mette Lykke, Mette Kirkebjerg Due, Metus Kristensen & Ivan Nielsen

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Cover photos (Anne Mette Lykke)

Front: Senegalese farmer in discussion about natural resource management

Back: Danish scientist discussing with Senegalese farmer

The Danish Sahel Workshop 2004

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Lykke, Due, Kristensen & Nielsen

Contents

Preface

This volume of SEREIN Occasional Paper contains the contributions to the Danish Sahel Workshop held in Aarhus 5-6 January 2004.
Since 1988, Danida has sponsored the organization of an annual workshop for discussions of development issues in Sahel and surrounding countries. The workshop has been a forum for discussions and exchange of information among Danida staff, researchers, NGOs, consultants, students and a few counterparts from West Africa. The workshop is multidisciplinary in its scope and has over the years covered many different social, agricultural, political and environmental issues.

This year the workshop focused on the following four issues:

- current politics in West Africa
- the use of local knowledge in applied research
- participation in project planning and capacity building
- Danida and EU Sahel strategies

We would like to thank Danida for financial support and the workshop speakers for their contributions. The contributions in this proceeding have not been scientifically reviewed, but are printed with editorial and linguistic corrections only.

Aarhus, March 2004.

Anne Mette Lykke
Mette Kirkebjerg Due
Metus Kristensen
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Lykke, Due, Kristensen & Nielsen

Côte d'Ivoire and West African wars – a threat to development, also in the Sahel region?

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Introduction

This paper presents the reflection of a humanitarian aid worker, who has spent the last 13 years working with development projects and humanitarian assistance in Africa. The paper should be seen as reflections on wars in West Africa and their consequences for the general development in the region. The reflections are to a certain degree based on self-experience, i.e. what the author has seen with his own eyes and subsequently contextualised by current analytical literature and political commentary as found in different scholars' analyses and reviews. The observation in the field, so useful when it comes to reporting on human rights violations and other infringements on international regulations in respect to ongoing conflicts, is the strength of any research and should underpin all analytical approaches including providing arguments for whatever hypotheses put forward. The paper focuses on the war in Côte d'Ivoire and the consequences for the region. Appendix 1 provides an explanation of the 'three key elements in the Ivorian crisis'.

Africa, the former Cold War battleground, finally lost its faith in western hegemony in the early nineties. Major events contributed to this development, like the US disinterest in the civil war in Liberia and the US 'defeat' in Somalia. France became a victim of its own post-colonial support to brutal dictators and failed to react consistently to the Rwanda and Congo-Kinshasa wars contributing to the same downward development. Africa south of Sahara slipped into oblivion for a while. Africa got disconnected from many traditional bonds of political affiliation

and economic integration into world markets (Bayart et al. 1999), which even found its physical expression in the devaluation of the CFA-franc in January 1994 and later in the loss or weakening of the control of the CFA-franc, when France joined the European currency, the 'Euro' in 2001. This did not mean that Africa became uninteresting to individual entrepreneurs and economic interests, only that the ensuing development from entrepreneurial and economic activities was reduced and not connected to a parallel administrative and state developing mechanism. Some of the ongoing wars are by certain scholars even considered Africa's second battle for 'real' independence, like for example the war in Côte d'Ivoire, after so many years of mutual understanding between the successors of colonial legacy and former colonial masters.

Schools of thought

Theories are legio regarding underlying causes for the continued warfare in Africa. Seven arguments will be presented briefly in this paper and held up against the actual conflict in Côte d'Ivoire. It is the author's postulate that none of the conflicts can be analysed and labelled under one school of thought only, but has to be viewed in accordance with each country's history and links to neighbouring countries as well as to the international community. There is no way that the wars in the Mano River Basin can be seen as either the consequence of an agrarian crisis, deforestation, population pressure or the like. The wars become manifest expressions of many intertwined and underlying causes, of which the theories of exclusion, enrichment ('politics of the belly') and the development of war systems take up prominent places in the hierarchy of causality. The war in Côte d'Ivoire provides fuel for the revival of the theory of the un-captured peasantry or maybe the receding peasantry and rural youth into 'fields', which are out of reach of centralised power. The arbitrary use of ethnicity, like in Cote d'Ivoire the development of 'Ivoirité'[1] goes hand in hand with thoughts on 'cultural clashes' and war systems.

[1] The notion of 'Ivoirité' is described and publicised in 1996 by the former President Bedié and his 'Cellule universitaire de recherche et de diffusion des idées et actions politiques du Président Henri Konan Bedié', implying those who are 'real' Ivorians, i.e. born in Côte d'Ivoire by 'Ivorian parents'.

Environmental crisis

According to Kaplan (1994), the deterioration of the political climate into continued warfare stems from the fact that the continent is suffering from an ecological crisis as a result of the high birth rate, leading to overpopulation and subsequent exhaustion of natural resources. Deforestation, desertification, erosion and low precipitation are all factors resulting from man's improper use of natural resources resulting in a declining resource-base. The primary forest in for example Sierra Leone and Côte d'Ivoire only make up 5% of what it was 100 years ago. The man-made pressure on natural resources increases competition amongst populations, factions or ethnic groups to a degree that war becomes unavoidable.

Agrarian crisis

One of the late reasons for warfare in West Africa has been given the all-encompassing name 'Agrarian Crisis'. Richards (1996), the author of 'Fighting for the Rain Forest' is claiming that we are faced with a crisis, which has its roots in the complete upheaval of the agricultural set-up together with a failure to accommodate rural youth in the redistribution of wealth, access to social positions, including creation of family. Rural youth is not being incorporated into the general development and their social status is undermined, not only by the political stakeholders, but also by its own elders. Having no access to neither education nor promotion within own traditional ranks, and without any option of exodus into big cities, the youth goes back into rural wilderness, or into the 'comforting bosom' of the forest, as Richards is reciting Foday Sankoh[2] as saying.

Cultural clashes

Almost at the same time that Kaplan (1994) aired his ideas of over-population and its impact on available resources, Huntington (1993) wrote his paper on future wars resulting from the 'Clash of Cultures'. According to Huntington the world is moving from nation-state conflicts by-passing ideological conflicts to cultural clashes, i.e. that people become divided more by cultural affinity, religion and ethnicity, which are fuelling future conflicts. The theory of culture appears in various wars, in relation to

[2] Late Commander of Sierra Leone's 'Revolutionary United Front', who became famous for his cruelty in warfare by hacking off limps of thousands of civilians.

rebels' perception of being discriminated against and being excluded from participating in the development of the society.

Criminalisation and politics of the belly

The 'Politics of the belly', as described by Bayart et al. (1999), becomes an integral part of the criminalisation of the state. For either internal or external reasons, economic conditions in Africa developed along lines, which were either secret, discrete or far from transparent, whereby personal enrichment no longer has any relation to hard work or good management, but is linked to personal relations and access to state revenue through unknown channels. At the same time, clientelism together with the anthropologically or culturally based perception of redistribution favours or legitimises activities, which are considered directly criminal. The state becomes a 'shadow state' according to Reno (1998), and powerful individuals exert much more power than any institution of the state, which withers away. Individual politicians possess total power and control of resources.

War as an instrument of disorder

The instrumentalisation of disorder as explained by Chabal and Daloz (1999) includes the concept of war. Creation of disorder as a means to achieve a continued grip of power also encompasses the use of violence, of which warfare can be a crucial instrument to 'maintain disorder'. Through continued disorder people will seek protection from persecution and harassment and only warlords or power-wielders are able to provide security for the population. Disorder and arbitrary behaviour, or 'confusão', as they say in Angola, becomes an expression of 'normality', and equally so, the provision of security becomes an ever requested 'commodity', which you have to pay for in cash or kind on a regular basis. However, according to Reno (1998), the development of 'warlordism', is not a result of bureaucratic collapse, but of 'a social coalition of strong men, small scale commercial operators and a small segment of the country's youth'.

War-systems

Systems of war go beyond the nation/state conflict and could be perceived as a precursor to terrorism. Distance and borders no longer serve as inhibitors for the achievement of destabilisation. On the contrary frontiers and distance can add to the obfuscation of all tracks and secret connections. The West African wars are especially system-like in the Mano River

Region, where one event will normally produce side-effects or spill-over into neighbouring countries. The region from Senegal down to Côte d'Ivoire has been embroiled in wars, which are indeed system-like and linked to regional superpowers like Nigeria and Libya, acting as either brokers of peace (Adebajo 2002) or the opposite. Earlier, especially Côte d'Ivoire played the role of either divider or broker, starting with the Biafra crisis. During the present crisis in Côte d'Ivoire, many neighbouring countries have watched with barely hidden satisfaction, the fall of Côte d'Ivoire, the former giant of West Africa.

Terrorism

The link between systems of war and terrorism are obvious. Contrary to Huntington's claim that future conflicts will change from wars between nation/states to cultural clashes, it is interesting to observe, that the wars in West Africa are not between nations or states. Since independence African countries and their leaders have cleverly avoided the discussion of borders, and maintained, as an imperative, the sovereignty of the states. They have been keen to maintain borders, which were drawn during the 1884 Berlin Conference, even though they represented the colonial interests, and did not reflect the composition of populations or traditional ethnographic set-up. The development of West African wars into systems of wars, supported by different actors with opposite interests, has also shown its adaptability to the international network of terrorism (Reno 2002).

Côte d'Ivoire embroiled in a typical West African war?

The most stable country of West Africa, Côte d'Ivoire, with an economic and physical infra-structure above most African countries and representing 40% of GDP in Sub-Saharan West Africa excluding Nigeria, entered into a phase of continued instability in the early nineties. The famous 'Miracle Ivoirien' (Akindes 2000) from 1960 to 1980 faced economic recession in the eighties due to dwindling prices on primary commodities for export, draught periods etc. The one-party country embarked on a 'forced' stabilisation/structural programme by IMF and the World Bank as a consequence of the optimistic overspending in the seventies and early eighties and began a modernisation process, which derailed upon the death

in 1993 of Houphouët-Boigny, the country's first and longest serving president.

The IMF/WB demand for open borders and economic financial equilibrium was very much in line with Côte d'Ivoire's own policy, but the demand for privatisation initiated a 'scramble' in the leading political circles for cheap and easy access to state-owned companies (Bayart et al. 1999). This ended up in a deadly crisis between the state's top figures, prime minister Alassane Ouattara and Henri Konan Bedié, who was the immediate successor as party chairman. The imposition of conditionalities by the Bretton-Woods institutions, despite its good intention, did not serve its purpose, but was cleverly diverted into personalised access to public assets by the political elite, with no ensuing democratisation and proper redistribution of assets. The Ouattara-Bedié crisis has continued since then, and passed through phases of ethnic and religious hatred, and of late, into criminalised war fare connected to certain high-level politicians and their regional and personal links to what could be named the West African 'war-system'. All aspects of the different theories on wars, which are presented in this paper, can be found in the civil war of Côte d'Ivoire.

The war and its regionalisation

From the onset of the Ivorian crisis in the early nineties, links can be traced to neighbouring countries of which the two most important are Burkina Faso and Liberia. These again are interlinked through relations to the wars in the Mano River Region. The presidents of Burkina Faso and Liberia together with the late warlord of Sierra Leone, Foday Sankoh, all went through the same military training in the desert of Libya, sponsored by their mentor Muammar Ghaddafi. For this reason it was interesting to note that within the first week of the outbreak of the Ivorian crisis on the 19th of September 2002, the president of Burkina Faso went to see the Libyan President and so did a high level delegation from the Ivorian government[3]. Côte d'Ivoire has always accused Burkina Faso of being the backbone of the riot of the 700 mutineers, who initiated the failed coup in 2002. During the coup attempt President Gbagbo was visiting Rome. Soldiers, who had been recruited by the former military President Robert Gueï, before and after his coup in 1999, had been informed by Gbagbo's government that

[3] On the 18th of October, the French foreign Minister, Dominique de Villepin is supposed to have presented the problem of the 'axe du mal Tripoli-Ouagadougou-Monrovia' during his visit to Libya.

they would be laid off, causing them to stage the coup attempt. These soldiers were coming from the north or from the western part of the country, and were accused of being Burkinabés or Liberians, which was also the case for many.

Severe destabilisation started with the death of the first president, Houphouët-Boigny in 1993. Henri Konan was elected as his successor Bedié in 1995, which lasted up to 1999, when he was ousted in a non-violent coup by the head of the armed forces Robert Gueï, who became a military president. He was later forced to accept elections in 2000. When he stood to loose the elections he dissolved the process, but Laurent Gbagbo managed to mobilise the parliament of the street, and came out as the winning candidate amidst accusations of fraud. A national reconciliation process was undertaken and ended in December 2001 with all actors on the ground, i.e. Alassane, Gbagbo, Gueï and Bedié. It took nine months before the country was ready for the next coup attempt.

During the 2002 coup morning hours Robert Gueï was killed together with his family, whereas both Alassane Ouattara and Henri Konan Bedié managed to flee to nearby embassies before they were flown out of the country. Robert Gueï had been chief of the army and instrumental in providing Liberia's President Taylor with weapon. Not only did the late president Houphouët-Boigny authorise Charles Taylor to stage his war from Ivorian territory in 1989 (Marchal 2002), but he also subsequently capitalised on the provision of ammunition for Charles Taylor's future wars in both Sierra Leone and Liberia. The coup plans were not unknown to the Ivorian army[4]. While Robert Gueï is accused of staging the coup attempt helped by the link to Charles Taylor, Alassane Ouattara is accused of being behind the same coup through connections to the President of Burkina Faso, Blaise Compaoré. However, even though Gueï may have been preparing a coup, he seems not to be aware when it takes place and probably it has been undertaken by his strong opponents (Comfort and Marshall 2003).

Former prime minister Alassane Ouattara had been labelled non-Ivoirian in the aftermath of Henri Konan Bediés 'Ivoirité' campaign, which started immediately upon the death of Houphouët-Boigny in 1993. Alassane Ouattara had a career in the Bretton-Woods institutions using a diplomatic Burkinabé passport and because of his parents' origin he was

[4] The author travelled from San Pedro to Liberia on the 18th of September 2002, the day before the coup attempt. While having lunch in Tabou, the last provincial town before the border, it was observed that the restaurant was visited by some of the highest ranking Ivorian army officers.

barred from standing for the elections in 2000 after the first coup. He had been called in to serve as prime minister from a position as governor of the Central Bank of West African States (BCEAO). The row over citizenship had poisoned the political climate in Côte d'Ivoire since Bedié took over in 1993, to the extent that the Senegalese President accused Côte d'Ivoire of pursuing a racial policy, which was worse than what the continent had seen during the colonial era.

The attacks on foreigners in Abidjan and throughout the country after the coup attempt in 2002 sent waves of Burkinabés, Malians and Liberians out of Côte d'Ivoire. This was not the first time. Already in 1999-2000 hundreds of thousands fled, especially the Southwest region, due to general xenophobia with a subsequent collapse of agricultural activities. The famous death squadrons with close ties to the wife of President Gbagbo undertook more or less arbitrary killing sprees during the night in and around Abidjan, which especially targeted northerners or people believed to be of Burkinabé origin. The killing of Gueï paved the way for a direct intervention of Liberia's President in the conflict in January 2003. The son of Gueï wanted that his father should be revenged. Charles Taylor sent his militia into Côte d'Ivoire in the western region to revenge the killing of Gueï[5]. The Ivorian rebellion, which started out in the north as Mouvement Patriotique de Côte d'Ivoire (MPCI), immediately split into 3 movements, of which the northern MPCI was backed by Burkina Faso and the two western rebel groups, Mouvement pour la Justice et la Paix (MJP) and Mouvement Patriotique Ivoirien du Grand Ouest (MPIGO) were backed by Liberia. All three movements, however, collaborated with a view of gaining access to the port of San Pedro, from where most of Cote d'Ivoire's Cocoa was exported together with rubber and timber from Liberia. The purpose being to acquire access to the revenue from these commodities. By the intervention of the French this was avoided in the last minute. The involvement of the neighbouring countries has been extensively documented by Banègas and Fratani (2003), Banègas and Otayek (2003), and Comfort and Marshall (2003).

The rebels did not manage to control Abidjan, but retrieved to the north where they entrenched in the economic centre of Bouaké. The rebels still control the north and the country is literally split into two by a

[5] Robert Gueï hails from the West of Côte d'Ivoire and one of Gueï's sons was seen regularly in the South-eastern county of River Gee in Liberia during that period. The girlfriend of the son was killed in Gueï's house during the morning of the coup attempt. Another son is in the presidential guard of M. Ghaddafi of Libya.

demarcation line passing from east to west through the middle of the country. The foreign involvement in the crisis was easily identified from the sophisticated weaponry that the rebels used. Towards the end of 2002 and in the beginning of 2003 the fighting intensified in the west with the involvement of the Liberian and former Sierra Leonean RUF fighters sent in by Charles Taylor[6]. Even some of the most wanted war criminals from Sierra Leone, like Sam Bockary (Mosquito) headed the Liberian infiltration until he and his whole family was killed by Charles Taylor to hide any tracks of Taylor's involvement. One of the reasons for the indictment of Charles Taylor at the Sierra Leone war tribunal was the protection he had given to Sam Bockary by not extraditing him to Sierra Leone. During the same week that 'Mosquito' was killed, the leader of the western movement MPIGO, Felix Doh, was also killed. Felix Doh proved to be an Ivorian of Baolé origin from the east of the country, but presented himself with a name from the western part of Côte d'Ivoire or Liberia. The Baolé forms part of the Ivorian migrants having moved into the centre-western part of Côte d'Ivoire together with the northerners and having bought entitlements from the 'autochtones' for growing their land (Kappès-Grange 2003).

Franco-Ivorian relationship

Only by help of the French did Côte d'Ivoire manage to free some of the South-western part of the country. But unfortunately the Liberian type of warfare had already been introduced into Côte d'Ivoire to a degree that even the northern movement MPCI tried to reduce the influence from the rebel movements in the West of the country, as they turned out to be difficult to control. Now the Ivorian President took revenge on Liberia, recruiting Liberian youth in refugee camps in Ghana and in Côte d'Ivoire and amongst northern opposition fighters in Liberia. The fighters were trained and sent back into Liberia under the name of the Movement for

[6] The author travelled from Southeast of Liberia to Monrovia in December 2002 and January 2003 and saw cars full of young men in odd clothing and the typical hairstyle for rebel fighters, being transported towards Côte d'Ivoire through the Nimba county in Liberia. The border town with Guinea, Ganta, on the highway to Côte d'Ivoire has since been completely destroyed in the escalation of the Liberian war following Charles Taylor's 'adventure' in Côte d'Ivoire in the beginning of 2003. Charles Taylor's soldiers/rebels were all sporting new rifles even though the country had been under weapon embargo for years.

Democracy in Liberia (MODEL)[7]. This was the end of Charles Taylor's regime in August 2003.

Despite the Franco-Ivorian defence accord[8], the French maintained that the Ivorian crisis was an internal affair, seeing no evidence of external involvement in the conflict. The Ivorian government took this as an indirect support to the rebels. The French position was initially marked by indecisiveness. Only when the Americans intervened to rescue American children at a boarding school in the rebel held central town of Bouaké, did the French make up their minds not to let the Americans become the restorers of order. France decided to send in troops to protect the demarcation line, which divided the country, but the French had already lost the little respect they had in the Ivorian population. France later managed to regain some of her lost prestige through the peace negotiations in Linas-Marcoussis in January 2003. The former French policy of supporting the 'strong man' to maintain stability had led to a humiliating French diplomatic defeat in the crises of Rwanda, Congo-Kinshasa and Madagascar. This policy was no longer on the agenda. The French were looking for a new political strategy to compete with the slowly rising American influence in the region, but France failed to 'give comfort to its former ally' by acting inconsistently and irresponsibly towards the government of Côte d'Ivoire. Only later France realised, that it was not possible to 'do away' with Laurant Gbagbo, and had to adapt her policy to that fact (Laloupo 2003).

The double standard that the French have shown with respect to Côte d'Ivoire and Burkina Faso is difficult to fully understand. France tried to threaten Côte d'Ivoire by denouncing atrocities and other human rights abuses committed by the Ivorian government and announced through the late Human Rights Commissioner, Sergio Viera de Melo. But the French had forgotten to put the same pressure on the rebels and their backers, i.e. Blaise Compaoré and Charles Taylor. The impunity of Blaise Compaoré is highly questionable (Smith 2003), and equally so is the French eagerness to have the UN-Security Council's sanctions on Liberia lifted, even before any proper government is in place.

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[7]Information given by young MODEL rebels crossing into Côte d'Ivoire in July 2003, who told how they had been recruited and trained in camps in Côte d'Ivoire and then sent into Liberia to fight Charles Taylors militia in South-eastern Liberia.

[8] France has a base in Côte d'Ivoire and an agreement to assist Côte d'Ivoire unconditionally, if the country is being attacked from outside. France was not keen to apply the agreement immediately after the coup attempt.

Political and economic consequences for the region

The involvement of Burkina Faso is difficult to understand from a political and economical point of view. Being landlocked and without any important natural resources and highly dependent on remittances from migrant workers in Côte d'Ivoire, the position of Burkina Faso is paradoxical. All commodities for export and import have to pass the trucking routes or the railway through Côte d'Ivoire, which makes the economy extremely vulnerable to any obstruction of a smooth evacuation of goods in and out of the country. Blaise Compaoré immediately set up a task force to counteract the negative social and economic consequences of the closed borders and transport routes, and received praise for doing so (Kanyi 2003).

Even though fingers pointed at Blaise Compaoré, he cleverly managed to turn the development into his favour. Having suffered a severe political set-back in the wake of the murder of the Burkinabé journalist Zongo in 1999, who allegedly was murdered for investigating corruption involving the President's brother, Compaoré managed to use the Ivorian xenophobia to his own advantage. By accepting the migrant Burkinabés back and by diverting attention from his own political credibility, he turned the Burkinabés' attention to the fact that they were being expelled for ethnic reasons, and even managed to benefit politically from a new wave of nationalism in his own country. In 2001 a former minister of education in Côte d'Ivoire was killed in a Burkinabé government guesthouse in Ouagadougou. Blaise Compaoré pointed fingers at Côte d'Ivoire. The case was never disclosed. Journalists trying to investigate the case have been intimidated or called to order, but the recent development has obscured or helped downplay the involvement of the Burkinabé' government.

The popularity stemming from the anti-Burkinabé wave in Côte d'Ivoire has also been used to blur the fact, that Burkinabés living in Côte d'Ivoire have no right to vote in Burkina Faso. Even though the Burkinabés never possessed a citizenship in Côte d'Ivoire, some were allowed to vote during the Houphouët-Boigny era, mainly for the simple reason that they were supposed to vote for the right president. Blaise Compaoré, on the other hand, has never allowed that Burkinabés staying in Côte d'Ivoire should be granted the possibility of directly influencing the voting or democratic process in Burkina Faso. This fact has been forgotten by the Burkinabés, who are now facing a common enemy, the xenophobia of Côte d'Ivoire. During the height of the crisis in the beginning of 2003 more than 350.000 Burkinabés and 60.000 Malians are supposed to have returned to

their countries (Reliefweb 2003a), at the same time that 50.000 Ivorians of Baolé origin had to flee their plantations. Many fled through Liberia and Guinea back to their countries. Slowly they are returning to see if they can regain access to some of the land they used to till[9]. A recent incident in the central town of Gagnoa, between the President's tribesmen, Beté, and immigrants from Mali, resulting in several deaths, has proved that the situation is far from resolved. About 500 immigrant cocoa farmers had been evicted from their land and fighting erupted. The severity of the incident provoked President Gbagbo to visit both Burkina Faso and Mali (Reliefweb 2003b). The immigrant cocoa producers had refused to sell their produce through newly created agricultural cooperatives, which prompted the patriotic youth to evict them from their farms. The resistance of the peasants reminds of the theories on the un-captured peasantry and their reality. In the context of Côte d'Ivoire it develops into a receding peasantry. The small scale farmers cleverly shy away from outside control.

Both Mali and Burkina Faso have suffered tremendously from the Ivorian conflict. Not only have the important remittances by migrant workers dried up, but the dependency on the Ivorian transport routes has made import/export a troublesome task. Three million Maliens depend on the revenue from cotton (Katendi 2003). The transit routes for major produce like cotton (30-40% of Mali's and Burkina Faso's export revenue and 5-10% of BNI) remain partly closed, but Côte d'Ivoire also represents a relatively rich market for direct consumption of livestock (Soulé 2003). More than 700.000 cows from Mali, Burkina Faso and Niger are sold in Côte d'Ivoire every year. For new export itineraries Mali turned to both Senegal and Ghana, whereas Burkina Faso turned to Ghana. Two thirds of Niger's export of onions used to be sold in Côte d'Ivoire and is now being commercialised in Nigeria and other countries, but the regional market has not been able to absorb the production of various commodities which suddenly lost an important market. As a purveyor of commercial goods, Nigeria has strengthened its position in the region. Due to poor infrastructure and complicated custom systems, Togo and Benin are only

[9]The author assisted through UNHCR 'Ivorian Burkinabés', who had fled Côte d'Ivoire into Liberia, back to the Sous-prefecture of Grabo in the Southwest of Côte d'Ivoire in August 2003. They remained in their villages, but access to their land was not given immediately. On the contrary, the 'autochtones' had generally given the land to Ivorian migrants of the Baolé ethnic group, in preference to the Burkinabés. The 'Burkinabés' complained of this practice as a general pattern. On the other hand, the agricultural production cannot be maintained without the presence of the Burkinabés or migrant labourers.

able to draw limited benefits from especially the increase in shipping activities.

The ultimate winner of the crisis, however, seems to be Ghana. Not only for economical and strategic reasons has Ghana benefited from the crisis but also due to good political leadership. The instability in Côte d'Ivoire sparked off an immediate rise on the cocoa stock market in London which benefited Ghana, even though the harvest in Côte d'Ivoire was not severely influenced by the crisis, as the production was already in place and the major problem was the labour for the harvest. Six millions Ivorians depend on the income from the cocoa production (Kappès-Grange 2003). The effect on the harvest 2003-4 is supposed to be much more catastrophic. The use of Ghana as a transit centre for 'hinterland' commercialisation of primary produce is even more important, and it remains to be seen if Ghana has the capacity to provide the services which are needed to obtain a position as a regional economic centre.

Even though Ghana has become extremely instrumental in the solution of the Ivorian crisis through its President spearheading the Economic Community Of West African States (ECOWAS), and even though Ghana by the mischief of its bigger neighbour has been offered an enormous market for domestic and regional growth, it does not have the infrastructure in terms of roads, port facilities and the economic banking network to facilitate business activities at an Ivorian level at a short to mid-term level. However, Ghana is trying to speed up and increase her capacity in port, stocking, transportation and administrative facilities.

Conclusion

Liberia started a disarmament process on the 1st and Côte d'Ivoire on the 15th of December 2003. It would be a bit too naïve to expect that this is the end of the crisis in the two countries. Even though groups of youth are disarmed, 'arms are plenty' in the region and they are easy to come by for those who are in need. The underlying causes for war are not removed by disarming only. The disgruntled youth is around and it is not being listened to or given any opportunities of social integration at a reasonable speed. For too long the youth has been ostracised and left to solve its social problems alone or even disregarded. This is the case for the youth in Guinea Bissau, Sierra Leone, Liberia and also Côte d'Ivoire. During the booming seventies the youngsters left the countryside and were absorbed in

the towns. In the eighties in Côte d'Ivoire they had to go back to survive and started exercising control over the local resources. This tendency has been exacerbated during the last crisis, where rural youth and 'anachronistic' warriors have learned that probably they can earn more by distancing themselves from the state administrative system in the short to mid-term perspective. The latest event in Gagnoa (Reliefweb 2003b) in Côte d'Ivoire where the youth wanted to control the marketing of cocoa was a proof of this development as are all the check-points which have been mounted by village 'guerriers' in rural Côte d'Ivoire. All wars need youth who is or feel excluded or discriminated against. The prevention of the youth from access to 'modern life' at the same time that they are prevented by traditional structures of 'coming of age', i.e. making themselves a decent living and establishing families and being recognised by society has created a new group of dissatisfied and mobile youth, which will not refrain from using violence as a means of achieving their goals.

There is no obvious environmental crisis, but resources are becoming scarce and no more virgin land is available to accommodate the ever growing population. Travelling along the coast in Côte d'Ivoire to Liberia, one will no longer see virgin forests, but many small plantations coming up amidst dead trunks of trees like a ghost landscape. This 'encroachment' can no longer continue, i.e. the growth in population can no longer be absorbed by traditional agriculture. This is one of the major reasons for the Ivorian crisis. That the Ivorian crisis is also agrarian is beyond doubt, in the sense that land is becoming scarce, and that access becomes a problem of ethnicity and historical and cultural links within the local community.

The ethnicity factor has been extremely instrumental in creating a war environment based on cultural factors in Côte d'Ivoire. The northerners, often referred to as Dioulas, are Muslims and southerners are Christians. This factor has been abused extensively by the former government and also by the present, even though the underlying causes for the conflict should be found in access to land and citizenship, exclusion of youth and immediate personal enrichment by some politicians. The same division along ethnicity and religious affiliation has also been promoted in Liberia with extreme success in the ethnicity dimension, but limited success in religious division. Even though the Mandingoes in northern Liberia are Muslims, there is no basis in claiming that the conflict has roots in religious divisions.

What is new and frightening in the Ivorian war is the inclusion in the 'West African war system'. The spill-over from the Mano River Wars has proved to be hard lived. The northern MPCI movement realised at an early

stage in the beginning of 2003, that the connection to the two western movements was not easy to handle for the mere fact that any political objective was not part of these movements' ideological set-up. The connection to mercenaries and child soldiers being moved around in the region was a new experience to Côte d'Ivoire. The latest development in the rebel controlled northern part of the country has proved that the movement is not able to maintain social control and avoid the temptation of quick access to wealth for individual rebel leaders. Not less than three armed bank robberies have taken place within the last six months, and high ranking rebel leaders are supposed to be involved. Equally so the rebel commander in Korhogo in northern Côte d'Ivoire, who is surrounded by Liberian mercenaries, has been reluctant to follow instructions from the general rebel political leadership, paving the way for the crisis to deteriorate into warlord uncontrolled activities. Warlords are difficult to control, and war systems are feeding themselves by forging links to new interest groups.

This has been the case for the Mano River wars which have now also absorbed Côte d'Ivoire by linking up to new groups in the region. The disgruntled youth then becomes the front operators of the war systems and the secret connections, which make up 'the politics of the belly and the shadow state syndrome', become the driving force behind. This system does not only link to the primary political operators and economic interests, but also involves the humanitarian aid. Control and abuse of humanitarian assistance, which is well documented from refugee camps in DRCongo in the nineties has also become part and parcel of the war system in West Africa. UNHCR has been directly accused of being part of the feeding system for wars in the region by poor refugee camp management (McGovern 2002). Refugee camps in Guinea, Côte d'Ivoire and Ghana serve as providers of youth for rebel activities and the complete lack of managerial skills in the organisation by the UN of disarmament processes in the region also makes the entire UN become part of the war system.

The responsibility of regional leaders like the presidents of Burkina Faso and Liberia also connects to the war system theory, and so does the fact that both Liberia, Burkina Faso and Côte d'Ivoire claim to have arrested coup plotters in each country within the last six months. Burkina Faso is accused of backing the recent coup suspect, Ibrahim Coulibaly[10],

[10] Ibrahim Coulibaly (IB) is the former body guard of Alassane Ouattara's children and the main brain behind the 1999 coup d'état.

and Côte d'Ivoire is supposed to have assisted the arrested suspects in Ouagadougou, between the 1st and 6th of October, of which already one died in detention, for allegedly plotting a coup. Liberia and Burkina Faso's link to Libya also feed the theory of terrorism. Mali has managed to stay clear of all accusations, but many dissatisfied immigrants or northerners from Côte d'Ivoire are said to use Bamako as their base. It remains to be seen what will happen in Guinea and Togo when their ailing presidents die, and whether somebody manages to stage a real coup in Burkina Faso. There is a system in place, which can help those who want changes for personal gains. In his address to the Security Council on the 9th of December 2003 on protection of civilians, under-secretary-general Jan Egeland said: 'The extensive engagement of largely young unemployed men in the militias fighting in Sierra Leone, Liberia and Côte d'Ivoire threatens to undermine the security of the region as a whole if this culture of youth violence is allowed to become entrenched. Disarmament, demobilisation, rehabilitation and reintegration (DDRR) must be addressed on a regional basis and neighbouring states should recognise their responsibility to assist' (Reliefweb 2003c).

Senegal and Guinea have been instrumental in the recent civil war in Guinea-Bissau, and Guinea-Bissau in Senegal's Casamance region. Guinea has been involved in the Liberian war and Liberia in the wars in Côte d'Ivoire, Sierra Leone and in heavy destabilisation in Guinea. Côte d'Ivoire and Burkina Faso have both been involved in Liberia's civil war and Burkina Faso in the coup attempt in Côte d'Ivoire. Côte d'Ivoire is now expected to assist in any destabilisation in Burkina Faso. Neighbour involvement does not take the form of direct attack of a neighbouring country, but becomes part of the war system, as stated in the November 2003 International Crisis Group (ICG) report on Liberia: 'The umbilical cord between exiled fighters and regional heads of states needs to be broken if the deadly round of state-sponsored rebellions is not to destroy West-Africa's current state structure for good'.

Côte d'Ivoire aspired to become the regional superpower of West Africa. These dreams are long gone, and its leaders do not even seem to understand the consequences of the prolonged conflict. Agricultural production for 2003/4 is estimated at 75% of the average of the last 5 years in Côte d'Ivoire. The Sahelian countries are expecting a bumper harvest of 10 to 20% above normal (FAO 2003). If civil war had not been on the agenda, the same promising perspective would have been envisaged in Côte d'Ivoire.

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Appendix 1. Three key elements in the Ivorian crisis

Borders and migration

Historically, there haven't been many border disputes in West Africa after independence, even though Côte d'Ivoire disputed the border with Liberia immediately after independence, and Burkina Faso had a row with Mali in the eighties. However, the region has seen a considerable number of foreign citizens being expelled since the seventies. These include the Nigerians from Ghana in 1973; more than one million third country nationals from Nigeria in 1983-85; the Burkinabes in Southwest Côte d'Ivoire in 1999; tens of thousands of West Africans from Libya in 2000, and latest the Burkinabés, Malians, Guineans and Liberians from Abidjan in 2002.

The former French administrative division of what is now Burkina Faso between Côte d'Ivoire and Mali, and the use of the migrant workers in the development of the Ivorian economy has been more or less unproblematic up to the abandoning of the one-party state, and the subsequent abuse of the concepts of nationalism and ethnicity by power-greedy politicians. The need for labour to develop the plantation economy created a continued flow of migrant workers across the borders with Burkina Faso and Mali, even with accusations that some of the workers were or are enslaved children. The economy which was divided between cotton and cattle-raising in the north and cocoa, coffee, oil palm and other plantation crops in the south needed the labour. The former president encouraged each and everyone to join in the development of the economy. The creation of ECOWAS, where people are free to move and work across borders was also instrumental in this respect. The assassination in the eighties of Burkina Faso's President, Thomas Sankara, was in part due to the fact that he tried to intervene in the economic flow related to the migrant economy from Côte d'Ivoire, and his accusation that the Ivoirians were promoting racism.

From the 1930'ies, the movement of migrant workers had been internal, as well as external. The Baolé from the mid-east of the country moved towards the south and the west, at the same time that the northerners, together with the Burkinabés and Malians, moved to the centre and south-west. The Sahelian zone with its reduced capacity for extraction of wealth provided a surplus of human labour for the south, and up to 40% of the population in the Southwest were considered to be Burkinabés in 1998.

Newcomers participated in the 'mise en valeur' of the national territory, at the same time that forest disappeared and new land was put under plough or turned into plantations. This happened in a joint-venture with the local population and parallel to the development of an urban clientilistic elite, which controlled the revenue from the 'settlers' together with the traditional chiefs in the local setting. It was the economic boom of the sixties and seventies that permitted such generosity. The migrant workers were allowed to till land and even to vote, and by paying their duties to the traditional chiefs through the 'tutorat'[11] each and everyone benefited due to the lavishness of the economy. The migrant workers obtained access to land and they were supposed to vote

[11] 'Tutorat' reflects the traditional perception that the indigenous owner of any land continues to exert rights and decision in future land use, and the occupier remains subject to the patron and continues to pay taxes to his patron.

for the president. When any problem arose at the local level, the president would make sure that proper redistribution would be undertaken to guarantee that calm would be reinstalled in the local setting.

Demography and citizenship

The idea of citizenship and nationality doesn't have to follow the notion of identity. Many people will still call themselves Burkinabés, even though they claim to be Ivorians as well. Part of these problems can be related to colonial border drawing. Obtaining citizenship in Côte d'Ivoire, in the light of the demographic 'explosion' has become highly contested just like the rights to own land, and even more so as citizenship entails the legal basis for acquisition of land. Land ownership or permanent access to land derives from your legal status within the country.

Being born in Côte d'Ivoire doesn't provide for automatic citizenship if your parents are not Ivorians. For this reason, the Burkinabés staying in Côte d'Ivoire for generations, cannot be considered Ivorians, as long as they have not passed through the 'naturalisation' process and neither can their children. At the same time the law doesn't allow for two citizenships (Code de la Nationalité en CI 1972), i.e. if a Burkinabé still consider him/herself a Burkinabé with Burkinabé identification, he is excluded from Ivorian citizenship.

The demographic development has reached a level, where accommodation on scarce resources is now developing into a power sharing contest. At independence the population of Côte d'Ivoire was made up of 3 to 4 million inhabitants. By year 2003 the population of Abidjan, the economic capital, is oscillating around 4 millions, and the population of the country is estimated around 16 millions. Of the 16 millions more than 4 millions are considered non-Ivorians, i.e. they do not have the citizens' rights. Today, most of these 'non-Ivorians' are born in Côte d'Ivoire.

Land rights

The colonial policy for development of a plantation economy to create basis for taxes and government revenue continued after independence to a degree that the first president of the country in 1963 proclaimed that 'La terre appartient à celui qui la met en valeur' (Chauveau 2000). The colonial power as well as the independent government continued the economic development of the country by motivating each and everyone to enter into production of cash crops, which could be taxed and exported. Not only huge colonial plantations were developed, but also small plantations owned and manned by either indigenous migrating Ivorians or migrating foreigners, especially Burkinabés who settled and occupied land. Malian youth were also imported for the 'mise en valeur', but they were in general 'slaves', – and sometimes still are.

The development of the economy by migrating distinct ethnic groups and the control of land posed no problem as long as land was in abundance and new forest could be cleared. This is no longer so. There is no more forest in Côte d'Ivoire, only 5% of the original (Kaplan 1994). The taxation was also controlled through traditional chiefs, who were being paid tributes, and local political leaders with connection to urban political circles in form of a clientilistic set-up. All interests were accommodated;

surplus was enough to develop new land, to accommodate more 'land owners' and more population.

In colonial times, all land belonged to the state, and people or companies were given the right to exploitation, when paying taxes to customary local and central administration. At independence in 1960, the system continued according to the French 'Code Civil' and due to the extreme bureaucratic and expensive procedure of obtaining a land rights certificate, only 1 to 2% of all land is considered to have a legal status. This was even so during colonial time, when land was leased and almost nobody went through registration (Feder and Noronha 1987). Côte d'Ivoire is trying to solve its land disputes by the approval of a new land law in 1998, which allows for everybody to make claim on land up to year 2008 for the right to receive a 'certificat foncier'. Foreigners are entitled to exploit land as 'occupants de bonne fois', through 'titulaires autochtones' or through the state (Chauveau 2000).

Local knowledge and remote sensing of forest biodiversity and forest carbon across the Sahel

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Introduction

People across the Sahel depend on trees for firewood, timber, food, and the ecosystem services of soil and water conservation, nutrient cycling, and carbon sequestration. Climate change and desertification can harm forest cover and, therefore, rural livelihoods in the Sahel.

This paper presents preliminary results of ongoing field research in the Sahel. Local knowledge, aerial photos, and satellite data show that forest species richness, tree density, and forest carbon have declined in the past half-century, a local manifestation of a shift of vegetation zones towards the south. First, this section of the paper introduces three phenomena: climate change, desertification, and vegetation zone shifts. Then, the paper discusses each of three research topics: the shift of the Sahel, Sudan, and Guinea vegetation zones; the decline in densities of mature trees in the Sahel; and the decline in forest carbon in the Sahel.

Climate change is an alteration of atmospheric composition that modifies temperature, precipitation, and other meteorological conditions. Climate change acts through the increase of gases in the atmosphere, primarily carbon dioxide (CO_2), that prevent the escape of heat into space. Currently, humans emit 7.9 ± 1.4 billion t y^{-1} of carbon into the atmosphere, approximately four-fifths from fossil fuel burning and one-fifth from land use changes (IPCC 2001b). Global vegetation and oceans can only absorb 4.6 ± 2.1 billion t y^{-1}, so the remainder stays in the atmosphere. From the beginning of the Industrial Revolution, ca. 1750, to 1998, the atmospheric concentration of CO_2 increased from 280 parts per

million (ppm) to 365 ppm (IPCC 2001b). Since 1900, mean global surface temperature has increased 0.6 ± 0.2ºC and mean global sea level has risen 10–20 cm (IPCC 2001b).

Projecting trends in population and energy use, the concentration of CO_2 in the atmosphere could double the pre-industrial concentration by 2100 AD, causing an increase in mean global surface temperature of 1.4-5.8ºC and a rise in mean global sea level of 11-77 cm (IPCC 2001b). Regional climate modelling shows that these global impacts of climate change may translate into significant meteorological changes across Africa. While mean surface temperature in Africa has increased by only 0.5ºC since 1900, it could increase 2-6ºC by 2100 (Hulme et al. 2001). Rainfall may decrease up to 20% in many areas, but generally increase in equatorial areas (Hulme et al. 2001).

The U.N. Convention to Combat Desertification (UNCCD) defines desertification as 'land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities'. The UNCCD further defines land degradation as a 'reduction or loss, in arid, semi-arid, and dry sub-humid areas, of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest, and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation'. The principal climate factors that cause desertification include precipitation declines, temperature increases, and sea surface temperature anomalies. The principal anthropogenic factors that cause desertification are unsustainable agricultural practices, overgrazing, deforestation, and any other practices that reduce permanent vegetative cover.

Since 1968, the Sahel has experienced the most substantial and sustained decline in rainfall recorded in the world within the period of instrumental measurements (Diouf et al. 2000, Hulme 2001). Sea surface temperature anomalies (Lamb 1978, Giannini et al. 2003), reinforced by two positive feedback mechanisms – between precipitation and surface reflectance (albedo) (Charney 1975, Xue and Shukla 1993) and between precipitation and vegetation (Aubréville 1949, Taylor and Lebel 1998) – seem to best explain drought in the Sahel (Zeng et al. 1999, Wang and Eltahir 2000, Hulme 2001, Zeng 2003).

The tragic death of up to a quarter of a million people in the Sahel drought of 1968-1973 (United Nations Conference on Desertification (UNCOD) 1977) demonstrated the tragic human toll of desertification. The principal impacts of desertification include the disruption of agricultural and livestock production systems, the loss of ecosystem services such as proper nutrient cycling and watershed protection, and alterations to fundamental socio-economic conditions.

Feedbacks between land degradation and precipitation inextricably link climate change and desertification. Climate change exacerbates desertification through the alteration of spatial and temporal patterns in temperature, rainfall, solar insolation, and winds. Conversely, desertification aggravates climate change through the release of carbon from cleared and dead vegetation and through the reduction of the carbon sequestration potential of desertified areas.

Because climate change alters the spatial and temporal patterns of temperature and precipitation (the two fundamental factors that determine the distribution and abundance of vegetation), climate change can shift the ranges of individual plant species and entire vegetation zones. Furthermore, the changes in potential vegetation productivity that occur with desertification can also change the ranges of individual plant species and entire vegetation zones.

Since the last glacial maximum, 18 000 years before present, pollen data show that the ranges of dozens of Northern Hemisphere tree species have migrated latitudinally and altitudinally to follow the warming climate (Davis and Shaw 2001). In Africa, Sahel vegetation reached 21˚N latitude around 8500 y before present, preceding Guinean vegetation, which reached 16˚N latitude (Lézine 1989). At the Holocene climate optimum of increased precipitation and temperatures around 6000 y before present (Sarnthein 1978), the Sahel extended to 23˚ N latitude, 1000 km north of its current limit (Irizarry-Ortiz et al. 2003, Jolly, et al. 1998, Petit-Maire 1989).

Global warming due to human carbon emissions since ca. 1750 has already caused vegetation shifts in high altitude and Arctic ecosystems (Walther et al. 2002). Projected vegetation shifts due to continued global warming may continue to follow the pattern of latitudinal and altitudinal retreat from higher temperatures (Neilson et al. 1997), yet the changes in climate may exceed the capabilities of vegetation species to alter their ranges, which may require vegetation zones shifts of 1 km y^{-1} (Malcolm et al. 2001).

Shift of the Sahel, Sudan and Guinea vegetation zones

Across the part of Africa in the Northern Hemisphere, increasing rainfall and decreasing evapotranspiration towards the Equator differentiates vegetation into three latitudinal bands of increasingly mesic species: the vegetation zones of the Sahel, the Sudan, and Guinea (Aubrevillé 1950, White 1983). Thorny tree species with small, deciduous, sclerophyllous, and bi-pinnately compound leaves characterize the Sahel. Trees occur singly and widely-spaced with small groves occurring in some cemeteries and interdunal valleys. In the Sudan, trees collect in small groves and form dense thickets in low-lying seasonal ponds and fossil valleys. Trees form an open layer 8-20 m height. Most Sudanian tree species possess pinnately compound leaves with leaflets larger than Sahelian species and produce dense, slightly sweet fruits. In the Guinean zone, mesic species form a closed-canopy broad-leaved evergreen forest. High precipitation and insolation bestow Guinean vegetation with an energy surplus that many forest species allocate to the production of dense timber or succulent fruit.

Previous field research on all 126 forest species found across 7600 km^2 in Northwest Senegal documented a decline in forest species richness from 64 ± 2 species per 4 km^2 ca. 1945 to 43 ± 2 species per 4 km^2 in 1993 (Gonzalez 2001). Arid Sahel species expanded in the North, tracking a concomitant retraction of mesic Sudan and Guinean species to the South (Figure 1). The Sahel, Sudan, and Guinea vegetation zones shifted towards areas of higher rainfall 25-30 km in the period ca. 1945-1993, an average rate of 500-600 m y^{-1} (Gonzalez 2001).

These results are consistent with biodiversity studies of small individual sites in Senegal (Poupon 1980, Lericollais 1988, Frankenberg and Anhuf 1989) and anecdotal reports of local species disappearing since the 17th Century (Chamard and Courel 1999). Field research in a more extensive area in the Guinean zone of southern Senegal showed that agricultural clearing and reduced precipitation are causing the local disappearance of Guinean species (De Wolf and Van Damme 1993). Moreover, field research in Delta du Saloum National Park, located in the Guinean zone, has also documented how fire has reduced natural regeneration of many Guinean species (Lykke 1998). One study in northern Burkina Faso, however, found recent revegetation of sand dunes in one part of the Sahel (Rasmussen et al. 2001).

The research in Northwest Senegal (Gonzalez 2001) compared actual forest inventory data for 1993 with systematic surveys of elders in a grid of

135 villages concerning the presence or absence of the area's 126 forest species ca. 1945 and in 1993. Recollections of the historical presence or absence of species served as a proxy for non-existent data on historical distributions. Although recollections are inexact, the research required only one point of binary information: presence = 1, absence = 0. In order to quantify the error of recollection of the male elders, P. Gonzalez recorded corrections made to ca. 1945 recollections by male peers in group discussions or in individual conversations separate from the semi-structured interviews, corrections to ca. 1945 and 1993 data made by female elders, and corrections made from the author's observations of 1993 species distributions. Corrections to data from male elders amounted to only 1% of 34 020 data points.

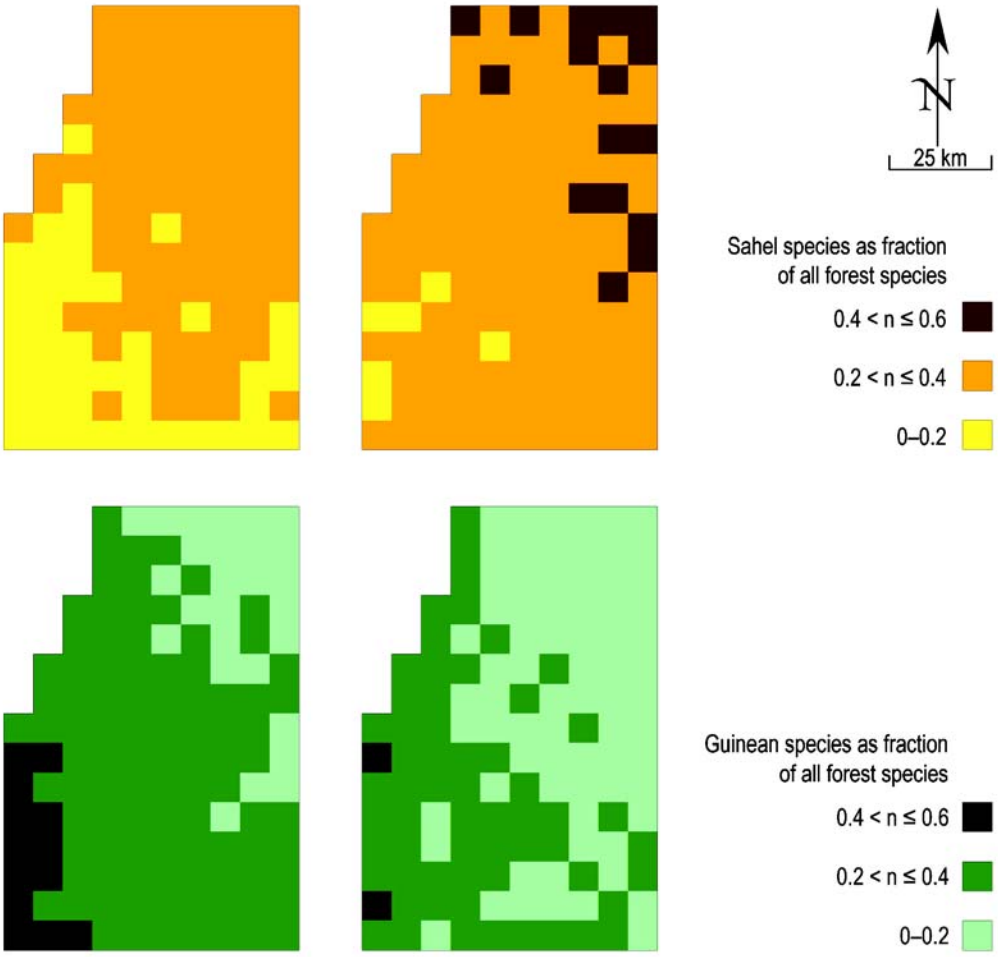

Figure 1. Shift of the Sahel, Sudan, and Guinea vegetation zones in the north-western Senegal ca.1945-1993 (Gonzalez 2001).

The conviction with which most elders identified the presence or absence of species and the cogent manner in which they discussed the local flora demonstrated their thorough knowledge of natural history. Indeed, elders often identified the exact location of the last individual of a species that had disappeared from village lands. Countless times, farmers sat down in their compound and provided a running narration of the layout of their fields, complete with the locations of individual trees.

Guinean and Sudan species experienced the greatest decrease in geographic range (Tables 1, 2). As Lykke (1998) also observed in similar semi-structured interviews, people, when asked a general question about the local disappearance of tree species, tend to mention species that reflect personal values, but not necessarily the relative magnitude of calculated range decreases (Table 3).

The same method of comparing current data from forest species surveys to structured recollections of elders of historic species ranges was used by Issa Khalil, Dr. Hamady Sy, Dr. Joseph Sedgo, and Salif Sow of the Système d'Alerte Précoce contre la Famine (FEWS NET) and P. Gonzalez. Forest species surveys were conducted in 14 village territories in Burkina Faso, Chad, Mali, Mauritania, and Niger in 2000 and 2001. Villages were chosen to generally represent the wide West to East band in the lower Sahel vegetation zone. Village elders provided information on distributions around the time of independence in 1960 and field observations gave current distributions. In semi-structured interviews, village elders also discussed their observations of environmental change and their adaptive responses. The observed changes across the Sahel are consistent with the changes documented in detail in Senegal, with decreases in forest species richness of up to 57% (Figure 2).

Decline in densities of mature trees in the Sahel

In addition to documenting changes in forest species richness in northern Senegal, previous analyses of aerial photos taken in 1954 by the Institut Géographique National of France and in 1989 by the Japanese International Cooperation Agency permitted quantification of total tree densities (Gonzalez 2001). Ground-truthing of the 1989 photos indicated that, in general, only trees of $h \geq 3$ m show under 8x magnification. Densities of trees of height ≥ 3 m declined from 10 ± 0.3 trees ha^{-1} in 1954 to 7.8 ± 0.3 trees ha^{-1} in 1989 (Gonzalez 2001). Both the fall in species richness of 33 ±

5% over 48 years and the decrease in tree densities of 23 ± 5% over 35 years translate to a rate of -0.008 y^{-1}.

The launch of the first commercial high-resolution satellite IKONOS in 1999 now permits monitoring of tree density in the Sahel over time independent of the ability of Sahel governments or international donors to fund aerial photo missions. We are now conducting additional analyses of 1954 and 1989 aerial photos and 2002 IKONOS high-resolution images of three areas of dimensions 10 km (E-W) by 20 km (N-S). We are using the 1-meter resolution panchromatic IKONOS band. In May 2002, we conducted complete forest inventories of 11 one-hectare sample areas in the three IKONOS research areas. This will permit us to ground-truth the IKONOS images and determine the spectral signature of trees and shrubs of certain sizes and species. We are scanning paper prints of the aerial photos at a 1800 dot per inch resolution, which will give a data resolution similar to the IKONOS images.

Previous research provides information on environmental change in the three areas: Njóobéen Mbataar, Senegal (Gonzalez 2001), Fete Olé, Senegal (Poupon 1980), and Wolum, Mauritania (unpublished data summarized in Figure 2). We are now in the process of defining sample areas in the photos and counting individual trees in order to calculate the change in tree density over time. Initial examination of the aerial photos indicates that the change in tree density previously documented in Northwest Senegal has also occurred at Fete Olé and Wolum.

Table 1. Range decrease of the ten species experiencing the greatest relative decline from ca. 1945 to 1993 (Gonzalez 2001). The range decrease is expressed as a percentage of a species' range ca. 1945.

rank	species	vegetation zone	decrease (% of range ca. 1945)
1.	*Ficus ingens*	Sahel	100
2.	*Cordyla pinnata*	Guinea	96
3.	*Nauclea latifolia*	Guinea	94
4.	*Swartzia madagascariensis*	Guinea	90
5.	*Afraegle paniculata*	Guinea	87
6.	*Detarium senegalensis*	Guinea	86
6.	*Ekebergia senegalensis*	Guinea	86
8.	*Morus mesozygia*	Guinea	83
9.	*Ekebergia capensis*	Guinea	83
10.	*Macrosphyra longistyla*	Guinea	80

Table 2. Range decrease of the ten species experiencing the greatest absolute decline from ca. 1945 to 1993 (Gonzalez 2001). The range decrease is expressed as a percentage of the 7600 km^2 research area.

rank	species	vegetation zone	main use	decrease (% of research area)
1.	*Sterculia setigera*	Sudan	gum	54
2.	*Anacardium occidentale*	Sudan	fruit	53
3.	*Strychnos spinosa*	Guinea	fruit	52
4.	*Jatropha curcas*	Sudan	fence	51
5.	*Moringa oleifera*	Sudan	food	50
6.	*Grewia bicolor*	Sahel	medicine	47
6.	*Mangifera indica*	Sudan	fruit	47
8.	*Securidaca longipedunculata*	Guinea	medicine	47
9.	*Zizyphus mucronata*	Sahel	fruit	45
10.	*Aphania senegalensis*	Guinea	fruit	44

Table 3. Species most mentioned in 270 semi-structured interviews in response to the question 'When you were a child, what tree species were in fields locally but are no longer present?' The last column gives the rank of the species, out of the 126 species in the research area, of the absolute range decline of the species from ca. 1945 to 1993, as a percentage of the 7600 km^2 research area (Gonzalez 2001).

rank	response	vegetation zone	main use	decline (rank out of 126 spp.)
1.	*Tamarindus indica*	Sudan	multiple	111
2.	*Sterculia setigera*	Sudan	gum	1
3.	*Parinari macrophylla*	Sudan	fruit	51
4.	*Lannea acida*	Guinea	fruit	15
5.	*Acacia albida*	Sudan	multiple	113
6.	*Balanites aegyptiaca*	Sahel	multiple	118
7.	*Gardenia erubescens*	Guinea	fruit	26
8.	*Anacardium occidentale*	Sudan	fruit	2
9.	*Sclerocarya birrea*	Sahel	fruit	110
10.	*Acacia raddiana*	Sudan	multiple	114

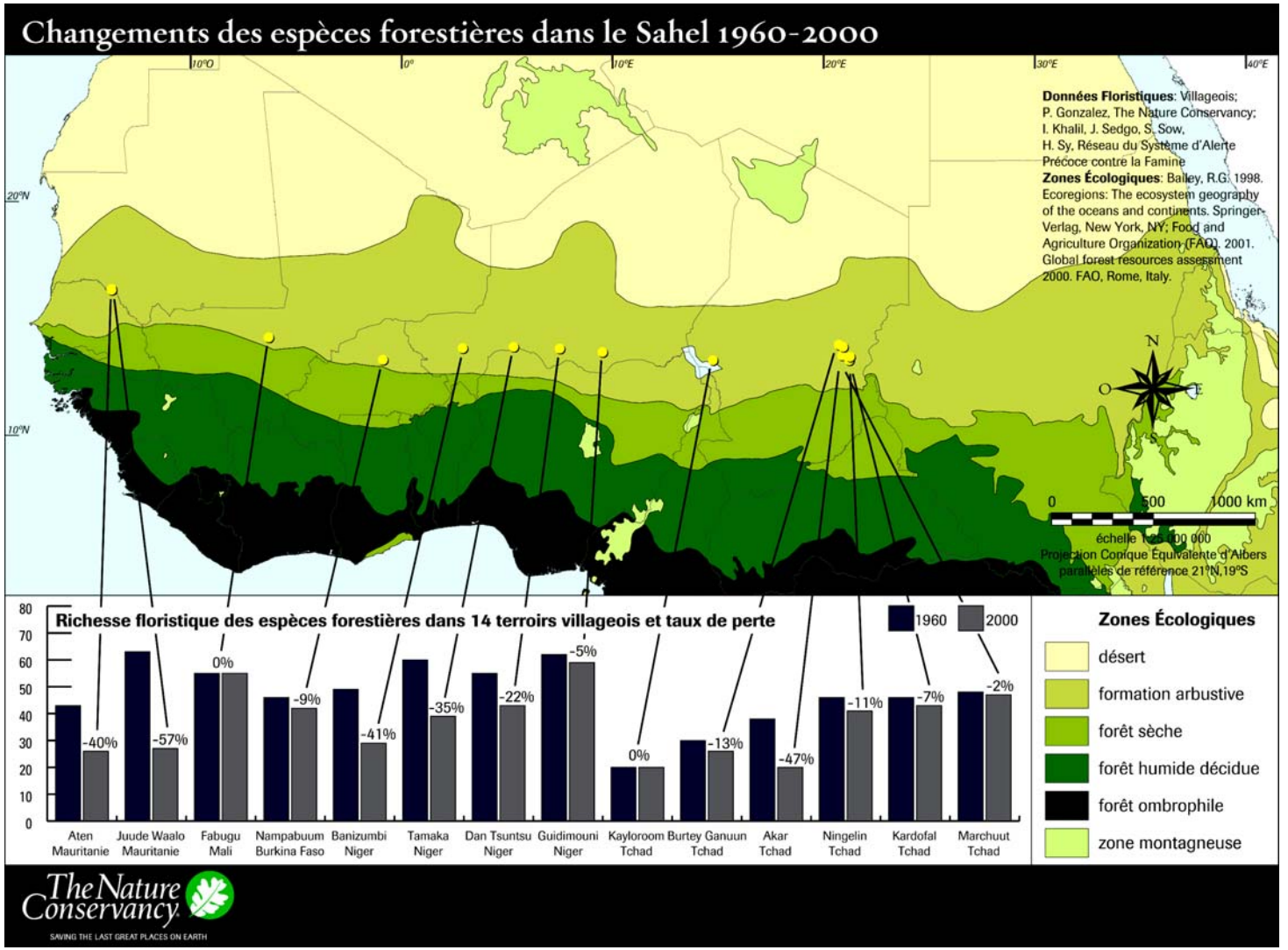

Figure 2. Forest species changes in 14 villages across the Sahel, 1960-2000. In the graph, the black and grey bars show the total number of forest species in the village lands ca. 1960 and in 2000, respectively. The percent decrease in species richness ranged from 0% at Fabugu, Mali to 57% at Juude Waalo, Mauritania.

Decline in forest carbon in the Sahel

Height and diameter measurements from forest inventories in Northwest Senegal of 135 one-hectare quadrates and analyses of 137 wood cores permitted quantification of standing wood biomass and wood growth, using allometric equations (Poupon 1980, Coughenour et al. 1990) and growth rates (Catinot 1967, Giffard 1967, Cazet 1989, CTFT 1989) derived for West African species. The death of trees over time caused standing wood biomass in Northwest Senegal to fall 2.1 t ha^{-1} in the period 1956-1993, releasing 900 kg ha^{-1} of carbon at a rate of 60 kg C $person^{-1}$ y^{-1} (Gonzalez 2001).

So, the woodlands and trees of the Sahel, Sudan, and Guinean vegetation zones constitute a net source of carbon to the atmosphere. Natural regeneration, agroforestry, plantations, and other practices could change the balance to make these vegetation zones a net sink of carbon, mitigating global carbon emissions and providing possible opportunities for selling carbon sequestration credits.

Farmers and herders in Africa have traditionally adapted to arid and semi-arid conditions by promoting the natural regeneration of trees and shrubs. For example, the Sereer in Senegal (Lericollais 1973) and the Mossi in Burkina Faso (Kessler 1992) have doubled tree densities of *Acacia albida* and *Butyrospermum parkii*, respectively, in areas cultivated during the rainy season and grazed by livestock in the dry season. In Northwest Senegal, small trees ($h < 40$ cm) occur at a density of 160 ± 18 trees ha^{-1}, over 20x the density of adult trees ($h \geq 3$ m) (Gonzalez 2001). Because drought-tolerant Sahel species account for 37% of small trees, natural regeneration under current climatic conditions could potentially reconstitute the vegetative cover.

The quantification of tree and shrub densities from the IKONOS images, combined with the allometric equations and growth rates cited above will permit quantification of forest carbon changes over time.

Conclusion

Fragmented habitats, extremely variable climate, poor soils, and societies and economies in transition render Africa particularly vulnerable to the impacts of climate change and desertification (IPCC 2001a). Field research

in progress will provide additional information on: the shift of the Sahel, Sudan, and Guinea vegetation zones; the decline in densities of mature trees in the Sahel; and the decline in forest carbon in the Sahel.

Effective climate change adaptation and mitigation strategies will require natural resource management practices to address these declines and to improve rural livelihoods. Natural regeneration of trees and shrubs, a traditional practice of many farmers and herders, comprises the most promising such practice for the Sahel (Gonzalez 2001). Natural regeneration is a practice in which farmers and herders seek to reconstitute the vegetative cover either by setting aside parcels of land or by selecting small trees in their fields, protecting them, pruning them to promote rapid growth of the apical meristem, and raising them to maturity. The practice requires no special inputs and encourages the propagation of well-known, multiple-use trees. Ultimately, only natural regeneration can cover an extensive surface area, a condition necessary not only to map a comprehensive system of natural resource management, but also to engage positive climatic effects.

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Local knowledge of vegetation changes in Sahelian Africa - implications for local resource management

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Introduction

Vegetation changes occurring in Sahelian West Africa are reported in different sources. In most cases, the term 'vegetation changes' refers to changes in vegetation cover, changes in species composition as well as for an often not specified degradation of vegetation.

Natural long-term vegetation changes have been documented for the last centuries (Lézine 1989, LeHouérou 1997), but also short-term changes in particular associated with the droughts of the 1970s and 1980s. Tucker et al. (1991) showed that these short-term changes are strongly linked to inter-annual rainfall variability altering vegetation cover enormously from year to year. Moreover, inter-annual rainfall variability is also responsible for year-to-year changes of species composition (Bille 1977, Elberse and Breman 1990, Wezel and Schlecht 2004). Besides the climatic factors, the West African Sahel population expansion is also strongly contributing. Although vegetation changes always existed, human activity played a major role in the last decades (LeHouérou 1997). Tree cover decreased due to firewood cutting and overgrazing (Breman and Kessler 1995, Bandré 1996, Gonzalez 2001). Many former tree savannas degraded to shrub/grass savannas or to bare land.

Apart from the changes of climate, vegetation cover or species composition, the knowledge of local populations about vegetation changes was increasingly investigated in the last years. In different countries of Sahelian West Africa a decrease or even the disappearance of various

species was perceived by the local population (Hahn-Hadjali and Thiombiano 2000, Lykke 2000, Lykke et al. in press, Sadio et al. 2000, Wezel and Haigis 2000, Müller and Wittig 2002). In most cases people mentioned valuable woody species with high utility and socio-economic importance for the individual households. Although all investigations report vegetation changes, they only reflect findings from case studies under specific local conditions. In this paper, I aim to summarise the data of the different case studies and analyse three questions. First, can a general decline or increase of certain species be assumed for the whole Sahel, or are decreasing/increasing numbers of certain woody species only of local importance. Secondly, what are the driving forces for species changes (human impact or climate change), and third, what implications for local resource management in respect to conservation of endangered species, priorities for regeneration or reforestation can be derived from the different case studies.

Data and analysis of local knowledge

Five investigations from three West African countries were used to analyse local knowledge about vegetation changes in the Sahel. Three investigations have been carried out in Burkina Faso (Hahn-Hadjali and Thiombiano 2000, Lykke et al. in press, Müller and Wittig 2002), one in Senegal (Sadio et al. 2000) and one in Niger (Wezel and Haigis 2000, Appendix 1). A few study sites are located in the Northern Sudanian Zone. They are included because they allow an analysis of species, e.g. *Vittelaria paradoxa* and *Khaya senegalensis*, which have a core zone of distribution outside the Sahel.

Number of villages studied, number of local people interviewed and climatic parameters are presented in Appendix 2. Although interviews were carried out with single persons in some investigations and group discussions in others and the decision of which species to include and finally list in the different case studies changed from study to study, the studies are comparable on the basis of general trends of species changes. All studies present and discuss the general perception and knowledge of the changes of woody species.

Species changes as perceived by the local population

In total, 123 different woody species were named by the local population in Burkina Faso, Niger and Senegal to have changed in numbers compared to the past. In general the past means 30-50 years ago, depending on the age of the informants. Most species (80%) were classified as decreasing or as having disappeared (Figure 1). Among them are 20 species which were exclusively attributed to the criteria 'disappeared'. Only 13 species (11%) have increased compared to the past or where newly introduced. The remaining 11 species were classified differently at different locations.

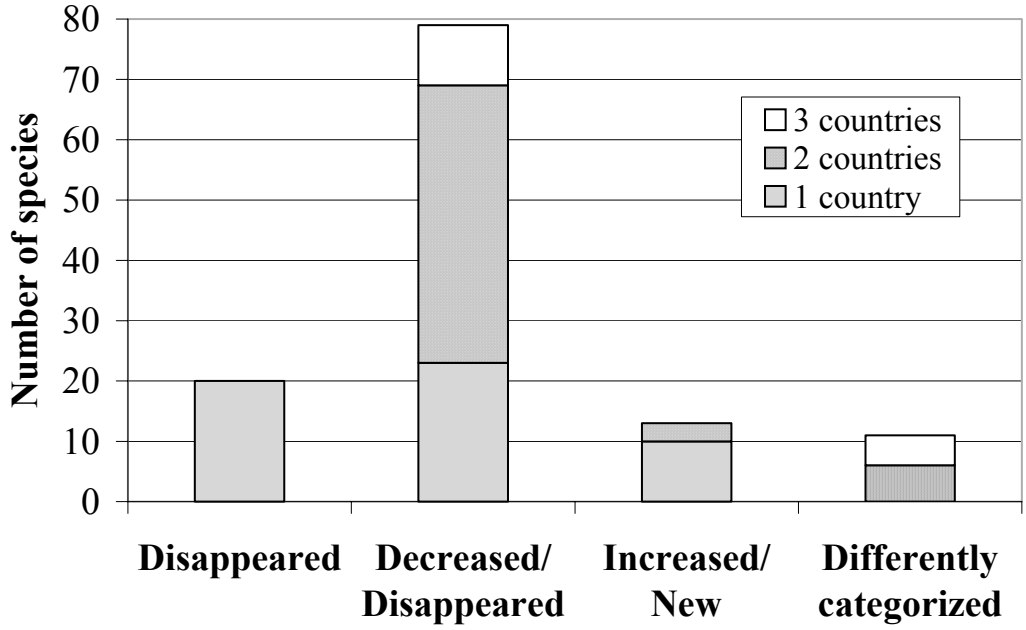

Figure 1. Number of species stated in five case studies in Sahelian West Africa to have changed in frequency compared to the past and their mention related to three study countries.

Most species listed exclusively in the category 'disappeared' were mentioned only in one of the case studies and at only one or two locations, except for *Celtis integrifolia* (Appendix 1). Many more species were classified as having disappeared at certain locations and as decreasing at some other locations. The most prominently species mentioned at various locations are *Acacia ataxacantha*, *A. senegal*, *A. sieberiana*, *Grewia bicolor*, *Parkia biglobosa* and *Ficus gnaphalocarpa*. Other important species which were categorised as mainly decreasing and to some extent as

disappeared are *Anogeissus leiocarpus*, *Ceiba pentandra*, *Combretum micranthum*, *Diospyros mespiliformis, Mitragyna inermis*, *Khaya senegalensis* and *Vitellaria paradoxa*. The bulk of decreasing or disappeared species were only stated for few locations.

Almost all new or increasing species are exotic, often introduced by different developing projects, except for *Lannea fruticosa* and *Calotropis procera* which belong to the original flora of the Sahel (Arbonnier 2000). Some species such as *Acacia albida*, *A. tortilis*, *A. nilotica* and *Parinari macrophylla* indicate significant difference between case studies, e.g. the latter species disappeared in Senegal, but increased in Niger. Moreover, other species such as *Combretum glutinosum* and *Ziziphus mauritiana* reflect differences within the locations analysed in Niger.

Influence of climate on species change

To what extent are climatic factors responsible for changes in species numbers? In general, many authors report a persistent decline in precipitation in the Sahel since the 1970s (Sivakumar et al. 1993, Hulme 2001, Hôte et al. 2002), the latter even speaking of 'the drought continues'. Nevertheless, some researchers see indications of an increase in precipitation since 1990, e.g. in Senegal and Niger (Ozer et al. 2003), and in other areas of the Sahel after the 1980s drought (Eklundh and Olsson 2003). An increasing aridity could be one cause for the decline of at least some species, e.g. *Acacia senegal* or *Guiera senegalensis* which had a mortality of about 50% at a protected site, caused by the drought in 1973 (Poupon and Bille 1974). Nevertheless, Poupon and Bille (1974) reported no species to have disappeared. Breman and Kessler (1995) found a reduced cover of woody vegetation in the Sahel in comparing pre-1970s drought canopy covers with post-1970s drought canopy covers. They mentioned a high mortality of *Acacia raddiana* (syn. *A. tortilis*), *A. senegal* and *Commiphora africana* on sandy soils of the Sahelian Zone, *Pterocarpus lucens*, *Combretum aculeatum* and *Gewia bicolor* on rocky soils and *Combretum glutinsoum*, *Guiera senegalensis* and *Terminalia* spp. on all soil types. As reported by Poupon and Bille (1974), no species disappeared because of drought years, instead, in years after drought many woody plants increased again. This was particular the case for *Acacia nilotica, A. seyal*, *A. senegal* and *A. tortilis* in valleys of the Southern Sahelian Zone, whereas outside these areas this can also be found for *Balanites aegyptiaca* (Benjaminsen 1988, Poupon 1977 and Miehe 1990, all cited in Breman and Kessler 1995, Lykke et al. in press). Thus valleys

may serve as refuge areas for woody species susceptible to drought (Breman and Kessler 1995, Lykke et al. in press). In general, a decline of certain species can be related to years of low rainfall, but they do not disappear totally. This is only indicated for species occurring at the northern limit of their geographic range, e.g. *Sclerocarya birrea* disappeared from upland areas in the Southern Sahelian Zone of Senegal (Miehe 1990 cited in Breman and Kessler 1995) or *Bombax costatum* reaching 100 % mortality where annual rainfall had been less than 350 mm during 2 successive years, which is considered the minimum for survival of this species (Togola et al. 1975 cited in Breman and Kessler 1995). The spatial change of the northern limit of their distribution is also reported for *Acacia senegal* (Ohler 1982 cited in Breman and Kessler 1995) and *Vitellaria paradoxa* (Breman and Kessler 1995).

Finalizing the question to what extent climatic factors are responsible for changes in species numbers, the following can be summarised from the results of various analyses discussed above: certain species are declining in periods with precipitation deficit, mainly at their northern limit or on geomorphic units such as upland areas of dunes. Nevertheless, the disappearance of certain species due to decreased precipitation is very rare. Thus human impact must be the dominant factor for the many species reported to have disappeared at different location in the Sahel (Appendix 1). This is underlined by Breman and Kessler (1995), Nicholson et al. (1998) and LeHouérou (2002). They also see a relation between reduced rainfall and declining species, but in most cases the final 'knockout' of species can be related to human over-use.

Implications for local resource management

What can be learnt from the list of species named by the local people as having changed in numbers and the influence of climate on species? First and very general, human impact must be seen as the most important factor for species change and not climate change. Therefore, local management of woody vegetation plays a crucial role.

Second, there are a lot of species which disappeared or decreased at many different locations. Compared to them, only very few species increase or are new, many of them being exotic species and reported for only few locations. To focus on the most endangered species, two types of key species can be extracted (Table 1). Key species I are species mentioned

as decreasing/disappeared in Burkina Faso, Niger and Senegal, whereas Key species II were reported in only two of the three countries. A common characteristic of all is, that they are declining in many areas of the West African Sahel or have already disappeared at some locations. As these woody species are highly endangered, priority should be given to them in local management. Based on the data of five case studies, this systematisation is a first step to improve the information basis for projects engaged in local resource management, although up-scaling to the whole Sahelian Zone from a few case studies might not be valid for all local conditions. Species endangered at very few or single locations should of course not be left out, but the fact that most of the key species identified here, are multi-purpose species used in many ways by the local population (for details see Hahn-Hadjali and Thiombiano 2000, Lykke et al. in press, Sadio et al. 2000, Wezel and Haigis 2000), underlines that management of local vegetation play a crucial role. In most of the different studies, the local people mentioned the following uses: firewood, construction, medicine, fodder, nutrition and tools. They listed 19 of 24 key species (Table 1) for five or six use criteria, although not all criteria were equally mentioned at each location. Four species were mentioned with four use criteria, whereas *Acacia sieberiana* is only used for firewood, nutrition or medicine. Nevertheless, these findings do not specify the intensity of use. This has to be more deeply analysed in future research.

A third discussion point for local resource management is that although individual interviews provide a better database, few group discussions might be sufficient to get satisfactory information about locally endangered species. Group discussions are also effective for selection of species for multiplication or regeneration. Anyhow, in group discussions or interviews gender aspects have to be considered, because perception on species change is in some cases different for male and female farmers (see Wezel and Haigis 2000).

Concerning multiplication of species, exotic species often fare better than local species because rural people were trained to multiply introduced species or even received the seedlings by the projects, whereas knowledge about multiplication of local species is very limited. Thus an intensive collection of more local knowledge is necessary, as well as a better distribution of already existing information about the multiplication of local species.

Table 1. Proposed key species for local resource management in Sahelian West Africa.

Key species I (species that decreased/disappeared in all countries studied and at least at 5 locations)	Key species II (species that decreased/disappeared at least at 5 locations, but not in all countries studied)
Acacia ataxacantha	*Acacia senegal*
Acacia seyal	*Acacia sieberiana*
Boscia senegalensis	*Acacia nilotica*
Ceiba pentandra	*Adansonia digitata*
Combretum glutinosum	*Anogeissus leiocarpus*
Combretum micranthum	*Ficus gnaphalocarpa*
Diospyros mespiliformis	*Hyphaene thebaica*
Grewia bicolor	*Khaya senegalensis*
Parkia biglobosa	*Mitragyna inermis*
Piliostigma reticulatum	*Sclerocarya birrea*
Prosopis africana	*Vitellaria paradoxa*
Tamarindus indica	
Ziziphus mauritiana	

Further, natural regeneration of many species is low because young seedlings are often grazed by livestock or eliminated by annual clearing of fields. To improve regeneration, some species need to be specifically protected from being grazed or by selective clearing of fields. This seems to be the easiest, cheapest and most promising way, as shown by some successful projects. In southern Niger, most of the peasant promoting regeneration of natural woody species on their fields benefited from sufficient wood production for their household and increasing sustainable crop yields after 2-3 years (Taylor and Rand 1992, see also Rinaudo 1996, Joet et al. 1998).

Lastly and surely not new, but still actual, is that improved stoves or fireplaces are needed for more people to reduce amount of firewood.

Conclusions

The comparison of local knowledge of local people analysed in case studies from different countries in the West African Sahel clearly shows that many woody species decline or even disappeared in the whole of the Sahel; and some species even at locations in the Northern Sudanian Zone. The major

cause is over-utilization by humans because a lot of species are used for many purposes. Clearing and extension of agricultural land may have also played an important role in certain areas. In addition, the relative dry climate period in the Sahel in the last three decades also influenced species numbers. Nevertheless, except for few species at their northern limit of geographical distribution, only a decline of species due to deficit rainfall could be found, but not their disappearance. The high number of different species reported by the local people as having declined or disappeared undoubtedly indicated the need to improve local resource management by generally promoting regeneration and protecting young trees as well as improving reforestation of suitable species. In addition, on local scales, e.g. different villages, prioritisation of species for resource management should be further worked out by conducting rankings or group discussions with different user groups to improve local acceptance and implementation for species conservation.

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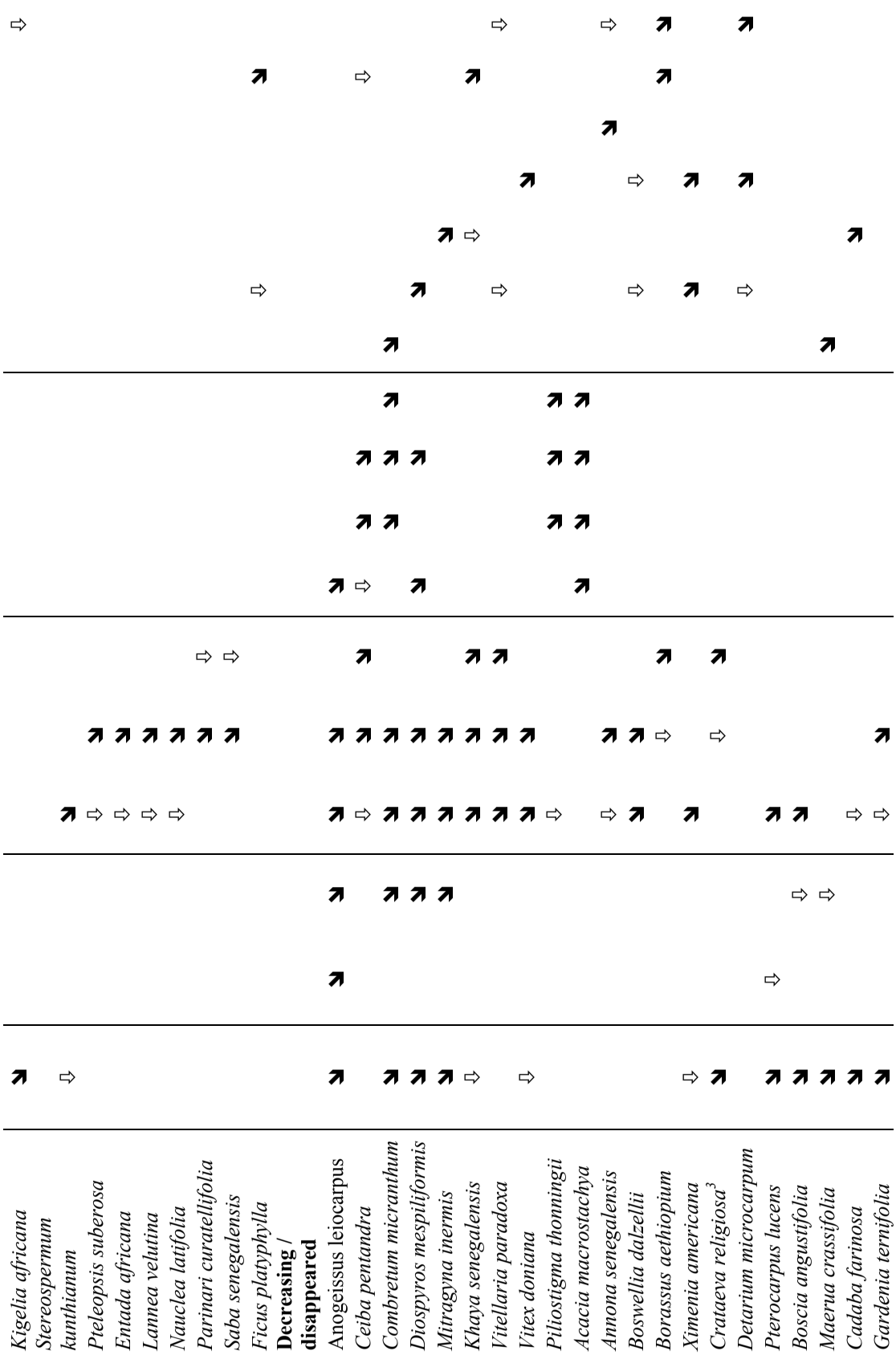
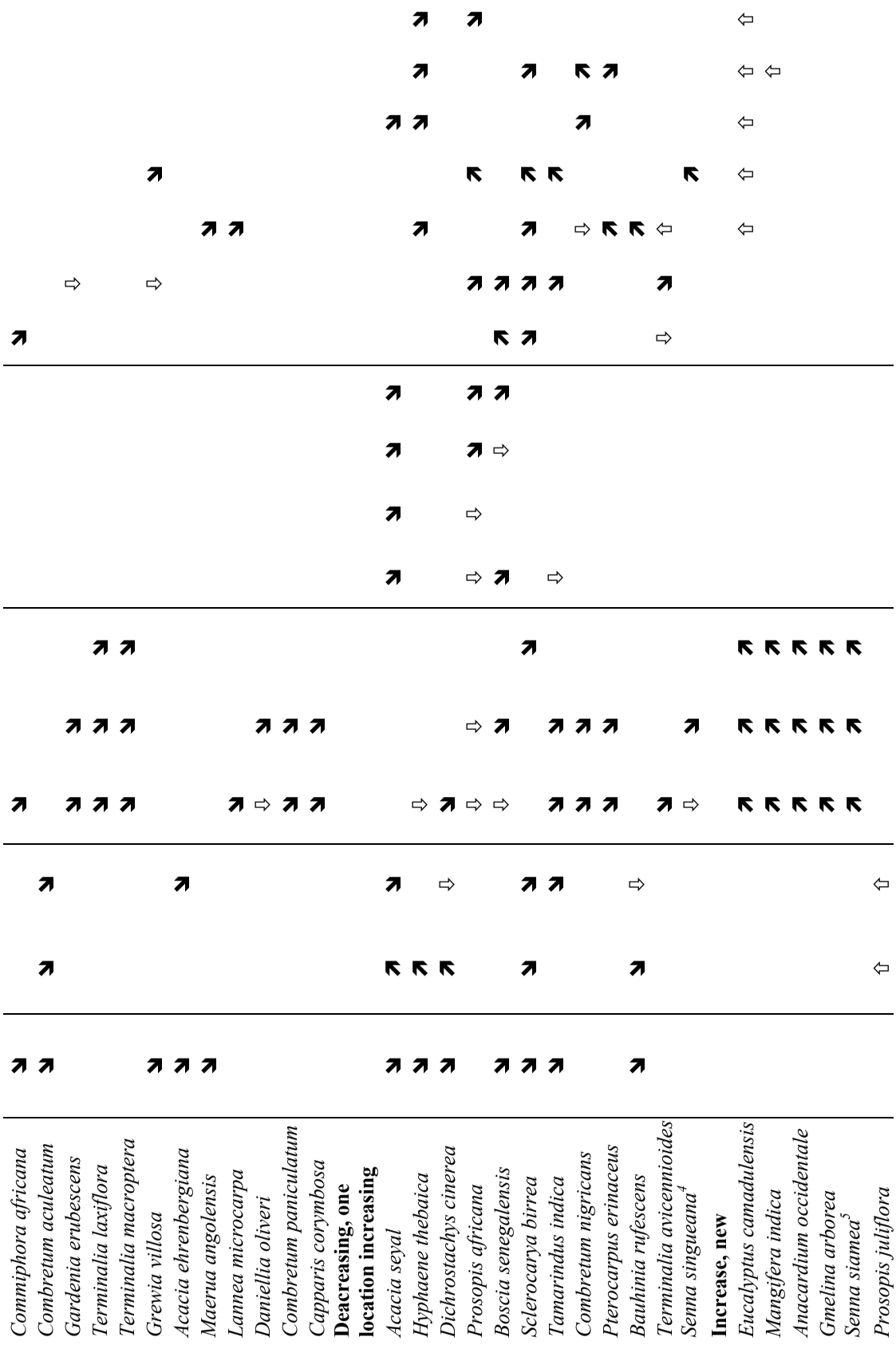
Appendix 1. Local perceptions of vegetation changes in Burkina Faso, Senegal and Niger.

Country	Burkina Faso	Burkina Faso		Burkina Faso			Senegal				Niger						
Reference	Lykke et al. 2000	Müller and Wittig 2002		Hahn-Hadjali and Thiombiano 2000			Sadio et al. 2000				Wezel and Haigis 2000						
Study locations*	5 vill.	Tint.	Koll.	Bo	Fa	Pa	DRII	NS	Ngod	Sob	C	DI	B	SH	L	KS	SD
Disappeared																	
Celtis integrifolia			⇩	⇩	⇩	⇩											
Sterculia setigera							⇩	⇩	⇩	⇩							
Cordyla pinnata							⇩	⇩	⇩								
Senna sieberiana[1]							⇩	⇩	⇩								
Afrormosia laxiflora				⇩	⇩												
Afzelia africana					⇩	⇩											
Burkea africana				⇩	⇩												
Erythrina senegalensis				⇩	⇩												
Pseudocedrela kotschyi				⇩	⇩												
Terminalia mollis					⇩	⇩											
Disappeared / decreasing																	
Acacia ataxacantha	↘			⇩	⇩	⇩	↘	⇩	⇩	↘	↘		↘				
Acacia senegal	↘	⇩	⇩				⇩	⇩	⇩	⇩							
Grewia bicolor	↘	⇩	⇩				⇩	↘	⇩	⇩		↘		↘			
Acacia sieberiana				↘	↘		⇩	⇩	⇩	↘							
Parkia biglobosa				↘	↘	↘	⇩	⇩	⇩	⇩						↘	⇩
Ficus gnaphalocarpa[2]	↘			⇩	↘	↘	⇩	⇩	⇩	⇩							
Dalbergia melanoxylon	↘	⇩	⇩	⇩													
Securidaca longepedunculata				⇩	↘	⇩											
Bombax costatum				↘	↘		⇩		⇩								
Moringa oleifera							⇩	↘	⇩	⇩							
Andira inermis	↘				⇩	⇩											


Kigelia africana
Stereospermum kunthianum
Pteleopsis suberosa
Entada africana
Lannea velutina
Nauclea latifolia
Parinari curatellifolia
Saba senegalensis
Ficus platyphylla
Decreasing / disappeared
Anogeissus leiocarpus
Ceiba pentandra
Combretum micranthum
Diospyros mespiliformis
Mitragyna inermis
Khaya senegalensis
Vitellaria paradoxa
Vitex doniana
Piliostigma thonningii
Acacia macrostachya
Annona senegalensis
Boswellia dalzellii
Borassus aethiopium
Ximenia americana
Crataeva religiosa[3]
Detarium microcarpum
Pterocarpus lucens
Boscia angustifolia
Maerua crassifolia
Cadaba farinosa
Gardenia ternifolia


Commiphora africana
Combretum aculeatum
Gardenia erubescens
Terminalia laxiflora
Terminalia macroptera
Grewia villosa
Acacia ehrenbergiana
Maerua angolensis
Lannea microcarpa
Daniellia oliveri
Combretum paniculatum
Capparis corymbosa
Deacreasing, one location increasing
Acacia seyal
Hyphaene thebaica
Dichrostachys cinerea
Prosopis africana
Boscia senegalensis
Sclerocarya birrea
Tamarindus indica
Combretum nigricans
Pterocarpus erinaceus
Bauhinia rufescens
Terminalia avicennioides
Senna singueana[4]
Increase, new
Eucalyptus camadulensis
Mangifera indica
Anacardium occidentale
Gmelina arborea
Senna siamea[5]
Prosopis juliflora

Parkinsonia aculeata													⇧				⇧	
Ziziphus spina-christi												⇧		⇧				
Calotropis procera	↘						↗	↗	↗	↗								
Different trends																		
Acacia albida	↘	↗		⇩	⇩	⇩					↗	↗	↗	↗		↗	↗	
Acacia tortilis[6]	↗	↗	↗				↘	↘	↘	↘								
Parinari macrophylla							⇩	⇩	⇩	⇩			↗			↗	↗	
Acacia nilotica	↘	↘	↘				↘	↘		↘			↗	↗				
Combretum glutinosum	↘		↘	↘	↘			⇩	↘		↗		↗	↗	↘	↗	↘	
Guiera senegalensis	↘		↘	↘							↗	↗	↗	↗	↘	↗		
Piliostigma reticulatum	↘	↘	↘	↘		↘			↘	↘		↗	↗	↗	↘	↗	↗	
Adansonia digitata	↘		⇩	↘	↘							↗	↘	↗		↘	↘	
Ziziphus mauritiana	↘	↘	↘	↘			↘				↘			↗	↘		↗	
Balanites aegyptiaca	↘	↗	↗								↘		↗		↗	↗	↗	
Azadirachta indica	↘	⇧	⇧				↘	⇩		⇩		↗	⇧	⇧	↗	⇧	⇧	

⇩ disappeared ↘ decrease ↗ Increase ⇧ new

*Tint: Tintaboora, Koll: Kollangal Alyaakum, Bo: Boganda, Fa: Fada N'Gourma, Pa: Pama, DRII: Darou Rahmane II, NS: Ndiamsil Sessène, Ngod: Ngoddjilème, Sob: Sob, C: Chikal, DI: Dan Indo, B: Boulkass, SK: Serkin Hatchi, L: Liboré, KS: Kirtachi-Seybou, SD: Sounga-Dossado.

[1]syn. *Cassia sieberiana*, [2]syn. *Ficus sycamorus*, [3]syn. *Crataeva adansonii*, [4]syn. *Cassia singueana*, [5]syn. *Cassia siamea*, [6]syn. *Acacia raddiana*

Disappeared at one location:
Acacia polyacantha and *Celtis toka* (5 villages), *Acacia erythrocalyx* (Tint.), *Crossopteryx febrifuga* and *Combretum molle* (Bo), *Dombeya multiflora*, *Gardenia sokotensis*, *Pavetta crasipes* and *Terminalia glaucescens* (Fa*), Isoberlinia doka* (Pa).

Decreasing at one location:
Capparis sepiaria, *Leptadenia hastata*, *Leptadenia pyrotechnica*, *Ziziphus mucronata*, *Securinega virosa* (syn. *Flueggea virosa*), *Grewia flavescens*, *Grewia tenax*, *Phoenix dactylifera*, *Boscia salicifolia* and *Feretia apodanthera* (5 villages), *Strychnos spinosa* (Bo), *Trichilia emetica* (Fa), *Acacia laeta* (C), *Ficus thonningii* (b).

Increasing at one location: *Euphorbia balsamifera* (Tint.), *Lannea fruticosa* (SH).

New at one location: *Acacia tumida* (DI), *Acacia torrulosa* (SH).

Appendix 2. Parameters of the different case studies on the local knowledge about vegetation change.

	Lykke et al. (2000)	Müller and Wittig (2002)	Hahn-Hadjali and Thiombiano (2000)	Sadio et al. (2000)	Wezel and Haigis (2000)
Country	Burkina Faso	Burkina Faso	Burkina Faso	Senegal	Niger
Average precipitation	400	400	570-850	400-500	330-580
Number of villages analysed	5	2	3	4	7
Total number of interviews	100	group discussions	45	group discussions	253
Asked for species that are/have	- increasing, - declining (slight, moderately, severely/extinct)	- increasing, - decreasing, - disappeared	- endangered (decreasing), - disappeared	- still existing, - becoming rare, - disappeared	- new (introduced), - increasing, - decreasing, - disappeared
Selection criteria of species for enrolment on species list	first 59 species were selected in 21 group discussions; then 100 individual interviews were conducted and species that were attributed by at least 50% of the interviewees to the different categories were enrolled	first a species list was created in several group discussions; then all species on the list were classified to the different categories in the group discussions	species that were mentioned by at least 30% of interviewees per village for the respective classification were enrolled	species change categories were first attributed to four different time periods (<1960, 1960-1972, 1972-1990, 1999); then the changes over the four time periods were used for final categorisation	species that were mentioned by at least 20% of interviewees per village were enrolled; a species was attributed to the respective category, if it was indicated exclusively or at least with a frequency of more than two thirds of all indications for this species per site

The importance of local knowledge in natural resource management – a case study among the Gourounsi people in Burkina Faso

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University of Aarhus, Denmark

Introduction

The value of incorporating local knowledge and indigenous resource management into science-based resource management plans is increasingly recognised (Gadgil et al. 1993, Appiah-Opoku and Mulamoottil 1997, Berkes et al. 2000, Etkin 2002, Ticktin and Johns 2002). Managing the natural ecosystems without integrating the local people and their knowledge and wisdom is out-dated (Kangas 1997). It is realised that most of the natural resources around the world are managed by people in one way or the other and so-called 'pristine nature' or 'wild nature' is a misleading term (Sprugel 1991, Wild and Mutebi 1996).

Local knowledge is here defined as: 'The knowledge base acquired by indigenous and local people over hundreds of years through direct experience and contact with the environment'. This kind of knowledge has become popular in natural resource management as a) the local people have a large, diverse and unique knowledge obtained during generations, b) incorporating their knowledge into management plans is a way to achieve ownership and responsibility among the local people, c) it can improve and extend science-based management and secure participation by the local people and d) it is an excellent tool when setting priorities in conservation work.

In this paper a new approach to obtain quantitative information on local knowledge of plant uses and local people's perceptions of important plant species is presented and discussed. Secondly, even though the

significance of local knowledge is increasingly recognised we lack investigations comparing this knowledge with vegetation investigations and analyses; and it is exiting to see whether information derived from the local people can be supported by vegetation data. Therefore local knowledge is evaluated by comparing the knowledge of the Gourounsi people with actual measurements of the tree populations. Thirdly, it will be shown how indigenous knowledge gives information on how to organise and implement natural resource management plans. In conclusion, the significance and importance of local knowledge in applied research is discussed.

The study site and the Gourounsi people

The study was conducted in villages around the Nazinga Game Ranch in south-central Burkina Faso, 200 km south of the capital, Ouagadougou. In this province of Burkina Faso the human population density is 27.5 inhabitants/km^2. People from the Gourounsi ethnic group inhabit the study area. The adult population varies between 150 and 400 in each of the 10 villages surrounding the game ranch. Traditionally, the Gourounsi lived from agroforestry, but today more and more people go to Ghana during the dry season as migrant workers. Their major subsistence crops are sorghum, maize, groundnuts and yams. Cotton is grown as cash crop. Recently, people from the Mossi and Fulani ethnic groups have started to move from the north into the study area in search for new land suitable for cultivation and grazing. The newcomers teach the Gourounsi to rear livestock.

The average annual precipitation is 1014 mm (1988-1997) in Pô, 15 km from the study site, with a four month rainy season between mid-May and mid-September. The mean annual temperature is 27.5°C, with a maximum mean monthly temperature of 31.4°C in April and a minimum mean monthly temperature of 25.1°C in August. The study area lies within the Sudanian phytogeographic region (Guinko 1984). Non-cultivated areas support savannas with a continuous herb layer and a discontinuous layer of trees and shrubs. *Vitellaria paradoxa* C.F. Gaertn., *Terminalia avicennioides* Guill. and Perr. and *Piliostigma thonningii* (Schumach.) Milne-Redh. dominate the vegetation.

The Nazinga Game Ranch covers 940 km^2. Created in 1979 it was the first of its kind in West Africa, and was established to improve the ecological condition for wildlife in the area and to establish controlled

hunting that would benefit local people. The large game animals in the reserve area are elephants, different species of antelopes, crocodiles and warthogs. No fence borders the game ranch, but a buffer zone established outside its border is the villagers' hunting zone. Both natural and man-induced fires are common and strongly influence the vegetation structure and composition. In addition the wildlife has a major effect on the vegetation as browsers on trees and shrubs. The 10 villages located around its periphery collaborate with the game ranch; the villagers work there, sell their handicrafts and collected products, fish in the ponds and obtain game meat from the ranch.

How can we obtain local knowledge suitable for natural resource management?

Here I present a new informant-based valuation system with three valuation categories which has been develop by Kristensen and Lykke to obtain quantitative information on local knowledge of plant uses and local people's perceptions of important plant species (Kristensen and Lykke 2003; Lykke et al. in press). In this approach, the informants themselves value the use of woody species for a number of different purposes.

The interviews included questions about twenty useful woody species. The species were selected beforehand either because they were mentioned as being very useful during preliminary interviews (Kristensen and Balslev 2003), they were abundant in the area or they were known to be important from other investigations in West Africa. The species were presented to the informant by their local names. The same set of questions was asked for each species. Table 1 summarises the questions asked and the valuation system used in the interviews. For each informant exactly the same questions were asked and in the same way. However, the order of species was changed to avoid any systematic bias in answers. The data were collected in the 10 villages surrounding the Nazinga Game Ranch. In each village, 10 women and 10 men were interviewed individually, their age were between 21 and 100 years old.

Table 1. Presentation of an informant-based valuation method used to obtain local knowledge suitable for natural resource management. The questions were asked to 200 Gourounsi informants around Nazinga Game Ranch, concerning their valuation of 20 woody species that are common and economically important in the area.

Personal information	
Name Age Gender Village of residence	
Questions asked for each species	**Valuation**
Do you know the plant?	0: do not know the plant, 1: do know the plant
How important is this species:	
for its **edible fruits**?	0: no importance, 1: moderate importance, 2: high importance, x: do not know
for making **vegetable sauce**[1)]?	0: no importance, 1: moderate importance, 2: high importance, x: do not know
for **construction**?	0: no importance, 1: moderate importance, 2: high importance, x: do not know
as **firewood**?	0: no importance, 1: moderate importance, 2: high importance, x: do not know
as **medicine**?	0: no importance, 1: moderate importance, 2: high importance, x: do not know
commercial value[2)]?	0: no importance, 1: moderate importance, 2: high importance, x: do not know
as **field tree**[3)]?	0: no importance, 1: moderate importance, 2: high importance, x: do not know
The **conservation priority** of the species[4)]?	0: no priority, 1: moderate priority, 2: high priority, x: do not know
The **change in abundance** of the species[5)]?	0: not decreasing, 1: slightly decreasing, 2: severely decreasing, x: do not know

[1)] The main course in Burkina Faso is a thick porridge accompanied by vegetable sauce
[2)] Fruits, sauce ingredients, firewood, construction material and medicinal products can be sold on markets
[3)] Some tree species are left in cultivated fields
[4)] How important do the informants think it is to conserve a particular species
[5)] The valuation "not decreasing" include both stationary and increasing populations

Figure 1 gives an overview of the information gathered from this interview method. It shows which species that are important and for what purposes and it shows the connection between what is used and what is given high conservation priority. Information about food products are well-known to everybody and in general they agree about their importance, whereas their opinions about firewood, medicine, commercial value and field trees vary, often depending on their village affiliation. From the figure we can derive key species that should be given special emphasis in natural resource management and conservation as they have many uses and are very appreciated by the local people; e.g. *Adansonia digitata*, *Parkia biglobosa*, *Tamarindus indica* and *Vitellaria paradoxa*.

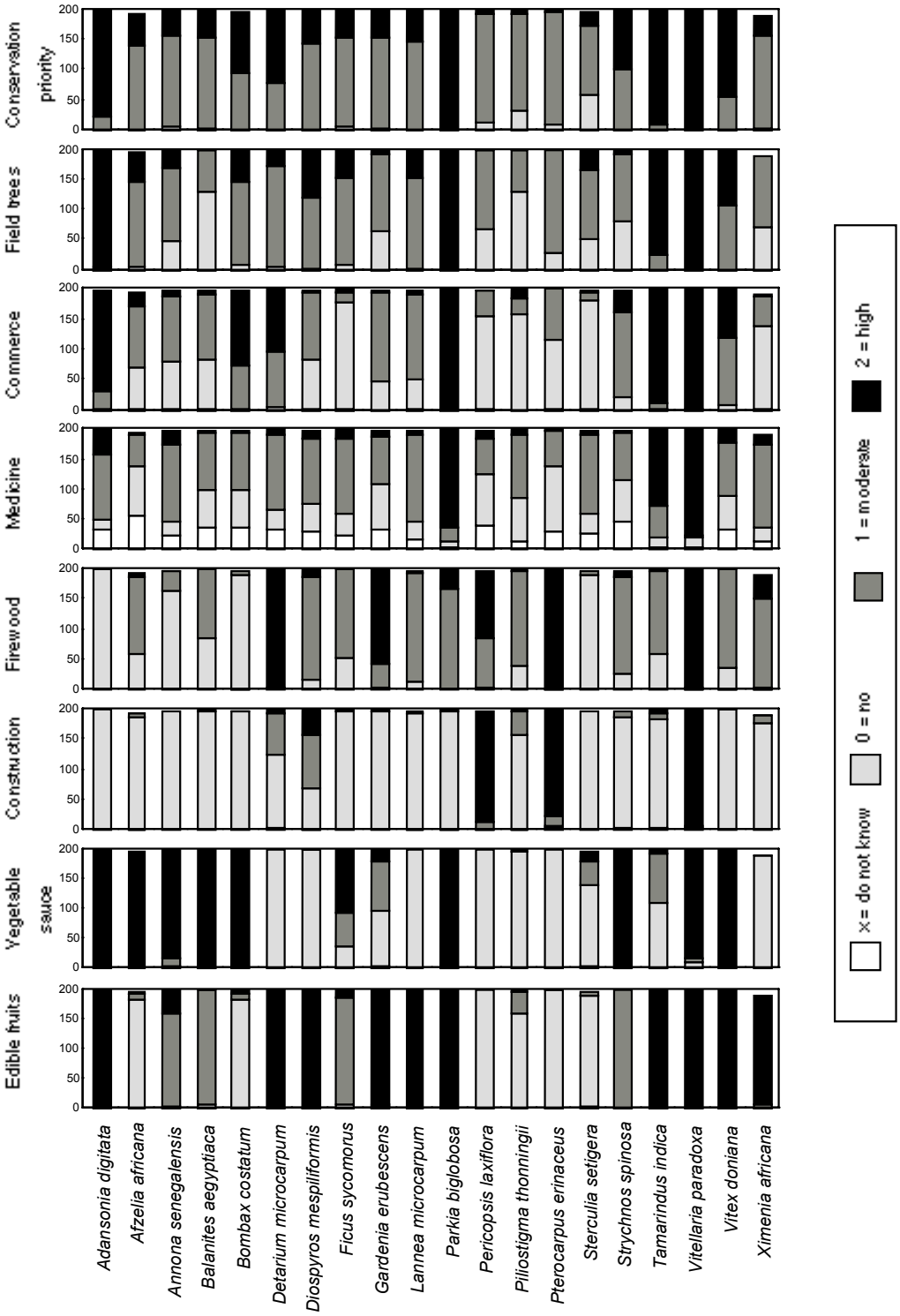

Figure 1. Informant-based valuation of nine different categories of local knowledge concerning the use of 20 woody species. Data are based on answers from 200 Gourounsi informants. Columns with a total lower than 200 indicate species unknown by some informants. The eight categories correspond to the questions in Table 1.

The data also reveal how the people's perception of which species are particularly worth conserving differ from village to village (Figure 2). Informants from three villages consider almost all of the 20 species of high conservation priority whereas the other seven villages only give high priority to four species. This difference indicates a shift in the availability of the resources. Around the three villages (Sia, Natiedougou and Kounou) there is high concentration of wild animals and they have a high impact as browsers on the trees. In addition, most of the newcomers from further north in Burkina Faso settle around these villages, leading to less non-cultivated savanna areas and therefore a higher pressure on the remaining tree resources. These villagers may have started to realise that the natural resources are limited and need some kind of protection, whereas the rest of the villagers, from the seven other villages, still experience that there are plenty of almost everything.

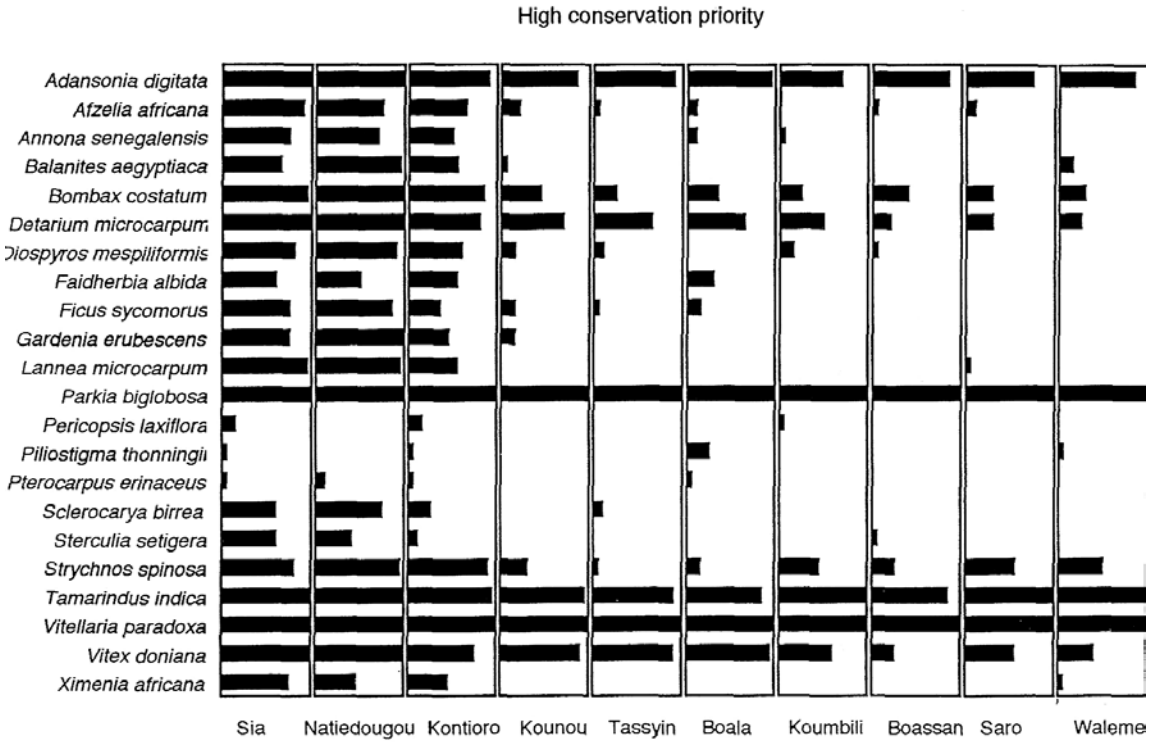

Figure 2. Informant-based valuation of conservation priority of 20 woody species, separated out by village. Data are based on answers from 200 Gourounsi informants around the Nazinga Game Ranch, 20 in each village. The black bars show the number of informants giving a species high conservation priority.

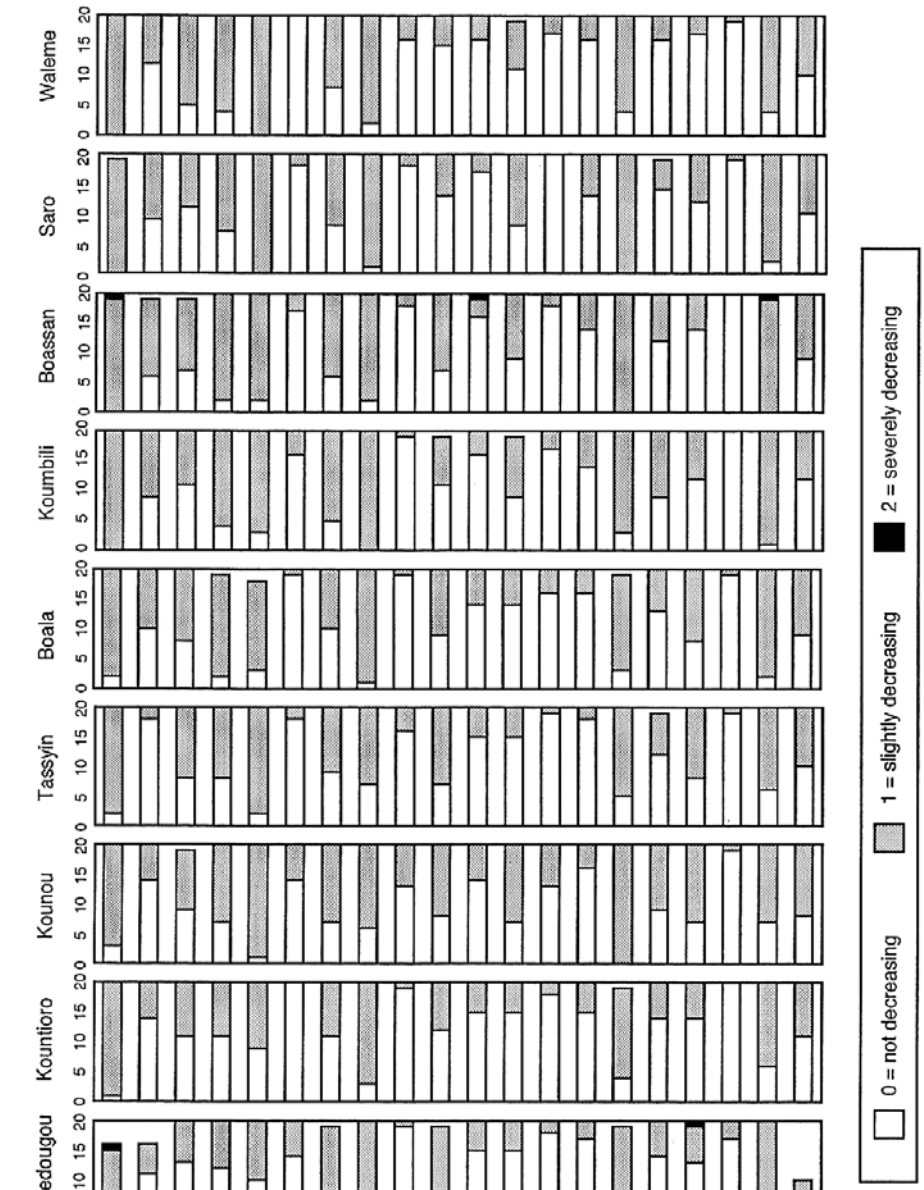

Figure 3. Informant-based valuation of the change in abundance of 20 woody species, separated out by village. Data are based on answers from 200 Gourounsi informants around the Nazinga Game Ranch, 20 in each village. The informants were asked to value the species as either: not decreasing, slightly decreasing or severely decreasing. Therefore the answer ‘not decreasing‘ include species that are stationary or increasing in numbers.

Few informants from one village (Sia) found some of the 20 species to be severely declining (Figure 3). In the rest of the villages no species were severely declining, but five species were valued as slightly decreasing. However, there was not an exact match between species having a high conservation priority and species found declining. E.g. Ficus sycomorus were declining, but not a highly appreciated species, probably because it is not much used.

All in all this method is recommended as a method to undertake a local quantitative valuation of the uses of plants, to reveal the knowledge distribution in the community, and to identify key species for conservation management. The method gives an overview of uses, leaving out details. Ecological questions such as degree of abundance, growth rate, degree of disturbance, etc. could also be included.

How accurate is local ecological knowledge?

So far we have been discussing how important local knowledge is in natural resource management as it, for example, can improve or extend science-based management plans and provides a way to establish ownership of conservation project. But first of all we need to know how accurate local knowledge is. Can we trust it as a reliable way to gain ecological information about the species and ecosystems?

To answer this question a study was designed to compare local ecological knowledge with vegetation investigations and analyses. It focused on two highly appreciated species: *Bombax costatum* (red flowered silk cotton in English, kapokier rouge in French) which is valuable because of its tasty calyces used in vegetable sauce and its light wood used to make furniture, masks, utensils and handicraft; and *Detarium microcarpum* (tallow in English and petit détar in French) which is valuable because of its fruits, eaten either fresh or boiled and the wood are used to make e.g. shelters, storage containers and utensils. Both species have several medicinal properties as well.

Interviewing Gourounsi people

Interviews were carried out in the ten villages surrounding the Nazinga Game Ranch. In each village four men and four women were selected randomly and interviewed using open-ended questions regarding *Bombax costatum* and *Detarium microcarpum*. The questions included ‘how is the

population trends of *Bombax costatum*/*Detarium microcarpum*? ' and 'what explains this trend? '.

Bombax costatum was found to be declining by 39% of the informants, mainly because of felling and increasing fire frequency, but some informants said it was increasing because of lots of regeneration. In contrary, 66% found *Detarium microcarpum* to be increasing, mainly because of lots of regeneration and because they did not cut the trees anymore.

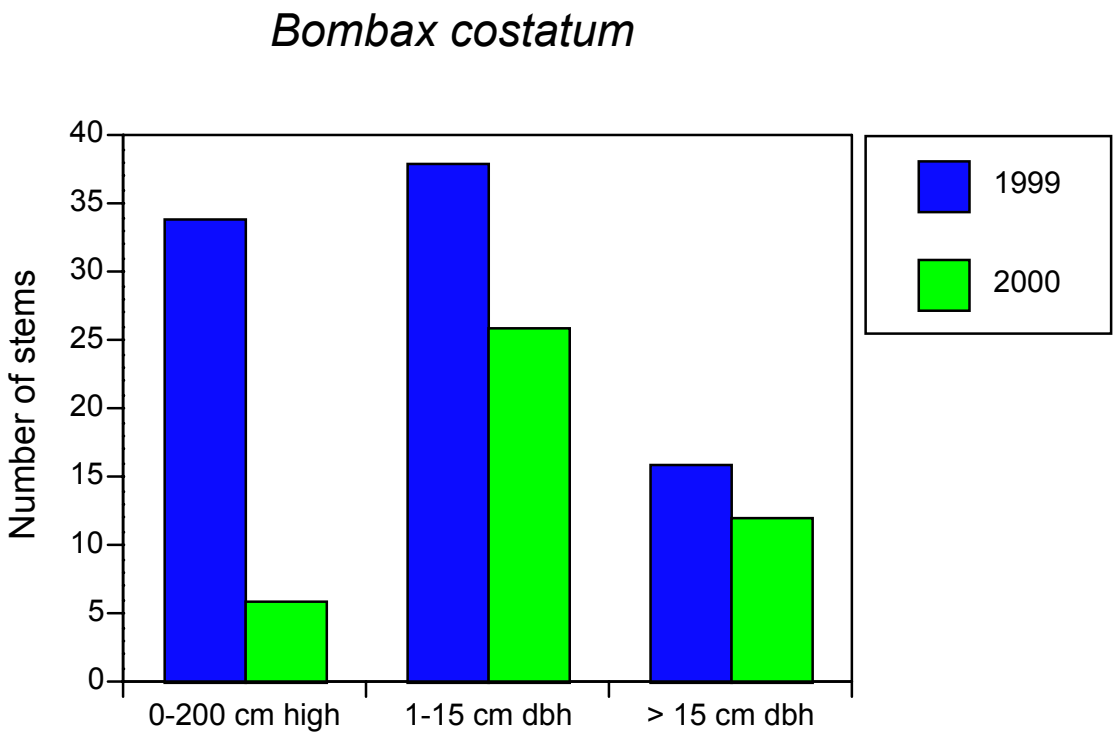

Figure 4. Number of stems of *Bombax costatum* measured in twenty 0.1-ha plots in non-cultivated areas in and around the Nazinga Game Ranch. First census in the dry season of 1999 and second census a year later. The individuals are divided into three categories: small ones of less than 200 cm height, those of 1-15 cm dbh are well-established but not reproducing yet, whereas the last category of dbh > 15 cm produce edible flowers.

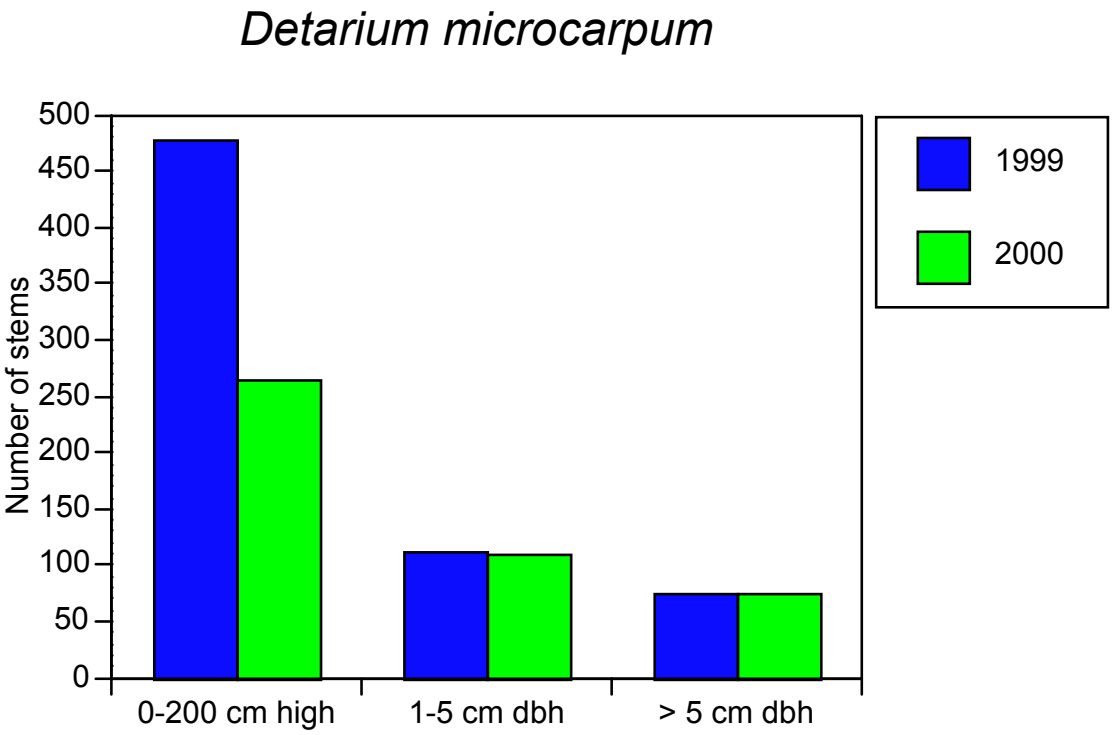

Figure 5. Number of stems of *Detarium microcarpum* measured in twenty 0.1-ha plots in non-cultivated areas in and around the Nazinga Game Ranch. First census in the dry season of 1999 and second census a year later. The individuals are divided into three categories: the small ones of less than 200 cm height, those of 1-5 cm dbh are well-established and set fruits and the last category of dbh > 5 cm are large enough to be used in construction.

Vegetation sampling

Twenty 0.1–ha permanent plots were established from January through March 1999 in non-cultivated areas in and around the Nazinga Game Ranch. All individuals of *Bombax costatum* and *Detarium microcarpum* were sampled. In June 1999 all individuals were relocated and measured and new recruits were recorded and measured as well. A third census was made in March 2000.

The results showed that many of the large individuals of *Bombax costatum* disappeared during this one year period, whereas the number of large *Detarium microcarpum* individuals was constant (Figure 4 and 5). The survival rate of the regeneration from the middle of the rainy season (June 1999) to near the end of the next dry season (March 2000) was 3.6% for *Bombax costatum* and 29.3% for *Detarium microcarpum*.

The general tendency

During the interviews, *Bombax costatum* trees were often explained to be felled in order to reach the flowers whereas it was enough to tap the branches of *Detarium microcarpum* and then the fruits felt down. This difference in collection method is probably the reason for the disappearance of large *Bombax costatum* individuals. If this trend continue it will soon be a rare resource in the area.

The vegetation data showed that regeneration of *B. costatum* had problems surviving the dry season with its frequent fires whereas *D. microcarpum* was less vulnerable. For *B. costatum* the combination of a non-sustainable harvest method and low survival rate of the regeneration indicates that it is severely declining. However, many of the informants were not aware of this severity as they have seen lots of regeneration during the rainy season.

This study shows that local ecological knowledge can give an indication of the status of the vegetation and come up with different explanation for the population trends. But it must be supplemented by vegetation studies as the local ecological knowledge is not exact and invariable.

Table 2. Suggestions for management of surrounding savanna areas, given by 50 Gouruounsi people around the Nazinga Game Ranch in south-central Burkina Faso.

Management suggestion	Proportion of informants giving this suggestion
Not so much fire	44%
No cutting of living tree	34%
Have a person in each village who teach how to conserve	10%
No cultivation in the bush	8%
No killing of wild animals	6%
Early burning in the dry season	4%
Planting of new trees	4%
Get ride of poachers	4%
Ask God to give more rain	4%
Ask God to protect the bush	2%
Improve the soil	2%
Fewer wild animals in the area	2%
More rain	2%
More fire	2%
Cutting of living tree	2%

How to incorporate indigenous resource management

During an ethnobotanical survey 50 informants around the Nazinga Game Ranch were asked if they had any management suggestions on how to conserve the savanna with its valuable plants and animals (Table 2). Their suggestions can be divided into four different categories. 1) Include active involvement of the local people, like not so much fire, no cutting of living tree, early burning in the dry season, planting of new trees, get ride of the poachers, fewer wild animals in the area and improve the soil. 2) Some suggestions had a very protective approach, like no cultivation in the bush and no killing of wild animals. The local people themselves come up with these suggestions and it gives hope for conservation in the area and participation by the local people. 3) This category includes passive suggestions like ask God to give more rain and ask God to protect the bush. Except spending time praying, these informants did not think that they, by active management, could make a difference. 4) This last category includes a concrete new idea: have a person in each village who teach how to protect and conserve.

The management suggestions by the local people must be followed by investigating:

- the reasons for cutting living trees and alternative ways of exploiting the resources
- what is optimal conditions for planting new trees in the area
- how can we establish or secure such conditions
- which tree species are must suitable for planting in the area
- the impact of fire, distinguishing between different timing, frequency and intensity
- the impact of wild animals on the vegetation.

The concrete idea of having a person in each village who teach how to protect and conserve the savanna vegetation must be followed up be investigating how the suggested consultants or teachers should be organised and implemented? E.g. should it be a villager from each village who become educated at the ranch headquarter some days every month? How to distribute the knowledge in the village – during regular meetings or as direct training in the field. Or is it better if the consultant is an outside, maybe a forester educated in the capital, who travel from village to village and give plenary sessions in conservation and sustainable use. Anyway, no matter how such a function is organised it is very important to follow up on this suggestion, as it is given by 10% of the interviewed people.

Conclusion

The presented research has highlighted several advantages of using local knowledge in natural resource management:

- rapid assessment of the status of the resources and their appreciation
- easy way to set priorities in conservation planning
- a diverse kind of knowledge can be obtained
- can reveal the local people's perception of the natural resources and their availability, vulnerability and importance
- gives information of where to use the means in ecological research
- can provide new management ideas
- gives insight into indigenous resource management and thereby suggest pitfalls in a science-based management plan
- local knowledge of the natural resources can function as a platform for participation in natural resource management.

However, at the same time we need to be aware of the limitations in using local knowledge in natural resource management. Local knowledge should be seen in a local context and extrapolating the results to another area or ethnic group of people might give wrong conclusions. In addition, traditional ecological knowledge might not match the actual situation of the vegetation and therefore need to be followed up and verified by vegetation studies.

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The limits of participation in development

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Introduction

A general critique of participatory approaches emerged in the 1990s as a reaction to participation becoming mainstream in development interventions. These ideas about the 'tyranny of participation' (Cooke and Kothari 2001) encompassed a number of points ranging from the narrow localism and functionalism of many project-based participatory activities, to the broader problems inherent to working with power and inequitable social structures.

Emerging work of the last few years has tried to take account of such critiques and move beyond them towards more politicised and socially located conceptualisations of participation. These developments are particularly expressed in ideas about the need for greater emphasis on participatory governance, and for the opening up of 'transformatory spaces' for the articulation of rights (Hickey and Mohan, 2004). This paper intends to review some of the major themes in the 'tyranny of participation' critique, and to identify some of the challenges the 'post-tyranny' ideas pose for development practice.

Critiques of participatory approaches

Although the participatory imperative is still strong in development thinking and practice, there is now a diverse body of work containing critiques of participatory development. Some of the major ideas contained in these critiques are outlined below.

Project approaches; narrow and functional
Most participatory approaches are implemented through project structures and projects are, by their nature, clearly delimited enterprises, defined by quantifiable costs and benefits, with time limited activities and budgets. Within projects there is a tendency to emphasise the visible manifestations of community participation (through structures such as local committees, associations and assemblies) and to limit the focus only to those aspects of people's lives of concern to the project. Critics suggest that the project's focus on efficiency of outcomes often leads to the neglect of longer term understandings of social processes, of the local dynamics of decision-making, of the reasons for people's 'partial enrolment' in project activities.

Foundationalism about communities
Strongly related to the above point is the tendency in development practice to conceive of unitary communities. There is an assumption that not only do clearly defined communities exist, but that living together generates trust (and social capital) and that where apparent differences between community members exist these can be uncovered and overcome through participatory processes. Local knowledge and action is seen, in itself as 'a good thing', and communities as (potentially) endlessly resourceful. Critics suggest that such views misunderstand the complexities of people's networks and affiliations, that they over-romanticise the effects of living together and that they underplay both the deeply inhibiting effects of structural poverty and the enduring inequities reproduced through local power relations.

Neglect of power within communities
Participatory approaches have been heavily criticised for overlooking the elite capture of participatory processes (by local leaders, the wealthy or more educated residents), and for neglecting the constraining effects of social structures on poorer, weaker and more marginalised people who feel unable to participate to the same extent. In addition to identifying some of the power blind approaches to participatory practice and events, critics suggest that the *impact* of participation on inequality, poverty and empowerment is frequently assumed rather than proven.

The tyranny of techniques
Participatory techniques in development have been characterised by a strong emphasis on techniques, on the development of toolboxes, manuals,

checklists and 'menus' of participatory practice to secure 'real' participation. Considerable emphasis has been placed on 'getting the techniques right' and on the role of the facilitator in this. Critics suggest that such approaches, although often providing useful field tools, over-emphasise the public participatory event, and tend to be used as a *substitute* for ongoing processual understandings of social and economic dynamics.

Underestimating resources

A common concern about participatory approaches is that they are usually constrained by time and budget restrictions; therefore token approaches to participation may be substituted for ongoing and open-ended support to local level decision making processes. Critics suggest that development agencies have often viewed participatory approaches as quick fixes to secure local consultation/representation and have underestimated the time, resources and long-term inputs needed to support real change. There is an additional concern about how the insights gained from such approaches can be incorporated into often highly bureaucratic and inflexible development agencies.

Paradoxes of participation

In my work on the paradoxes of participation I tried to investigate further the conceptual understandings which underpin participatory approaches and how these might limit the outcomes (Cleaver 1999). I found it useful to adopt a perspective from social theory; that of the recursive relationship between 'structure' and 'agency'. In social theory considerable attempts have been made to understand the complexities, diversities and regularities of patterns of interaction between individuals and social structure (Giddens 1984, Douglas 1997, Long 1992). However, such understandings have made little impact on development thinking where individuals are little understood except as 'farmers', or 'women' or 'the poor' and where a focus on the mechanisms of formal organisations substitutes for detailed understandings of social structure. Some of the results of such inadequate conceptualisation result in outcomes criticised in the points outlined above. However, examples are reproduced here to help illuminate some of the over-simplified assumptions about participation.

Efficiency and/or empowerment?

Those who theorise participatory approaches often distinguish between the efficiency arguments (participation as a tool for achieving better project outcomes) and equity and empowerment arguments (participation as a process which enhances the capacity of individuals to improve their own lives and facilitates social change to the advantage of marginalized groups).

However, in policy there is an assumption that efficiency and empowerment are inextricably linked. So for example in drinking-water projects it is hard to separate out the assumptions made about empowerment and efficiency impacts of women's involvement. Thus women's contribution to labour to construct water supplies is deemed practically beneficial, it is empowering in creating a sense of ownership and the related perceptions of responsibility which then efficiently result in the proper maintenance of facilities. The inclusion of women in management roles on water committees and associations is seen to represent a form of female emancipation, representing women's assertion of control over their own lives as well as conveniently ensuring the sustainability of facilities. Poor women paying for water services are supposedly 'empowered' as consumers, whilst the financial efficiency of the project is furthered.

It is often unclear in participatory approaches *who* exactly is to be empowered; whether the community as a whole, specific categories of people like women, or individuals. Moreover there is frequently an overriding imperative towards project efficiency. For example on one water supply project in India field staff avoided trying to empower the marginalised low caste residents. The water committee therefore consisted entirely of higher caste villagers. Project staff said that 'To insist on the low caste woman's representation on the water committee would have antagonised the higher caste community in the village. This would hamper completing the project on time, which was our major responsibility' (Joshi et al. 2003).

The scope and limitations of the empowering effects of any project are often little explored; the attribution of causality and impact within the project alone is problematic.

Institutions or organisations?

Discourses of participation are strongly influenced by the new institutionalism, theories which suggest that institutions help to formalise mutual expectations of cooperative behaviour, allow the exercise of

sanctions for non-cooperation and thereby reduce the costs of individual transactions. Institutions (mostly commonly conceptualised as *organisations*) are highly attractive to theorists, development policy makers and practitioners as they help to render legible community; they translate individual into collective endeavour in a form which is visible, analysable and amenable to intervention and influence (Scott 1998).

The aim of many development interventions is apparently to establish or support formalised community structures which most clearly mirror bureaucratic structures. Here there is a concentration on contracts, associations, committees and property rights as mechanisms for reducing transaction costs and institutionalizing cooperative interactions. Formalised institutional arrangements are considered more likely to be robust and enduring than informal ones, desirable characteristics for example include a clearly identified group and boundaries, a system of graduated sanctions imposed on those who offend against collective rules and public conflict resolution mechanisms (Ostrom, 1990).

For example in the water sector a concern with institutions has been manifested through much work on water committees, water user groups and associations, with the organizations for water resources management. However, water resource management may also occur almost entirely outside such structures, through practices embedded in social networks, daily interactions and the application of cultural norms (Cleaver 2000).

An over-concern with formal institutions can blind the development practitioner to the potential efficacy of social institutions and their processes. For example, in Nyangugwe Village in Tanzania five wells had been installed by a donor in 1989. No participatory approaches were adopted at that time; handpumps were installed on the wells and the community left to use them. Several years later (1996) a new phase of the same donor –funded programme aimed to improve the sustainability of water supplies in the villages by establishing Water User Groups for handpump maintenance and water management. When promotion staff visited the village they found that the community had already established a system of 'open' and 'closed' times for the wells supervised by caretakers on a rota, that maintenance funds were collected from households and receipts given and that there was a system of exemption from payment for the needy in place. Despite this evidence of dynamic and well–functioning management, embedded in existing social relationships and arrangements, promotion staff were clear that the village lacked formal Water User Groups and that these must be established in order to ensure sustainability!

Socially embedded institutions are not necessarily 'better' than formal/organisational ones as they may uphold and reproduce locally specific configurations of inequity and exclusion. However, the mere setting up of formal organisations and the specification of their membership does not necessarily overcome exclusion, subordination or vulnerability. It does not do so because the wider structural factors which shape such conditions and relations are often left untouched. Codifying the rights of the vulnerable must surely involve far more wide reaching measures than the requirement that they sit on committees, or individually speak at meetings.

Myths of community

The 'community' in participatory approaches to development is often conceptualised as some kind of natural social entity, imbued with all sorts of desirable values, and manifested in organisational form. This is unsatisfactory for a number of reasons.

There is strong assumption in development that there is one identifiable community in any location and that there is coterminosity between natural (resource), social and administrative boundaries. The very definition of community in development projects involves defining those who are 'included' in rights, activities, benefits and those who are excluded because they do not belong to the defined entity. A concentration on boundaries highlights the need in development for clear administrative arrangements, more to do with the delivery of goods and facilities than a reflection of any social arrangement. Researching community based water resource management in Zimbabwe it became clear to me that the idea of an administratively defined community little reflected the wealth and complexity of local networks of resource use, decision making and social interaction. Thus whilst domestic water resources were largely managed at waterpoint and at village level, decisions about grazing land for cattle use involved a wider group of people from three villages. Cultural ceremonies such as rain making (an occasion for the reinforcing of 'community' norms and resource use regulations) involved a wider and more diverse constituency than that of the village. Moreover individual households were connected through complex relationships of kin and associational activities (such as church membership) to networks of wider and overlapping 'communities', often physically distant from the household location.

Project approaches to community, where they recognise power, tend to adopt totalising and simplified approaches to it, little recognising

processes of conflict avoidance negotiation and accommodation between people. The 'solidarity' models of community, upon which much development intervention is based find difficulty in reconciling evidence of social stratification and conflict with project goals. For example, field workers on a community based water and sanitation programme in Tanzania were reluctant to publicly refer to, or even admit socio-economic differences within the communities with which they worked. They had dropped wealth ranking from their PRA exercises, fearing that this highlighted inequalities and saw the public acknowledgment of difference as incompatible with the desirable model of solidarity necessary for the smooth functioning of the project (Cleaver and Kaare 1998).

Development practitioners excel in perpetuating the myth that communities are capable of anything, that all that is required is sufficient mobilisation and the latent and unlimited capacities of the community will be unleashed in the interests of development. The evidence does little to support such claims. Even where a community appears well motivated, dynamic and well organised in terms of its own development, severe limitations are presented by an inadequacy of material resources, The people of one of my study villages in Zimbabwe were notable for their self reliance and positive sense of community. They had built their own school, established a variety of income generating clubs, and had high levels of associational activity. In response to severe water shortages they had established a community fund from household contributions for the purchase of a windmill pump. However, due to drought and low agricultural incomes, the fund was insufficient to buy a windmill. The villagers, constrained by their remote location, were unsuccessful in lobbying the district council and donor agencies for assistance and several years after my first visit they still lacked adequate water supplies and were forced to travel 10 km to access water from another village.

Individuals and agency

Participatory approaches can further be criticized for their inadequate model of individuals and the links between these and social structure. Despite the strong assumption of the links between individual participation and responsibility, there is little recognition of the varying livelihoods, motivations and impacts of development on individuals over time. Indeed project approaches which focus strongly on institutions as a development tool often see people as 'inputs'; as the 'human resource'. Social difference

is recognised only through the categorisation of general social or occupational roles; 'women', 'farmers', 'leaders' and 'the poor'.

In explaining motivations to participate, social norms are seen to occupy a secondary place to economic rationality. Social relations and participation, whilst supported by norms of responsibility and community service are seen ultimately to serve the ends of economic development. Such perceptions allow little place for personal psychological motivations, for the needs of individuals for recognition, respect or purpose, which may be independent of other material benefits. Nor are the complexities of long term and diffuse relationships of reciprocity occurring over lifetimes adequately recognised as shaping participation (Adams et al. 1997).

Functional project approaches to participation little recognize that in examining motivation it is helpful to see a person positioned in multiple ways with social relations conferred by specific social identities (Giddens 1984) and that in Long's words; 'individuals are only ever partly enrolled in the projects of others' (Long 1992).

Other papers of the author illustrate the intersection of age, gender and class and individual agency in shaping people's perceptions about the desirability of participation. For example poor young women with small children commonly find it difficult to publicly participate in development projects due to their burden of productive and reproductive activities. However, some individual women actively find ways of participating through active engagement with NGO's and new associational activities whilst others meet their needs in differing ways, for example by drawing on kinship relationships for assistance with agricultural activities, educational expenses and basic needs (Cleaver 1998).

Contrary to the ubiquitous optimistic assertions about the benefits of public participation, there are numerous documented examples of situations where individuals find it easier, more beneficial, or habitually familiar not to participate (Adams et al. 1997, Zwarteveen and Neupane 1996). Non-participation and non-compliance may be both a 'rational' strategy and an unconscious practice embedded in routine, social norms and the acceptance of the status quo. A fascinating study of irrigation management in Nepal shows how some women, constrained by prevailing ideas about proper gender roles, *did not participate* in the irrigation association but secured their water partly through the participation of male members of their own household, and through other kin and neighbour networks and partly through stealing and cheating. Their absence from the formal user

association made it far easier for them to do this without detection or censure (Zwarteveen and Neupane 1996).

If we accept that costs and benefits fall differentially and are mediated and perceived by people in differing ways, where does this leave us, for example, in terms of policies which target the participation in development of 'the poor' or of 'women'? Also how do we link the evaluation of such costs and benefits with a model of choice and voluntarism? It seems that where poor people are concerned their choices may be seriously limited, the scope for variation of action narrow. They may lack the resources for effective participation and yet remain vulnerable in their livelihood strategies based on kin and existing social structures. Participation in water supply projects, where water is scarce and it is difficult to procure enough for basic needs, is less a matter of choice, and more a matter of necessity imposed by constraint.

Negotiation, inclusion and exclusion

A recognition that community participation may be negotiated and mediated at the household and community and shaped by prevailing social norms and structures raises a critical question about whether participation can be empowering to individuals involved. The example of women irrigators in Nepal (Zwarteveen and Neupane 1996) illustrates this. Some women chose not to participate partly because they saw that in so doing they would be bound by rules and norms of the Irrigators Association, dominated by prominent men. However, in (consciously and unconsciously) drawing on ideas about the proper role of women as confined to the domestic arena to justify their non-participation, were they exercising agency and some degree of freedom, or simply reinforcing their gendered subordination, or both? Research reveals doubts amongst many individuals about the merits of being included in development projects, suggesting a sophisticated analysis amongst people of the structural instruments of their subordination and a blindness amongst development agencies to this (Long 1992, Scott 1985).

The participatory literature is very unclear on the links between inclusion and subordination; largely because it consistently omits an analysis of the structural and political aspects. In development policy and practice we would do well to more critically examine issues of empowerment and subordination, recognizing that they are not necessarily diametrically opposed conditions (Jackson, 1998). It is salutary also to remember that 'community' may be used as a definition of exclusion as

well as inclusion, that associating concepts of responsibility, ownership and social cohesion with local entities (which may draw on religious, ethnic, locational differences in definition) is not necessarily compatible with the universalizing of equality. Exclusionary tendencies may be increased in locally based participatory development. The introduction of concepts of 'ownership' of water-sources through development efforts in Zimbabwe resulted in restrictions on access which most adversely affected the poorest residents who had not made cash or labour contributions and who were therefore not seen as part of the 'rightful' user community.

From tyranny to transformation? – recent developments

In the introductory chapter to a forthcoming (2004) volume on new directions in participatory thinking Hickey and Mohan advocate the furthering of a radical political project based on the promotion of citizenship. This they see as necessary to overcome the perceived 'tyranny' of localised project led approaches to participation and to provide the potential for transformation of inequitable relations at a number of levels. The radical political citizenship approach, they claim offers the possibility of multi-level approaches to participation; linking the micro-politics of community participation to good governance and the workings of the state. Such a focus allows us to broaden thinking about participation away from a focus on projects and techniques towards the implicit possibilities of dealing with structural inequality through participatory governance and state action. This focus on tackling inequality structurally does not however involve abandoning the perceived importance of agency in participatory development. Indeed active citizenship, the exercise of voice, the championing of interests and the advocacy of rights is seen as the very manifestation of agency, by individuals, their representatives and collectivities.

This approach offers some valuable insights, in advancing the more rigorous conceptualisation of under-theorised participatory approaches, in embracing the complexities of a multi-level perspective and in tackling the need for structural change in the interests of transformation of inequality. However, some problems with conceptualising participation remain.

Citizenship, agency and culture

In defining citizenship as the active manifestation of agency there is a danger of abstracted under-socialisation. Citizenship cannot be exercised in a vacuum and it is the very minutiae of social life and relationships which shape the forms which citizenship can take. These may prove much more difficult to transform than public spaces and institutions of the state. Key factors which both enable and constrain the exercise of agency and therefore shape citizenship include moral understandings of action, the complexity of both individual and collective identities identity and the interdependence involved in the exercise of rights and livelihood interests.

Experience from elsewhere in Africa shows us that such events are governed by ideas of moral behaviour, 'the right way of doing things'. Thus showing respect (to elders, or to the powerful), avoiding open conflict and furthering reconciliation are common moral principles within which relationships within families and communities are (at least nominally) conducted. But several of these moral understandings of the right way to behave are incompatible with a notion of active citizenship informed by western liberal principles (Cleaver 2000). Here equal citizens enter political debate devoid of moral constraint, exercise open voice (or active resistance), operate transparently, freely confront perceived inequalities and may join together with similar citizens to overcome these.

The exercise of agency involves not just morality, but the mutuality and interdependence of people with complex identities. Rights do not exist in a vacuum but are embedded in social relations; these very social relations may either enable or constrain the exercise of such agency. For example evidence from Africa (Odgaard 2002) and India (Rao 2003) suggest the complexity of identities and relationships through which women's land rights are exercised. Women may claim rights to land as legal (and equal citizens) but also through their subject positions as daughters, wives and mothers, as members of a particular caste, or ethnic group. To these women, living their lives within marriages and kin groups, exercising their legal and political rights to land may not be the preferred option; the costs of asserting such rights to their conjugal and family relations, to their status in the community, to their livelihood outcomes may mean that they prefer to secure (inequitable) access through social institutions. How, within a model of radicalised, political citizenship do we see a preference for exercising agency within inequitable relationships, rather than for overcoming or challenging them?

Research also strongly emphasises the livelihood interdependence of people in different power positions. Relations of interdependence do offer the possibility of negotiation but such interdependence exists alongside structural inequality and the exercise of agency by the poor can only be partial, intermittent and cumulatively ineffectual in circumstances where they are dependent on the patronage of wealthier and more powerful neighbours. But the exercise of agency may well be passively a-social or actively anti-social (stealing cheating, vandalism) and 'being social' may well involve securing livelihood stability at the cost of equality.

Collective action, governance and institutionalising participation

Despite much recent research showing the diversity of institutions through which individual and collective interests are pursued (Benjaminsen and Lund 2002) writings about participation still has an overwhelming focus on the legible, the bureaucratic, and the public manifestations of decision making. There is much talk now about 'new spaces' and 'new rules' through which expressions of emancipatory citizenship are to be articulated and promoted (Cornwall 2002). However, questions remain about these ideas; how are new spaces and new rules socially authorised and legitimated, how far can they encapsulate the decision-making processes of everyday life, and to what extent are such concepts informed by simple evolutionism?

Theorists of society and institutions suggest that we all have a need to naturalise human arrangements, to see even the most modern mechanisms of social organisation, decision making and resource allocations as having continuity with the past, with the world as we know it, with existing systems of authority and legitimation (Giddens 1984, Douglas 1987). Inevitably ,'old' sources of authority are used to legitimise new institutions, accepted norms of public discourse and decision-making shape people's voice and articulation in new spaces. So we see existing elites (chiefs, headmen, landowners, higher castes, the urban educated) playing prominent roles in new spaces, in representing and articulating the needs of the poor and marginalized. Such processes do not obviate all progressive change, but they do cast doubt on the potential for dramatic transformation, at least over shorter and more immediate timescales. Odgaard (2002) has well illustrated how both 'traditional' and 'modern' institutional channels are used by people to 'double safeguard' their rights, but how such institutions can also doubly disadvantage the marginalized and inarticulate.

So how can a concept of politicised citizenship be worked through the multiplicity of channels within which (inequitable) norms are negotiated, reproduced, reinforced, through which authority is exercised and sanctions imposed? What does it mean to be a good citizen at the waterpoint, or at the market, in negotiating collective labour arrangements, in managing resources at the point of use? Research shows us that it is at these intersections between private and public livelihood activity that many negotiations about resource allocation, sharing, compromise, conflict resolution and appropriate representation actually take place (Cleaver 2002). The more vibrant the associational life in a community, the more diverse the livelihoods and the intermeshing of cultures, the less likely that 'participation' or 'citizenship' or 'collective action' manifests through any one channel.

Surely 'empowerment' and 'transformation' require not just opening up of participatory spaces to transparently debate citizenship, to hold the state to account and so on but also the more prosaic transformation of everyday life: relief from the burden of queuing for and carrying water, of hand tilling fields, of dependence of relations of patronage for daily subsistence, of the burden of care imposed by diseases of under-nutrition, poor hygiene, frequent pregnancy. Poor people suffering such conditions have little chance even to be a good neighbour, never mind to participate in newly opened up spaces for articulation of their needs, nor to become representatives. Transforming the notion of participation into one of a radicalised and political citizenship, doesn't suddenly do away with the costs of participation. And the costs to the poorest, the most marginalized, those with most to gain from transformation, are the greatest. In advocating participatory citizenship as a route to transformation we may simply perpetuate the pervasive myth of the endless resourcefulness of the poor (Gonzalez de la Rocha 2003).

Many writings on participation are implicitly underpinned by evolutionary concepts. It is assumed that the practice of participation is unilinear and cumulative; that spaces for participation can be progressively strengthened, that the exercise of agency and voice in one forum has knock on and cumulative effects in others. But institutions do not work like that. People's behaviour is not so consistent and, where structural inequalities are great, the exercise of oppositional agency is intermittent and partial. Processes of empowerment and transformation can be reversed, and development discourse used regressively as illustrated by Upperman's (2000) case of the use of traditional ideas and developmental initiatives to

create a modern taboo excluding women from access to irrigation water. One-off ad hoc manifestations of collective action and solidarity can be read two ways; as evidence of the potential for building something more durable, or as illustration of the crippling constraints which preclude frequent, regularised participation for the public good.

Conclusion – beyond participation?

A number of specific areas for further work can be identified from this discussion which may contribute to resolving some of the limits of participation. These include the need for:

An analysis of the resources which people need in order to be able to participate in development efforts and governance, and in particular an analysis of which participatory approaches are low cost and high benefit to poor people.

An analysis of whether and how the structures of participatory initiatives projects include/protect/secure the interests of poor people.

More data on participatory 'partnerships' which are claimed to work. In particular what is the role of better, more responsive bureaucracy in such partnerships (Jarman and Johnson 1997, Thompson, 1995).

Analyses of 'competent' communities and 'successful' participatory projects that focus on process, on power dynamics, on patterns of inclusion and exclusion. This would involve more process documentation and analysis of conflict, consensus building and decision making within communities; not just those activities related to the particular development project in hand.

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Poverty reduction strategy planning and decentralisation at district level, Ghana

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Introduction

Poverty Reduction Strategy Papers (PRSP) have been formulated in several Sahel countries during the last five years. Some of the PRSPs are closely linked as a response to the World Bank's (WB) Heavily Indebted Poor Countries (HIPC) debt relief initiative. In most countries, the poverty reduction strategy paper has become the single most important guideline and strategy for all national development initiatives. The formulation of a national PRSP - the Ghana Poverty Reduction Strategy (GPRS) - has challenged the question of the possible and actual participation of stakeholders in the PRSP development - the topic for this paper.

The formulation of the Ghana Poverty Reduction Strategy was started as a national initiative in the late 1990s to complement and poverty-target the government's development plan referred to as the Vision 2020. In year 2000, following presidential and parliamentary elections, the new government sought debt relief through the HIPC initiative. The completion of the Ghana Poverty Reduction Strategy (GPRS) became more closely tied to WB formats and standards as a consequence of linking the formulation of the GPRS with the HIPC initiative.

The formulation of the GPRS was supported by nine thematic studies, which were carried out between early 1998 and late 2000. Several of these studies identified poor people's poverty characteristics and priorities and extrapolated poverty reduction initiatives for development from these characteristics without addressing the issue of who should plan, implement and monitor these initiatives. Only one study focused on the actual links between the poor, poverty reduction and the administrative and political

reality at district level responsible for the implementation of the GPRS. That study was named the Ghana Poverty Reduction Initiative (GPRI), and it was completed in August 2000.

The GPRI study team (hereafter referred to as the Team) researched the link between decentralisation and more specifically the role of the district seen in the context of poverty reduction. The GPRI (2000) also recommended on best processes and practises regarding development initiatives at district level in various sectors including agriculture, health, and rural infrastructure.

Three years later the implementation of the GPRS, assisted by HIPC debt relief associated activities, is ongoing with several lessons learnt at district level. In general, however, there is an increasing recognition of the district level as the actual implementers of the GPRS, and the level where important poverty targeting becomes necessary and a reality. This recognition challenges the participatory aspects of poverty reduction at decentralised levels and necessitates a revisit to look at the findings and participatory aspects of the GPRI (2000).

This paper will a) present and critically examine the district's role and responsibility in a poverty reduction strategy formulation process, using the GPRI as a case, and b) examine and discuss possibilities for and actual participation of decentralised and local structures in formulating and implementing national strategies.

Poverty and decentralisation in Ghana and the Ghana Poverty Reduction Strategy

According to the Ghana Poverty Reduction Strategy (GPRS), 'poverty is now defined as multi-dimensional with complex interactive and causal relationships between the dimensions'. The Government of Ghana (GoG) aims – through the implementation of the GPRS – to create wealth by transforming the nature of the economy in order to achieve growth, accelerated poverty reduction and the protection of the vulnerable and excluded within a decentralised and democratic environment.

The setting of poverty trends in Ghana in the 1990s was an economy, which has achieved positive per capita economic growth rates during the decade. The GDP has grown on average by 4.3 per cent per annum during the 1990s. The questions which are raised in GPRS (2002-2004), the Ghana

Living Standard Survey (GLSS4) (2000), the Poverty trends in Ghana in the 1990s (2001) and a regional perspective on poverty in Ghana (2001) are: to what extent has Ghanaian households and communities benefited from this growth? Which groups have benefited most? Have the lives of poor Ghanaians improved as a result? What has been the impact of recent economic growth on poverty in the country?

Taking the upper poverty line of Cedis 900,000[12] the percentage of the Ghanaian population defined as poor has fallen from almost 52% in 1991-1992 to just below 40% in 1998-1999. 'In summary, though the poverty has fallen, the depth of poverty for those who remain poor has remained relatively stable' (Poverty trends in Ghana in the 1990s, 2000). The decline over the ten-year period is not evenly distributed geographically and by main economic activity. In general, the poverty incidence is highest in the three northern regions and far above the national average of 40% (Northern (69%), Upper West (84%), Upper East (88%), while the remaining seven southern regions experience poverty incidence lower or just above the national average.

Decentralisation is seen by the GPRS as interlinked with governance. While the GPRS emphasises economic growth as the main agenda for poverty reduction, decentralisation is seen as a tool and precondition: 'The aim must be to decompose power to the districts to the extent that Assemblies are in effective and total control of their departments and staff within the context of relevant legislation. Ultimately, district departments must have the capacity to carry out all district level programmes and projects funded from their own resources and by central government' (GPRS 2000-2004). However, as much as decentralisation is seen as a vehicle, the various stakeholders developing the GPRS also identified issues at district level that need to be addressed in order to link decentralisation and poverty reduction. These issues include (i) identification of best practices (sectors and processes) of poverty reductions at district and sub-district level, (ii) identification of needs for capacity building at district level, enabling the district to establish a poverty profile and undertake poverty monitoring, and (iii) development of a set of appropriate tools for monitoring the process and the poverty impact of project interventions.

And as much as poverty reduction is linked to decentralisation and governance, decentralisation itself faces several challenges, which

[12] Approximate exchange rates as per January 2004 USD 1 = Cedis 9,000, DKK 1 = 1,400 Cedis

summarised by the Ministry of Local Government and Rural Development (MLGRD) (2002) include:

General decentralisation

- The varied responses from different sector ministries to decentralisation (in particular the issue of 'ministries becoming services') are an issue. Yet the MLGRD recognises the positive aspect of the ministries' overall de-concentration.

Political decentralisation

- Absence of maps to firmly identify boundaries that will enable Metropolitan, Municipal and District Assemblies (MMDA) plan for the development of their respective geographical areas.
- Difficulties in how to sustain the non-partisan local government subsisting under a partisan central government.
- The presidential appointment of the District Chief Executive (DCE) and the 30% of the members of District Assembly (DA) being appointed represent a strong central government presence.
- Managing the power balance between the Member of Parliament, the DCE, and the rest of the DA.
- Not all the 16,000 Unit Committees (administrative and political structure below the DA level) established by law are yet in place, because of difficulties in conducting elections owing to the size of their population or other peculiarities (including the conflict in Northern Ghana).

Administrative decentralisation

- Sectoral conceptual differences in the interpretation of the decentralisation policy: transfer of power, functions and resources. There is no clarity at various levels of government and within different sectors, ministries, and departments. This is manifested in the creation of sectoral services (sector ministries becoming services) in education, health and forestry, while the proposed Local Government Bill has not yet become law.
- Sectoral differences in approaches to institutional reforms for decentralised management, e.g. the establishment of Education Oversight committees, District Health Management, are creating

difficulties in the integration of sectoral programmes and resources into the DA's composite budgeting.
- Lack of enough and adequately trained human resources.
- Unco-ordinated donor support activities, because of the absence of a strategic framework for implementing decentralisation.
- Uncertainty among civil service personnel likely to be affected by the integration and rationalisation in decentralisation.

Challenges regarding decentralised planning
- Inadequate methodology, technology and skills for operationalising participatory, bottom-up planning and resources mobilisation.
- Sector departments in the districts still get their programmes prepared, approved and financed by their national and regional offices, thereby making integration of programmes difficult for the District Planning and Coordination Unit (DPCU).

The Ghana Poverty Reduction Initiative

The Ghana Poverty Reduction Initiative (GPRI) was initiated after most of the other thematic poverty studies were completed or being completed. The thematic studies were funded by various donors (e.g. GTZ and UK Department for International Development (DFID)) and referring to different ministries and only loosely coordinated by the National Development Planning Commission (NDPC). The institutional set up of the GPRI was different. It was the only study funded by the EU and was coordinated by the Ministry of Finance with no official links to the NDPC. However, no less than three ministries and the NDPC felt some kind of ownership to the GPRI and decentralisation, and seeking the participation of the district assembly during the GPRS formulation, as well as its future role and responsibility once the GPRS was ready for implementation.
The key expected activities and output of the GPRI included:
- To undertake an evaluative study of identified approaches, which are considered to have a positive impact on poverty in order to identify the conditions for success and draw up guidelines of best practices, and
- To develop a methodology that districts could use to undertake their own poverty profiles and to monitor the effectiveness of interventions.

Two districts in two administrative regions were selected by the Team in consultations with the Government of Ghana and the European Delegation

and in accordance with certain criteria such as poverty characteristics, concentration of poverty reduction programmes, etc.

The Ghana Poverty Reduction Initiative's method and approach – the principle of direct inclusion

The Team conducting the GPRI developed an approach based on the widest participation of the district assembly's elected members and the administrative staff, staff of decentralised departments and the poorer segments of communities and individuals. The widely inclusive approach was much emphasised, as the Team wanted a situation where all participants only represented themselves - and where speaking on behalf of others should be avoided. This approach again necessitated wide usage of triangulation among participating stakeholders of poverty perceptions, views on development and poverty reduction characteristics and findings. The method of **direct inclusion** instead of **indirect representation** became a very strong tool for advocacy and understanding the nature of poverty reduction seen from the district's perspective, during presentation of findings to the responsible GPRS planners and the ministries involved.

The method and approach of the GPRI included the following sequence of activities.

District mapping

District mapping carried out in the two pilot districts containing poverty conceptualisation, situational analysis and project assessments. The poverty analysis was carried out at the first stakeholders' workshop in both districts aiming at the following:

- Discussion on the concepts of poverty and best practices – mainly as characteristics of poverty and good interventions and incorporation of local perceptions.
- Poverty situational analysis based on map reading and triangulation with cause/effect analysis of poverty.
- Mapping of ongoing and recent poverty-oriented project interventions and local initiatives.
- Selection of relevant interventions based on district stakeholder assessment.

- Final selection of communities where the study on local poverty profiles and assessments would take place. The selection was based on the maps to capture areas both with poverty pockets, and ongoing or recent interventions.

District poverty analysis
District poverty analysis containing poverty conceptualisation, situational analysis and project interventions' assessment. The poverty analysis was carried out at the first stakeholders' workshop in both districts.

Community poverty profiles and analysis
Community poverty profiles and analysis including local poverty situational analysis (poverty characteristics, causes and effects, poverty trends and coping strategies of the poor) and assessment of poverty – oriented interventions and initiatives. The community studies were based on Participatory Rural Appraisal methods.

Individual assessment of selected interventions
With reference to the findings from the first stakeholders' workshop and the community studies, the implementation agencies and the GPRI Team made an in-depth assessment of the interventions.

Triangulation of best practices
Triangulation of best practices and joint assessment of capacity needs to triangulate the findings on best practices from community studies, the first stakeholders' workshop and individual stakeholder interviews and on that basis to identify best practices. Moreover, a joint assessment was carried out of district administration and decentralised line departments' professional capacity to implement and monitor poverty-oriented planning.

Triangulations included in the GPRI's method and approach to poverty conceptualisation, poverty identification and finally best practises to poverty reduction at district level. All triangulations became an important analytical tool to identify and analyse best practises for poverty reduction at district level.

Figure 1 contains important principles of the triangulation method in which best practices identified at the district level are compared with best practices from the community level. Moreover, external knowledge and experience from effective, participatory and sustainable poverty reduction

are drawn in to shape the best practices in the district and to put them into a broader perspective (triangle 3).

The input to triangle 3 comes from the district poverty studies in triangle 1 and community poverty studies in triangle 2, which are also based on triangulation:

First of all, assessment of project interventions is carried out for different categories of stakeholders, namely local communities and district stakeholders including both district assemblies (district administration, decentralised line ministries and politicians) and implementing agencies (district line ministries, international NGOs, local civil society organisations, etc.). The purpose of using the triangulation method is to obtain a multi-dimensional response in which the intervention and the issue are seen from various angles and perspectives, thereby enabling the GPRI team to broaden their analysis and crosscheck assertions and different opinions. In the case of poverty-oriented interventions, this method has a clear advantage as such interventions tend to be assessed very differently depending on from whose perspective they are seen. Or, in other words, the so-called 'beneficiaries' from the communities may not have experienced the same poverty reduction impact as the implementing agency claims to have generated.

Secondly, it is important to notice that different data collection techniques were used for the study. The district poverty analysis in triangle 1 was mainly based on workshops, mapping exercises, quantitative statistics and individual interviews, whereas the community poverty analysis in triangle 2 contained PRA techniques including focus group discussions, semi-structured interviews, scoring and ranking. The use of different data collection methods strengthens the validity of the findings.

Thirdly, to be able to investigate and compare best practices it is important also to pay attention to the specific poverty context. Therefore, the project assessments must be compared with poverty profiles, including poverty characteristics (indicators, poverty concept, etc.) and poverty situational analysis (causes, effects, coping strategies, household/income statistics, mapping of geographical distribution of the poor, public services, production etc.). This forms the underlying principle for both district poverty studies and community poverty studies as shown in triangle 1 and 2. Again, it is seen that the triangulation method is based on differentiated data collection, e.g. the district government may not see the same causes of poverty as the poor from the communities themselves. Likewise, the

income/household statistics may not be in accordance with the district poverty mapping.

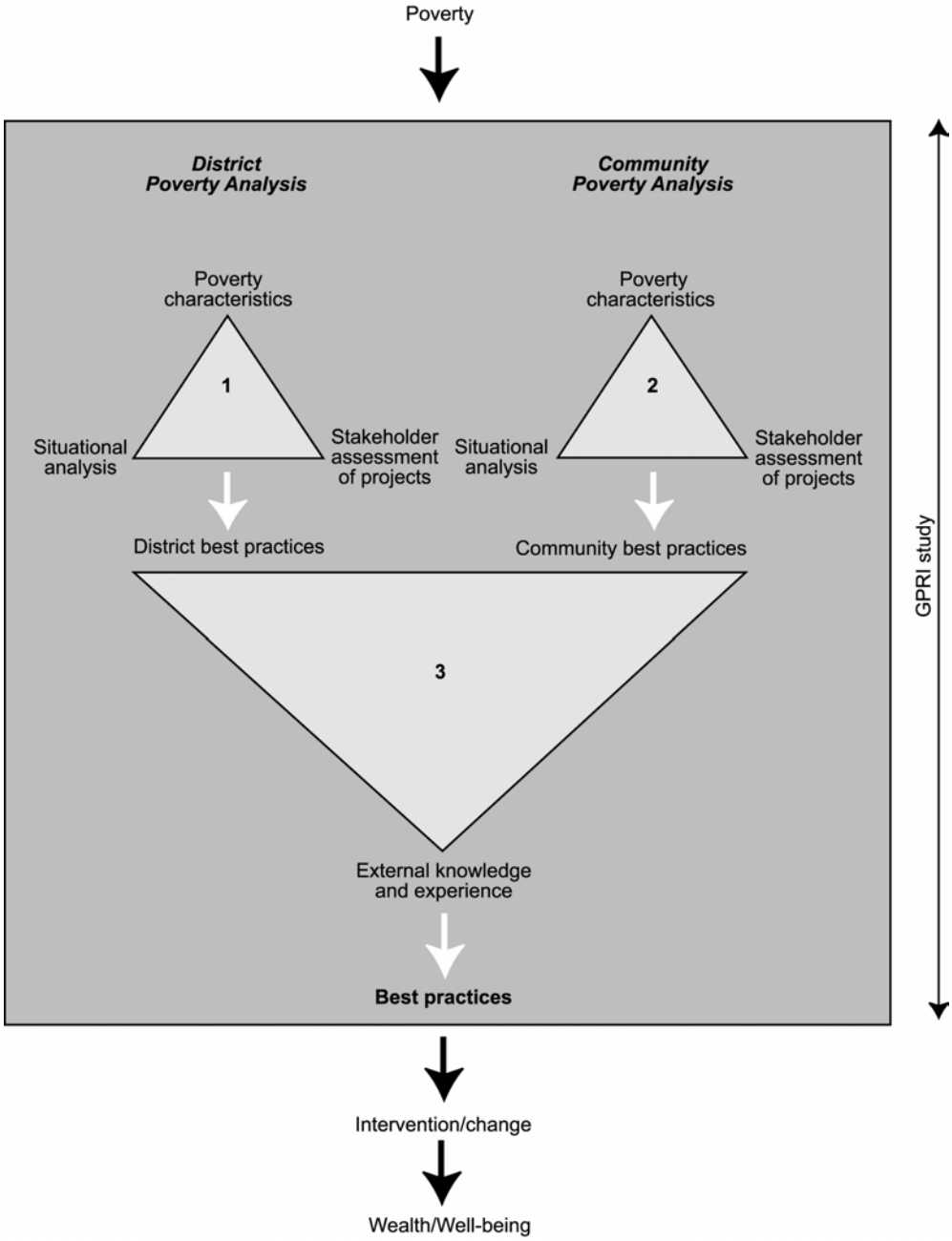

Figure 1. Sequence of triangulation methods to identify best practices.

The participation of the district assembly's elected members and administrative staff in conducting the study became an opportunity for the Team to assess the capacity of the district vis-à-vis the later implementation of the GPRS. The method and approach also used existing poverty

reduction initiatives at district level to discuss best practises development with regard to improving processes to facilitate participation at district level in poverty reduction.

Selected findings regarding poverty and poverty reduction

The following selected findings on poverty and poverty reduction at community and district levels collected by the Team include:

- The conceptualisation and the perceived reality of poor, poverty and poverty reduction vary considerably among stakeholders at district level, wherefore time spent conceptualising and later triangulating findings and characteristics is necessary.
- Poor people participating in the GPRI rarely perceived the existing development initiatives as poverty reduction initiatives, and preferred their own coping strategies, which they found more valuable and effective. However, it should be noticed that not all coping strategies can be classified as sustainable poverty reduction initiatives - by our standards of sustainability and poverty reduction.…
- Poverty stigmatises and the participation of the poor needs careful thinking, strong ethics, and much targeting – 'we have come to study you and your poverty'.
- Intra-household poverty characteristics persistently showed that the women and the woman headed household were often not poor and rather had strong poverty agendas unlike households headed by and dominated by a man[13].
- The existing GPRS thematic studies focusing on the poor and analysing their poverty did not link to any local administrative entity and did hardly discuss the poor's poverty reduction initiatives. As a result the GPRI had to spend more time conceptualising poverty, the poor and their poverty reduction initiatives.
- Previous poverty reduction initiatives Poverty Alleviation Fund (PAF) and District Assemblies Common Fund (DACF) were implemented

[13] 'Conventional wisdom holds that ..(women).. are poorer, more vulnerable and more prone to transmit disadvantage to the next generation than households headed by men…By contrast, findings from Angola, Indonesia, Latvia, Maldives, Sudan and Uganda shows that households headed by women have equal or even higher incomes and consumption level than their male counterparts. The presence of children in the household, its structure and composition, and the age of the head have a stronger influence on the probability of being poor than female headship' (Grispun 2000, pp. 61-62).

without a comprehensive understanding of poverty and poverty reduction and without any clear poverty targeting or later monitoring of initiated activities by the district assembly.

- The existing guidelines to the PAF and the DACF have a) been changed every year (1995–2003), and b) approaches to poverty reduction have been fluctuating (private sector focus, primary needs focus, etc.) and much influenced by political trends and ideology.
- Guidelines to the DACF have only recently been formulated in a process, which included the district assembly, and so far no harmonisation exists between the DACF Guidelines and the recently formulated HIPC disbursement guidelines at district level.
- Moreover, a number of key decentralisation issues are unresolved as mentioned earlier. Some of these strongly influence poverty reduction at district level. Especially, the persistent, irregular and inadequate release of the DACF to districts hampers planning and budgeting at district level and negatively influences the much needed planned and targeted poverty reduction at district level.

Lessons learnt regarding participation in the formulation of a national Poverty Reduction Strategy

The following lessons learnt regarding participation in the GPRI and the wider aspects of Poverty Reduction Strategy (PRS) planning seen from a district perspective include:

- For the poor the participation in a study like the GPRI is wasting their time and often beyond comprehension. Why participate? It should be remembered that the idea of participation also includes the actual right not to participate. The Team had to keep this in mind during all interactions with the poor.
- The GPRS was initially (and to some extent still) seen as a macro-economic exercise. And the GPRS was strongly biased as a national attempt to ensure continued economic growth. Poverty targeting, good governance and decentralisation as key mechanisms to poverty reduction were later added to the GPRS. All economic development sectors in Ghana are strongly influenced by the belief in 'trickle down' of economic benefits.

- The participatory process leading to the formulation of the GPRS has been strongly criticised by the NGOs/CSOs. They claim the process was top-down and secretive. And to date e.g. access to the thematic studies has been denied. Access to the GPRI was also denied by the Ministry of Finance, due to an inter-ministerial dispute. Nevertheless, the European Delegation decided to widely distribute the GPRI Final Report, and has demonstrated a willingness to advance copies to interested offices and individuals when demanded.
- At district level (administrative and political) the general access to and availability of information on GoG policies, strategies and publications are very limited. This includes access to key documents in the poverty debate. No administrative staff or politically elected members of the district assembly had seen the draft GPRS, the GLLS4, or other key documents although several of them had participated in their development. Key GoG documents are rarely available on the Internet and few district assemblies are connected to the Internet.
- District assemblies staff, elected members and staff of decentralised departments at district level are witnessing an increasing use (and misuse) of their participation in consultancies, research, etc. Research and consultancies often occupy important staff and take considerable time from actual duties of these staff. Consultants and researchers do often only include the mentioned staff and elected district assembly members as interpreters, local assistants, etc. The mentioned staff and elected members are increasingly becoming critical on the actual usage of them in consultancies and research.
- Participants in the GRPI demanded full access to existing documents in order to participate. Participants at district assembly level also demanded a process, which included full access to and discussions regarding the GPRI's draft and final report. A process that was not included into the original terms of reference for the GPRI and therefore only inadequately added to the GPRI.
- The comprehensive research approach resulted in a limited sample - number of districts studied. However, the long time spent with each district became an asset and opportunity for the approach and quality of findings. The district assembly staff, elected members and staff of decentralised departments participating in the study considered the long time spent and their inclusion in research planning more rewarding than the usual information extraction of e.g. other thematic studies during the GPRS formulation.

- The GPRI approach and method positively answered the demand on how the district assembly should benefit from the study, and what remained in the district, when the Team left. The study left a better understanding of poverty and poverty reduction in districts, and piloted a poverty mapping and best practise approach that later became national and standard procedures in the GPRS.
- The GPRI's approach and method also inspired other poverty reduction initiatives and development activities, which e.g. included social and physical poverty mapping exercises at district level as a planning and district assembly team-building tool.
- The district assembly and the Team appreciated the simultaneous capacity building and research included in the GPRI's approach and method.
- The Team found that their comprehensive triangulation and persistent inclusive participatory approach (everyone speaks for himself) became a strong tool for advocacy, regarding e.g. the need for poverty targeting, when findings were presented at the ministries' policy planning level. The findings had a better chance of feeding into the GPRS process and the GPRS Document than the other more fragmented and isolated thematic GPRS studies.

Conclusion

Seeking and ensuring the continued participation of stakeholders at the local level in a national poverty reduction strategy planning process is not an easy task. A piecemeal approach, where each group of stakeholders is consulted at the local level followed by findings being analysed at the national planning level characterised the development of the GPRS. Consequently, a broader and continued inclusive participation of the district level and the poor in the process of GPRS formulation was rather fragmented. Although the process was described as participatory by the National Development Coordinating Council, several offices, NGOs, donors and civil society representatives view the participation of stakeholders as ad hoc and inadequate. Stakeholders' participation mostly took place during hearings. However, there was limited access to documents leading to the conclusions presented at those hearings. Moreover, the thematic studies were not coordinated. The studies each

documented a certain aspect of poverty, poverty reduction and national development, but no attempts were made to coordinate approaches and methods, and link the various researchers and study teams.
As poverty reduction was mainly viewed as an economic development initiative by the macro-economists and planners, it emphasised supporting already strong economic sectors and then expected a trickle down to the poorer segments of the society. This view does not need the active participation of the poor or a specifically strong poverty targeting.

The GPRI's method and approach characterised by an inclusive participation of a number of interlinked stakeholders at district level highlighted that participation in national PRSP planning is possible and useful. Moreover, the GPRI documented and analysed that poverty targeting was much needed and previous and ongoing poverty reduction initiatives had failed because of lack of targeting[14].

The GPRI succeeded in linking the issue of national poverty reduction with the local implementing level both in theory and more importantly in practice. The approach and method used by the researchers (including the district assembly) during the study were the same tools to be used by the same individuals and offices when implementing the GPRS. Researcher and implementers were integrated, and poverty and poverty reduction integrated as the GPRI progressed.

The strong integration of the approach and research with the district assembly as the future implementers of the GPRS added a determining strength to the findings and suggested best practice to poverty reduction processes at district level, when later presented to the planners at the national level.

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Working together for capacity development in the management of plant genetic resources for food and agriculture - the experience of the International Plant Genetic Resources Institute (IPGRI)

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Introduction

Plant genetic resources are crucial to societies as they are the basis of food security and protection of the environment. FAO estimates that about three-quarters of the original varieties of agricultural crops have been lost from farm fields since 1900. And this trend has accelerated in the last half century. Studies on the status of natural resources and agricultural production base in Africa reveal continuous and intensive exploitation pressures on plant genetic resources (PGR), leading to genetic erosion. If these trends are not reversed and the genetic basis of traditional crops safeguarded, there is likely to be a serious threat to food security in the majority of the African countries in the foreseeable future, especially in the Sahel.

The International Plant Genetic Resources Institute (IPGRI) is one of the sixteen centres of the Consortium Group for International Agricultural Research (CGIAR). The CGIAR goal 'to reduce poverty, hunger and malnutrition by sustainably increasing the productivity of resources in agriculture, forestry and fisheries', conveys the mandate to provide scientific understanding, technologies and services which can be used as international public goods to preserve and favourably impact both the

environment and its natural resource base, while improving human well-being' (Harwood and Kassam 2003). IPGRI's mission is to encourage, support and undertake activities to improve the management of genetic resources worldwide, so as to help eradicate poverty, increase food security and protect the environment. This paper describes IPGRI's approach and experience in building institutional capacity and adequate human resources capable to conduct relevant training and education, research and development programmes, geared towards an effective conservation and use of PGR to meet countries food security needs and environmental protection agenda.

Background

What plant genetic resources are and why they matter

The genes and their different combinations within species (genetic diversity) give species the ability to adapt to changing environments, including new pests and diseases and new climatic conditions. Since the dawn of agriculture, farmers and forest dwellers have used the genetic variation available in plants to develop new varieties of crops and other useful species (IPGRI 1999). A joint IPGRI, FAO and UNEP (IPGRI 2004) highlights the following 10 issues and options in favour of genetic resources conservation programmes:

- Genetic diversity helps to ensure the survival of species
- Plant genetic resources increase options for environmentally sound agriculture
- Plant genetic resources are needed to meet challenges to human survival
- Plant genetic resources are vital element of a nation's cultural heritage
- For plant genetic resources to contribute to future agricultural development, they must be used as well as conserved
- Coordination efforts are essential for the sustainable conservation and effective use of plant genetic resources
- Exchange of information on plant genetic resources is necessary both to raise awareness and to allow the transfer of technology
- National coordination provides a solid basis for participation in regional and international activities on plant genetic resources
- National sovereignty over plant genetic resources implies government responsibility for conservation and use
- National policy and legislation affecting plant genetic resources should support both international obligations and national objectives

How to maintain genetic diversity of plants in ecosystems in a global challenge. The Future Harvest Centres of the CGIAR, through legally binding agreements signed with FAO, hold the world's unique collections of crop diversity in-trust for humanity in order to make the genetic resources in the collections available without restriction. But the bulk of responsibilities for the conservation and use of PGR lies on national genetic resources conservation systems, which hold 83% of the world plant genetic resources ex situ accessions on the legal basis of sovereignty of each nation over the genetic resources within its borders, a principle endorsed by the Convention on Biological Diversity (CBD). Yet this diversity cannot be conserved without adequate capacity, particularly in Sub-Saharan Africa which has been endowed with great plant diversity and endemism. For this reason IPGRI and partners have trained over 6,000 people from various audiences, ranging from gene bank curators to farmers via scientists and educators. Other CGIAR centres e.g. ILRI, ICRISAT, IITA and WARDA just to mention a few, have also greatly contributed to training human resources for the collecting, characterizing, evaluating and conserving plant materials.

IPGRI'strategic choices and Capacity Development Framework

IPGRI'strategy sets an example of partnerships as powerful and sustainable mechanism for development impact. Eight strategic choices govern IPGRI's work, of which two are essential to its capacity development framework: 1) strengthening national systems and 2) working with networks.

IPGRI's experience and lesson learnt are summarized in following sections below.

Training and capacity development in IPGRI

Capacity development refers to developing an organization's ability to perform effectively in order to meet its goals. Training is an important and integral part of capacity development and cuts across all of IPGRI's work (Capacity 2004). Training is aimed at building human resource competencies (knowledge, skills and attitudes) that will 'expand human capabilities and access to opportunities in the social, economic and political arenas' and thus contribute to capacity development. However, capacity

development includes not just training or development of human resources, but also encompasses strengthening the larger system (e.g. policies and programmes) in which the organization operates, including the social, political and environmental context, and the financial and physical resources available to the organization (Figure 1). It is not a one-way, one-time event, but a continuous learning process driven by the needs of partners. Capacity development also encompasses planning, coordination, decision-making and resource mobilization processes as necessary components of an effective organization.

IPGRI sets its training and capacity development objectives squarely in the context of the needs and priorities of national partner institutes to help them meet their goals. Activities are designed and implemented together with partners, based on their own needs, in their own institutional system and within their own context. In this way, IPGRI contributes to building sustainable national PGR programmes. IPGRI is also proactive in assisting partners to identify gaps and providing appropriate options from which they can choose. In this way, IPGRI helps partners refine their needs which can lead to a positive change in attitudes and perceptions about sustainable conservation and utilization of genetic resources in the context of development.

Recently, IPGRI's Capacity building Community of Practice (CoP) has adopted the concept of Centre of Excellence, in order to meet the growing training needs of partners in the regions. This is reflected in the new strategy for Training and Capacity Development; one of the objectives of this new strategy is to mainstream PGR into formal education programmes and assist countries to reinforce their education-research-development links. The concept of Centre of Excellence offers an opportunity for IPGRI to systematize its work with national education and research institutions to leverage and increase impact and sustain its capacity development efforts.

The Centres of Excellence (CE) will take the leadership for training and education in specific PGR subject specialization or topic(s) where their strengths are, for a given sub-region or entire region.

The CE will work with IPGRI to organize and mobilize PGR training capacity within the sub-regions and regions and host short courses, long-term courses and degree programme on their specific subject specialization, depending on their nature (University, Research institute).

In the current situation, not many institutions and organizations in developing countries meet the standard requirements for CE. IPGRI will

source for applications from potential institutes in the regions, make a selection based on agreed upon criteria and thematic/geographical distribution, and work with each CE on the basis of mutually agreed upon action plan towards strengthening capacities and raising of profile up to the standard of internationally recognized CE.

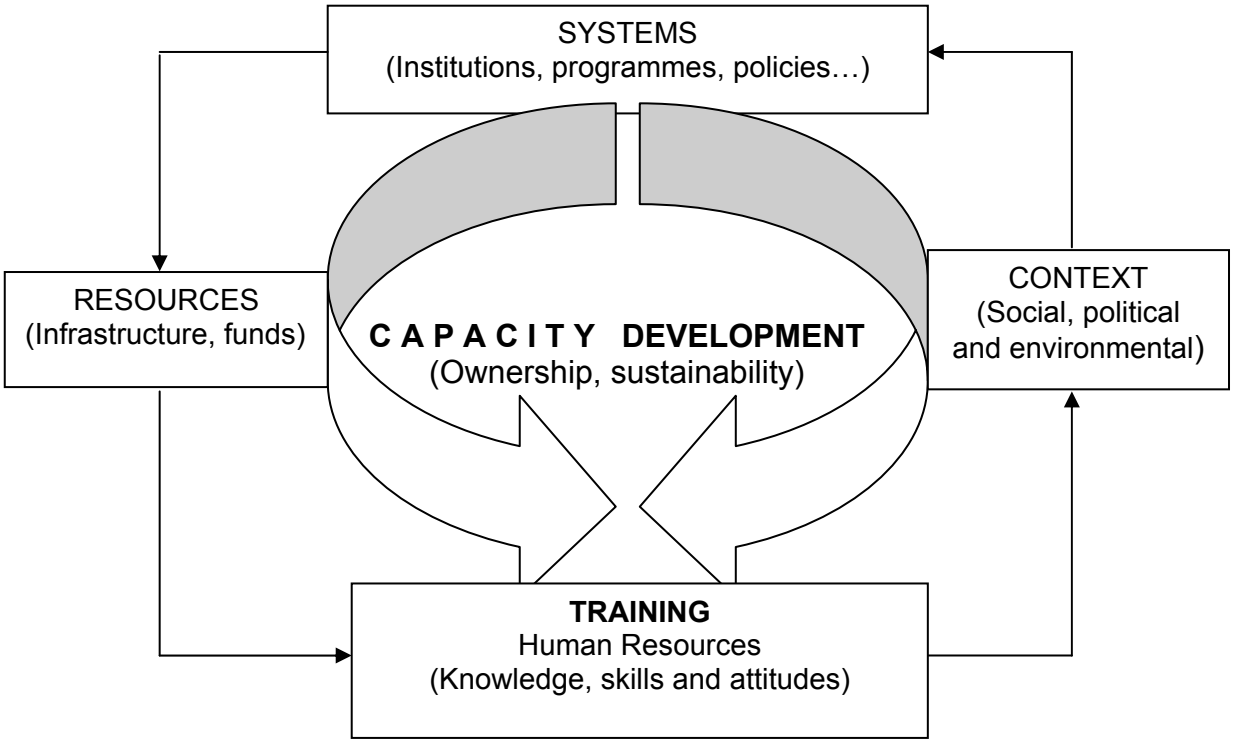

Figure 1. Relation between training and capacity development.

National PGR Programme development and strengthening

The central role of national plant genetic resources systems in the conservation and use of biodiversity has been recognized in all global fora and legal instruments dealing with this issue. Who are the stakeholders in national programme development?

IPGRI's partners are the national genetic resources systems, comprising not only the scientists of National Agriculture Research Institutes (NARIs), gene banks managers and plant breeders, but also policy makers within government ministries, universities and schools,

extension services, NGOs, private companies, and farming communities (Table 1).

Table 1. IPGRI audiences for training and capacity development.

Audience	**Objective**
Scientists	Technical knowledge and skills built through workshops, research fellowships, training materials and technical bulletins
PGR programme managers	Knowledge and skills built in the management, technical and policy area to plan and manage effectively PGR programmes through workshops, training materials and technical bulletins
Policy and decision makers	Understanding of and sensitivity to PGR policy issues and options created through public awareness seminars, fact sheets, and other communication tools
Educators	Technical knowledge in new areas of PGR science organized and curricula updated through curriculum development workshops, joint training materials development and access to related reference materials
Students	Technical knowledge and skills especially in the latest advances in PGR science developed through thesis research, internships, and on-the-job training
Youth	Awareness and appreciation of the importance of conservation and use of plant genetic resources is created through targeted public awareness materials on web sites, in school curricula, in magazines, posters and in other communication tools
Extension workers	Knowledge of participatory and gender sensitive approaches for agro biodiversity conservation and use increased through workshops and targeted training materials
Farmers/community based organizations	Knowledge of participatory approaches for conservation and use of genetic resources such as community biodiversity registers, seed fairs, and local seed supply systems documented and exchanged in guidelines and brochures
Networks	Knowledge about effective network function in general and in terms of their capacity development roles
National programme focal points	Increased skills in stakeholder involvement and in processes of developing national priorities and strategies, including information system development to assist with national programme assessment and decision-making at the national level, with the objective of strengthening national programme function

At the national level, the various stakeholders are encouraged to form sectoral sub-networks that would be part and parcel of the national PGR network, with a national PGR committee and a national coordinator.

In the case of the Sahel, the different countries are at various level of national programme structuring and functioning. All these national

programmes are actively involved, at the regional level, in activities of regional networks e.g. the Genetic Resources Network for West and Central Africa (GRENEWECA) or the Sub-Saharan Africa Forest Genetic Resources network (SAFORGEN).

Strategic alliances are also envisaged through fostering North-South or tripartite cooperation between universities in the North and the South and IPGRI, particularly for strengthening research linkages. Alliances with other key players that add value to the institute's efforts are forged and nurtured e.g. with regional bodies (CORAF), UN Agencies, mainly FAO and UNESCO, other CGIAR Centres, are some of IPGRI's allies. As the convening centre of the CGIAR System-wide Genetic Resources Programme (SGRP), IPGRI has a particular responsibility and opportunity to further inter-Centre collaboration on genetic resources training.

Lessons learnt - effective partnerships in capacity development

From IPGRI's experience and perspective, it is all about collaboration i.e. 'working in associations with others for mutual benefit' at the national level (intra and inter-sectoral associations) as well as at the regional and international levels (networks). It implies positive, purposive relationship between organizations that retain autonomy, integrity and distinct identity, and thus the potential to withdraw from the relationship (Huxham 1996).

Networking

Steps to networking

1. Internal assessment of networking opportunity
   (reason, vision, strengths/resources…)
2. Identify and select potential partners
   (complementarities, synergies, issues/conflicts…)
3. Intentional formation
   (jointly develop and share vision, values, modus operandi…)
4. Implementation strategy
   (objectives/outcomes, activities, communication…)

Foundational elements

These elements need to be addressed early in the development of associations and partnerships. These are:

- Shared compelling vision
- Strong and shared leadership
- Shared problem definition and approach
- Power equity
- Interdependency and complementary
- Mutual accountability

Sustaining elements

These elements are constant throughout the life of the network. These are:

- Attention to process
- Communication linkages
- Explicit decision-making process
- Trust, respect and commitment
- Credit and recognition

National programme development

How do we know measure national programme development? What criteria do we use? What data do we base our judgment on? How do we get them?

Five main indicators are being used:

- National co-ordination mechanisms
- Capacity for PGR conservation and use
- PGR activities
- Political goodwill and enabling environment
- Sustainability

National Co-ordination mechanisms

- National co-ordination infrastructure: existence of national PGR Committee with members meeting regularly; existence of national PGR Centre or national gene bank; there is a focal point for implementation of PGR activities
- Institutionalization of the coordinating mechanism: Existence of ministerial decrees and policy guidelines
- National plan of action and strategies

Capacity for PGR conservation and use

- Human resources development: There is a critical mass of skilled human resources at different levels and areas of expertise; there are adequate training institutions and programmes in PGR
- Conservation infrastructure and facilities: availability of gene banks and maintenance of scientific standards (seed banks, field gene banks etc.); existence of other ancillary services and infrastructure (Seed labs; field for conservation activities)
- Information and documentation: availability of manuals and computerized PGR documentation systems; e-mail connectivity, access to internet, GIS etc. Good level of awareness

On going PGR activities

- *Ex situ* conservation with collections held; number and types of methods
- *In situ* conservation ; on-farm and natural habitats
- Characterization and evaluation: Number of accessions and methods
- Use of PGR: Number and breeding programmes and exchange among farmers
- On going research and development projects: Numbers and quality

Political goodwill and enabling environment

- Country signatory to international commitments e.g. CBD, FAO Commission, GPA etc. and participation in regional and international networks
- Membership and commitment to regional/sub-regional undertakings and networks e.g. PGR networks, crop networks

Sustainability

- Programme hosted by agricultural research centre or other national research structure, with semi-autonomy and budgetary allocation
- Supporting legal and policy frameworks; Access to germplasm and benefit sharing; place of PGR in environmental laws and statutes
- Staff turnover: level and frequency

Conclusion – new approaches in working together for capacity development: the IPGRI-FAO Sahel Project

IPGRI is keen on building coalitions that bring different sectors and knowledge systems at work. A good example is the new project supported by IFAD Technical Assistance Grant. This project brings research institutions, IFAD development projects and NGOs and universities from Burkina Faso, Mali and Niger, to work together with farmers for enhancing their livelihood strategies. It builds on IPGRI's previous work in the Sahel (Global in situ conservation project in Burkina Faso, Farmers Field Fora in Mali…) with the technical assistance of FAO, ISNAR, ENDA-Tiers Monde and universities from the north i.e. Louvain-la-Neuve (Belgium) and Pisa (Italy). A similar approach is pursued through the development of an IPGRI-ICRA led proposal on 'Building capacity in multi-stakeholder problem-solving approaches to the management and use of agro-biodiversity for improved livelihoods of rural people'. This project also builds on existing IPGRI projects across regions e.g. *in situ* on-farm projects, Genetic Resources Policy Initiative (GRPI) and Neglected and Under-utilized Species (NUS). Both projects aim at sustaining development through capacity building. The role of research and education and the challenges are the following:

Role of research in the new capacity building approach

- Facilitating pro-poor technical, economic, financial, political, institutional and organizational innovations
- Enhancing processes of collaborative research combining different knowledge systems and building on the existing risk management strategies of small farmers

Enabling the enablers: the role of higher education in capacity building

- The prevailing situation at the universities in the Sahel is characterized by a predominance of science in one-way teaching; emphasis on theoretical and quantitative aspects; weak inter-disciplinary, multi-stakeholder and systems-thinking approaches; lack of social skills development in training; disregard of emotional intelligence aspects; marginalization of formal education in the research-development continuum

- The new approach consist of testing a strategy for incorporating participatory research approaches into higher education that will yield a new generation of 'agents of change'

Findings and challenges ahead

- Close inter-dependence between higher education, professional, personal, and institutional changes
- New learning modes versus consolidated teaching practices
- Need for a new science recombining rigour and social relevance in the
- context of pro-poor/by-poor research
- New incentive structure to be put into place
- Complexity of managing partnerships between actors with different value systems
- Proving the benefits of investing in pedagogical research and higher education transformation is required

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The contribution of AGRHYMET Regional Centre to capacity building in food security and natural resource management in the Sahel

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Introduction

The Sahel is the vast savanna region of West Africa bordering the Sahara desert. The countries lying in this region and covering 5,343,545 km^2 have in common the fragility of the agro-ecosystem, characterised by the vagaries of the climate, drought and advancing desertification. For the greater part of the region, annual rainfall varies between 200 and 700 mm (CILSS 2000). The Permanent Interstate Committee for Drought Control in the Sahel (French acronym: CILSS) was created in September 1973 in the wake of the recurrent droughts that hit the region in the late 1960's and early 1970's. With more than 54 million people and an average annual growth rate of 2.7%, the population of CILSS member countries has the potential to double every 25 years. These natural phenomena, coupled with poor soils, little investment in irrigated agriculture and pests and disease pressure among other factors, have largely hampered the region's capacity in tackling food insecurity and the degradation of its natural resources. These environmental constraints have constantly posed big challenges to the CILSS member countries. Because of the erratic rainfall patterns, poor soils and depleting vegetative cover brought about by high population grow rates, the region pose a greater challenge to development. To face this challenge, the development of human resources through professional

training was seen as one of the starting points. The creation of the AGRHYMET Regional Centre (ARC) in 1974 underscored the determination of the CILSS member countries in this regard. Initially created as a training centre in operational agrometeorology and hydrology, the areas of concentration of the ARC evolved over time to include other vital domains such as training in maintenance of hydro-meteorological instruments and microcomputers used for processing and transmitting data, and crop protection.

In line with CILSS' objective of attaining food security and sustainable management of natural resources for its member countries, the ARC's areas of intervention were extended over time to include operational activities such as crop and pest monitoring, remote sensing, biophysical and socio-economic data collection and analyses for the purpose of producing and disseminating decision making tools and information to end users, climatological and hydrological data bank management, agricultural statistics, applications of geographic information systems (GIS), etc. These activities are meant, among other things, to generate decision making tools for early warning in food security and natural resource management.

Support for the training and related activities has been provided by various development partners including the Danish International Development Agency (DANIDA), the Directorate General for International Development (DGIS) of the Netherlands, the Italian, French and Belgium Cooperation Agencies and the United States Agency for International Development (USAID). Additional sources of funding have been obtained from the Arab Bank for Economic Development in Africa (BADEA) and Portugal on an *ad hoc* basis and through funds generated from private scholarship comprising 24% of the 2002-2005 student intakes.

Training and related activities at the AGRHYMET Regional Centre

The CILSS restructuring exercise conducted in 1993 culminated in the setting up of four 'major programmes'. Two major programmes dealing with policy, respectively in food security and natural resource management are based at the headquarters in Ouagadougou (Burkina Faso) and are responsible for strategic orientation. Two technical major programmes at each of the specialised institutes: ARC in Niamey (Niger) responsible for Training and Information Management and Sahel Institute (INSAH) in

Bamako (Mali) responsible for agro-socio-economic research and population development. Human resource development being a major preoccupation for CILSS member countries, training activities within the CILSS system are assigned to the Training Major Programme.

Basic long-term training

Long term training at the ARC is conducted in agrometeorology, hydrology, crop protection and maintenance of hydro-meteorological instruments and micro-computing. These areas are considered of strategic importance in agriculture in general and in particular in the management of information for food security and natural resource management. The courses last for two years for the 'Higher Diploma' (entry level: high school certificate or its equivalent) and three years for the 'Ingénieur' course (entry level: higher diploma or equivalent certificate), equivalent to the Bachelor of Science degree. The target groups for ARC's training programmes are employees of technical departments of the CILSS member countries, high school leavers, employees of Non-Governmental Organisations and those of other services dealing with rural development in general and agriculture and natural resource management in particular. Admission is granted on a competitive basis after a selective entrance examination.

All the diplomas/degrees delivered by the ARC in the various disciplines mentioned above have been recognised by 'Conseil Africain et Malgache pour l'Enseignement Supérieur (CAMES)', the African and Malagasy Council for Higher Education, except the new three-year courses in crop protection, which started in October 2002 and in instrument maintenance and micro-computing which is scheduled to start in October 2004.

Continuing education

These short-term courses for technicians from national technical services, research institutes, NGO's, agricultural schools and agricultural development projects, include seminars, workshops, special refresher courses, training of trainers and individual attachments. They can last from one week to four months. They are conducted in all the domains treated by the two major programmes of the ARC: agrometeorology, hydrology, crop protection, maintenance of hydro-meteorological instruments, library science, data bank management, remote sensing and early warning systems, agricultural statistics and GIS. In addition, six new training modules were

created in 1998 in sustainable agriculture under the broad title, 'Sustainable management of Sahelian agro-ecosystems'.

In addition to these short-term courses and individual attachments, staff of the TMP supervise practical thesis research for students from universities and agricultural schools in the West African region and elsewhere. Such research activities last from one to six months depending on the nature of the degree to be conferred.

Training-supported research

Research conducted in the various training disciplines generates results and tools used in the training process. The objectives are to provide a framework for practical field training, to broaden the experience and aptitude of the teaching staff and to generate results that can benefit farmers. Given the fact that many of the graduates (e.g. 60% in crop protection) work with farmers in rural areas, some of the training-supported research activities are conducted in collaboration with farmers in three different cropping systems: millet/cowpea intercrop, irrigated rice and vegetables.

Information and documentation

Information and documentation are indispensable support services for training institutions like the ARC. The ARC's documentation centre contains more than 31,000 references in agriculture, crop protection and atmospheric and environmental sciences and grows at the rate of 10% per year. In addition, databases exist on student reports and theses, former students of the ARC, scientific journals and other publications, and a mailing list of individuals and institutions that request bibliographic assistance. The scientific and technical information is made available to users via the publication and dissemination of bibliographic bulletins or through modern electronic means where this is available. The Documentation Centre registers 7,000 users each year. The main beneficiaries of the provided services are the ARC's technical staff and students, students and lecturers from other institutions in Niamey, researchers, agricultural school teachers and extension agents and NGO personnel. The centre participates in a network of documentation centres and has close ties with the Centre for Agriculture and Rural Cooperation (CTA) in Wageningen, The Netherlands.

Link-up with technical services in CILSS member countries

The entire AGRHYMET System, including the TMP, is linked to the National AGRHYMET Components (NAC). The NAC is composed of technical departments (agriculture, meteorology, hydrology, crop protection, livestock services, forestry, environment, etc.) which deal with activities related to food security and natural resource management. They provide biophysical and socio-economic data that are used by the information major programme; and at the same time they are the beneficiaries of the activities of the ARC. It is thus within these technical services that the graduates of AGRHYMET's training programmes operate. For instance, the maintenance of data collecting networks (climatological data, hydrological data, crop monitoring, pest monitoring, etc.) and the analysis and transmission of data from these networks is done by graduates of the ARC.

The training programmes of the ARC were, and are still, meant to build and strengthen the capacities of these national services. The extent to which this objective is met can be assessed through the achievements registered to date by the TMP in its major intervention areas, namely long term and continuous training activities, scientific and technical information dissemination and other related activities as are described below. An important yardstick is the measurement of the performance of ARC graduates in the various tasks and duties assigned to them in their respective departments.

Orientation of training programmes with respect to expressed needs of the Sahel

The principal role of the Policy Major Programmes at the level of the CILSS headquarters is to ensure strategic orientation of all the projects and programmes in the long term. An example is the Sahel 21 exercise, a popular grassroots consultation of Sahelian civil society conducted during the first triennial plan (1995-1997), (CILSS undated). This exercise enabled all stakeholders to express their visions and aspirations for the Sahelian region in the 21st century. The Sahel 21 process culminated in a forum of Sahelian societies which, following the results of the consultation exercise,

retained human resource development as the first of five priorities of the Sahelian people for the 21st century. A second exercise, Cooperation 21, was conducted by development partners in order to define mechanisms by which they could accompany the visions expressed by the Sahelian people. The results of these exercises, particularly those of Sahel 21, were used as a reference by the six major programmes, including the TMP, in defining their activities for the second triennial plan (1999-2001). Because soil fertility and conservation, water management for irrigation and integrated pest management were considered among the major areas of emphasis for transforming Sahelian agriculture, common training modules were created by the TMP for the 2-year courses in agrometeorology, hydrology and crop protection. Furthermore, six modules were created in sustainable agriculture to give a broader base to the training curricula which are thus far highly specialised and interdisciplinary in scope. These and other topics in food security and natural resource management (see Boxes 1 and 2 below for examples) are the pillars on which ARC's training programmes are built.

The Sahel 21 exercise gave rise to the formulation of a strategic framework for sustainable food security and poverty reduction in the CILSS member countries (CILSS 2000). This strategic framework was formally adopted by the CILSS Heads of State Summit Meeting in Bamako, Mali, in November 2002. Five-year and ten-year food security strategic plans have been formulated and initiated as of January 2003. The activities of the TMP and the contents of its training curricula are a contribution to these plans as far as human resource development is concerned.

The TMP has established collaborative links with various research and educational institutions both in developed and developing countries, to reinforce its expertise in its various areas of intervention These institutions include the Luxemburg University Foundation (FUL) in Belgium, the Wageningen Agricultural University in The Netherlands, the University of Reading in the United Kingdom, the University of Niamey in Niger, the University of Bobo-Dioulasso in Burkina Faso, the Regional Centre for Training in Remote Sensing (RECTAS) in Nigeria, various agricultural schools in the Sahelian Countries, the International Institute of Tropical Agriculture (IITA), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), etc. These collaborations are based on exchange training missions, joint research activities, mutual technical assistance or execution of joint projects.

Box 1. Food security training topics

- Applications of Agrometeorology : water balance and crop growth models, drought tolerance, crop yield estimation, etc
- Reinforcement of the information management system through training: data collection and analysis, databank management, etc.
- Water management (for agriculture + domestic use): irrigation, water quality
- Agricultural diversification : inclusion of industrial crops (cotton, sesame, sugarcane, tree crops, etc) in training curricula
- Reduction of crop losses and protection of harvested produce: application of integrated pest management
- Phytosanitary inspection and pesticide management capacity building: to promote the quality of agricultural commodities for the export market

Box 2. Natural resource management training topics

- Sustainable management of Sahelian agro-ecosystems
- Management of watersheds
- Soil conservation and fertility management
- Various applications of Geographical Information Systems (GIS)
- Photo-interpretation of satellite images in land use and land cover mapping
- Sustainable use of renewable energy sources: promotion of renewable energy sources
- Database management

AGRHYMET Regional Centre's achievements to date in capacity building

Regarding long-term training

Since its inception in 1974, the ARC has developed quality training curricula that have constantly been revised and adapted in accordance with the needs and prevailing conditions in the field. The availability of adequate infrastructure and equipment (classrooms, dormitories, laboratories, field workshops, experimental and demonstration plots, meteorological and hydrological observation stations, automatic weather stations, etc.) have enabled high quality training emphasising on the acquisition of practical skills for better performance in the field. Because of

its long experience in training, the quality of the courses it offers and the extent of its international cooperation in training and information management, the ARC attracts students from beyond the borders of the CILSS member countries. Figure 1 shows the countries that have benefited from the ARC's training courses since the creation of the ARC.

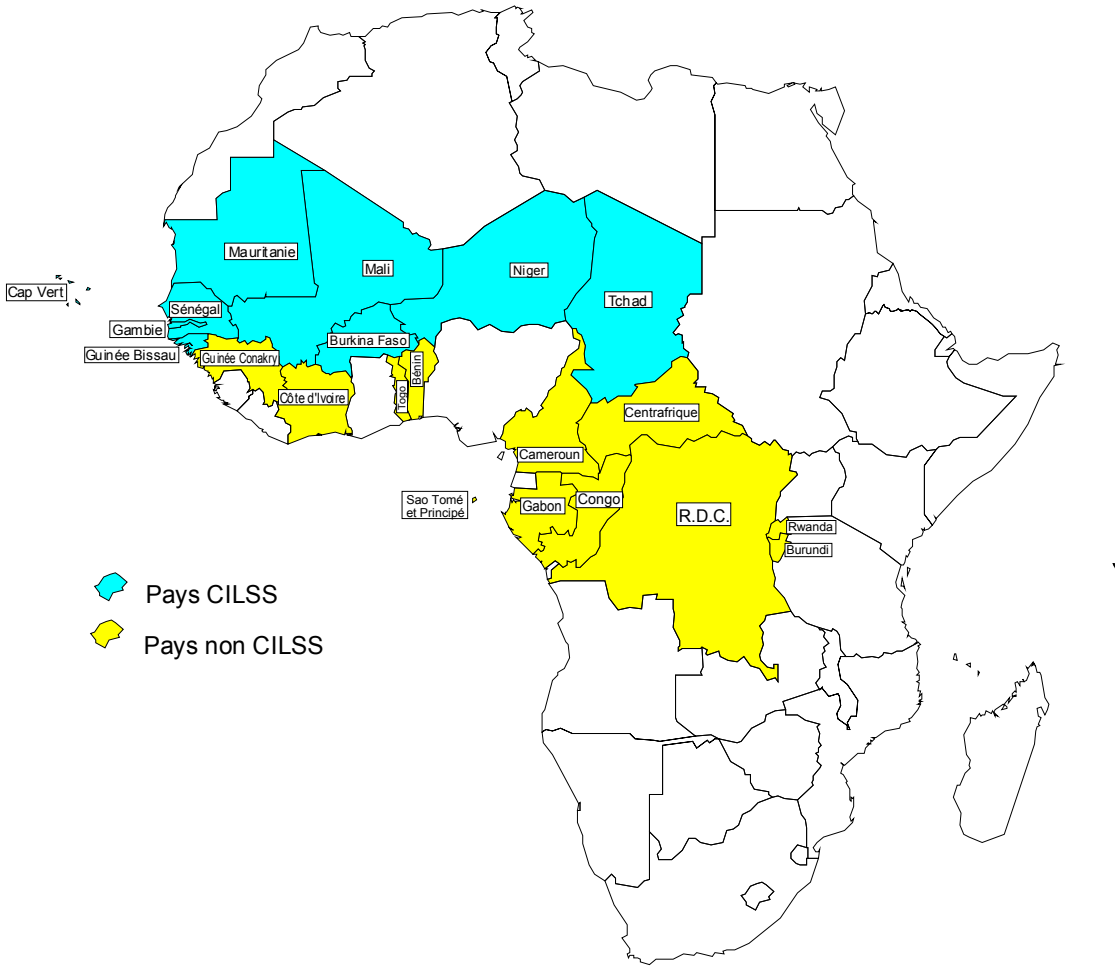

Figure 1: Geographical coverage of the ARC's training activities.

A total of 755 students graduated in the various training courses from its inception until now. Of these trainees, 679 (90%) originated from CILSS member countries and 76 (10%) from non CILSS member countries. Table 1 below shows the distribution of graduates between the different training domains and between CILSS and non CILSS member countries from 1975 to 2002.

Table1. Results of the long term training activities conducted by the ARC from 1975-2002.

Domains / **Countries**	**Agrometeorlogy**		**Hydrology**		**Instrument**	**Crop protection**	**Total**
	Ingénieur	Higher Diploma	Ingénieur	Higher Diploma	Higher Diploma	Higher Diploma	Graduates
Burkina Faso	11	13	8	18	7	51	108
Cape Verde	3	9	0	2	7	7	28
The Gambia	3	6	1	4	4	12	30
Guinea-Bissau	6	6	0	4	5	8	29
Mali	6	13	1	0	6	31	57
Mauritania	3	8	4	5	7	15	42
Niger	8	18	5	17	9	65	122
Senegal	10	11	7	20	8	79	135
Chad	10	20	8	18	8	64	128
Total CILSS	**60**	**104**	**34**	**88**	**61**	**332**	**679**
Benin	2	4	1	2	1	1	11
Burundi	0	0	0	1	1	0	2
Cameroon	0	2	0	3	0	0	5
CAR	1	2	2	2	3	1	11
Congo	1	1	0	0	0	0	2
Côte d'Ivoire	3	3	0	3	2	0	11
Gabon	0	10	0	0	0	0	10
Guinea Conakry	0	2	0	1	1	0	4
Rwanda	0	2	0	0	0	0	2
Saõ Tomé	0	0	0	1	0	0	1
Togo	4	9	0	0	3	0	16
DRC	0	0	1	0	0	0	1
Total Non CILSS	**11**	**35**	**4**	**13**	**11**	**2**	**76**
Overall total	**71**	**139**	**38**	**101**	**72**	**334**	**755**

Instrument = Instrument Maintenance and Micro-computing ; Ingénieur = Bachelor of Science ; CAR = Central African Republic ; DRC = Democratic Republic Congo

The results indicated above show to what extent the ARC has contributed to providing qualified manpower to the sectors dealing with food security and natural resource management. In order to better appreciate ARC's capacity building efforts in these areas, one has to take a look at the duties performed by the graduates once they return to their respective countries as shown in Table 2 below.

Table 2. List of the main duties performed by ARC graduates within their respective technical services.

Specialised field	**Duties performed**
Agrometeorology	• Management of Agrometeorological data collecting network • Monitoring of crop growth and development during the cropping season • Forecasting and early warning the cropping season • Management of agrometeorological and climatological databases • Extension activities and advice in agrometeorology
Hydrology	• Operating hydrological data collecting networks in the field (installation and maintenance of equipment, gauging, etc.) • Computerised management of hydrological data banks • Analyses and use of hydrological data for the conception of hydraulic and irrigation schemes • Hydrological forecasting, watershed management, etc. • Scheduling irrigation
Crop protection	• Pest surveillance and prevention • Agronomic monitoring of major crops • Intervention: estimation of crop losses and execution of integrated pest control activities • Research (installation of field trials, data collection, participation in data analysis and interpretation) • Extension and training in agriculture in general and in crop protection in particular • Phytosanitary monitoring and protection of post-harvest agricultural produce and seeds • Phytosanitary control of agricultural commodities entering or leaving the country
Instruments and micro-computing	• Installation and operation of computer and telecommunications equipment (e.g. for data analysis and transmission) • Maintenance of computer, telecommunications and other electronic equipment • Installation, maintenance and repair of agro-hydro-meteorological equipment • Maintenance and repair of all other equipment used by the technical services • Management of equipment spare parts and advice in the placement of equipment orders

As shown in Table 2, ARC graduates play a key role in performing tasks that are directly or indirectly linked to activities related to food security and natural resource management, including the maintenance of instruments used in data collection, analysis and transmission for early warning purposes.

A survey conducted in the CILSS member countries in July 2002 (Halilou and Jika 2002) showed that ARC graduates constitute the bulk of the technical staff working in sectors dealing with agrometeorology, hydrology and crop protection. In some cases, 100% of the technical staff is composed of ARC graduates (see Table 3 below).

Table 3. Proportions of technical staff trained at the ARC in the areas of Agro-météorology, Hydrology and Crop Protection.

Domain of Intervention	**Percentage of technical staff composed of ARC graduates / country**								
	Burkina Faso	Cap Verde	The Gambia	Guinée-Bissau	Mali	Mauri-tania	Niger	Sénégal	Chad
Agro-meteorology	100	60	100	55	70	90	80	50	95
Hydrology	90	50	20	50	0	100	45	98	95
Crop Protection	87	100	70	5	60	20	50	60	80

This survey further revealed that the AGRHYMET National Components unanimously agreed that the training programmes offered by the ARC have a positive impact on the strengthening of their technical capacities. For instance, in all the member countries of CILSS, the ARC graduates are the principal animators of the Multidisciplinary Working Groups (MWG) set up to monitor the cropping season. As such, they play a key role in the upkeep of the early warning system for food security and natural resource management for which CILSS is well known. Besides the Government services, ARC graduates are employed in Non-Governmental Organisations (NGO's), parastatals and the private sector, particularly in telecommunications and computer companies where instrument maintenance graduates serve as software and hardware maintenance technicians or engineers. The results of this survey have been corroborated by an audit conducted on the CILSS System by an independent consulting firm, SOFRECO, in November/December 2003, the results of which are summarised in Box 3 below for the Training Major Programme (SOFRECO 2003).

Box 3. Summary of the results of the 2003 CILSS Audit
(Training Major Programme)

- Continuing education and long term training very pertinent and respond to needs as confirmed by the Danish evaluation (NCC, 2001), Italian evaluation (2003) and American evaluation (Ye, 2001)
- Monitoring survey indicated that 97% of the graduates are employed in fields for which they were trained
- The gender dimension is taken into account in the training curricula
- Training is of good quality and up to international standards
- Training has brought about positive change in performance and in decision making
- Most of the personnel of national meteorological services involved in producing the cropping season monitoring bulletins are ARC graduates
- Quality crop protection training programme

In the area of continuing education

In its thirty-year of existence, the ARC has trained more than 1,500 technicians through its continuing education programmes. These training activities update the knowledge and sharpen the skills of technicians already working in the field. Between 1998 and 2002, continuing education programmes were intensified at the ARC, due mainly to the introduction of the new modules on sustainable agriculture and the activities conducted in the framework of the training project on natural resource management and food security (2000-2003). Thus, during this five-year period, 841 participants took part in the short courses.

In September/October 2001, all the short term training modules were subjected to an external evaluation (Ye 2001). The results showed that these short term courses are a good means of updating the knowledge and skills of technicians already working in the field. Overall, the knowledge and skills gained through these courses are applied in most areas. The duration of some specialist courses, such as the applications of GIS in natural resource management, were nevertheless considered insufficient and further suggestions were made to introduce some relevant topics such as agro-forestry and livestock.

Monitoring and evaluation

Monitoring and evaluation of former trainees is done through periodic surveys (once every three years) conducted in countries and departments in

which they work. The former trainees and their employers are questioned on the technical difficulties encountered by the former in conducting their duties, as well as their needs for further training. The results of these surveys are used either to formulate new training modules or to improve on the content of existing training programmes.

The Technical and Management Committee and the Scientific and Educational Council, each of which meets once a year, are respectively responsible for reviewing and approving results of activities and work programmes, and examining and advising on the quality of the programmes conducted at the ARC.

The enrolment of women and inclusion of the gender dimension in the training curricula

Women play a vital role in agriculture in the Sahel. In the agricultural sector, they are involved in almost every step from production to consumption: sowing, weeding, harvesting, storage, food processing and preparation. As such, women should benefit from extension information and training if significant progress has to be made in ensuring sustainable food security through increased crop production. Unfortunately, extension information targets primarily men and most of the extension staff are men. The low representation of women in extension activities is due to social barriers that limit contacts between female farmers and male extension workers. The former are often made to believe that the extension information only has the desired impact if it is passed on to men. Furthermore, the low number of female extension workers is due to their low enrolment in basic educational institutions in Sahelian countries. Many of those admitted to high school either do not complete their education or show a weak interest for professional technical courses such as those taught at the ARC.

In the past few years, however, significant progress has been made in the enrolment of women. For instance, before 1995, the percentage of women enrolled in ARC courses never exceeded 2%. Between 1995 and 1997, this figure increased to 18%. The proportion of women in the 1999 and 2002 intakes was 46% and 27% respectively. This significant rise was due to the adoption of admission policies that favour women (at equal competence as a result of the selective entrance examination, priority is

given to female candidates), donor support in providing scholarships for women and an awareness campaign targeting decision makers in the CILSS member countries. Such initiatives are necessary for bringing about change in the role of women in all sectors of rural development.

Recognising the role that women play in agriculture and in crop protection, the Training Major Programme, in 1998, embarked on a process that intended to assess the constraints and opportunities of women in agriculture in general and in crop protection in particular. Limited access to information and training was identified as one of the major constraints facing women. Thus, a number of areas were identified through regional seminars (ARC 1998) as training needs in crop protection for women farmers. Ten training modules were then conceived and validated through a regional seminar that at the same time served as a forum for training future trainers for all the nine CILSS member countries. The training tools developed for this activity are being made available to the trainers.

By addressing gender-related issues in its training curricula and promoting the admission of women in its courses, the ARC has succeeded in putting women in professional positions (agrometeorology, hydrology, crop protection, computer/instrument maintenance and tele-communications) that have thus far been dominated by men.

Difficulties encountered

High demand for admission against limited number of scholarships

The ARC receives more applications for admission than it can absorb, due to increasing demand for its training programmes. For example, in 1999 a total of 140 applications were received by the ARC for its various long term training courses (ARC 2002). This number increased to 283 in 2002. The admission capacity of the ARC is 110 students. Nevertheless, the student population in the last three years fluctuated between 73 and 91. It is important to note that most of the applicants apply for the ARC scholarships which are limited in number. Other sources of scholarships are faced with the same problem because of the high demands and limited financial resources. This situation puts a ceiling on the ARC's full absorption capacity and slows down the pace of capacity building in the beneficiary departments at the national level in CILSS member countries.

Shortage of permanent teaching staff
Maintaining an adequate number of permanent teaching staff requires a lot of financial resources. The ARC has long been faced with this difficulty. To alleviate the problem, the ARC strives to secure a critical mass of lecturers, supplemented by hired part-time lecturers and exchange programmes conducted with partner training institutions.

Language barrier
Among the nine CILSS member countries, three are non-French speaking (Cape Verde and Guinea-Bissau which are lusophone and The Gambia which is anglophone). These countries have to benefit from the ARC's training activities as much as the francophone countries. Their full participation in the long term training activities requires that their candidates undergo language training in order to be admitted into the courses. This language training, which lasts for three months, is conducted by the ARC at an additional cost. The high success rate of the non-francophone candidates notwithstanding, some of them encounter difficulties in following the courses. Such difficulties discourage prospective students from these non-francophone countries from applying for admission at the ARC.

Information transfer
National programmes are the principal beneficiaries of ARC's training activities. Because of their meagre budgets, they find it difficult to keep pace with the rapid advances in the disciplines taught at the ARC. As such, even though students are exposed to new developments in their respective areas, the application of their knowledge and full potential is often hampered by the inadequacy of appropriate materials and equipments for their jobs. The ARC tries to resolve this problem by providing some basic materials and equipments to the NAC's through funds allocated to its different programmes, as well as training of nationals on their maintenance. Rapid technological change also creates a gap between the aptitudes of technicians working in the field and the new knowledge and skills they should acquire to better perform their duties. This situation results in more training needs in continuing education than could be reasonably satisfied by the ARC's admission capacity and financial means.

Prospects

The ARC strives to reaffirm its position as a centre of excellence in human resource development and information management in food security and natural resource management. To do this, it has to further open up its programmes and make its know-how available to other countries, particularly those belonging to other sister intergovernmental organisations such as the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (WAEMU). Technical cooperation with international, regional and national research, development and educational institutions, through the sharing of expertise and resources (both human and material), is also vital in order to produce the desired impact. The creation of the 'Plateforme des Institutions Régionales pour l'Environnement et la Météorologie' (PIREM) demonstrates the ambition of the partner institutions to work towards this objective. These institutions, all based in Niamey, are ARC, Regional Centre for Specialised Training in Agriculture (CRESA), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Niger Basin Authority (NBA), African Centre for Meteorological Applications and Development (ACMAD) and African Meteorological and Civil Aviations School (EAMAC).

The various training curricula will be continuously revised and re-adapted in order to ensure that they respond to the needs and realities in the field. In addition to the relevant issues taken into account in the current training curricula, the areas mentioned in Box 4 below will be reinforced or introduced as the case may be.

Box 4. Future areas of emphasis

- Natural Resource Management and Sustainable Agriculture: emphasis on integrated water resource management; small scale irrigation; soil conservation and fertility management; economic aspects of natural resource management
- Sustainable food security (Food Security Strategic Framework, Regional Food Security Strategy and its first 5-year plan: 2003 to 2007)
- Capacity building in integrated pest management and phytosanitary inspection and quarantine
- Information and documentation: application of New Information and Communication Technology (NICT) and selective dissemination of information
- New orientation of training supported research: subject areas with a regional scope
- Institutional collaboration and Regional integration
- Reinforcement of the Gender Dimension

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Integrated Pest Management in the Sahel – illustrated by examples from selected food crops

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Introduction

In Sahel, yields of agricultural crops are much smaller per area unit and much more uncertain than in Denmark, i.e. because of poverty, degraded soils, very variable climatic conditions or attacks by pests. Most peasants rarely have sufficient money and labour capacity to count on a larger production of agricultural crops, which even some times may be difficult to sell on the local market. In order to manage the daily life, many of the younger and most productive family members have to earn the necessary money by taking up seasonal work in other parts of the country, in particular the towns, or in neighbouring countries.

Investigations show that pests are reducing the potential yields quite significantly. The pests may be animals (e.g. insects, mammals, birds or nematodes), plants (weeds or parasitic plants), fungi, bacteria, or viruses. Losses caused by pests in Sahel normally vary between 30–40% of the potential yield, to which one must add losses in storage. Certain pests, however, such as locusts, blister beetles (*Meloidae* sp.) and parasitic plants (*Striga hermonthica*) may totally destroy a millet or sorghum field.

The purpose of this paper is – by examples – to describe some of the most serious pest problems in some of the most common food crops in Sahel: Pearl millet (*Pennisetum typhoïdes*), sorghum (*Sorghum* spp.), cowpea (*Vigna unguiculata*) and tomato (*Lycopersicon esculentum*). Furthermore, the aim is to describe how peasants try to encounter these problems and to give examples of how donors, through development assistance, can support the peasants in finding better possibilities to protect their crops. Most of the examples are experienced during the author's work in the Sahelean region, where the crops often are cultivated under

extremely dry conditions. All the pests mentioned in the paper are described in an illustrated publication by Institut du Sahel (INSAH), Bamako, Mali (INSAH approx. 1990).

Integrated Pest Management

Important cash crops such as cotton have over long periods been cultivated with increasing use of chemical pesticides. This has led to a situation where it has been become increasingly difficult and expensive, and sometimes even not profitable, to cultivate the crops (Mengech et al. 1995, Abdelrahman 1989).

This development especially in Central America contributed strongly to the formulation of a control strategy, which was not exclusively based on chemical control of pests, but also took into consideration the existing natural enemies of pests, and other methods developed by the peasants themselves or through research. This strategy is called Integrated Pest Management or IPM.

There have been several definitions of IPM over the last three–four decades. One of the latest and most accepted definitions is formulated by The Consultative Group for International Agricultural Research (CGIAR), which is supported by many donors and development banks. CGIAR defines IPM as 'ecologically based pest management that promotes the health of crops and animals, and makes full use of natural and cultural control processes and methods, including host resistance and biological control. Chemical pesticides are only used where and when the above measures fail to keep pests below damaging levels. All interventions are need-based and applied in ways that minimise undesirable side-effects' (CGIAR 1995).

It is important to consider IPM as a *strategy* and an *approach* to develop technologies to 1) integrate control of pests in the overall agricultural cultivation system, 2) use biological methods, 3) keep the level damages below economic thresholds, and 4) minimise risks for human health and for the environment by using selective control means and methods (Kiss and Meerman 1991). One has to reduce losses rather than simply to develop or transfer specific control technologies.

Components of Integrated Pest Management

Integrated Pest Management consists of a number of components. Some of these are preventive e. g *crop rotation* and the *composition of agricultural systems* or use of *resistant* or *tolerant* varieties or landraces. Another type of preventive measures are composed of *agricultural measures*, that may be based on indigenous or traditional methods, modification of traditional methods, or new innovations or methods, introduced from outside. Several forms of *biological* control are also preventive, others are curative. These embrace *mechanical,* some *biological, chemical* and other direct control measures. *Monitoring* of crops, pests and their natural enemies is an essential part of IPM, which is also the case with the dissemination of the knowledge of improved control to the peasants through *training* and other forms of *communication*. Below is described some of the measures, that are used - or that could be used advantageously - in the Sahel region.

Since the beginning of agriculture, peasants seem to have developed and adapted their agricultural systems in order to reduce the destruction of crops by pests. The peasants have organised their cultivation according to historical, social and ecological factors and have experimentally (trial-and-error principles, critical observations and innovations) developed a holistic knowledge about the enormous biological diversity around themselves (Asare 2003). It must be assumed that there always have been innovators among peasants, who have been trying to develop new methods to control pests. Some of these indigenous or traditional methods today make up parts of in particular the agricultural measures of IPM.

Rotation of crops

It is well-known that repeated cultivation of a crop on the same piece of land may cause increased risk of attacks by insects, diseases and weeds. Hence, it has been common to cultivate the crops on 'new' land each year. This type of crop rotation was earlier connected with a *fallow*, which, even in the relatively sparsely populated Sahel, has become more rare along with the cultivation of all good agricultural lands. Crop rotation is of great importance for the control of diseases and weeds, but also restricts the development of insect pests. Thus, the millet/groundnut cultivation system found in Sénégal and The Gambia, where the two crops are cultivated in yearly alternations, reduces attacks by stem borers (*Coniesta ignefusalis*), the parasitic plant *Striga hermonthica*, and downy mildew (*Sclerospora*

graminicola) on millet, and attacks by armyworms (larvae of *Heliothis armigera*) on groundnut (AGRHYMET/Niger 2000, FAO 1987).

A situation in northern Nigeria illustrates what lack of crop rotation may entail. Farmers had throughout some 10 years grown tomatoes profitably on the same piece of land. Then the yield drastically decreased in 1995 due extremely heavy attack by white flies (*Bemisia tabaci*), attacks which the farmers until then had controlled by frequent spraying with insecticides. It was very difficult to convince the farmers, that they – for a couple of years only – had to cultivate another crop e.g. maize, which was not attacked by white flies, but gave farmers less income (Zethner 1995).

Cultivation of a larger area than necessary

Peasants have – to the extent possible – cultivated a larger area than necessary for the needs of the closest family. They have wanted to create a certain surplus for more distant family members and friends, who may be needy, and taken into account that pests empirically take a certain share of the harvest. In the Sahel region, where weaver birds eat large amounts of almost ripe grains of millet before the harvest, one could - to a certain extent - join in on the verse of the Danish harvest song 'the bird and the poor also must be full'. Less good agricultural land at the disposal for peasants has, however, reduced the possibilities for cultivating a surplus of land.

Use of resistant or tolerant varieties and landraces

In the 1980s, some of the Fulani people (Peul) living in The Gambia and Sénégal, used a specific landrace of millet to reduce the losses caused by weaverbirds. The landrace *Souna bado laebi* ('the early maturing millet with hairs') has long bristles on the spike, which makes it difficult for weaverbirds to get hold at the grains. This landrace was also shown to be more resistant against the blister beetle species (*Psalodolytta fusca*) and was well liked by the women, probably because of the higher content of protein in the grains, as compared to the variety of millet (with short bristles on the spike) normally cultivated in The Gambia at the time. Despite more stable and at least equally high yields as the normally cultivated millet variety, the cultivation of *Souna bado laebi* did not expand significantly, perhaps because the men during harvest suffered skin irritation due to the long bristles (Zethner et al. 1990).

Resistance to insects are often related to morphological characteristics such as found in *Souna bado laebi.* More active types of resistance may

occur when the host plant comes into contact with fungi, bacteria or viruses. Plant breeders have e.g. bred a variety of millet, which is resistant against the smut fungus in Sahel (*Tolyposporium penicilariae*) (AGRHYMET/Niger 2000).

Many virus diseases are transmitted by insect vectors (INSAH approximately 1990). This is the case for aphids (*Aphis craccidae* and *Myzus persicae*), both transmitting mosaic-virus in cowpeas, and white flies (*Bemisia tabaci*), transmitting mosaic viruses of tomato, cassava, beans and other plants and geminivirus of tomato and a number of other vegetable crops. Geminivirus has increasingly become a very serious pest, which is rapidly spreading geographically and to new host species. Research in resistance to insect transmitted virus diseases requires a high degree of coordination and considerable funds, which Danida, among other donors, has contributed, in particular to international research institutions such as Centro Agricultura Tropical (CIAT) (Colombia), International Institute of Tropical Agriculture (IITA) (Nigeria and Bénin) and International Centre of Insect Physiology and Ecology (ICIPE) (Kenya).

Intercropping

Peasants have over centuries developed mixed cultivation systems of one, two or more different crops, simultaneously or synchronously in the same field. In such intercropped systems weed problems are reduced to a minimum, and problems of insect pests and pathogens cultures may be reduced, too, merely because the possibility for the pests to reach their host plants is impeded. The reduction of damages, however, depends much on the different crops used for intercropping. If two crops, attacked by the same pest, are mixed, the total loss may increase.

A good example is the influence of intercropping on attack by stem borers (larvae of *Busseola fusca* and *Chilo partellus*), which live inside the stems of sorghum and maize. Stem borers belong to the most damaging insect pests in Africa and may reduce yields by nearly 50% causing great losses to millions of peasants, for whom control by expensive systemic insecticides is economical impossible. Researchers from ICIPE, among others, have during the 1990s developed new intercropping systems (push-pull strategy), that reduce the damages considerably (Khan et al. 2000). The research showed that wild Molasses Grass (*Melinis minutiflora*) and a clover species (*Desmodium unsinatum*) when sown inside the field of the crop, repel (push) the egg-laying female moths. When sown around the field other wild grasses such as Napier Grass (*Pennisetum purpureum*) and

Sudan Grass (*Sorghum sudanensis*), attract (pull) the egg-laying females, more than sorghum and maize do. It was also shown that Sudan grass produces a gum-like substance, which attracts and kills the pest to a degree that only 10% of the eggs developed into adult moths.

The method was developed and tested together with 600 farmers in Kenya, who had selected wild grasses, that are useful as cattle fodder. Besides controlling stem borers, the intercropped *D. unsinatum* also reduces losses caused by the parasitic weed *Striga hermonthica*.

This was, in the author's opinion, a breakthrough for the control of stem borers, that can also be used in the Sahel. Similar good results could undoubtedly be obtained for the control of other important pests in Africa, provided that more human resources and funds were used for this type of research, where peasants participate throughout the research period, thus deciding which measures best suit the solution of their problems.

Time and method of sowing

Research has shown that early sowing reduces damages and losses caused by blister beetles (*Psalodolytta fusca*) in millet and by aphids (*Aphis craccivora*) in groundnut. Dense sowing also diminishes damages by *A. craccivora* considerably, because the aphids clearly prefer to lay eggs in fields with many plant free 'holes' in the planting (AGRHYMET/Niger 2000).

In contrast, late sowing reduces attacks by larvae of the shoot-mining moth (*Heliocheilus albipunctella*) in millet. Despite of the importance of the pest, peasants in Sahel will nearly always prefer to sow soon after the arrival of the first heavy rain, in order to ensure a good start for the crop. To control the pest peasants could instead use a late variety of millet that does not develop early enough to be attacked by the shoot-miner (AGRHYMET/Niger 2000).

Time and method of weeding

Weeds cost the peasants in the Sahel more than other types of pests measured in the efforts required for weeding. Weeding is done by hand or mechanically with a donkey-hove, only rarely by using herbicides. Correct timing of weeding was essential for keeping the losses down. Thus, the conversion of men starting weeding mechanical between rows in millet and sorghum fields, followed by women and childrens' hand weeding in the rows reduced the losses by between 30 and 50% (Carson 1987). The reason is found in the simple fact that weeds are located closer to the crop in a row

than between rows, and therefore compete earlier with the crop in the row. Furthermore, women may not have sufficient time left to do proper weeding besides their many other duties. Frequent illness among the population does also increase losses caused by weeds.

Crop sanitation

Most peasants in Sahel compile and destroy, by burning, plant debris, that could be the source of infection for a future crop, as a part of land preparation shortly before sowing. This destruction may have an effect against stem borers, hibernating as larvae and pupae inside the stems and stumps of millet and sorghum, and against fungi such as downy mildew (*Sclerospora graminicola*) and smut (*Tolyposporium penicilariae*), both on millet. Such destruction may be more effective if done soon after harvest, which, however, is difficult to implement, as cattle graze freely and feed on the plant debris during the dry season.

The most competent farmers execute crop sanitation during the growing season by early removal and destruction of plants, that are heavily infested or infected by pests, which are likely to spread in the cultivation if not removed. Such 'good farming practices' may, at least, delay spreading. Many peasants select and harvest completely healthy looking spikes of millet and sorghum before the general harvest. These spikes are kept as healthy seed sources for next years crop, thus reducing the risk of infection by smut and some other pests.

Box 1. Example of peasants' observations leading to erroneous conclusions

There are examples of peasants' observations - though not necessarily objective - which may lead to conclusions, that will not result in better control of a pest. Thus, peasants in The Gambia maintained that they had found the blister beetle *Psalodolytta fusca* on the leaves of the tree *Entada africana* soon after the start of the first rains in June and before the beetle attacked millet in August. When we investigated the matter, we found blister beetles on the trees, but a smaller and different species, *Epicauta villosa*, which the peasants thought were 'children' of *P. fusca* (Zethner and Laurense 1988). The peasants' conclusion is understandable, considering that they did not know anything about beetles metamorphosis from larvae to adults. Incidentally, we researchers did not know at the time where the larvae of *P. fusca* were living, and could only later prove that they were feeding on grasshopper eggs in the soil (Selander and Laurense 1987). An uncritical follow-up of the peasants' belief could have resulted in a recommendation to cut down *E. africana* trees, which -apart from being a totally ineffective control method- would have had a bad environmental effect.

Biological control

Practical biological control in the Sahel has been centred around three methods:

Classical Biological Control (CBC) involves control of pests, that un-intentionally have been brought into a new country or region. Search for natural enemies in the country or region of origin of the pest, may result in identifying such enemies, that may play a key role in controlling the pest in its areas of origin. After careful selection and testing of its host selectivity in its place of introduction, the biological agent will be mass-produced and released. The most successful example of CBC in Africa has been the release of a parasitoid wasp (*Epidinocarsis lopezi*) against cassava mealybug (*Phenococcus mahihoti*), the most devastating pest of cassava. This pest had in the 1970s been un-intentionally introduced to East Africa from South America, and had over a period of 10–15 years spread to practically all parts of Africa, where cassava is cultivated and is the basic food crop for some 200 millions Africans. The releases resulted in a reduction of the pest to levels, that were managable for the peasants (Herrren 1990). Apart from biological control of the cassava mealybug, only few attempts of CBC have been made in the Sahel. Among those are the introduction of a parasitoid wasp (*Gyranusoidea* sp.) from India to control the mango mealybug (*Rastrococcus invadens*), un-intentionally introduced into Togo (Meerman 1991).

Biological control may also consist of the release of local control agents e. g. parasitoid wasps and entomophagous fungi, such as *Metarhizium anisopliae*, investigated and developed into a myco-insecticide by the project LUBILOSA (Lutte Biologique contre les Locustes et Sauteriaux) in Sahel (Bateman 1997). This 'bio-pesticide' can be applied in large quantities (*Inundation)* in ways similar to curative control by chemical pesticides. Other bio-control agents may be applied in small amounts to establish the organisms in the area, thereby preventing damages (*Inoculation*).

The most important type of biological control in Sahel will probably be C*onservation* of indigenous natural enemies, where peasants show consideration for natural enemies by reducing the use of chemical control to a minimum, by planting flowering and other plants, which serve as food or shelter for natural enemies, and by utilising knowledge of the relationship between pest and natural enemies. The latter was illustrated by the control of termites in forest tree nurseries in Burkina Faso, where a thin layer of millet husk placed approximately 5 cm below the soil surface,

attracted ants, which by their bare presence repelled termites from destroying the seedlings (Zethner 1988). Success of conservation requires intense training of the peasants and awareness campaigns to highlight the importance, which peasants in the Sahel only rarely are aware of.

Certain species of locusts and grasshoppers often occur as serious pests in the Sahel region. Almost all governments in Sahel did in 1988 carry out control campaigns against the migratory locust (*Schistocerca gregaria*), and since 1987 campaigns against other species of grasshoppers (e.g. *Oedaleus senegalensis* and *Zonocerus variegates*). A large part of the Sahelian plant protection personnel have been and may still be deployed in these campaigns, which were mainly financed by donor countries, initially also by Denmark.

To create alternatives to the purely chemical control campaigns, Danida is presently supporting a research project directed at an environmentally sound control of grasshopper species in the Sahel region, financed by Danida (IITA 2001). The project is executed by International Institute of Tropical Agriculture (IITA) (Cotonou, Benin) with participation by Centre Régional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationelle (AGRHYMET) (Niamey, Niger), Danish Environmental Investigations (DMU) (Silkeborg, Denmark) and Ornis Consult (Roskilde, Denmark). The aim is to develop strategies and tools for using various IPM components: Agricultural control, CBC, inundation, may be inoculation, conservation and chemical control. Both indigenous and exotic biological agents are investigated: Parasitoid wasps (*Scelio* spp.), insect pathogenic fungi (*Metarhizium anisopliae*), nematodes (*Nosema* sp.) and predatory birds. Government and NGO staff will be trained in implementing the strategies. Investigations of the risks of introductions of exotic enemies are being carried out by a Danish Ph.D. student.

Chemical control

As long as peasants in Sahel cultivate crops exclusively for own consumption, they rarely use chemical pesticides, simply because they can not afford to buy them. However, when peasants start to grow cash crops and earn more money, they start using pesticides. This has been the case for peasants who since the colonial time have cultivated cotton and groundnuts for export, but the number of growers of vegetable crops for sale in local and regional markets is increasing rapidly, in particular near towns. Even

cereal crops such as rice, maize and millet are becoming important cash crops in many countries.

In the Sahel region the change to more chemical control seems to have augmented after the great grasshopper campaigns since the end of the 1980s. Large amounts of insecticides, which were not used for grasshopper control, were given away or sold cheaply to peasants, who used them for control of other insect pests, often in a way, that was inappropriate or directly wrong.

Pesticide companies promote their products so aggressively that many peasants become convinced that they cannot grow cash crops without using chemical pesticides. Even in cases, when the pesticide producers promote spraying according to needs, the local pesticide sellers may urge peasants to use pesticides to make the products look better on the market place. In countries where pesticides are not readily available, such as Niger, pesticides are easily imported unofficially from neighbouring countries, often without any label at all.

Peasants, who spray their own fields, often become sick, and they and their customers may suffer from eating crops, sprayed too close to the harvesting time. Peasants do not use protective clothing, as these are too expensive and too warm to use in a tropical climate, and often not available. It is, however, fairly simple to train peasants in how to reduce risks for example by covering legs, arms and hands by cheap cotton cloth to hinder that pesticides penetrate through the skin; and by keeping the body dry by directing the spray away from the body; and not to walk through crops, that just have been sprayed. Some pesticide companies are arranging spraying courses, but the precaution needs are still far from being met in most countries.

Examples of other types of direct control

In The Gambia, peasants have experienced that blister beetles (*Psalodolytta fusca*) are able to destroy all grains in a millet field within about a week, if the attack takes place at the time the grains have reached the ‘milky’ stage. Experiments with released beetles in net houses confirmed that the farmers' fear of the beetles was justified. In the 1980s peasants in some Gambian villages controlled blister beetles during nights, by making small fires from groundnut shells in millet fields at the time of the ‘milky‘ stage. The beetles, which are flying at night time, were repelled from the fields by the smoke. Researchers showed that his simple, but time consuming method kept losses almost at zero (Zethner and Laurense 1988).

Bruchid beetles (*Bruchidus atrolineatus* and *Callosobruchus maculates*) attack pods and seeds of cowpea in the field, and are carried into the storage, where they during a few months may destroy most of the harvest. Many peasants in Niger place fresh branches and twigs of local tress and scrubs in the storage huts, which diminishes the feeding activity of the beetles, and consequently reduces the losses by up to 60%. Branches of *Annona senegalensis* and *Boscia senegalensis* seem to provide the most efficient 'botanical insecticides' (Belko 1994).

Monitoring

Normally peasants follow closely the development of their crops. They lack, however, the knowledge about stages and time of the development of pests, and are therefore often too late to do anything but chemical control, when an attack occurs. Extension service staff may recommend to carry out 'preventive' calendar sprays with pesticides, whether or not there is a need for such sprays. Calendar sprays are often more harmful than useful, as they add to a quick build-up of resistance in population of pests, kill many natural enemies and add to costs of cultivation. Instead, eventual sprayings or other control treatments must be based on regular estimations – or monitoring - in the field of the need for such actions. Peasants can be trained to monitor e.g. in farmer fields school, as described below.

Training of peasants

Local extension service staff in Sahel are only able to reach but a very limited number of the peasants, as it is the case in most other parts of Africa, too. Only a small parts of the research results and other publication are written in a language which peasants, and even most extension personnel can understand.

Fortunately, there has lately been a change towards involving farmers more directly in research activities, with the hope that they could be capable of utilising more of the results from research. Also, researchers gradually become more conscious of the importance of collecting and using the peasants' own knowledge, their opinions and wishes in the research programmes. New ways of getting into dialogue with peasants are being developed and implemented. This has e.g. resulted in the so-called farmer

field school concept, originally developed by the Food and Agricultural Organization of the United Nations (FAO). Groups of 25-30 peasants meet in a specific field half a day per week, and examine, together with one or two specifically trained facilitators, the crop. The insect fauna is sampled with an insect net, sorted, drawn and analysed. Peasants normally know the most important insect pests, but are not aware that they have helpers in the field in the form of natural enemies of the insect pests. The peasants also learn about the various symptoms of diseases. Based on results from the analyses and following active discussions among peasants, they are activated to take decisions on whether or not to control the pests and if yes, how to control them. Frequently the decision is not to use chemical control, whereby peasants save money without decrease in the yields. On the contrary, most often yields have increased (Thalbitzer 1998). The saving of money stimulates peasants to continue on the road to IPM.

Since the mid-1990s Danida has financed very large IPM programmes in Bangladesh, Vietnam, Cambodia and Thailand, where training in farmer field schools has been the major activity. This has resulted in the education and activation of many hundreds of thousands of small farmers. Also in Africa including countries in Sahel, training in farmer field schools have taken place, though with less promising results than in Asia. This may indicate that different training models, that may include other crop production or marketing aspects, will have to be developed. The dissemination of knowledge in market places, bus stops or other places where peasants meet could be another way, as shown by Commonwealth Agricultural Bureaux International (CABI Bioscience) in Bolivia.

Research cooperation

Quite a bit of research, though not nearly enough, has been carried out in the area of plant protection in Sahel. Among this research work one could mention:

1) Research on grasshoppers by Centre de Coopération Internationale en Rechèrche Agronomique pour le Développement (CIRAD) (Montpellier, France) and other related French institutions.

2) Research and development of IPM carried out under the ‘Integrated Pest Management project for Basic Food Crops in the Sahel’ 1981-1987, executed by Comité permanent Inter-Èstats de Lutte contre la Secheresse dans le Sahel (CILSS) (Ougadoudou, Burkina Faso) with technical support

from the Food and Agricultural Organization of the United Nations (FAO) and financed by United States Agency for Development Assistance (USAID).
3) Research in CGIAR institutes, in particular IITA (Nigeria and Benin). The Council for Development Research, Denmark (RUF) has financed or is financing projects, such as the grasshopper project mentioned above, and Ph.D. thesis work in Sahel.

It is important that donors increase their contribution to national agricultural research institutions in developing countries, because research is essential for the development of a society. As seen in a recent Danish publication 'every time the agriculture in the worlds poor counties earns one extra Danish Krone, the income in the society as a whole earn 2.5 Danish Krone'. The funds used for research in developing countries is only one quarter of the funds used by developed countries, and must therefore be increased drastically (Friis Bach et al. 2003).

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Are we frogs? – on participation in the development process

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Introduction

My key-word is: participation. The audience could be people that deal with development in so-called developing countries of the Sahel. A Chinese saying came to my mind when preparing this. I wanted to quote it correctly, but lost my little red book of Mao Ze Dong thinking decades ago. Now-a-days we have solutions for this kind of problem. I fed Google.com with 'Mao' and 'frog' – and found immediately a web-site of Maoist quotations. Therefore the following quote: 'a frog in a well says; 'The sky is no bigger than the mouth of the well'. That is untrue, for the sky is not just the size of the mouth of the well. If it said, 'A part of the sky is the size of the mouth of a well' that would be true..'. In approaching a problem a Marxist should see the whole as well as the parts, Mao added to be sure we all understood the metaphor. (And you can replace 'Marxist' with a word of your own option).

Development

Why then this memory flash from the late sixties – from a book by a man, who by the way made some terrible mistakes in his development strategy? Because I somehow fear that only a part of the issue might be taken seriously? Well, I am quite sure that when we talk about development, one part of an issue can only be understood if we look at the other parts as well – and make an effort to see them as parts of a whole, namely, a whole that is much more and of another quality than the sum of the parts. There might be some physical phenomena where the understanding of separate parts can be independent of the whole. But the issue of development includes so

many social and psychological aspects that no aspect can be understood as an isolated factor.

Likewise with families. You can't understand a family without the aspect of each member, their mutual relations, e.g. a son with his brother and with his sister, the two brothers as males to the sister, each one to the father and to the mother, two or three children to the parents etc. And still a family cannot be understood as the sum of its members. We have thousands of years of experience in analysing families – because we have to learn how to live in them. We don't have the same experience when we analyse the concept of participation in a development context – where some are meant to help others in a different culture to develop their society. And why do I – who is not a university graduate like so many in this audience – try to introduce such a complicated view on our issue of participation? The answer is that I want to remind each and every one of you, myself included, that development issues are that complicated. To develop is to de-velop, somehow to open - the opposite of en-velop; almost like opening Pandora's box of the Greek mythology what contained all kinds of problems – and hope. Some terrible problems – but also hope.

Are we frogs?

Where to start then? Well, I let Google decide again – and fed her with 'Danida' and 'participation'. It gave me less than I imagined, but made it clear that: popular participation in the development process, especially women's participation, is a main issue in Danida's strategy in their assistance to developing countries. Consequently, the question of participation is a noteworthy component in all kinds of project planning and reports. And normally, this concept will deal with the degree of participation of the local population in a given activity or process – one part of the whole.

Today's white elephants are not sophisticated dairies that are given up shortly after the hand-over to the local governor, because of lacking spare-parts or power. I am sure you agree that development is not only a technical issue, but first of all a social and psychological one, and we should therefore accept that only if those touched by the result, namely the local population, are involved in the process, can we talk about real development. Let me quote the famous Burkinabè historian Joseph Ki-Zerbo – in French: on ne développe pas, on se développe. In Danish: man

udvikler ikke, man udvikler sig. In English: you do not develop, you develop yourself. (We tend to lose the meaning in English).

The participation of the local population in the process is a crucial part – and in a complicated correlation with the participation of the expatriates (say: Danish experts) in the process. These are two parts of the problem which create development in the field of international co-operation, both of them influence each other and other parts of the process and are influenced by the whole of the process. To consider only one of them would be a frog's way to analyse the aspect from its well. Are we frogs? Well, normally we Westerners have great difficulties in conceiving the complexity of a given phenomenon belonging to another culture. We are quite often not aware of this limitation, and that is a big problem. Let me try to elaborate on this aspect of our culture.

Western and West African thinking

The basis of modern Western culture is linear, a fact which leads to dualistic thinking: yes or no. Black or white. Good or bad. Friend or enemy. The most recent example is the New Year speech given by the Danish Prime Minster. Among other things Anders Fogh Rasmussen talked about our young immigrants, how they ought to pull themselves together, make an effort to understand and respect the Danish society and contribute more. 'We have abolished the clashes of class. We are one united people...', he said. He believes that the feeling of 'us against them' is so well-known that it makes us feel comfortable. It is nice to know that nothing is wrong with us, whereas they must change and adapt. He offered no serious analysis of the responsibility of the 'well-adapted', no comprehension of the interaction of the separate parts; he showed no courage to confront himself with the complexity of the whole, in this case the Danish society at the beginning of the 21st century. Complexity with no easy conclusions makes us feel uncomfortable. The same reaction was seen a few months after the collapse of the USSR. Without an enemy, what about NATO and our common feeling of being members of the right club, the good guys? A new enemy was immediately invented, Islam.

Western science is based on the idea of cause and effect: if I do something, seen as a mark on an imaginary line, what will happen further down that line? This is what can be called one-string thinking. In contrast, West African thinking is more multidimensional based on the tradition of

an extremely multicultural society. Dilemma Tales form an interesting example: a man is sitting in a canoe together with his wife, his mother and his mother-in-law. The canoe turns over, and a crocodile says to him: I'll let you go, if you give me one of the women. Which one should he give to the crocodile? In a Burkinabè family we would discuss the answer for so long that I should need no more notes for this presentation. Dilemma Tales strengthen the ability to handle uncertain situations. There is a remarkable development potential of such situations where delving into the dilemma is more important than reaching the goal, where proposals are not final conclusions, and answers seem to be open questions to be handled in unison. This part of the oral tradition is probably meant to teach members of the society to see things from the point of view of their neighbour, to understand the other side of a matter.

Western and West African background

Western history has taught us to look upon society as consisting of a number of incompatibilities, because the most conspicuous aspect of European history has been to conquer territories and defend them. On the other hand, the basis of the Sahelian pre-colonial societies has been development of relations. The main example is called Joking Relationship – an extremely complex and still working tradition targeted for peacekeeping and conflict resolution. It has aspects of integration as well: a Wolof living in a Mossi area will normally have the name of Traoré – and his relations to the Mossi is thereby defined for everybody. The ethnic situation in pre-colonial West Africa was not rigid, as we often seem to believe. To call it flexible would be closer to the truth, since new groups were formed according to the need of new situations.

I remember when travelling with Dr. Idé from Niamey, he told me that in a given area before colonisation, five ethnic groups took turns being in power according to a given system of rotation, when a new king was crowned. After colonisation the French guaranteed permanent power to one of these groups, and thus provoked a lot of conflicts. These oral traditions, methods of peacekeeping and conflict solutions strengthened the ability of the Sahelians to conceive correlations among the different parts of a phenomenon and to understand how they form a whole. Participation in a development process is a concept of such complexity that it is almost

beyond our comprehension, especially for those of us who are brought up in a culture that is based on linear and dualistic thinking.

To sweep in front of one's own doorstep

Talking about participation, let me offer one piece of good advice. You ought to sweep in front of your own doorstep, our forefathers said. The idea, as I understand it, is if we make an effort to keep our own path clean and do what seems right, most likely it will create a positive attitude for the other parties involved. However, if we primarily focus on the actions of our neighbours and forget our own role, it will spoil the good intentions on both sides of the fence and only promote ill will. My message is not to say that what you demand of others, you should also demand of yourself. This would be a moral one. My primary intention is to express that if you make demands on yourself, the other party most likely will do the same.

It is essential to concentrate about one's own role, one's own duty in the process. But we are all allowed to rememeber that this situation is the same for the other party. If he or she concentrates on his/her own duty to improve the process with the common goal in mind, my positive attitude towards the matter in question will increase considerably - as well as the creativity of us all to find solutions. The more I concentrate my energy on this question, the more I will understand my own role in the whole, and the other party will probably look seriously upon it in the same way from his point of view. The more I concentrate on the duties of the other party, the more I will probably freeze their attitude in a kind of psychological self-defence.

To feel responsible

The Danish philosopher Kierkegaard said: if you are to succeed in bringing somebody to a certain place, you must first of all start by finding him, where he actually is… Exactly the same has been expressed by the famous peasant leader of Burkina Faso, Bernard Lédéa Ouédraogo, who founded the Naam groups. Once when I visited him, he said that the main problems of the Sahel are: desertification, hunger, illiteracy, and the increase of population. 'But these four are not real problems,' he added, 'The real aim is to make people feel responsible of their problems. If we can reach that

point, the problems I just mentioned, will we solved'. Furthermore, he mentioned that: quick results and full supplies are short-lived phenomena, but self-management (autogestion) creates a new attitude, a new behaviour and new desires to obtain results. He stressed that a development process is first of all a mental process. This is also true in regards to the process of participation.

Does our involvement in a development process in the third world have a problem? The root of our own problems does not lie within desertification, hunger, illiteracy or increasing populations. But let us assume that we have the problem that our involvement in the project process tends to increase the dependence of the local population, mentally and economically. That would pose a problem, right? And is the capacity building process in which we are involved often increasing the gap between modernity and tradition? Would that not be a problem, too? No, not really, according to the logic of the Naam the essence of the case is to make sure that we consider the problem of our own responsibility. Only then can it be solved.

The etiquette

Kierkegaard also wrote the following about the concept of help: 'to be truthfully able to help another person, one must understand more than him – but first of all understand what he understands'. This confirms what I just said about one's duties, and it could include many aspects of the concept of participation. Let us begin with etiquette, the rules of good behaviour. When some Danish NGOs met West African NGOs a year ago at a seminar in Ouahigouya in Burkina Faso, the participants tried to establish a code of conduct that the two parties, the Westerner and the West African, should always try to observe. We can make this into a kind of game, a New Year's quiz. They made two lists – one for the Europeans and one for the Africans. I have included some examples and mixed them, and you are supposed to guess for which group each piece of advice is given. When the seminar expressed that one should not forget to show respect towards elderly people, was this advice for Europeans or Africans?

- Respect for time!
- Don't put money before people.
- Don't caress one another in public.
- Don't interfere in somebody's problems without being asked to.

- Don't sleep during meetings.
- Don't refuse water you are offered. It will be considered lack of respect or the existence of an unsolved conflict.
- Don't boast about your status in public.
- Don't eat with your left hand.
- Women should not smoke.
- Don't disturb a person who does not want to be disturbed.
- Don't beat children and don't try to improve manners of other people's children.

I like this list because of the idea behind improving the quality of co-operation, because the examples are specific and concrete - but first of all because the effort is mutual. The duty of both groups to understand the need of the other is taken seriously.

The partnership

The same seminar as above-mentioned tried to list the basic conditions for a successful partnership. It should be based on:

- Mutual respect
- Mutual understanding
- Taking responsibility together
- Flexibility
- Confidence
- Laying down rules from the beginning in order to make it easier to solve conflicts
- Access to the same level of information
- Establishing relations between the partners based on the same level of dignity

By which means?

Working for at successful participation of all groups in a development process is in itself a complicated development process. Development is meant to solve problems. But we should also remember that most West Africans tend to be more comfortable with a process of improvement than with the idea of change. As the Naam say: développer sans abîmer – to develop without spoiling. This is only one of many cultural challenges

relevant to our involvement in the process. With which tools can we handle these kinds of challenges?

It is a question of meeting people – of the quality of this encounter. We all know when we have eye contact with somebody, even among thousands. We feel it. We were created that way. Have you ever attended a session for personal development or in other contexts have looked steadily into the eyes of somebody else with the intention of actually seeing the other person – and kept doing so for a considerable amount of time? I have had this experience, and it brought tears to my eyes. We know that the energy created by a real encounter between people can go together and become synergy. Most people probably know this wonderful feeling. This quality of contact is our tool to improve participation for all parties involved in the development process.

Empathy is a must, if a person from one culture is supposed to contribute positively to the development of another society – just as if somebody was supposed to contribute to the personal development of one of us. The characteristics of personal development are no different from the characteristics of the development of societies. You can train yourself to become more empathetic, as you can avoid to show empathy. This too is a mental process. But you cannot force somebody else to develop. Could expatriates from another culture have contributed to the radical change of the Danish society about 150 years ago, based on the organisation of hundreds of peasant co-operatives within a small number of years? Yes, probably, if these conditions were respected, were fulfilled.

A vision

I have a vision for the Danish development aid. It is my way to try to guarantee the mutuality that is a necessity and indispensable element of the process. My proposal is to split the 10 billion kroner into two parts. I would prefer to have the sum increased, but if this is not possible for the time being, let us split it anyway, so that half of that money is spent on making people from the so-called third world help us in Denmark to solve our development problems – different from their problems, but not smaller. I don't think that a person or a social structure can help another person or a social structure in developing, if this person could not imagine that the roles were reversed. Maybe the first training of future expatriates should concentrate on this proposal. And I am convinced that the remaining 5

billion kroner would offer more sustainable development to the developing countries than the 10 billion of today's Danish assistance.

Conclusion

Participation was my key-word, and my main point is that the concept of participation - just like development as such - is a mental process. To participate means to involve oneself in the process. To make others participate is also based on our own ability to involve ourselves. To do so, it is important to see the whole of the process as well as the separate parts – and not just one part. This is not a strong characteristic in Western culture, but the Sahelian culture offers immense inspiration.

Participant profiles

The participants of the workshop were asked to make a short description of their Sahel activities and experience. These summaries are printed below with minor editorial corrections.

AXELSEN, Jørgen
Abstract: We are working on a DANIDA financed project named 'A Regional Programme for Environmentally Sound Grasshopper Control in the Sahel'. The objective of the project is to improve the yield in the millet fields in the Sahel. Our job is to produce a simulation model that can simulate the dynamics of the climate - millet - grasshopper - natural enemy - system. The idea is to be able to simulate the damage caused by the grasshoppers, mainly the Senegalese grasshopper, on the millet, and to predict where and when the grasshoppers will cause problems. Another purpose of the model is to be able to simulate when proactive actions with a bio-insecticide (a fungal disease) or insecticides give the optimal results.

BREINHOLT, Tine
Keywords: Rural socio-economy, gender and poverty analysis, gender mainstreaming, farmer-based natural resources management, agriculture-based local development and decentralisation, traditional energy resources management.
Abstract: Working as consultant on short-term assignments and long-term backstopping to development projects, mainly in Africa. Main recent tasks include backstopping to the Support Project for Rural Development in the Regions of Zinder and Diffa, Phase II in Niger (Danida), technical advise to a project on integration of women in agricultural development in Benin (Danida), including elaboration of the gender action plan for the Ministry of Agriculture, formulation of a component for promotion of women's and children's legal rights in Benin (Danida) and a study of poverty aspects in the rural water supply programme in Benin (Danida).

CHRISTENSEN, Jens Hesselbjerg
Keywords: Climate change, regional climate modelling.
Abstract: The Sahel-Sudan zone of West Africa is situated on a strong rainfall gradient between the Sahara and the humid Guinean forest-savanna zone. Climatic changes, variations and fluctuations therefore have profound effects on growing conditions of natural vegetation and crops, and thus on the economy, human livelihoods and food security of the people living in the region. The prolonged drought period from the early seventies and into the eighties has caused crop failures, famines, semi-permanent dependence on external food supply, changes in composition and productivity of the natural vegetation, drying out of rivers and water resources and dislocation of the population. Since the eighties the climatic trends have been less consistent, and some regions seem to have experienced increased rainfall. Speculations as to the future of the region have been plentiful. Most have been based on the assumption that climatic trends towards lower rainfall will continue. This is, however, not an assumption based on an

understanding of the climate system. An improved understanding of the functioning of the climate system is thus needed, and establishment of a satisfactory physical base knowledge on which speculations on and predictions of the future conditions for agriculture, environment and the availability of water can be built is necessary in order to provide input to policies of governments and international institutions. On the basis of Regional Climate Model (RCM) outputs predictions of climate change related impacts can be assessed. Such methods have until recently mainly been applied to regions covering industrialised nations. New projects are believed to commence soon focusing on the Sahel-Sudan zone as well.

ELMEGAARD, Niels
Keywords: Combining consideration for production and environment, pest management strategies, risk assessment, crop protection, land use.
Abstract: The shortage of food emphasises the importance of crop protection in the Sahel area. Crop protection is heavily dependent on aid in the form of materials such as pesticides, aircrafts, or funding of capacity building, RandD activities etc. At the same time crop protection measures pose a risk to the Sahelian people, domestic animals, wildlife, and ecosystems. Currently undertaking risk evaluation of grasshopper/locust control programmes for the Sahel. The novel strategies include both macro and micro biological control measures combined with pesticide use.

FENHANN, Jørgen
Keywords: Energy and environment, climate change, Clean Development Mechanism (CDM), energy issues in developing countries.
Abstract: I am participating the Capacity Building project for CDM (CD4CDM) at our UNEP Risø Centre. This project is a four year project with 12 developing countries (3 in South America, 3 in Asia, 3 in Sub-Saharan countries and 3 Arab countries). The overall objective of the project is to develop the institutional capability and human capacity needed for developing countries to fully participate as equal partners with developed countries in the formulation and implementation of the CDM. The specific development objective of the project's activities is to generate a broad understanding among all stakeholders, including governments, the private sector and financial institutions. The project seeks to develop the capacity of policymakers to establish regulatory frameworks, define baselines and cooperate with national institutions to establish a national CDM entity. Within public sector and research institutions, the project seeks to build capacity for CDM baseline definition and project validation. The project will also help the private and financial sectors identify CDM projects, formulate business plans, raise financial support and implement project activities. I am also participating in the new phase of the 'jumelage' between the Energy Agency in Burkina Faso and the Danish Energy Agency.

FISKER, Eva Nølke
Abstract: Methods for risk assessment of biological control programs in the Sahelian region: A Ph.D. project within the PReLISS project.

The objective of the PReLISS project is to develop different Integrated grasshopper management strategies. One component of these strategies is the application of Green Muscle™, a fungal product developed by the LUBILOSA programme. A second component consists of classical biological control using a parasitoid wasp *Scelio* sp. This Ph.D. project will aim to evaluate the use of Green Muscle with respect to effects on non-target grasshoppers and survival of the fungus in the field as well as to study the possibilities of using *Scelio* sp. as a biological control agent. Based on these practical case studies and a theoretical study on methods for risk assessment of biological control programmes, it is the ambition to identify limitations of current practices and to identify ways to improve the present methods. The study shall describe the strengths and weaknesses of methods to assess and compare risks of pest management strategies and give a general outline of what is needed for risk assessment of biological control agents. It shall provide guidance for application of the methods in the Sahel and identify limitations to their use. The Ph.D. project is funded by RUF, DANIDA and carried out at the National Environmental Research Institute (NERI) in Denmark. The study is supervised by The Royal Veterinary and Agricultural University in Denmark. In West Africa the Ph.D. project is supervised by IITA in Benin, which also manages the PReLISS project. Field work in the Sahel is carried out in collaboration with the Regional Centre Agrhymet in Niger. The Ph.D. project ends in June 2006.

FREDERIKSEN, Lone

Keywords: Empowerment, NGO partnership, poverty reduction, family poultry, women, cooperation South-South and South-North.

Abstract: Since 1996 the Danish NGO (Cykler til Senegal) has developed a close partnership with the Senegalese farmers' association COLUFIFA (Comité de Lutte pour la Fin de la Faim). Through this partnership we have carried out a number of development activities, such as sesame processing at village level, training of auxiliary opticians, collecting and sending used spectacles, bicycles etc., and implementation of two smallholder poultry projects. Important elements in these projects are empowerment, both of the farmers (women) and of the organisation. The network, Friendship Association Denmark – West Africa, works for increased cooperation between organisations that work in West Africa, and has arranged two seminars for Danish and West African participants. These have led to creation of a West African South – South Partnership, involving NGOs from Senegal, Guinea, Burkina Faso, Niger, and Mali.

GRIGNON, Isabelle

Keywords: Rural development, poverty reduction, restoration of degraded natural resources, local resource-management, pastoralism, democratisation, civil society, empowerment.

Abstract: Cand. scient. in Tropical Botany from Aarhus (Ecuador-group), I started my career, within developmental work, in Ecuador with Danish NGO Ibis (known for its solidarity work with peasants' and indigenous organizations). Five years of fieldwork in Amazon, aiming at empowerment and capacity building of indigenous organizations through support to their own implementation of production projects in the rainforest,

brought me to Niger with Danida, where I led the coordination unit of a Rural Development Project in Zinder and Diffa for 2 years. First phase of DANIDA project in eastern Niger has come to an end. The project, running on 5 years, was aiming at poverty reduction in rural environment through capacity building and empowerment of local and national NGOs and other democratic structures intervening within animal breeding and pastoralism, attenuation of land-use conflicts, local management of natural resources, restoration of degraded natural resources, rural credit. Conceived as a contribution to the democratisation process in Niger, the project-strategy was to finance local projects, that were owned and implemented by local/national NGOs in Niger, according to a vision of partnership with civil society. A coordination unit in Zinder made supervision and proximity accompaniment possible.

JEPPESEN, Kristine Zeuthen
Keywords: Water, sanitation, urban environment, public participation, hygiene promotion, awareness raising, capacity building.
Abstract: I have more than 8 years of experience from various short and long-term assignments in Mozambique, Guinea Bissau, Bangladesh, Tanzania and Ghana. During these assignments I worked in the sectors of water supply, sanitation and urban environment, where I focused on the following areas: awareness raising and hygiene promotion, people's participation, school sanitation and hygiene education, capacity building of municipalities, NGO's and field workers with regard to water, sanitation and urban environment, mainstreaming of cross-cutting issues (poverty and gender) and project planning, monitoring and evaluation

JØRGENSEN, Anne Mette
Keywords: Meteorology and climate (weather forecasting on timescales from days to seasons). Scenarios for future climate.

LUND, Søren
Keywords: Participation, social sustainability, actor-sensitive research on development and environment projects and programs, capacity development, training and curriculum development.
Abstract: I have worked with issues concerning participatory approaches to development and natural resource management both in practice and academically since 1984. For many years I worked mainly in francophone Africa. I am currently engaged in the PETREA research program. In later years, I have also worked in South East Asia and included urban environmental management issues as well.

LYKKE, Anne Mette
Keywords: Botany, ethnobotany, local knowledge, natural resource management, vegetation analysis, vegetation change.
Abstract: Since 1991, I have worked with various aspects of vegetation investigations and local interviews to obtain a better understanding of vegetation dynamics in West African savannas and to provide data for rational natural resource management in relation to biodiversity conservation and local needs. I am currently engaged in

SEREIN, a multidisciplinary research program, and co-ordinator of an ENRECA/Danida program, which is collaboration between the universities in Dakar (Senegal), Ouagadougou (Burkina Faso) and Aarhus (Denmark).

MADSEN, Jens Elgaard
Keywords: Plant diversity, research capacity building, vegetation dynamics.
Abstract: I have carried out a number of botanical studies in Senegal and Burkina Faso during the passing decade. The main objective of these studies has been to generate reliable baseline data concerning the native flora and vegetation in cultural landscapes. This kind of information is important for two reasons. In the first place are wild plants contributing considerably to the livelihood of local people. In the second place has much recent debate concerning environmental issues in the Sahel lacked verifiable hard data. The focus of my studies has been to analyze floristic composition and dynamics of woody vegetation using permanent hectare plots and time series of aerial photographs. Species composition in local floras has also been documented for some of the principal landscape formations in West Africa. As project coordinator, I have also taken part in a research capacity building project (ENRECA/Danida) in Senegal and Burkina Faso during 1993–1996. This project is still underway and has produced some highly skilled, young African scientists at the PhD level.

MOUSSA, Latifa Maï
Keywords: Gestion des ressources naturelles, développement rural, suivi-évaluation et renforcement des capacités.
Abstract: Le Sahel et ses aléas climatiques nécessitent un travail conjugué, harmonisé et concerté des pays sahéliens et des partenaires au développement y intervenant. Les programmes et les projets suivis à notre niveau sont relatifs en grande partie aux secteurs et domaines cités plus haut. Le Niger, un grand pays sahélien et classé parmi les plus pauvres dans le rapport mondial sur le développement humain depuis plusieurs années, mène ses actions au développement en partenariat avec plusieurs partenaires dont Danida. Danida intervient d'une manière bilatérale, ainsi que d'une manière régionale à travers le Centre Régional Agrhymet dans le cadre des pays du CILSS. Notre travail consiste, entre autres, en le suivi des actions et interventions, en la réflexion avec les partenaires nationaux et internationaux du Niger et des pays du CILSS sur la problématique de la réduction de la pauvreté, les politiques et les stratégies sectorielles, nationales et régionales, en la coordination et la concertation avec les acteurs et les groupes cibles, en l'orientation (voire la réorientation) des interventions et des actions en veillant à ce que celles-ci correspondent aux besoins exprimés et aux attentes des populations. Le renforcement des capacités lorsqu'il n'est pas vertical dans l'action menée, il y est transversalement.

NYGAARD, Ivan
Keywords: Planned intervention, clientelism, relations of power, decentralisation, village groups, rural electrification, local level politics.
Abstract: I am working on a Ph.D. project, which entry points are planned intervention activities in 2 villages in the Seno and Yagha provinces in Burkina Faso. The work

focuses on the interface between the local communities and planned interventions activities mediated through three different types of externally imposed institutions, namely village groups, a municipality and electricity cooperatives. Focus is on the different views of these interventions, the donor perspective and the local perspective, especially trying to understand what are the main logics for local people to engage in such institutions. It further analyses, how these new institutions are appropriated by different groups of interests, clans and factions and how control over these externally imposed institutions and their attached resources is used in the local and national struggle for influence and power.

OLSEN, Jørgen,
Keywords: Concrete projects to improve living conditions in Sahel-areas in Niger and Mali.
Abstract: Jørgen Olsen is coordinator in the small NGO Genvej til Udvikling (Short Cut to Development), a member-group of Emmaus International, founded by the French Abbé PierreSince its foundation in the late seventies GtU has been concerned about the Sahel-region. Together with the Belgian Emmaus-association Opération Terre it has supported a cooperative in Tessalit in Northern Mali. In Tessalit the income is mainly based on selling vegetables in Kidal, capital of the region. A workshop produces various metal-articles and assumes reparations of cars and trucks needing some care after hundreds of kilometres in Sahara. GtU has since mid-1996 collaborated with la Cooperative d'Amataltal, located in a region southwest of Agadez in Nigers Sahel-area. Very few of the 8.500 inhabitants work with nursery-gardens along river-beds, and approximately 20 pct. live partially or entirely from handicraft-production. The main activity is cattle-breeding, which includes repairing wells, installing pumps, buying cattle *(goats, sheep, donkeys, camels and zebu- and azawak-oxen)*, building fences, shelters, a granary etc. One of the ideas is to feed *(by cotton-seeds, bran, hay, and licking-stones)* the weakest and the pregnant sheep and oxen inside the fences for the three hottest months (April-June) - together with male calves and sheep planned to be sold. The prices of these animals are increasing, and this fact gives the cooperative a chance of generating income by selling sheep, oxen and camels on the domestic market, but also to neighbouring countries such as Nigeria, Libya, and Algeria. A new initiative in the collaboration is a bilingual school in which 104 children as well as a growing number of adults are learning to read and write the Touareg language, mother tongue of almost two thirds of the population of the area. GtU is seeking all kinds of contacts which might provide pieces of advice and in other ways help to create a successful development in the Amataltal-region.

RASMUSSEN, Christa Nedergaard
Keywords: Community based development, NGOs and partnership activities, Water and sanitation, Environmental education, Integrated health, Income generating activities and micro-credit, Gender, IEC, Communication and PR, Development of administrative and financial procedures, Project management, monitoring and quality assurance
Abstract: 13 years of experience mainly from Sahelien countries as project coordinator and consultant. Participation in project design, planning, implementation, monitoring

and evaluation. Responsible for training of trainers, development of information tools, institutional development, elaboration of management tools. Organisation of sub-regional workshops. Worked 8 years for the Danish Red Cross as responsible for Westafrica, then for DaniCom as communication and PR advisor the 1999 edition of Fespaco. Since 1999 as consultant, mainly in Niger on two projects: Household Fuel project (ended 2003/Rambøll) and Rural Water Supply (ongoing/Rambøll) – input as sociologist, gender expert, management expert, CTA, team-leader. Participation in the annual sector review in Burkina Faso, Water and Sanitation (2003/NCG). Participation in a feasibility study for Rural Electrification in Benin (2003/04/Cowi/Carl Bro/Rambøll).

REENBERG, Anette

Abstract: My research interest is land use systems in the Sahel. Coordinator for a multidisciplinary research programme (SEREIN), funded by Danida/RUF (described in www.geogr.ku.dk - research - SEREIN), which focuses on natural resource management strategies, in a biological, agricultural and institutional perspective. Furthermore, she is responsible for a Danish programme endorsed under the 'Human Dimension of Global Change - IGBP/LUCC - Land use and land cover change'-programme (see www.geogr.ku.dk - research - IGUC-LUCC).

RÆBILD, Anders

Abstract: Many projects and programmes in the Sahel intervene into agriculture and natural resource management with activities on tree planting. Usually being supported with inputs and money, few of these activities continue after the project end. In a collaboration between Centre National de Semences Forestieès (Burkina Faso), World Agroforestry Centre and Danida Forest Seed Centre, we investigate the possibilities for enhancing the sustainability of tree planting activities. We have recently conducted a survey of tree planting activities among farmers in Burkina Faso. The results show that more than 80 % of the farmers have planted trees, and that the most commonly planted trees are Mango, Eucalyptus and a few other exotic fruit species. Trees with fruits and trees providing a monetary income are the most important. According to farmers, the major constraints for tree planting are lack of planting material, money, technical problems (low survival, lack of water) and grazing animals. We are now planning research and pilot projects that aim at. 1. Investigating in further detail the constraints to tree planting 2. Constructing networks that facilitate the exchange of seed, plants and information.

SØNDERSKOV, Mette

Abstract: We are working on a DANIDA financed project named ‘A Regional Programme for Environmentally Sound Grasshopper Control in the Sahel’. The objective of the project is to improve the yield in the millet fields in the Sahel. Our job is to produce a simulation model that can simulate the dynamics of the climate - millet - grasshopper - natural enemy - system. The idea is to be able to simulate the damage caused by the grasshoppers, mainly the Senegalese grasshopper, on the millet, and to predict where and when the grasshoppers will cause problems. Another purpose of the

model is to be able to simulate when proactive actions with a bio-insecticide (a fungal disease) or insecticides give the optimal results.

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