Exploring environmental knowledge: the construction and conservation of agricultural biodiversity in Ghana

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This paper explores the idea of environmental knowledge by focusing on the social construction of agricultural biodiversity. The fieldwork was conducted in 2003–2004 in Ghana. The research methodology consisted of interviewing and focus group discussions. The respondents varied from researchers and government officials to members of women's farming groups who cultivate rice. This paper argues that by understanding how agricultural biodiversity is constructed it is possible to highlight different ways of understanding the environment by different actors. The paper begins with an overview of the emergence of agricultural biodiversity as a global environmental issue. With this background in mind, this paper examines the different ways of construction and conservation of *Oryza glaberrima*, the indigenous rice variety of Ghana. Three different discursive positions, ranging from scientific to local knowledge, are identified. The Agric, Diversity and Local discourse frame and categorise rice and other crop varieties in a different manner. The categories identified reflect the visible characteristics of the varieties and their social meanings, related to their use or function in the wider social context. These different categories are corresponding and conflicting, as well as inclusive and exclusive, and have become institutionalised into social rules, norms and practices, which further establish the efforts to conserve *O. glaberrima*.

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Global Environmental Change

Last three decades of the 20th century witnessed the rise in awareness of the global environment and the impacts of human actions. From transboundary pollution and the depletion of the ozone layer, the debate on Global Environmental Change (GEC) has seen issues such as desertification, climate change and loss of biodiversity emerge in the international level. These issues did not originate from public experience but as a result of scientific concern (Rayner 2006). Agricultural biodiversity as an environmental concept is a part of these global developments, emerging into the global arena at the 1990s. Agricultural biodiversity interestingly combines the conservation of biological resources with agriculture which in turn is seen as the major cause of the destruction of wild biodiversity (Wood & Lenné 2005).

However, not all have accepted the emergence of environmental problems and the recommended solutions and treaties without scepticism. Increasingly, the definitions and meanings of these environmental issues have been contested and challenged in literature. It is now acceptable to challenge "received wisdom" (Leach & Mearns 1996), "narratives" (Roe 1999) and environmental discourses (Hajer 1995; Hajer & Versteeg 2005). The appeal of discursive analysis lies in their ability to reveal aspects about the use of language that other forms of analyses are unable to do. The role of language and the embeddedness of language in practice make it possible to scrutinise how the use of language by actors affects the process of problem framing and definition. Discursive analyses are more interested in understanding why some definitions or understandings of the environment are more prominent and how that relates to the solving of these issues.

This paper examines the different ways of construction and conservation of *Oryza glaberrima*, the indigenous rice variety of Africa, in the Upper East Region of Ghana. Three different discursive positions, ranging from scientific to local knowledge, are identified, which frame and categorise rice and other crop varieties in a different manner. These do not only reflect the visible characteristics of the varieties but also their social meanings, related to their use or function in the wider social context. This paper firstly focuses on agricultural biodiversity as an environmental issue. Secondly, the methodological issues are briefly discussed and scope and scale are presented as tools for analysing different discursive positions. Thirdly, this paper outlines the three discourses and analyses the framing of diversity in their discourses. In the discussion section these are then compared and it becomes clear how the understanding of rice cultivated in the case study location varies depending on the discourse in question. This naturally has implications for the conservation of these varieties.

Understanding agricultural biodiversity

The emergence of post-modern and post-structural literature has affected the way social sciences approach the concept of environment. The realist approach of the environment being something objectively verifiable through observation and hypotheses testing is questioned. Instead, it is argued that the environment is constructed and reconstructed materially and semiotically (Castree & Braun 1998). Post-structural approaches in environmental politics focus on the role of discourse and the creation of global discourses of environmental change (Keeley & Scoones 2003). Identification of over-arching discourses at the global level sheds light on the different ways these global discourses approach environmental issues (Dryzek 1997). More detailed analyses of specific environmental discourses have emerged, such as ozone depletion (Liftin 1994) and acid rain (Hajer 1995). Hajer's contribution is of specific interest here as it introduces a discursive analysis with a clear institutional dimension. According to Hajer, discourses are internally related to the social practices, thus institutions, in which they are produced. In this way, both the text and the context in which the text is represented require analysing in order to recognise why some understandings of environmental change occur and others do not.

The word biodiversity is a very recent one, only found in dictionaries after the mid-eighties (Blaikie & Jeanrenaud 1996: 2). Natural scientists as early as the mid-19th century wrote about the diversity of species (Barbier et al. 1994). These ideas were most prominently featured in the publication edited by E. O. Wilson (Wilson 1988). The most common definition of biodiversity that one encounters in the literature is the variability of life in three different levels: at the genetic, species and ecosystem level. This general definition of biodiversity has become:

> "[R]ather like an optical illusion. The more it is looked at, the less clearly defined it appears to be and viewing it from different angles can lead to different perceptions of what is involved" (quoted in Barbier et al. 1994: 7).

The definition enables different instances to interpret and mould it to their liking. Thus, it is broad enough to mean something for everyone and similarities can be drawn to concepts like 'sustainable development' (Cline-Cole 1996), which can be defined in several different ways with several different meanings. This paper demonstrates this to be true for agricultural biodiversity also.

Agricultural biodiversity was acknowledged as a thematic issue in the Convention on Biological Diversity (CBD) in 1996. The emergence of agricultural biodiversity in the global biodiversity agenda is an example of where two very different issues appear to come together as a single issue in the GEC debate (Wood & Lenné 1997, 1999, 2005, 2006; Bardsley 2006). Agricultural biodiversity has been defined in various different ways in the literature (Juhola 2006). These have ranged from plant genetic diversity to agricultural diversity and diversity in farming practices. The CBD defines agricultural biodiversity consisting of three dimensions. First of these is the plant genetic resources, the second animal genetic resources and finally the microbial and fungal genetic resources. According to the CBD, this also includes the socio-cultural, economic and environmental elements of agrobiodiversity (Convention on Biological Diversity 2008).

Methodology

The local research was conducted in the Upper Eastern part of the country in Bawku municipality.

Population density in the area is one of the highest in the country and it is amongst the poorest regions of Ghana. The area can be characterised as sudan-savanna with uni-modal, relatively poor rainfall (900 mm annually). The climate permits the cultivation of rain-fed rice crop during the rainy season from May until September. Despite several rural development projects, including introduction of new varieties in the area (Russell 1989), farmed crops and techniques have remained largely the same since 1975 (Whitehead 2002). Despite this, diversity and deliberate, managed change in these smallholdings by innovative farmers can be emphasised in the West African context (Richards 1985) and in Ghana specifically (Russell 1989).

In order to examine a concept like agricultural biodiversity, a case study approach was deemed most suitable (Yin 2003) and this was conducted during an 11 month fieldwork period in Ghana during 2003–2004. The choice of Ghana as the case study location is based on its involvement in the People, Land Management and Environmental Change project (PLEC), the first global initiative in the field of land management, agriculture, biodiversity and environmental change. This paper is based on 87 semi-structured single informant interviews and three focus group discussions undertaken in the case study localities and the national level in Ghana. Interviewees at the national level varied from the Minister of Agriculture to agricultural scientists and extension workers. In the case study villages interviews with the farmers farming rice were conducted with the help of a translator. Interviews were transcribed and these were then analysed discursively.

Discourse analysis has originally been developed in the disciplines of linguistics and sociolinguistics (Sarangi & Coulthard 2000). The discursive analysis in this paper focuses on the issue of framing (Gasper & Apthorpe 1996). In this process, aspects of the problem are included and excluded whilst meaning is given to it and these depend on who frames the problem. By excluding aspects from its scope, framing then determines what can and cannot be said.

The concept of positionality has been discussed in studies on gender and development as well as strands of critical geography since the late 1980s and is important in empirical studies that adopt a post structural epistemological stance (Bell et al. 1993; Bhavnani 1993; Moss 1995; Wolf 1996; Kapoor 2004). The issue of positionality and identity and how it affected the data with regards to this research is further discussed elsewhere (Juhola 2005).

Framing agricultural biodiversity in the Ghanaian context

Terminology, concepts and meanings are crucial in this paper. Thus, the focus is to understand how the concept of agricultural biodiversity is framed by different institutions in the case study. Two concepts, scope and scale, help us to tease out the different discursive positions that the institutions adopt and highlight the social construction of agricultural biodiversity. Three institutions were identified in the case study and are introduced here now.

All the institutions focus on the cultivation and conservation of the indigenous African rice, *O. glaberrima* in the Northern Ghana. The discourse of the *Local institution* narrates a story of unpredictable rainfall and of land shortages as the ultimate reasoning behind land management decisions. The discourse of the national agricultural system, the *Agric institution*, also interprets the farmers as being constrained, but mainly attributes this to lack of support to the failings of the market and the unfavourable policy climate. The third institution, named here as the *Diversity institution*, however, takes a distinct approach to these two mentioned above and its discourse claims that small farmers are in fact managing their diverse environment and the farming systems with success and that this is an inherent part of small-scale farming in the rural areas of the world.

Exploring agricultural biodiversity through different scales of analysis

The concept of scale is more frequently used in the natural sciences whilst in the social sciences the usage has been less common. In addition, in social sciences it has been used in somewhat confusing ways with its definition changing depending on discipline or even individual study (Evans et al. 2002). In exploring the multiple uses of the concept of scale, Gibson et al. (2000) refer to the use scale in biology and taxonomy. Here, scale of agricultural biodiversity, comes closest to examining the definitions given of agricultural biodiversity and focuses on how discourses frame the objects of conservation, i.e. what it consists of. Scale of

diversity in this instance refers to examining the range, or extent or the depth of detail in defining diversity.

Foucault shows how various methods of classification of that time were based on the same epistemological base, hence 'a knowledge of empirical individuals can be acquired only from continuous, ordered, and universal tabulation of all possible differences' (Foucault 1970: 157). However, there are those who disagree and argue that there are indeed patterns in nature that can be observed and recorded. The idea of a hierarchically ordered nature as perceived by the human eye is also put forward by some of those who have studied the classification systems of indigenous populations. In one of the most comprehensive of theories in ethnobiology it is argued that despite the great variety in human societies, there are certain widely shared principles (Berlin 1992).

These general ideas of taxonomy, nonetheless, are mostly ignored when it comes to cultivated plants. The classification of cultivated plants has been a topic that has not interested many partly because many crops and pasture species have been described as 'taxonomic nightmares' (quoted in Cox & Wood 1999: 36). This was also discussed by Harlan who claimed that the purpose for classification is essentially to reduce the number of plant types to manageable proportions (Harlan 1975). It is argued that classification and naming are an important process in dealing with the complexity of cultivated plants in a rational manner. Hence, 'taxonomy is, pragmatically, a science of convenience' (Harlan 1975: 108) and at the heart of this problem is the question: what are the most useful traits or characters used for the separation of different groups? The differences between taxonomy of naturally occurring and cultivated plants was made and it was suggested that 'the people who deal with cultivated plants the most, geneticists, agronomists, horticulturalists, and foresters, have developed their own informal and intuitive classifications, based on experience, as to what constitutes useful groupings' (Harlan 1975: 109).

Scales of agricultural biodiversity in the case study

In order to examine the scale of diversity in the discourses the focus was placed on how rice varieties are defined and classified. Crop identification and language play a crucial role in this. For the *Local* discourse two categories emerged but the two categories are very fluid. The *Agric* discourse recognises two categories but also acknowledges the fact that no one really knows what the rice cultivated is. The *Diversity* discourse, contrary to the other two, presses the fact the rice cultivated and the object of conservation is indigenous African *O. glaberrima*.

For the *Local* discourse, there are two categories for classifying rice in Kusaal, the local language. Firstly, for improved varieties of rice, there is the *Agric bunbuudi*, i.e. seed from Agric station. Another word can also be used which denotes directly that it is improved rice. *Agric mui* literally means rice from Agric station, *mui* being the Kusaal word for rice. The second category consists of those rice varieties that are considered local. The word that is used for local varieties in general is *bunbuud kudda* which when, literally translated, means "varieties that farmers were using a long ago" [Rice farmer, female]. Also, to specifically indicate local varieties of rice, a term *muikudda* can be used. This refers to rice that has been farmed in the area for a long time.

The markers for distinguishing rice varieties are crucial in understanding local framing. The most common ways to define were colour and size of the seed, plant height and the time it took to mature on the field. Colour of the seed appeared to be the most popular way of distinguishing different rice varieties from each other. However, it is surprising and noteworthy that only three people out of 37 said that they distinguish between rice varieties by name. Thus, the names of varieties were not important in identifying different varieties of rice.

The origin of rice varieties cultivated in Northern Ghana features prominently in the discourse of the *Agric* institution. Firstly, in purchasing the seed from the market or exchanging it with other farmers, farmers receive seeds of which origin is unknown. Hence, the farmers get the seeds from the market

> "[A]nd they go and grow it for some time and then they say it is an old variety, that is an indigenous and they give it a name" [Agricultural technician].

A similar situation occurs if the seed source is a research station.

> "Or maybe if I pick a sample of rice here, go to the house and plant. Somebody goes to my field and sees it is growing nice. That person wouldn't know it has come from [an agricultural station]. So, the person

would name the variety after my name" [Rice farmer, male].

Essentially then, the outcome is that farmers do not really know what varieties they are cultivating but it is argued that it is very likely that they are not indigenous varieties i.e. *O. glaberrima* but instead are of *Oryza sativa* origin, thus Asian rice. Hence, it is stated that

"[I]n Northern Ghana, most of the varieties that farmers grow are improved. It is the only difference that some of the varieties have been introduced 40–50 years ago" [Agronomist].

The scale of diversity in the third discourse has a relatively similar starting point to the previous discourse in that the initial scale is at the variety level. It does, nevertheless, differ in the way that categories are defined and what they signify. According to the *Diversity* discourse, farmers are reluctant to adopt modern, improved varieties but rather to continue to cultivate indigenous varieties that are better adapted to their local conditions. Thus, the main notion here is the classification of crops into two categories. A division is made between the indigenous and the "traditional" varieties and the wild biodiversity that the farmers conserve actively and the "modern", improved, high yielding material and crop varieties that are increasingly replacing the material that farmers are using.

The varieties that the farmers are growing are classified as *O. glaberrima* and researchers have spent time in analysing their characteristics in co-operation with the farmers (Tanzubil & Dittoh, 2000). However, it is also accepted that not all is known about these indigenous varieties and that farmers are the custodians of this knowledge and that co-operation is necessary between the two groups. Hence, '[I]t is hoped that as more and more indigenous varieties are discovered, conserved and characterised, certain important traits of the varieties will be discovered and developed' (Anane-Sakyi & Dittoh 2001: 1). Table 1 below summarises the different categories that the discourses classify varieties of rice grown in the case study area.

Scoping diversity: a product or a process of farmer actions?

The purpose of exploring the scope of agricultural biodiversity is to understand what constitutes it in different discourses, how it is framed and what is excluded and included in that framing. The focus is on the dynamics of agriculture and the role of farmers in it. A central question is whether there are forms of agriculture and cultivation that inherently reduce agricultural biodiversity or alternatively create, foster and even increase it? At the heart of this question is the dilemma between farmer intentionality and unintentionality with regards to "creating" agricultural biodiversity.

The dichotomy between modern and traditional agriculture provides a starting point for understanding the framing of scope. Frames here encompass aspects relating to the knowledge behind farmer management decisions and practices. One the one hand, agricultural biodiversity can be defined at the genome or variety or species level in crop species cultivated on farmers' fields or lines on plant breeders' nurseries. In this way, diversity is seen as a product, very much like the improved seed that is given to farmers. On the other hand, however, the scope of diversity covers a wider range of agriculture. It is seen as a process that evolves as farmers adapt to changing social, economic and environmental conditions. Interesting as this divide is on its own, there is a further reason why it is important here. Depending on how the scope of agricultural biodiversity is drawn, this affects how discourses design methods to preserve and conserve it.

An exhaustive study of the developments in politics of plant breeding and conservation highlights how both strategies emerged out of different concerns of scientists and how they consequently have been institutionalised into practices (Pistorius

Table 1. Scales of diversity in discourses.

	Local discourse	Agric discourse	Diversity discourse
Categories of rice varieties	*Muikudda, agric mui*	Improved varieties (*O. sativa, O. glaberrima)* / local varieties (origin unknown)	Improved varieties (*O. sativa*), indigenous varieties (*O. glaberrima*)

1997). According to Pistorius, the differences in advocating either *ex situ* or *in situ* methods derived from scientists' understanding of evolutionary theories as well as from objectives of conservation. One of those who favoured this form of conservation, Otto Frankel, argued that genetic material 'should not be left in the field exposed to continuously changing agricultural practices', thus making *ex situ* facilities 'a safe niche amid "a hurricane of change"' (quoted in Pistorius 1997: 26). On the other hand, it was argued by Erna Bennet, a fervent supporter of *in situ* conservation that

"I see no special advantage in conservation in the form of seed apart from the very eminent one of convenience, and I think that attempts to find other merits in the 'steady state' which seed storage represents, seem to come dangerously near to adopting museum concepts. The purpose of conservation is not to capture the present moment of evolutionary time, in which there is no special virtue, but to conserve material so that it will continue to evolve…" (quoted in Pistorius 1997: 27).

These two quotes explicitly demonstrate the two end points on the continuum of the scope of agricultural biodiversity. They are also a brilliant example of the use of tropes in discourses. "Hurricane of change" and a "safe niche" as well as "museum concepts" evoke powerful and persuasive images in narratives. Some have argued that in the recent decades, there has been a paradigm shift towards the appreciation of *in situ* methods in the conservation of these resources (Hammer 2003).

Framing scope in the case study

In order to examine the scope in the case study, the rationale in behind the farmer management decisions was focused on and these were researched by using farmer interviews and observation of farming techniques. In the *Local* discourse, the diverse farm is created unintentionally in order to secure some harvest. The *Agric* discourse views the diversity as a negative outcome of farmer management whilst the *Diversity* discourse considers the agricultural biodiversity present as a conscious action on behalf of the farmers.

In the case study area, intercropping and mixed cropping are common practices in the fields. In the *Local* discourse, getting two crops from one piece of land, shortage of land and the fact that one of the crops planted is a creeping crop are the reasons for engaging in this kind of farming. This is related to the idea of land scarcity and the notion that it is necessary to utilise all the land as much as possible in order to secure enough food for the lean season. The aspect of food insecurity surfaces as a reason behind management decisions taken. Hence, intercropping and mixed cropping are considered to be strategies that are utilised in order to secure some harvest and that some loss is accepted because of that strategy.

In the *Agric* discourse, the key idea here is that agricultural biodiversity is an end-product created unintentionally by farmers. One of the reasons why rice industry is performing poorly is the fact that farmers are still cultivating traditional varieties despite the fact that there have been consistent introductions of new varieties into the country. It is acknowledged that '[M]ost farmers do not have access to improved or pure seed. Cultivar mixtures are common and considered a major problem' (Dogbe & Djagbletey 2001: 1). Others within this institution agree, claiming that '[O]ne of the main reasons for poor yields of the traditional varieties is that they are often mixtures of more than two varieties with different growth characteristics' (Otoo 1998). Furthermore, it suggested that with regards to small-scale farmers,

"[M]ost of them still use the local varieties… they are continuously cropping on those mixed varieties for almost 20, 30 or even 50 years…" [Agricultural extension worker].

The *Diversity* discourse views agricultural biodiversity as a process and includes the management level within its scope. The main thesis of this discourse is that farmers intentionally create diversity to meet and counter the outside pressures that they are facing and that they have been doing so for centuries. Another aspect of this discourse is the realisation that management practices of farmers are important, as they have evolved over time. Farmers have adapted to their changing environment and continue to perform despite the external constraints. The ingenuity of the small farmer is demonstrated in the diverse way in which the fields are managed. In recognising the highly uncertain climatic conditions it is argued that

"The rationale for the traditional farming systems is clear… [they] include practices such as mixed cropping, to ensure mechanical protection against erosion... Planting of groundnuts is also an agronomic measure providing surface cover against erosion. Soil fertility is traditionally maintained by practices such as intercropping of cereals with legumes and use of

manure and households wastes and land fallowing" (Kranjac-Berisavljevic 2000: 2).

All these activities form the basis for a system that can also benefit from indigenous crop varieties that are adapted to the local situation. It is maintained that more should be known about 'the knowledge and beliefs of traditional people that constitute the basis of their high level of awareness in conservation of biodiversity' (Laing & Ameyaw-Akumfi 1992).

Thus, all discourses do recognise the agricultural diversity that is present in the case study area. What they do, nevertheless, is disagree on the source and purpose of it, see Table 2.

The cultivation and conservation of what varieties?

The previous sections have detailed the way the discourses frame agricultural biodiversity. It is now worth spending time in comparing these framings in order to discover the discursive differences and the implications to conservation that consequently follow from that. It is clear that the *Diversity* discourse advocates *in situ* conservation whereas the two other see no special reason for conservation albeit be it for different reasons.

In the *Local* discourse, the category of improved rice is fairly straightforward. Rice is considered to be *Agric mui* when farmers have received it directly from a research institution as certified seed. However, the lack of formal seed supply creates a situation where the second category of local rice becomes very dynamic. At the heart of the *Local* discourse's construction of categories is the custom of naming varieties. Due to this, the category of *muikudda* is locally specific with high variability even within localities. This classification system is very much based on individual ability of oneself to identify varieties and the ability to separate them by looking at visible characteristics, i.e. the colour seed or the plant or the maturation period. Names of varieties are not considered an important method of identification or classification as more emphasis is placed on tangible ways of identifying varieties.

The classification of categories in the *Diversity* discourse is heavily based on the accepted scientific classification of the genus *Oryza*. The indigenous rice category here refers to *O. glaberrima* that was domesticated in West Africa and throughout the institution's narrative, indigenous varieties are referred to as *O. glaberrima* and that they are worth conserving because of their indigenous status. In contrast, indigenous rice is seen to be locally adapted and outperforming or at least matching the improved ones in difficult conditions where there are no external inputs and unpredictable weather conditions (Anane-Sakyi & Dittoh 2000). In doing empirical research, the actors of this institution rely almost exclusively on language and names of varieties in its identification of local varieties. More importantly, this approach relies heavily on the recognition of the knowledge that farmers posses and consequently farmer identification takes centre stage. In this process, through participatory research techniques the *Diversity* discourse accepts the classification of the *Local* discourse and makes the assumption that *muikudda* i.e. local rice and indigenous rice categories mean the same thing.

Keeping all this in mind, it is interesting to compare the definition of local rice category in the *Agric* discourse. The *Agric* discourse's narrative recognises the inability of the current seed system of which it is part, to function properly, but still argues that up to 90 percent of the rice farmed in the three Northern regions is improved material and not indigenous that denotes *O. glaberrima* origin,

Table 2. Scope of agricultural biodiversity in discourses.

	Local discourse	Agric discourse	Diversity discourse
Reasoning behind farmer actions resulting in agricultural biodiversity	Land scarcity and fear of crop failure reasons behind intercropping	No access to improved inputs and therefore cultivar mixtures grown	Management practices, such as mixed cropping and intercropping adopted because they benefit the crops
Agricultural biodiversity	An unintentional outcome of actions	A negative outcome of farmer actions	An intentional process of farmers who diversify as a strategy

or that it rather was at some time in the past when it was released by the *Agric* institution. It is further clarified that

"Local rice is not *glaberrima*, in the parlance of this country; local rice is not the *glaberrima*. Local rice is rice, which has been planted in this country" [Rice breeder].

Hence, according to the *Agric* discourse, there is no significant difference between the indigenous, farmers and local rice but it is all taken to mean varieties that are impure and of poor quality compared to the improved varieties obtainable from research stations. Essentially, three categories are constructed and are overlapping and sometimes contradictory. Rice cultivated by the farmers is defined and classified differently by all the three different discourses. See Table 3 for details of individual rice varieties and into which categories the three institutions classify them.

This highlights the way that these constructs are based on language. Table 4 further exemplifies the overlapping of categories. Here it can be seen how categories on the left side column do not always correspond to the definitions given by each discourse. The classification and categories of rice varieties is a perfect example of a discursive tool or a concept that is utilised. These concepts, such as indigenous variety and *O. glaberrima* in the *Diversity* discourse and *Local* and *Agric* in the *Local*

Table 3. Individual rice varieties and their classification.

Rice variety	Local discourse	Diversity discourse	Agric discourse
Agona	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Aboyang	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Agonbela	Mui kudda	Indigenous variety *Oryz aglaberrima*	Local (introduced) *Oryza sativa*
Abong	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Adenbemah	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Agondiga	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Musabeliga	Mui kudda	Indigenous variety *Oryza glaberrima*	Indigenous variety *Oryza glaberrima*
Agongima	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Agonsanga	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Samolgu	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Awarigawariga	Mui kudda	Indigenous variety *Oryza glaberrima*	Indigenous variety *Oryza glaberrima*
Asakeda	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Satia	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Agric mui	Agric mui	*Oryza sativa*	Improved variety
Mendi	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Mr Moore	Mui kudda	Indigenous variety *Oryza glaberrima*	Local (introduced) *Oryza sativa*
Peter	Mui kudda	Indigenous variety Oryza glaberrima	Local (introduced) Oryza sativa

Table 4. Categories of rice varieties.

Categories	Local discourse	Diversity discourse	Agric discourse
Local rice	Muikudda	*O. glaberrima*	Introduced variety (*O. sativa* or *O. glaberrima*)
Improved rice	Agric mui	*O. sativa*	*O. sativa*, *O. glaberrima* or NERICA (*O. sativa* x *O. glaberrima*)
O. glaberrima	–	Indigenous variety	Indigenous variety
O. sativa	–	Improved variety	Improve variety, elite material

discourse are examples of categories that are used to denote the importance of one particular category of rice varieties over another in the discourse's narrative. This is especially true to the *Diversity* discourse as the conservation of an indigenous African rice variety, typed using its scientific name in *italics* is likely to command some form of authority (Juhola 2006).

These different categorisations also affect the need to conserve this diversity, see Table 5. The *Diversity* discourse advocates *in situ* conservation because they view diversity as an essential source of livelihood security and farm management. Furthermore, it is stressed that *ex situ* conservation strategies are not a viable option on their own because they ignore the knowledge that the farmers have of these crop varieties. Alternatively, the *Agric* discourse does not value diversity in planting material and advocates *ex situ* conservation for the sake of guaranteeing germplasm for breeding purposes and would rather have farmers plant pure, uniform varieties across the country. Finally, the *Local* discourse does not consider their farming activities and the choice of seed in terms of conservation, and farmers are willing to try new seeds if they are available.

Conclusion

The importance of discursive analyses, according to Hajer and Versteeg is that the discourses, by defining what can and cannot be said, act as precursors to policy outcomes (Hajer & Versteeg 2005). This paper demonstrates this to be the case for agricultural biodiversity. The policy debates that are the most relevant to agricultural biodiversity relate to its conservation. This research demonstrates how the concept of scope and scale affect the decisions to adopt conservation strategies. Recent analyses have also highlighted the contribution that discursive analyses can make to different areas of policy. For example, a recent analysis shows how food security can be conceptualised in a postmodern fashion (Carr 2006).

In fact, there are specific contributions that discursive analyses have made that have pushed our understanding of the environment-society linkages further (Hajer & Versteeg 2005) and contribute to the understanding of policy processes (Rydin 2005). However, it is argued that understanding the coining of concepts and the acknowledgement of knowledge as a construction is not enough in itself. This 'is because the policy process itself is constituted of certain discursive formations that lead to path dependency and can embed inequalities of power' (Rydin 2005: 76). Here, the emergence of concepts like agrobiodiversity at the global level directly influences the policy process all the way down to the local level. Thus, these new terms and terminology eventually lead to policy changes as these discourses become institutionalised into social rules, norms and practices.

Table 5. Need for conservation.

	Local discourse	Agric discourse	Diversity discourse
Need for conservation	No acknowledgement of rice varieties that need to be conserved	No need to conserve rice varieties; rather need for uniform varieties	Need to conserve the indigenous varieties farmed in the area

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