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**PRIORITY A.2.3.: Managing Arid and Semi-arid Ecosystems**



**Second Periodic Activity Report**  
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**ANNEX 1-2-1: Second Task Report on WP1 Activities Current Land Use**  
**Patterns and Impacts**  
**Deliverable D1.1 (Lead contractor: UKZN, Due date: October 2008)**

## **COMPETE**

**Competence Platform on Energy Crop and Agroforestry**  
**Systems for Arid and Semi-arid Ecosystems - Africa**

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## Project Partners

Participant role	Participant number	Participant name	Participant short name	Country	Date enter project (month)	Date exit project (month)
CO	1	WIP – Renewable Energies, Germany	WIP	DE	1	36
CR	2	Imperial College of Science, Technology and Medicine	Imperial	UK	1	36
CR	3	Utrecht University	RUUTR.STS	NL	1	36
CR	4	Stockholm Environment Institute	SEI	SE	1	36
CR	5	Austrian Biofuels Institute	ABI	AU	1	36
CR	6	Höhere Bundeslehr und Forschungsanstalt für Landwirtschaft, Landtechnik und Lebensmitteltechnologie Francisco Josephinum	FJ BLT	AU	1	36
CR	7	ETA - Energia, Trasporti, Agricoltura s.r.l.	ETA	IT	1	36
CR	8	European Biomass Industry Association	EUBIA	BE	1	36
CR	9	Practical Action	Practical Action	UK	1	36
CR	10	Consiglio Nazionale delle Ricerche	CNR	IT	1	36
CR	11	E+Co, Inc. (not funded)	E+Co	USA	1	36
CR	13	Institute for Sustainable Solutions and Innovation	ISUSI	DE	1	36
CR	14	AGAMA Energy (Pty) Ltd	AGAMA	ZA	1	36
CR	16	Center for Energy, Environment and Engineering Zambia	CEEEZ	ZM	1	36
CR	17	Environnement et Développement du Tiers-Monde	ENDA-TM	SN	1	36
CR	19	Food, Agriculture and Natural Resources Policy Analysis Network of Southern Africa	FANRPAN	ZIM	1	36
CR	20	FELISA Company Limited	FELISA	TZ	1	36
CR	21	Mali-Folkecenter	MFC	Mali	1	36
CR	22	MOI University	MU	Kenya	1	36
CR	24	Tanzania Traditional Energy Development and Environment Organisation	TaTEDO	TZ	1	36
CR	25	UEMOA - Biomass Energy Regional Program (PRBE)	PRBE	BF	1	36
CR	26	University of KwaZulu Natal	UKZN	ZA	1	36
CR	27	University of Cape Town - Energy Research Centre	UCT, ERC	ZA	1	36
CR	28	Chinese Academy of Agricultural Sciences	CAAS	CN	1	36
CR	29	Centro Nacional de Referencia em Biomassa, Brazil	GENBIO	BR	1	36

**Project Partners (continued)**

Participant role	Participant number	Participant name	Participant short name	Country	Date enter project (month)	Date exit project (month)
CR	30	Indian Institute of Science	IISC	IN	1	36
CR	31	The Energy and Resources Institute	TERI	IN	1	36
CR	32	Universidad Nacional Autonoma de Mexico	UNAM	MX	1	36
CR	33	Universidade Estadual de Campinas	UNICAMP	BR	1	36
CR	34	Winrock International India	WII	IN	1	36
CR	35	Interuniversity Research Centre for Sustainable Development - University of Rome "La Sapienza"	CIRPS	IT	1	36
CR	36	Universitetet i Oslo	UiO	NO	1	36
CR	37	University of Bristol	UNIVBRIS	UK	1	36
CR	38	University of Botswana	UB	Botswana	1	36
CR	39	University of Fort Hare	UFH	ZA	1	36
CR	40	TWIN	TWIN	UK	1	36
CR	41	Joint Graduate School of Energy and Environment	JGSEE	TH	1	36
CR	42	African Development Bank Group (not funded)	AFDB	Int.	1	36
CR	43	Energy for Sustainable Development Ltd.	ESD	UK	1	36
CR	44	Eco Ltd.	Eco	UK	1	36
CR	45	Chinese Association of Rural Energy Industry	CAREI	CN	1	36
CR	46	Food and Agriculture Organisation of the United Nations (not funded)	FAO	Int.	1	36
CR	47	Conservation International Foundation (not funded)	CI	USA	1	36
CR	48	Foederation Evangelischer Kirchen in Mitteldeutschland	EKMD	DE	1	36

## CONTENTS (ANNEX 1-2-1)

<b>1. INTRODUCTION .....</b>	<b>5</b>
<b>2. UKZN 2008 Activities .....</b>	<b>5</b>
<b>3. UiO 2008 Activities.....</b>	<b>11</b>
<b>3.1. Senegal .....</b>	<b>11</b>
<b>3.2. Burkina Faso .....</b>	<b>12</b>
<b>3.3. Mali .....</b>	<b>14</b>
<b>3.4. Kenya .....</b>	<b>16</b>
<b>3.5. Tanzania.....</b>	<b>19</b>
<b>3.6. Zambia .....</b>	<b>21</b>
<b>3.7. Botswana .....</b>	<b>23</b>
<b>3.8. South Africa.....</b>	<b>24</b>
<b>4. CNR 2008 Activities .....</b>	<b>27</b>
<b>5. References .....</b>	<b>32</b>

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## **Second Task Report on WP1 Activities Current Land Use Patterns and Impacts**

### **1. Introduction**

The principal objective of this work package is to identify land in the semi-arid and arid regions of sub-Saharan Africa where intensification of, or conversion to bioenergy use, will not have detrimental environmental and/or socio-economic impacts. The 2007 Task report on WP1 gave a detailed description of the data and information that was acquired and analyzed, and of the use of GIS to filter out all protected areas, closed canopy forests and wetlands, areas under food and/or cash crops, and areas with severe water, terrain and soil constraints. Maps for the continent, and for the eight case study countries showing areas in these regions available and suitable for bioenergy crop production in relation to the distribution of primary rivers, transport infrastructure and populated places main results were presented in Appendices to the report. The 2007 Task report provided an overview of the nature of information required for each of the case study countries from partners within them, as well as from task leaders and contributors to this work package, using South Africa as an example.

### **2. UKZN 2008 Activities**

UKZN's first activity in 2008 was quantifying the areas identified as available and suitable for bioenergy crop production in the eight case study countries. The findings are presented in Table 1. Arid regions are not represented in Tanzania and Zambia. In the other six countries they range from covering 1.9 to 39.7 percent of the country in the case of Burkino Faso and Kenya, respectively. While none of Burkino Faso's arid region and less than a third of Mali's arid region is potentially available and suitable for biofuel crop production, the greater proportion of this region in Senegal, Kenya, Botswana and South Africa is potentially amenable for such production. Semi-arid regions are represented in all eight countries and range from covering 19.8 to 78.0 percent of the country in the case of Mali and Botswana, respectively. The potential for biofuel crop production is least favourable in this region in the West African countries and most favourable in Kenya and South Africa. Considering available and suitable areas in both the arid and semi-arid regions, South Africa clearly has the greatest potential to accelerate bioenergy crop production. Its potential is 1.9, 2.5, 3.7 and 4.9 times that of Kenya, Botswana, Mali and Tanzania, respectively.

Country	Senegal	Burkina Faso	Mali	Kenya	Tanzania	Zambia	Botswana	South Africa
Total area km <sup>2</sup>	196 013	272 339	1 252 281	581 871	941 375	751 920	587 337	1 221 361
Arid region km <sup>2</sup>	14 093	5 117	389 734	230 888	n/a	n/a	128 289	378 418
Arid region %	7.1	1.9	31.0	39.7	n/a	n/a	22.0	31.0
km <sup>2</sup> of arid available and suitable	10 200	0	121 397	209 760	n/a	n/a	102 193	353 937
% of arid available and suitable	72	0	31	91	n/a	n/a	80	94
Semi-arid region km <sup>2</sup>	97 054	144 856	248 226	227 020	316 738	160 281	453 316	522 927
Semi-arid region %	49.5	53.1	19.8	39.0	33.6	21.3	78.0	42.8
km <sup>2</sup> semi-arid region available and suitable	5 583	22 756	71 041	169 938	147 252	67 383	189 667	368 944
% semi-arid region available and suitable	6	15	29	75	46	42	42	70
Arid & semi-arid km <sup>2</sup>	111 147	149 973	637 960	457 908	316 738	160 281	581 605	901 345
Arid & semi-arid region %	56.6	55.0	50.8	78.7	33.6	21.3	100.0	73.8
km <sup>2</sup> arid & semi-arid available & suitable	15 783	22 756	192 438	379 698	147 252	67 383	291 860	722 874
% arid & semi-arid available & suitable	14	15	30	82	46	42	51	79
Comparative ranking of available & suitable	8	7	4	2	5	6	3	1

Table 1: Areas identified as available and suitable for bioenergy crop production in the eight case study countries

While one can be confident that the comparative ranking of the eight countries in terms of potentially available and suitable areas in their arid and semi-arid regions is correct, the values ascribed to these areas in Table 1 may be over- or under-estimates. Watson (2009a) points out that protected areas only contain a limited, biased sample of the biodiversity in the arid and semi-arid regions of the case study countries. Historically the motivation for most protected areas on the continent being accorded their status was on account of either their being unsuitable for commercial agricultural activities because the land was marginal, too steep, infested with malaria and sleeping sickness etc, or their being needed to serve as a buffer between land claimed by the white colonists and land allocated for African use. For a substantial period, management practices within them such as veld burning and culling, were not driven by conserving biodiversity considerations but were rather focused on large mammals, trophy species and improving game viewing.

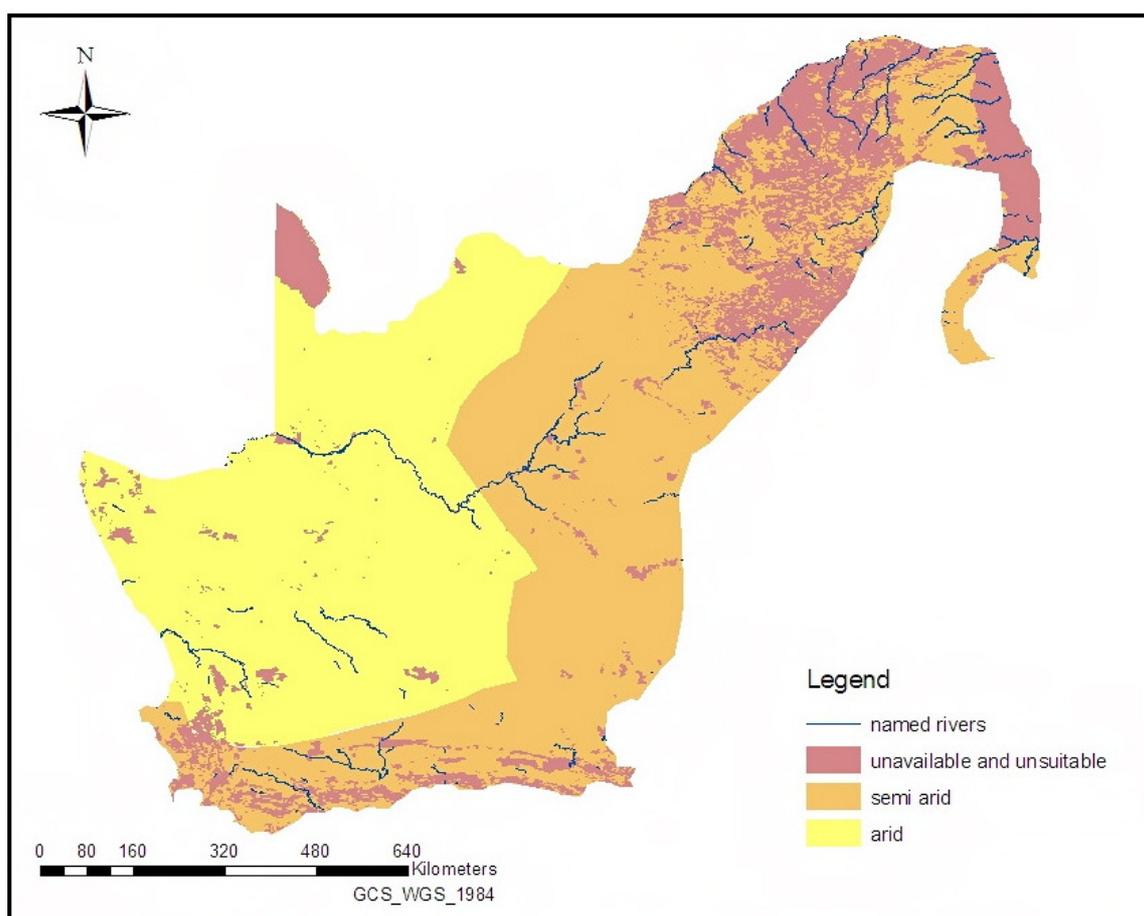


Figure 1: Showing areas unavailable and/or unsuitable for biofuels feedstocks production in South Africa's arid and semi-arid regions (Watson, 2008).

The areas shown as unavailable and unsuitable for bioenergy crop production in South Africa's arid and semi-arid regions in Figure 1 have been designated as such because they either include protected areas, closed canopy forests and wetlands, or they are under herbaceous or tree crops. The Figure suggests that most the arid region in the Western and Northern Cape provinces are available and suitable for such production.

However, Table 2 showing the status of biodiversity in the Succulent Karoo and Nama Karoo biomes in these respective provinces suggests otherwise. Both biomes have an extremely rich diversity of plants and a rich diversity of birds, mammals and reptiles. About two fifths of the plants in the Succulent Karoo and the same proportion of the mammals and birds in both biomes are endemic. The diversity of fish in the Succulent Karoo and of Invertebrates in both biomes, as well as the conservation status of plants in the Nama Karoo, is not yet known.

Biome	Succulent Karoo					Nama Karoo				
	Sp No.	% End	Crit No.	End No.	Vul No.	Sp No.	% End	Crit No.	End No.	Vul No.
Mammals	67	39	1	2	10	75	39	1	3	8
Birds	232	43	0	0	5	271	40	0	0	10
Reptiles	94	31	0	0	6	64	9	0	0	1
Amphibians	12	13	0	0	0	13	8	0	0	0
Fishes	?	?	?	?	8	29	3	2	?	?
Invertebrates	?	?	0	0	?	?	?	0	1	13
Plants	4849	40	1	?	?	2174	18	?	?	?

Sp = species, End = endangered, Crit = critical, Vul = vulnerable

Table 2: Status of biodiversity in two of South Africa's arid biomes, derived by Watson (2009b) from Le Roux (2002)

The accuracy of the values given for available and suitable areas in the arid and semi-arid regions of the eight countries in Table 1, may also be a function of having used the EC JRC's (2003) 2000 GLC dataset to filter out closed canopy forests and wetlands, and areas under herbaceous or tree crops. Results of studies based on 1km<sup>2</sup> global land cover datasets are influenced by inherent weaknesses in the dataset chosen. When comparing the results obtained using different global land cover datasets, Jung *et al* (2006) and McCallum *et al* (2006) and others, found limited agreement on the spatial distribution of the individual land classes, particularly at a continental or regional level.

The 2000 GLC was also used to filter out areas under food and cash crop production. Most such areas are under large scale commercial production. This dataset has a "forest with a crop component possible" category. But as Watson (2009a) cautions, the application of the definition of forest at very low thresholds of woody cover disadvantages the woody savannas, wooded grassland/shrub forest categories which have great temporal and spatial variation dependent on how recently cultivated plots were abandoned, veld was burned, grazing pressure, etc. It consequently misses the typical, traditional African communal landuse, where cultivated fields are scattered in a matrix of land used for grazing.

Dr Watson’s MSc student Diana Sibanda was a recipient of the COMPETE grant. Besides being able to have the most wonderful experience of presenting her thesis to and working with world biofuels leaders at Imperial College, the grant enabled her to successfully complete her thesis entitled “A land suitability assessment of Zimbabwe for sugarcane and sweet sorghum as bioenergy crops”.

Dr Watson’s MSc student Elmah Mudede (forthcoming) has identified three areas available and suitable for large scale *Jatropha* production in the semi-arid regions of Tanzania. She used GIS to buffer distance categories from rivers, populated places, railways and roads and calculate the percentage of the area within each category. Her findings are shown in the four maps in Figure 2, and in Table 3 below. She is currently reviewing literature on the influence of these constraints to facilitate interpretation of her findings and to substantiate assumptions such as proximity to rivers is more important than the other constraints because in these semi-arid regions *Jatropha* has to be irrigated in order to obtain commercially viable yields. Whereas, labour can be transported in or accommodated close by, railways and roads can be built.

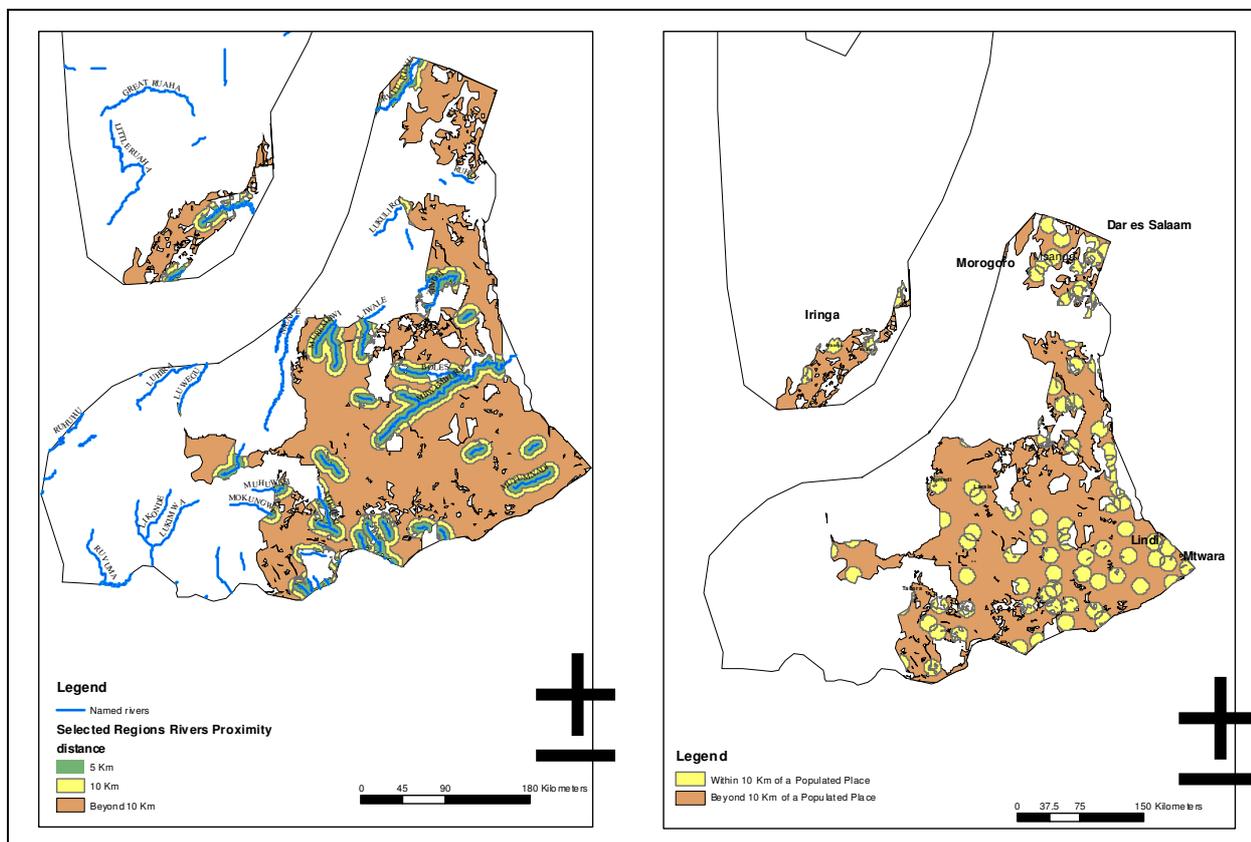


Figure 2a: Areas available and suitable for large scale *Jatropha* production in the semi-arid regions of Tanzania (distance categories from rivers, populated places, railways and roads)

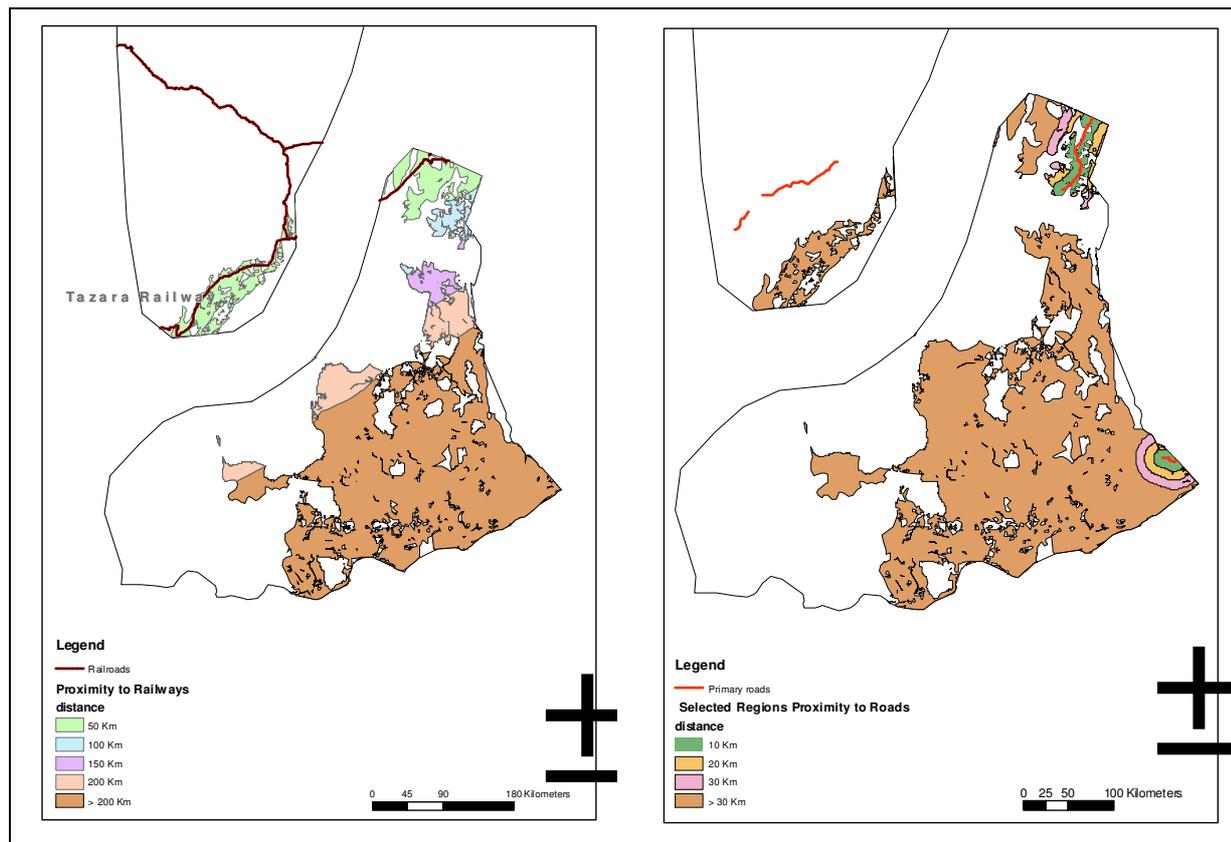


Figure 2b: Areas available and suitable for large scale Jatropha production in the semi-arid regions of Tanzania (distance categories from rivers, populated places, railways and roads)

	Area Km <sup>2</sup>	Rivers		Pop.	Railways			Roads		
		%<5 kms	% 5-10 kms	%<10 kms	%<50 kms	%50-100 kms	%<10 kms	% 10-20 kms	% 20-30 kms	
1	65 800	13	14	26	0	0	1	1	2	
2	4 435	12	13	20	100	0	100	0	0	
3	5 673	6	7	53	71	27	17	17	14	

Table 3: Percentage of area within distance categories in kms from rivers, populated places, railways and roads (Mudede, forthcoming)

### 3. UiO 2008 Activities (Submitted by Dr Kisten Ulsrud)

UiO was responsible for identifying and locating land in all eight case study countries which is unavailable for bioenergy crop production because of legal, or cultural status, or policy aspirations. UKZN is currently filtering out from the land from that identified as available and suitable in the maps presented in the 2007 Task Report.

#### 3.1 Senegal

##### *Political factors*

There are no violent conflicts in the arid and semi-arid areas of Senegal<sup>1</sup>.

##### *Cultural factors*

The Middle Valley stretches along the Northern Senegalese border towards Mauritania from Jallowali to Dembokan. The Valley has for thousands of years been the home to early settlements. The area from the Walade to Salde (16° 9'48.48"N) between the Senegal River and the river Doue Marigot contains several settlements dating from 800 BC (Deme et al. 2006). Some of these areas are marked as suitable for bioenergy crop production. Investments in these areas must consider the cultural heritage that exists there. Furthermore, thousands of earthen mounds of varying sizes, presumed to be funerary monuments, occur throughout western Senegal, in the regions Rao, L. de Guiers, Dahra, Mbacké, Ndalane and Nioro du Rip.

According to Keech, McIntosh and McIntosh (1993) there are 6982 mounds which are clustered within 1432 sites covering an area of approximately 32000 km<sup>2</sup>. The mounds are tumuli and megaliths. For example, there are some mounds in an area north-east of the town of Rao (15°54'56.20"N, 16°23'48.90"W); east of the village Mgoy and west of the village K. Amadou Ndiaye (15°57'19.02"N, 16°18'44.56"W). There are some arid and semi-arid areas marked as suitable for bioenergy crop production in the areas around Rao. Another area with earthen mounds is north and east of the town of Dahra (15°21'12.24"N, 15°28'54.48"W), where there also is a small area identified as suitable for bioenergy crop production. There are mound sites west of the village Mouye, north of the village Komb, south-east of the village Yang-Yang (15°35'23.64"N, 15°21'2.16"W), that may also be in the suitable areas, west of the village Njakhaté, east of the village Linguere (15°23'34.44"N, 15°6'55.80"W).

There is also a site south of Dahra (15°21'12.24"N, 15°28'54.48"W). Some other sites are found on the eastern bank of the Lac de Guiers north of Keur Momar Sarr (15°55'10.37"N, 15°58'7.29"W), and in the far lower Ferlo Vally system, close to its junction with the upper Senegal River delta. In the Kaolack region (N13°41'28", W15°31'21") there are some stone circles constituting a UNESCO world heritage site<sup>2</sup>. The site consists of four large groups of stone circles that represent a concentration of over 1,000 monuments in a band 100 km wide along approximately 350 km of the River Gambia. Together the stone circles of laterite pillars and their associated burial mounds present a sacred landscape created over more than 1,500 years. This may be in the area of interest, as there is an area west of

<sup>1</sup> Personal communication, Touria Dafrallah, ENDA-TM, Senegal

<sup>2</sup> <http://whc.unesco.org/en/list/1226>

Birkelane that is marked as suitable and/or available for bioenergy crop production, and may overlap with the stone circle area.

### *Legal factors*

Land policies and decentralisation policies are closely linked in Senegal, and have been so since the independence in 1960. Democratic progress has been made, but the political authorities and top administrative officials have also been accused for being slow to translate the legislative advances into action, which may be partially due to an administrative culture that is still influenced by its colonial past (Faye 2008). About 95 percent of the national territory was categorized as rural land in the national land law adopted in 1964. This was land used by the rural population for housing, farming, livestock rearing and woods under customary land regimes. The state became the holder of this land and aimed to administer it through the rural councils. However, rural communities can be highly stratified, and the local elites frequently form alliances with urban and national elites, at the expense of the land rights of less powerful groups (Amanor & Moyo 2008, Niang and Dieng 2004).

In the new decentralisation law from 1996, the decentralisation process was continued, but some of the rights of the central state to intervene in land issues were also strengthened. According to Faye (2008), the state is using this law to attract new actors into the agricultural sector. For example, the state is now able to remove land from local government jurisdiction. This is causing concern because it creates uncertainty and insecurity of tenure for local farmers. For farmers, it is expensive and difficult to register their lands and obtain land titles. Farmers, who have been allocated plots on national land previously covered by customary rights, find it impossible to acquire real land rights (Faye 2008). People with close contacts among elected officials or in the political and administrative sphere are accused for using their contacts for grabbing land. Moreover, conflicts between pastoralists and farmers, which occurred also in earlier times, have become more serious in recent decades, because of the increased pressure on land and the lack of recognition both in land policy and practice of pastoralism as a productive form of use for public lands (Niang & Dieng 2004). The government in Senegal has been attempting since 1995 to lead a reform in all land and natural resources legislation and develop a new land policy. A growing challenge is the increasing urbanization in the country, with 50% of the population living in urban areas by 2005 (Faye 2008). Land for housing, infrastructures, public amenities and economic activities is needed from the rural areas around the urban areas. All these challenges related to land tenure need to be taken into account when considering the allocation of land for bioenergy crop production.

## **3.2 Burkina Faso**

### *Political factors*

The location of the 600 kilometer border between Burkina Faso and Niger is not completely clear, and local officials in Niger and Burkina Faso have accused each other's security forces of crossing the border to rob and harass villagers<sup>3,4</sup> In 2007 Burkina Faso and Niger submitted a border dispute for adjudication to the International Court of Justice

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<sup>3</sup> <http://www.irinnews.org/report.aspx?reportid=63007>

<sup>4</sup> <http://www.afrika.no/Detailed/16341.html>

(ICJ) in The Hague, in order to make a resolution.<sup>5</sup> However, there is no military tension between the two countries<sup>6</sup>. Seno (13°21'27.42"N, 0°45'11.81"E) is a region in this border area between Burkina Faso and Niger which is found suitable to bioenergy crop production in WP 1.

### *Cultural factors*

Information in French, see footnotes<sup>7, 8</sup>

Les nécropoles de Bourzanga

Les sites d'extraction de fer de Kindiba

Les gravures rupestres de Pobe-Mengao

Parc National du W du Niger et aires protégées adjacentes

Sculpture park of Laongo

### *Legal factors*

Since the middle of the 1980s people involved in development work have been concerned about security of tenure in Burkina Faso. Due to adverse climatic conditions in the form of serious droughts since the 1970s as well as degradation of natural resources resulting from human activity, the cultivable land area has been reduced, and at the same time the human and animal populations have grown. Pressure on land has thus increased in many parts of the country, and land tenure problems have arisen (Ouédraogo 2002). Pasture land is being grazed to its limits in some regions (e.g. the Sahel and central regions), and herders are moving towards the south, south-west, and west of the country. Competition for land has become a problem both between people from the same locality, between locals and migrants, and between traditional farmers and urban investors. Traditional means for resolving land tenure problems have become insufficient. Therefore the land tenure issue has increased in importance in the country's development policy and strategy.

According to Ouédraogo (2002) and Mathieu (2003), it is necessary to find pragmatic solutions to the issue of land tenure and management, because this is a precondition for success in combating rural poverty. In 1984 a law was implemented on agrarian and land tenure reorganisation, and revised in 1991 and 1996 (Ouédraogo 2006). The law states that all untitled land belongs to the State, and land rights would be decided upon by an elected village committee in place of the chief (Toulmin 2007). The law was meant to make it possible to promote private economic investment in the agricultural sector by the allocation of land by the government. However, the law is said to have created a sense of insecurity in land tenure matters which seems to discourage economic investment. The procedures and decision-making authorities seem to have little legitimacy in practice, and land tenure management has become complex and unclear (Ouédraogo 2002, Mathieu 2003). Customary land management practices are still used, but declining, and there are contradictions between traditional principles and modern law, and some conflicts on land tenure may last for several years.

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<sup>5</sup> UN Integrated Regional Information Networks. Burkina Faso: 'Historic Deed' to Avert Border War. allAfrica.com. <http://allafrica.com/stories/200803101447.html>

<sup>6</sup> Personal communication, Biomass Energy Regional Programme, UEMOA, Burkina Faso

<sup>7</sup> <http://whc.unesco.org/en/statesparties/bf>

<sup>8</sup> <http://www.histoire-afrique.org/article14.html>

Suggestions from Ouédraogo (2002) on how to solve the problems include the encouragement of a gradual, voluntary and transparent progress from traditional, customary systems to more formal land tenure regimes by giving government recognition to some of the customary rights and usages, and gradually formalising these in close cooperation with people concerned. In addition, the need for regulating activities of newcomers in an area is pointed out, because businessmen, civil servants and other town dwellers have been given access to land without regard for land availability and local demand. These concerns will be important to take into account when considering bioenergy crop production in the country.

There are over 60 different tribes in Burkina Faso, with various degree of power over their land. The Mossi people in the Volta River basin is the biggest tribe, and still has much power<sup>9</sup>. Their leader, the Moghoo Naba, has substantial authority and needs to be consulted before decisions are being taken in the area, especially decisions concerning the destiny of the Mossi people. Some of the area labelled available and/or suitable for bioenergy crop production is located within the Volta river basin where the Mossi people lives at the Mossi central plateau<sup>10</sup>. Moreover, the migration of hundreds of thousands of Mossi farmers from the drought prone plateau to lower lands has led to denser settlement in the west of the country. People are now moving southwards to areas of lower settlement density (Toulmin 2007).

### 3.3 Mali

#### *Political factors*

In Northern Mali, the parts of the regions Kindal, Gao and Timbuktu that are situated north and east of the Niger River are regarded as unsafe areas<sup>11</sup>. Parts of these areas are within the arid areas of Mali. (The areas north of the place Kidal (18°26'39.51"N, 1°24'5.48"E) are outside arid and semi-arid areas. The divide is a nearly horizontal line east-west of Kidal, across Mali). In the Kindal region there has been frequent confrontations between rebel groups (which are relatively small) and military forces<sup>12</sup>. In the areas north and east of the Niger river in the Timbuktu- and Gao regions, there have been some cases of road robberies and kidnapping. This has also been the case along the road between Gao (16°16'27.84"N, 0° 2'30.48"W) and Kidal. Most of the arid and semi arid areas in these regions are marked as unavailable in the maps, but there are some small spots that are marked as available in the maps, and the information above could be relevant in these small areas.

<sup>9</sup> <http://www.uiowa.edu/~africart/toc/people/Mossi.html>

<sup>10</sup> <http://www.jstor.org/stable/161788?seq=4&Search=yes&term=mossi&list=hide&searchUri=%2Faction%2FdoBasicSearch%3FQuery%3Dmossi%26wc%3Don%26dc%3DAI%2BDisciplines&item=15&ttl=1256&returnArticleService=showArticle&resultsServiceName=doBasicResultsFromArticle>

<sup>11</sup> Personal communication, Dr. Øivind Hetland, University of Oslo

<sup>12</sup> Touareg Rebels Re□Emerge Africa Research Bulletin: Political, Social and Cultural Series, Volume 44, Issue 8, Page 17201A□17201C, Sep 2007

### *Cultural factors*

Some of the arid and semi arid land which are possible areas for bio fuel production in Mali is located in the land of the Dogons<sup>13</sup>. The Dogons is a people that lives in the cliffs of Bandiagara (14 20 00 N, 3 25 00 W) and on the surrounding Bandiagara Plateau in the Mopti region of Mali. Today, most of the Dogon are Muslims or Christians; however, they have kept many of their Dogon practices and beliefs. The area is rich in architecture, altars, communal meeting places and sanctuaries and several old traditions and rituals are still being carried out in the area<sup>14</sup>. Investments in biofuels in the area must, prior interventions, consider the rich cultural heritage and life in the area. Moreover, the area is important for tourism<sup>15</sup>. As the land around Bandiagara cliffs has become less fertile, people have moved further into the plains to cultivate their millets and grains.

### *Legal factors*

At the time when the colonial system was established in Mali, most land was acquired through inheritance within lineage groups, which was not recognized by the civil code. In order to decide legal owners of the land, the concept of “vacant and ownerless lands” was set out in the civil code, and the owner of such land was decided to be the state. The land that was seen as vacant included land used for pastoralism, collection of wood and gathering of wild grains, fruits and medicinal plants, which fell outside the European notion of property which was used. Thus large areas of fallow land and silvopastoral land became state owned land<sup>16</sup>. In this way the colonial state granted itself vast tracts of land, registered them and sold them to concessionaries (Wells 1999).

The colonial authorities had introduced legislation that paved the way for land registration to secure ownership rights, and there was also some recognition of some customary rights. The land register in particular benefited large trading companies and French settlers, who created large plantations and processing industries (Wells 1999). Much of this development took place around the Second World War and in the 1950es. Also the new Land Laws of 1986, 1995, and 2000 gave customary rights some legal value, but land titles and registration was the main focus of the laws and policy (Benjaminsen 1997, Djiré 2007). In some areas of Mali, there has been a rapid increase in the registration of land titles since 1984 and onwards. However, many of these new land titles belong to urban middle class bureaucrats and traders trying to secure their land acquisitions, rather than rural people appropriating land through titles. The explanation of the increase includes the return of a large number of Malian expatriates to their home country after political changes that took place in 1991.

Some of these people went into property, others into farming or rearing livestock, and many also bought land for housing. According to Djiré (2007), the legal procedures involved in registration of land titles are complex and the operations are relatively expensive and unfamiliar, and this effectively excludes much of the rural population from gaining access to legal land ownership. This is also a potential source of conflict. This may also mean that the protection of the land rights of rural people in the face of potential

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<sup>13</sup> <http://www.scribd.com/doc/265438/The-Dogon-people>

<sup>14</sup> <http://whc.unesco.org/en/list/516>

<sup>15</sup> [http://www.moxon.net/mali/dogon\\_country.html](http://www.moxon.net/mali/dogon_country.html)

<sup>16</sup> Benjaminsen, T. A. 1998. Decentralisation and management of village land in rural Mali. The World Bank/EDI's CBNRM Initiative. <http://srdis.ciesin.columbia.edu/cases/mali008.html>

activities from investors in bioenergy crop production may be weak. Much of the land in the country is unregistered lands belonging to the state, and there may be a risk for such land to be sold off to investors although it is important for the livelihoods of current users.

### 3.4 Kenya

#### *Political factors*

After the announcement of the contested presidential election results on 30 December 2007 announcing a second term to Mwai Kibaki, Kenya were in its worst political crisis since independence. Over 1,000 people died and 300,000 were displaced in violence with a serious ethnic character. After a power sharing agreement between Kibaki and Raila Odinga the violence calmed down. However, there is still insecurity and disagreement about land rights in several places after the violence, especially where groups of the population were chased away from their land and property<sup>17</sup>. The Rift Valley Province, especially the villages and small trading centres near Eldoret (0°30'54.86"N, 35°15'58.93"E) has been hard hit by the post-electoral violence. Mount Elgon district is also a conflict ridden area. (This district is near or within the areas identified as suitable for bioenergy crop production, or just outside).

It is uncertain how the situation in these areas will develop in the future; however, it is believed that the protracted political crisis has deep roots and could possibly lead to renewed violence (Crisis Group 2008). The crisis is related to longstanding disputes over land ownership. There is a tendency to view the disagreements as ethnic clash of interests, but clashes over land ownership is also said to have been fuelled by politicians for their own benefit since the restoration of multiparty democracy in 1991. In some districts in Kenya, such as the Turkana district (3° 4'31.14"N, 36°31'22.67"E) in the Rift Valley Province, violent conflict occurs from time to time in the form of raiding of cattle and other assets, banditry, and related disputes (Lind & Eriksen 2006). The Kajiado (1°51'7.45"S, 36°47'33.80"E) region south of Nairobi has for 30 years been experiencing a land use conflict, which is intensifying. The conflict reflects ongoing competition over access to scarce land and water resources between herding, farming and wildlife. There are several driving forces that keeps the conflict going, like economical interests and cultural, political and institutional forces (Campbell et. al. 2000). Getting one more actor in the area, investors in bioenergy crop production, might run the risk of intensifying the already existing conflict.

#### *Cultural factors*

The Rift Valley is a huge valley which stretches through big parts of the African continent. In Kenya the valley covers big parts of the Rift Valley district, situated North West in the country. It contains some extraordinary geological sites in addition to being an important archaeological area containing evidence of hominid activity dating as far back as 7 million years. In Koobi Fora (3°55'N, 36°06'E) is a 700 square mile area containing the largest body of evidence from early hominid activity ranging from 4 million years (Australopithecus anamensis) to 1.4 million years ago (Homo erectus)<sup>18</sup>. Hyrax Hill (1°35'N, 36°26'E) contains a cemetery and traces of domestic animals and ancient pottery from Neolithic occupation. Lothagam (2°54' N, 36°02' E) has a unique geological sequence and is known

<sup>17</sup> <http://news.bbc.co.uk/2/hi/africa/7386121.stm>

<sup>18</sup> <http://whc.unesco.org/en/tentativelists/1580/>

for its beauty. Evidence from hominids and hominoids ranging from 7 to 3,2 million years have been found in this cultural area. In addition, the landscape preserves a long record of African mammalian species ancestors in both extinct and extent form. Kanapoi (1 ° 32' N, 36 ° 09' E) is an area with traces from early human ancestors which is 4.2 – 4.1 million years of age. West Turkana is a cultural area containing much cultural heritage. The most complete skeleton of *Homo erectus* is found in this area, as well as the oldest workshop. Tugen Hills (probably 0 ° 51' N, 35 ° 53' E) preserves a long succession of fossiliferous sediments ranging in age from 10 million to Recent.

These sediments provide the opportunity to investigate the pattern of Neogene faunal change in detail. Sites of the 6.0 million year old hominid ancestor *Orrorin tugenensis* which is the most likely ancestor of the African Apes and early hominids are also located in the area. All the above mentioned sites are within the area labeled as suitable for bioenergy crop production. Ologessailie (30°06' E, 0°17'N) is a cultural landscape characterized by in-situ displays of prehistoric materials, including numerous stone hand axes representing one of the oldest forms of human technology and fossilized skeletons of extinct species of elephant and hippopotamus. It is one of the most intensively studied cultural landscapes in the Rift Valley outside Olduvai Gorge. (This site is probably overlapping with the area labeled as suited for bioenergy crop production.) In addition the Rift Valley is also an important area for agriculture and cattle rising for the cultural groups who live there today. Investing in biofuel production in the Rift Valley will have to be done in respect of geological and cultural heritage as well as the current activity of the area. The Sacred Mijikenda Kayas are cultural heritage sites that were included in the UNESCO World Heritage List by the World Heritage Committee in July 2008<sup>19</sup>.

The Sacred Mijikenda Kayas are seen as a unique example of how collective attitudes and beliefs have shaped or sculpted a landscape over time in response to the people's needs. The Kayas are forested or wooded sites situated in the Coastal plains and hills of Kenya. They are regarded as sacred by the coastal Mijikenda community, who are a dominant ethnic community in the coastal region south of the Tana river who speak closely related Bantu dialects. The Kayas are residual areas of extensive and diverse lowland forest and they are small in size, ranging in area from 10 ha to 400 hectares. To date, over 50 Kayas have been identified in five districts (the districts of Kwale, Msambweni, Kinango, Kaloleni, Kilifi and Malindi), of which the districts Kilifi and Malindi are located within (or maybe close to) the areas identified as suitable for bioenergy crop production.

### *Legal factors*

There are complex land tenure problems in Kenya, resulting of a long history of land administration associated with political processes, unequal access to land, and the creation of a large number of people without rights in land (Kanyinga et al. 2008). The violent conflicts in the Rift Valley Province mentioned under the political factors above relate to longstanding unsettled land issues in the area. There has been shifting ownership and tenure and large scale evictions from the fertile land in the Province, and these land issues go back to the colonial times and the post-independence land policies in Kenya (Oucho 2002). Under British rule, large arable areas of the Rift Valley Province were reserved for settlers from Europe, and pastoralist communities, especially Kalenjin and Masaai were moved away. After independence in 1963, the ethnic group Kikuyu got

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<sup>19</sup> <http://www.museums.or.ke/content/view/145/1/>

foothold in the province by buying land from white settlers<sup>20</sup>, partly because a large group of Kikuyu had been displaced from neighboring Central Province by European settlers, or lost their land when they fought the colonial regime during the Mau Mau rebellion (Amanor & Moyo 2008, Oucho 2002).

Other new entrants were Kisiis, Luos and Luhyas. Political patronage has allowed powerful persons to acquire public or common land in Rift Valley and elsewhere in Kenya. Some of this land has earlier been used by pastoralist communities for generations. Sometimes the concept of customary land rights tied to ethnic boundaries has been used in order to build up support for a policy of land grabbing and land accumulation by engaging large groups of supporters for reallocation of land. However, the supporters in some such cases have been allocated small plots of land, while the political elite have got rights to large plots, according to Kanyinga et al. (2008). Another source of bitterness has been the tendency for land to lie idle, especially land owned by absentee landlords or land where ownership is disputed. Kanyinga et al. (2008) and Oucho (2002) point out that colonial land laws and policies have had strong influence in the post-colonial period. Economically weak groups have continued to lose land to the influential and wealthy groups, and the political elites have prevented the democratisation of mechanisms for redistribution of land. Land and ethnic affiliations have been used to build a system of political patronage and influence, and the state and the president have strong positions over the control of land and the allocation of land both to individuals and to corporate interests.

New agrarian investment opportunities dominated by wealthy individuals are emerging to occupy land meant for the landless poor in urban and rural areas, and there is an increasing privatization of public land. (Kanyinga et al. 2008). However, there is also growing opposition creating pressure for accountability in land administration<sup>21</sup>. Public concern for the land reform process is voiced by spontaneous struggles of communities to defend their land, as well as civil society organisations and the media who are pointing out the state of land administration in the country and the urgent need for change.

The Kenyan government has presented a Draft National Land Policy for the cabinet, which has spurred renewed rivalry among interest groups<sup>22</sup>. In May 2008, the Kenyan Land Minister Orengo underlined the need to address disputes that fuelled the post-election violence. The policy aims to deal with issues of land ownership, security of tenure, land use and development, and environmental conservation on a sustainable basis, including redistribution of land to poor and landless groups. According to Land Minister Orengo, four groups are opposed to the policy: large scale landowners who let their land lie idle, land grabbers, those illegally settled in schemes, and those who got to own large land holdings that the colonial settlers left. However, there is a fear that Kenyan political leaders lack the political will to confront the elites (Kanyinga et al. 2008). On this background it is important to ensure that allocation of land for bioenergy crop production in Kenya does not worsen or hinder solution of land distribution problems in the country. Equitable and sustainable access to land is central for economic and democratic development in Kenya because of the agrarian nature of the Kenyan society.

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<sup>20</sup> BBC Monitoring Africa. 18. January 2008. Newstex ID: BBC-0002-22374124. Purchased from <http://www.alacrastore.com>

<sup>21</sup> Independent Land Newsletter (August 2004). Struggling with land reform issues in Eastern Africa today. [http://www.oxfam.org.uk/what\\_we\\_do/issues/livelihoods/landrights/downloads/ind\\_land\\_newsletter\\_easter\\_n\\_africa\\_aug\\_2004.rtf](http://www.oxfam.org.uk/what_we_do/issues/livelihoods/landrights/downloads/ind_land_newsletter_easter_n_africa_aug_2004.rtf)

<sup>22</sup> Nairobi The Standard, 26.05.2008, in BiblioLine Basic – Africa-Wide: NiPAD. [http://biblioline.nisc.com/scripts/login.dll?29092008095021\\_19](http://biblioline.nisc.com/scripts/login.dll?29092008095021_19)

In the Coastal Region, land reforms have been promised in a ten mile coastal strip, in order to allocate land to landless poor, and to formalize land ownership<sup>23</sup>. According to Acting Lands Minister in 2006, Kivutha Kibwana, 160.000 land titles had been issued in the Coast Province since 1963, and thousands of land titles were to be issued. However, it had taken up to 30 years for many Kenyans to get their land title documents<sup>24</sup>.

### 3.5 Tanzania

#### *Political factors*

Tanzania does not have any major conflicts or political tensions, and the influx of refugees in North West Tanzania is not affecting the areas identified as suitable for bioenergy crop production in the country<sup>25,26</sup>

#### *Cultural factors*

Stretching across the country from Ujiji (4°54'41.33"S, 29°40'28.42"E) at the shore of Lake Tanganyika to Bagamoyo (6°26'44.79"S, 38°53'58.56"E) on the mainland just opposite Zanzibar is the path that once was one of the most used slave routes in history. It carries evidence of a dark period of history and the stretch has many historical sites, like Arab forts and other historic buildings, scattered all along it. Today the stretch is important for research on slavery, and several communities also live along the route<sup>27</sup>. The route goes through historical places like the settlements in Mamboya in Kilosa District (6°48'53.47"S, 36°58'3.57"E), Mpwapwa in Dodoma Region, and Kilimatinde (5°51'0.00"S, 34°56'60.00"E). The old slave route thus crosses through some of the semi arid and arid areas of Tanzania that are mapped as suitable and/or available for bioenergy crop production. It is important that possible investors in the area act in respect of such important historical memories.

#### *Legal factors*

Before colonization all the land in Tanzania belonged to the various tribes. Within the tribal lands, the chiefs played an important role for the allocation of land in most tribes. In the Land Ordinance of 1923 (Revised laws of Tanzania), four years after the shift from German to British colonization, all land in Tanzania was declared as public land, and since that time the governor and later the president has had the superior control over and responsibility of land rights in the country (Tsikata 2003). The colonial agricultural policy encouraged the establishment of large-scale plantation agriculture by foreign corporations and white settlers, and large tracts of land were thus allocated for export crops. At independence, freehold tenures were converted into 99-year leases (Mtetewaunga 1985). The socialist development policy from the 1970's has also influenced the land rights in Tanzania. Nine million people were moved from their land and resettled in planned villages

<sup>23</sup> Media Africa, Sub-Saharan Africa Land Report 30. Aug.-30.September 2006 in BiblioLine Basic – Africa-Wide: NiPAD. [http://biblioline.nisc.com/scripts/login.dll?29092008094020\\_5](http://biblioline.nisc.com/scripts/login.dll?29092008094020_5)

<sup>24</sup> Nairobi the Daily Nation, 5.09.2006, in BiblioLine Basic – Africa-Wide: NiPAD. [http://biblioline.nisc.com/scripts/login.dll?29092008094020\\_5](http://biblioline.nisc.com/scripts/login.dll?29092008094020_5)

<sup>25</sup> [http://www.wfp.org/country\\_brief/indexcountry.asp?country=834](http://www.wfp.org/country_brief/indexcountry.asp?country=834)

<sup>26</sup> Personal communication, Estomih Sawe, TaTEDO, Tanzania

<sup>27</sup> <http://whc.unesco.org/en/tentativelists/2095/>

where social services would be provided, in order to do communal farming which was assumed to increase and rationalize production<sup>28</sup> (Tsikata 2003). On the other hand, large scale ranching under parastatal ownership was also encouraged.

According to Tsikata (2003), both small and large scale producers benefited somewhat from the reforms in terms of access to land and inputs, although the policies did not reverse the distribution patterns established in the colonial period. Village authorities later started to reallocate land from communal ownership to favourite villagers without consideration of those who had lived on the land before the resettlements. Some cases were taken to court, and some of these were successful. Many similar cases then followed, but no clear answers were given to the land allocation problems. The land ownership has continued to be a source of friction in Tanzania, both between families, communities, civil society organizations and between communities and the state or public corporations. The rights of pastoralists are even weaker than the rights of small farmers, although some reforms have been undertaken to ensure the security of tenure for livestock-keepers in the country. Demand for land from urban dwellers and encroachment by cultivators on grazing land has also influenced the availability of sufficient grazing land (Derman et al. 2007).

The National Land Policy from 1995 and the following Land Act of 1999 and Village Land Act of 1999 have been key land reform milestones in Tanzania. These distinguish between the land under the authority of central government and land under the authority of village governments. They recognize customary rights in land and allow for registration of these rights, but the implications of the new policy are still unclear, as there are limited government resources for the implementation and follow-up of the acts. The laws provide protection for common properties and simplified registration processes, but the wider government policy is ambivalent. Some departments are accused for attempting to bring large tracts of common land properties for investment purposes, and an amendment to the Land Act from 2001 strengthens such interests. One of the objectives for the amendment was stated as “allowing for and regulation of sale of bare land”<sup>29</sup>. This has been argued by the Government to be in line with the Poverty Reduction Strategy and supported by the private sector and the donor community, including the World Bank and Hernando de Soto’s Institute for Liberty and Democracy. However, the Government and also Village Councils and Assemblies are accused for letting the rights of peasants, artisanal miners, pastoralists and other smallholder producers remain marginalised<sup>6</sup> (Tsikata 2003). Some aspects of the rights of women to ownership and use of land have been well addressed in the Tanzanian land policy and law. However, the implementation of these laws has not come far, and in practice women continue to be discriminated against in land tenure issues, so that women’s land rights remain especially insecure<sup>30</sup>. Furthermore, it is still expensive, time consuming and complicated for the population in informal sector and with customary land tenure on their property to get public land titles. In this situation of land insecurity for large groups of the population, large scale bioenergy crop investments run the risk of adding to the threats to the land rights for those who are already vulnerable.

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<sup>28</sup> Cultural Survival 1999. Dispossession and land tenure in Tanzania: What hope from the courts? <http://www.culturalsurvival.org/print/3418>

<sup>29</sup> Independent Land Newsletter (August 2004) – Eastern Africa. Struggling with land reform issues in Eastern Africa today. Edited by Nelson Marongwe and Robin Palmer. <http://www.oxfam.org.uk/resources/learning/landrights/east.html>

<sup>30</sup> Independent Review Land Issues, 2004□5, Volume II, Issue 2 (Eastern Africa), December 2005. <http://www.oxfam.org.uk/resources/learning/landrights/horn.html>

### 3.6 Zambia

#### *Political factors*

There are no violent conflicts in Zambia.<sup>31</sup>

#### *Cultural factors*

The country has ancient ruins, rock-art sites, historic sites, cultural landscapes, historic towns, and archaeological sites<sup>32</sup>, and some of these are located in the semi-arid areas of Zimbabwe. Several of the sites are conserved under the *Zambian National Heritage Conservation Commission Act*<sup>33</sup>. In Lusaka District there are rock engravings lying within a 0,8 km radius of Ayrshire Farm within an area of approximately 202,3 hectares. And near the boundary of Livingstone Municipality (17°50'30.29"S, 25°48'59.80"E) and the Maramba River there is a fenced area of approximately 0,2 hectares in extent forming part of the first stratified site of the Middle Pleistocene Hope Fountain culture in Southern Africa. At this location there is also a fenced area of approximately 0,8 hectares in extent with a home and workshop site of the Great Handaxe Culture. A site which was an important village and burial ground from the seventh to the eleventh century A.D. is situated on the top of the hill known as Ingombe Ilede near Lusitu in the Gwembe District of the Southern Province (16°11'S, 28°19'E). The circular area of approximately 1,4 hectares in extent is one of the most important archaeological sites in Zambia, and many richly adorned skeletons have been recovered from the hill. The ancient village was trading copper and ivory for luxuries imported from the east coast of Africa. (All of the sites described here are in the semi-arid areas of Zambia, and they are possibly in the spots that are marked as available for bioenergy crop production in the maps.)

#### *Legal factors*

Before the coming of European settlers to Zambia, land was held under customary tenure, but with the Europeans, there was an introduction of freehold and leasehold tenure systems<sup>34</sup>. Upon liberation in 1964, Zambia inherited the distribution of land established by the colonial authorities and the two main forms of tenure (formal or statutory or leasehold, and customary or traditional or indigenous). In 1995 the country created a Land Act, and according to Mpundu (2007) it was a controversial piece of legislation which sought to roll back socialist land laws from the previous decades and liberalise the land market with an aim to increase productivity and attract domestic and foreign investments. The Act's main provision was that land could now be bought and sold on the open market. It eased restrictions on foreigners buying up land and allowed both Zambian and foreign investors to acquire private titles to previously customary land by converting it to leasehold land. However, the procedure for acquiring a title deed was still long and complicated for the applicant, involving a host of local and national entities.

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<sup>31</sup> The Chronic Poverty Report 2008-09: Escaping Poverty Traps, Chronic Poverty Research Centre, <http://www.chronicpoverty.org/cpra-report-0809.php>

<sup>32</sup> <http://www.international.icomos.org/risk/2001/zamb2001.htm#>

<sup>33</sup> The Zambian National Heritage Conservation Commission Act, [www.parliament.gov.zm/downloads/VOLUME%2012.pdf](http://www.parliament.gov.zm/downloads/VOLUME%2012.pdf)

<sup>34</sup> Draft land administration and management policy, Ministry of Lands, Government of Zambia, <http://www.sarpn.org.za/documents/d0002601/index.php>

According to Sjaastad (1998), this complicated procedure has been among the reasons for so-called land grabbing on traditional lands by government officials and businessmen, which emerged as a serious problem in the late 1980s. The opportunities for smallholders to resist such practices have been constrained by lack of economic resources, time, knowledge and contacts. Corruption both at the local and national levels of government and legal institutions has added to these problems (Sjaastad 1998). These actors have been better placed than smallholders to take advantage of the system. Customary land where titles do not exist comprises the majority of land in Zambia (around 90 per cent by some estimates), and the allocation and use of these lands are to a large extent administered by local chiefs and headmen on behalf of tribal communities, but not always for the best of the local smallholder families (Mpundu 2007). Moreover, customary laws governing land management are coming into conflict with modern statutory laws that aim to put land on the market. According to Sjaastad (1998) there is a real danger that the most relevant effect of the Land Act from 1995 is to “facilitate the acquisition of traditional lands by resourceful individuals in business and government”, rather than mobilize smallholders whose livelihoods depend on the land.

An example of a land dispute is in the village Kabanje where over 100 families and 17,000 cattle in the village face eviction from their homes and cattle sheds because Zambia Sugar Plc, a private firm, is claiming to have title deeds to the land. Such tensions between customary and private land rights are occurring in different parts of Zambia, and they have been sharpened by the liberalisation of land markets, which has led to the buying up of land by wealthy Zambians and foreign investors. This is land which has previously been held under customary tenancy by the rural poor (Mpundu 2007). The liberalisation of land markets has been promoted by international donors as a condition for debt relief. Another problem related to the allocation of land in Zambia is that the land which is leased from the state for commercial farms has a superior location compared to the customary land - on good soils close the major roads and the line of rail (Sjaastad 1998).

In 2006, the Government of Zambia released a Draft Land Administration and Management Policy, with the aim to address the problems resulting from the existing policy. This draft has been commented on by different organisations, including Zambia Land Alliance (ZLA) working together with forty different Civil Society Organisations. ZLA has released a Land Policy Options Paper, which emphasises the need for creating a land policy that promotes poverty reduction and development. The organisations point out that gender disparities, the lack of fairness in land distribution, and the lack of participation and transparency in land administration are issues that need to be addressed in the land policy.<sup>35</sup>

The Lozi people lives in western Zambia, on the floodplains by the Zambezi River, and they rely on agriculture and livestock. Twice a year the river floods and many of the Lozi people migrate with their cattle to higher ground in Limulunga (Taylor 2006). (This area is possibly overlapping with the area identified as available for bioenergy crop production.) Land that might seem available could be important seasonal grazing land for the livestock of the Lozi people (The Diagram Group 2000).

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<sup>35</sup> Southern African Regional Poverty Network: Land policy options for development and poverty reduction. <http://www.sarpn.org.za/documents/d0002993/index.php>

### 3.7 Botswana

#### *Political factors*

Botswana is considered a peaceful country with the continent's longest continuous multiparty democracy. However, tension in Botswana's neighboring country, Zimbabwe, has led to an increase of Zimbabweans crossing the border at undesignated entry points. Due to the high number of immigrants, the Botswanian government has put up a temporary refugee camp inside the Center for Illegal Immigrants in Francistown, where the newly arrived refugees are screened before they are sent to Dukwi Camp (20°35'0.31"S, 26°24'59.97"E), near Moseitse (20°39'34.89"S, 26°38'56.94"E). Under normal circumstances, Botswana accommodates hundreds of refugees and asylum seekers at the camp<sup>36</sup>, which has a capacity of 50,000 people, according to United Nations High Commissioner for Refugees (UNHCR)<sup>37</sup>. Refugees cross the borders from Zimbabwe to Botswana for example in the border area at Maitengwe<sup>38</sup> (20° 7'4.08"S, 27°12'56.88"E). If the situation in Zimbabwe continues, it may possibly influence the confidence of those interested in investing in bioenergy crop production in parts of the border area between Zimbabwe and Botswana.

#### *Cultural factors*

North West in Botswana are The Hills of Tsodilo (S18 45, E21 48), 53km southwest of Shakawe), a 22 square kilometre area containing over 4,500 rock paintings, which is one of the greatest concentrations of rock paintings in the world. These hills are now a UNESCO world heritage site<sup>39</sup>. Investments in bioenergy crop production in the areas near the hills should respect this important cultural heritage. In South Eastern Botswana a number of Iron Age settlement sites have been discovered. One of them is the Toutswe Mongala Hill Iron Age settlements, situated 50 kilometers north of the city Palapye (S22 14, E27 12). The flat top hill rises 50 meters above the surrounding area and there are house floors and burials dating from 7<sup>th</sup> to 19<sup>th</sup> century AD<sup>40</sup> in the area. Broadhurst Iron Age settlement is another example located 6 km northeast of Gaborone, which dates back to 14<sup>th</sup> century AD (Denbow 1981).<sup>41</sup>

#### *Legal factors*

Botswana predominantly faced indirect colonial rule and received few European farmers compared to African countries where colonizing nations permanently settled the colonial territory. The extreme concentration of people on small lands was thus not created in Botswana. However, smallholder farmers' and livestock keepers' access to land is restricted in different geographical areas, and the best lands have been assigned to white farmers. 6% of the country is largely land that was granted to white settler commercial livestock farmers (Molomo 2008). The land was communally held historically, and chiefs and sub-chiefs allocated the land. During British rule, particular tribes were given land, and tribal groups, especially nomadic people were marginalized.

<sup>36</sup> <http://allafrica.com/stories/200805051093.html>

<sup>37</sup> <http://www.reliefweb.int/rw/rwb.nsf/db900sid/LPAA-7GRJN3?OpenDocument&rc=1&cc=zwe>

<sup>38</sup> United States Department of State - Humanitarian Information Unit (HIU)

<http://www.reliefweb.int/rw/rwb.nsf/db900SID/CJCN-7JLM9S?OpenDocument&rc=1&cc=bwa>

<sup>39</sup> <http://whc.unesco.org/en/list/1021>

<sup>40</sup> <http://whc.unesco.org/en/tentativelists/1340/> available 29th September 2008

<sup>41</sup> Personal communication, Dr S.O. Keitumetse, University of Botswana

Local groups have been denied access to their traditional land, even though the national constitution has guaranteed the people to live there in perpetuity. Communal land, is often referred to as a social safety net for the majority of the rural people, and is important in sustaining rural livelihoods. According to Adams and Palmer (2007), Botswana has a well-defined land policy and legislation and adherence to the rule of law. However, the current land laws are criticized for maintaining the unequal access to land for different ethnic groups that was created during colonial influence. The country has land-related tensions and local conflicts, often related to issues of ethnicity.

The existing land policy is accused for imposing dominant Tswana cultural dominance over other cultural groups (Molomo 2008). Ethnic minorities are challenging the policies, and ethnic associations have been organized to demand the right to land. Moreover, the policy of enclosing communal rangeland for development of TGLP farms (the Tribal Grazing Land Policy introduced in 1995), Wildlife Management Areas, and tourism, has affected an estimated 20 000 people, by taking away their rights to utilize or occupy the land (Mutangadura 2007, Molomo 2008), and conflicts have sometimes risen. Allegations of corrupt allocation are sometimes examined by commissions of inquiry, in the courts and the Land Tribunal. In 2007, two Kgalagadi community trusts challenged the decision of the Botswanean Land Board to lease what they consider to be their communal grazing land to two foreign-owned companies (Adams and Palmer 2007). In order to carry out potential investments in respect of the rights to and needs for land, including communal land for the poor and marginalized, the government and potential investors should impose constraints on their own activities.

### 3.8 South Africa

#### *Political factors*

There is some influx of political and economic refugees from Zimbabwe into white owned commercial farms bordering the Limpopo river. (In some parts of the country there have been sporadic mob attacks against migrant workers and families from neighbouring countries, for example in the black townships around Johannesburg, Durban and Cape Town, such as Masiphumelele (34° 7'45.16"S, 18°22'34.24"E).<sup>42,43,44,45</sup> However, since these attacks have mostly been going on in urban and peri-urban areas, they are not very likely to influence investments in bioenergy crop production in South Africa.) There have also for many years been sporadic attacks, such as murder, robbery, rape, and inflicting bodily harm against white farmers in all provinces of the country (James 2007).<sup>46</sup>

#### *Cultural factors*

In the provinces of Gauteng and North West is the cultural heritage site which in South Africa is called the Cradle of Humankind (25° 55' 45" S 27° 47' 20" E).<sup>47</sup> (Gauteng seems to be in an area that is mostly unavailable and/or unsuitable for bioenergy crop production). These areas has one of the world's richest concentrations of hominid fossils,

<sup>42</sup> <http://www.socialistparty.org.uk/articles/4165>

<sup>43</sup> <http://www.globalexchange.org/countries/africa/southafrica/5670.html>

<sup>44</sup> [http://www.iol.co.za/index.php?set\\_id=1&click\\_id=3069&art\\_id=vn20081201052650486C558966](http://www.iol.co.za/index.php?set_id=1&click_id=3069&art_id=vn20081201052650486C558966)

<sup>45</sup> [http://www.iol.co.za/index.php?set\\_id=1&click\\_id=3069&art\\_id=vn20081016113827555C188775](http://www.iol.co.za/index.php?set_id=1&click_id=3069&art_id=vn20081016113827555C188775)

<sup>46</sup> <http://www.issafrica.org/images/menu/mnuresearch/page.gif>

<sup>47</sup> <http://www.southafrica.info/about/history/worldheritagesites.htm#rob>

representing evidence of human evolution over the last 3.5-million years, and the fossil sites cover an area of 47 000 hectares. The fossils, which are remains of ancient forms of animals, plants and hominids are captured in a bed of dolomite deposited 2.5-billion years ago. Also other sites in South Africa have similar remains, such as areas around Karoo National Park (32°21'0"S 22°35'0"E), and in Erfkroon (28° 52' S, 25° 36' E), which is named after the farm where most of the site is situated (Churchill et al. 2000). Moreover, famous records of hominid teeth come from the Plio-Pleistocene site of Gondolin (Wood and Richmond 2000).

In Northern Cape (28° 36' S, 17° 12' 14" E), the Richtersveld Cultural and Botanical Landscape covers 160 000 hectares of dramatic mountainous desert in the north-west part of South Africa. The land also contains extensive communal grazed lands, bearing testimony to land management processes which have ensured the protection of the succulent Karoo vegetation, according to the World Heritage Committee<sup>47</sup>. "This demonstrates a harmonious interaction between people and the land. The site is owned and managed by a community that until recently had very little to call its own, the Nama people, with their semi-nomadic pastoral livelihood. The area was returned to their ownership a few years ago, under South Africa's land restitution programme, and today, the Nama have managed to find the balance between the continuation of their ancient pastoral lifestyle and the needs of conservation to maintain the health of the land. They still practice seasonal migration between stock-posts, using and building traditional portable rush-mat houses<sup>47</sup>.

The rural communities in Venda and neighbouring Lebowa are still very traditional. In addition to ruins and burial sites, scattered throughout the landscape, are individual trees that have immense cultural value because they are used in order to hold community meetings under, or have medicinal and/or magical properties. These are factors that are likely to be relevant in several of the areas identified as suitable for bioenergy crop production in arid and semi-arid areas in South Africa. Therefore, before deciding to convert surrounding land that appears to be available to bioenergy crops, one would need to meet with key traditional figures to ascertain if the land is indeed available.

### *Legal factors*

The land acts of South Africa from 1913 and 1936 aimed to prohibit Africans from holding and owning land in the country, and divided the land into large areas controlled by the white minority, and areas called Bantustans, or "homelands", ruled by government endorsed chiefs, for the overwhelming black minority. The areas that were defined as white owned areas comprised nearly 87% of the territory, and state driven removals and relocations of black people from this land was carried out during several decades, and reached their peak in the 1970s (James 2007). It is estimated that in the period between 1960 and 1980, 3,5 million black people were relocated from White South Africa to the "homelands". At the same time, parts of the black rural population lived in the so-called white owned farming areas working as labour tenants in exchange for a piece of land to cultivate, and in rare cases for rent, but under the risk of being evicted, or under so intolerable conditions that they attempted to move to the traditional areas. As agriculture got modernized, black people were increasingly used as very low-paid farmworkers, sometimes with a right to land (Andrew 2007).

In addition, the 1927 Native Administrative Act defined women as subordinate to men and unworthy of owning property, and African women were even assigned a permanent status of “minor” in law. In addition, in the traditional agrarian society women represented labour power and property to be controlled through marriage. Still today women have access to very little land in their own right despite their clear demand for more land, and despite doing an important part of the agricultural labour in the country. Research shows that land related demands rank high in women’s aspirations to improve and stabilize their lives (Andrew 2007). Although a new Constitution and land reform programme exist that are committed to helping women attain their rights in land, the legislation and institutions from the apartheid area as well as customary law still influence the practices in the countryside, according to Andrew (2007).

Wegerif (2004) points out that in 1996 less than 1% of the population in South Africa owned and controlled over 80% of the farm land, and these owners were part of the population classified as white. The 76,7% of the South African population that was classified as African had access to less than 15% of the agricultural land in the country. In addition, their access to land was mostly without clear ownership or legally recognized rights.

In the early 1990s, the World Bank and other advisors in South Africa argued for land reform based on the arguments that land reform could be important for boosting economic growth and alleviating poverty. They also wanted to avoid peasant rebellion in the rural areas (Binswanger and Deininger 1993: 1466, in Andrew 2007). The first non-racial democratically elected government in South Africa adopted a market-based approach to land reform. This means that land could be purchased at market rates, from land owners who agreed to sell – the so called “willing seller, willing buyer” option. The land reform plans comprised three main programs: restitution, tenure reform and redistribution (Wegerif 2004). Land restitution is the issue of giving back land rights to persons or communities who can prove that they were dispossessed of such rights after 19 June 1913 due to racist laws or policies of former governments. Land redistribution is to enable citizens to gain access to land on equitable basis. Land tenure reform is to provide secure tenure to those whose tenure is insecure as a result of discriminatory laws and practices. These are people who live on communal lands or people who are farm dwellers on commercial farms.

The White Paper on South African Land Policy 1997 recognised underlying land-rights of individuals and groups living on state owned land (Wisborg 2002). In the first period of the redistribution program, from 1995, poor farmers were assisted with land purchases. From 2002 there was more emphasis on creating black commercial farmers. Critics have claimed that the land reform will merely change the racial composition of land owners, and will benefit only a minority of the already privileged. Criticism has also been raised because of the lack of mechanisms to ensure that women benefit from the reform, the willing-seller approach that allows land owners to continue dictating the availability of land, and the lack of a role for local government (Wegerif 2004).

There have been big expectations for land reform among the black population in South Africa after the end of the Apartheid period, and ambitious plans for land reform have been designed and planned by South Africa’s planners, lawyers, legislators, and NGO’s in order to address the complex need and demand for restitution, redistribution and tenure reform (James 2007). They also recognized that legislation alone would not suffice but that

institutions enabling mediation and conflict resolution would have to be put in place (Claassens 2000, and Cousins 2002 in James 2007). Some such institutions have been created, for example the Land Bank, which provides financing for rural development and poverty alleviation (de Villiers 2003). However, the implementation of the land reform is still limited, and according to Wisborg (2007), the inequality in land ownership remains extreme. In 2007 approximately 80% of the agricultural land was still held by whites (Thwala and Khosa 2008, in Clover and Eriksen 2009), although 1,2 million people had benefited from the land reform programme. Nevertheless, some experts argue that the implementation of land reform must not be hasty and unrealistic regarding time schedules, because it may create failure and new problems (De Villiers 2003).

In conclusion, the situation of land tenure in South Africa is still unclear. In addition, a lack of mutual understanding across the racial frontier is influencing the situation, and sometimes this leads to violent attacks on white farmers or violent evictions of black farm workers. In this complicated and undetermined context, the allocation of land for the growing of bioenergy crops may be hindered by uncertainty in land ownership of suitable land, and on the other hand it can also become a hindrance for improved land tenure rights for poor and marginalized groups who are living on land that they do not own. Bioenergy crop production may become a disturbance of poor group's use of land as a means to their livelihoods, and more than 70% of the poor still live in rural areas (de Villiers 2003).

#### 4. CNR 2008 Activities (Submitted by Prof Gabriele Ristori)

Ristori (2009) asserts that an important issue to be taken into account for assessing the suitability of an agro-ecological zone in the tropics, for growing a specific crop (no matter be it a food crop or bio-fuel crop), under **rain-fed** condition, is the **Length of growing period (Lgp)** for annual crop, taken as the period during which the soil profile remains humid and temperature permits crop growth. A crop cannot ripen under rain –fed conditions, if Lgp does not allow it to complete its vegetative cycle. The FAO subdivision of Drylands according Lgp is therefore very appropriate: **Hyperarid**, Lgp = 0, **Arid**; Lgp 1-59 days; **Semi-arid**, Lgp 60-119 days; **Dry-sub-humid** Lgp 120-179 days. These classes, except Hyperarid, are included in Drylands.

Table 4 shows the proportion of dryland categories based on Lgp represented in the COMPETE eight case study countries. The term "Dryland" includes dry-sub-humid areas. COMPETE's focus on arid and semi-arid regions rather than on "Drylands", and Watson's (2008) strict adherence to this focus (refer Table 1) means that most of Zambia and Tanzania (including areas where *Jatropha* and sweet sorghum are currently grown), are outside of the scope of interest of the COMPETE project. Noting that dry-sub-humid areas cover about 87 and 45 % of these countries respectively, Ristori (2009) argues that it is more appropriate for COMPETE to focus on Drylands. If Ristori can assist Watson in obtaining the shape files for these dryland areas, the GIS exercise of filtering out areas with biophysical and non-biophysical constraints, can be repeated.

Table 4: Proportions of Dryland categories based on length of growing period in the eight case study countries as % of country and area in 1000 km<sup>2</sup>. Compiled by Ristori (2009) based on FAO data.

Country	Hyper Arid		Arid		Semi-arid		Dry-sub-humid	
	%	Kms <sup>2</sup>	%	Kms <sup>2</sup>	%	Kms <sup>2</sup>	%	Kms <sup>2</sup>
Senegal	0	0	0	0	46	91	54	106
Burkino Faso	0	0	0	0	20	56	66	182
Mali	51	625	11	130	19	234	18	221
Kenya	11	64	19	111	31	178	18	100
Tanzania	0	0	0	0	2	14	45	395
Zambia	0	0	0	0	0	2	87	643
Botswana	57	342	11	62	31	186	2	10
South Africa	41	504	4	55	15	182	18	214

Figure 3 shows the extent to which the eight case study countries are inherently constrained by soil characteristics. In the areas of interest the most common constraints are to be ascribed to the very low overall fertility of Arenosols and to poor physical properties of Luvisols (often crusting soils) and Vertisols (shrink-swelling clay soils) that, if not appropriately managed, can hinder seeds emergency and plants rooting, and are prone to erosion, flooding and runoff. Of course for an exhaustive assessment of a soil suitability for a specific crop in a specific area a careful *in situ* survey and monitoring is needed. However, in general terms, it can be assumed that if an area in Dryland is suitable for food crops, from the soil fertility point of view, it can also be appropriate for less demanding bio-fuel crops (Jatropha, Sweet sorghum), particularly for non – commercial farming.

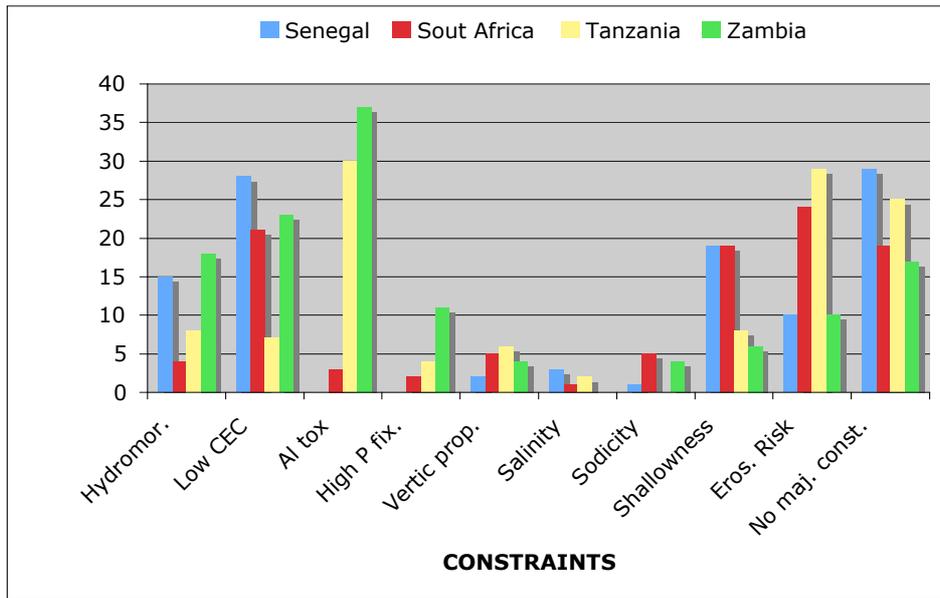
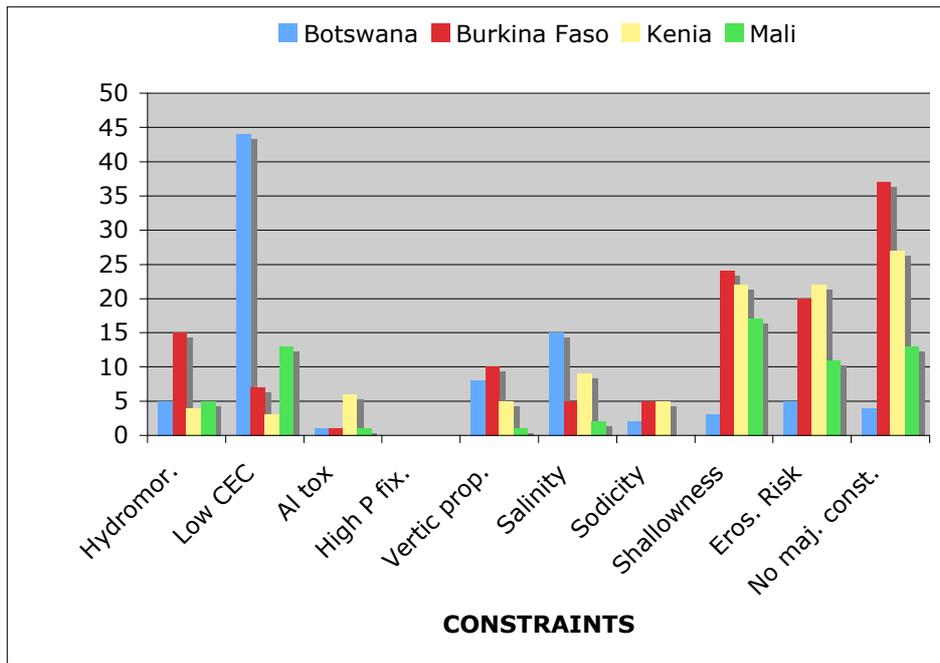


Figure 3: extent to which the eight case study countries are inherently constrained by soil characteristics (Ristori, 2009).

Figure 4 shows that land degradation (mostly due to overgrazing) is a serious problem in the eight case study countries.

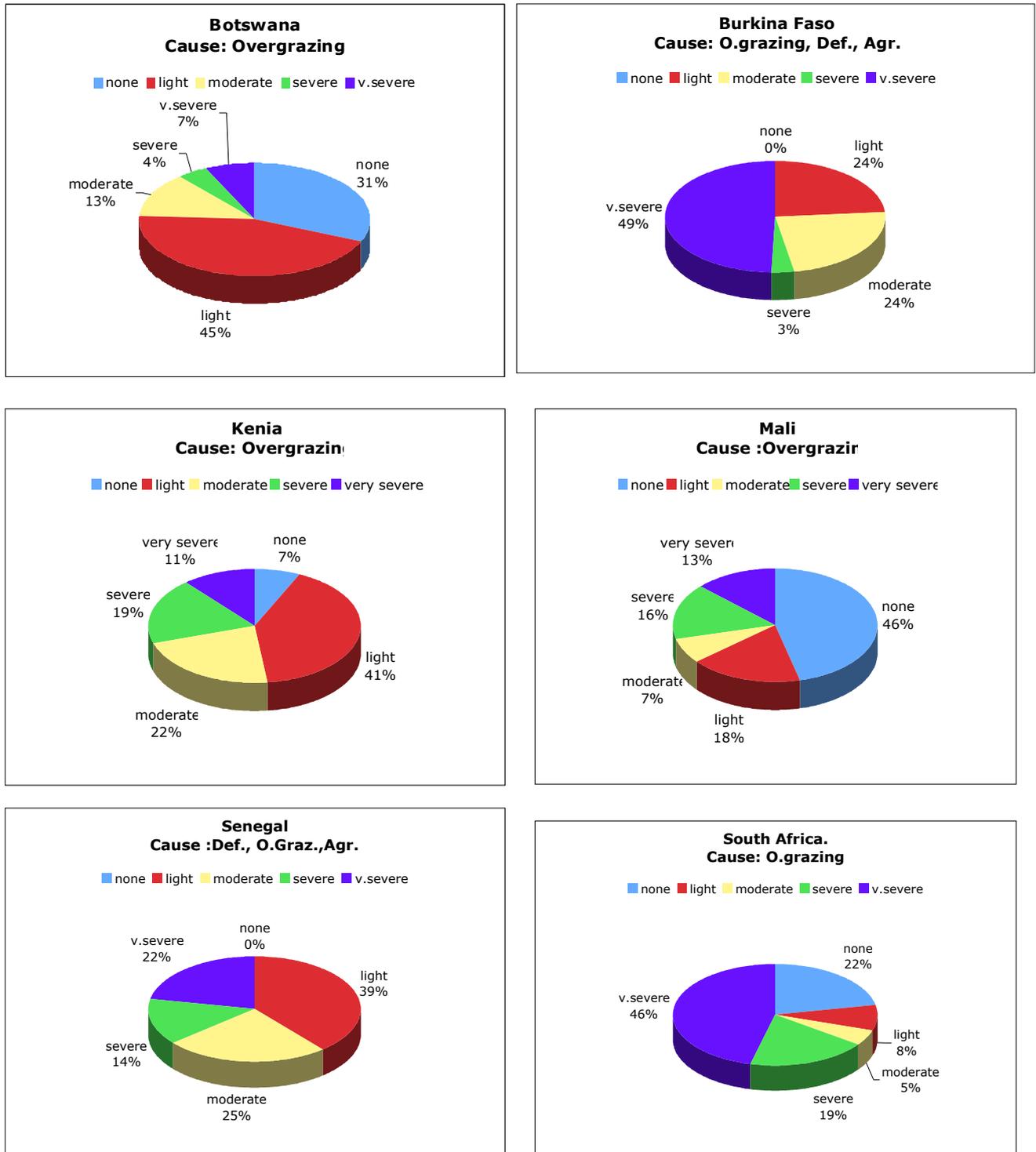


Figure 4 a: Proportions of categories of land degradation (mostly due to overgrazing in case study countries (Ristori, 2009).

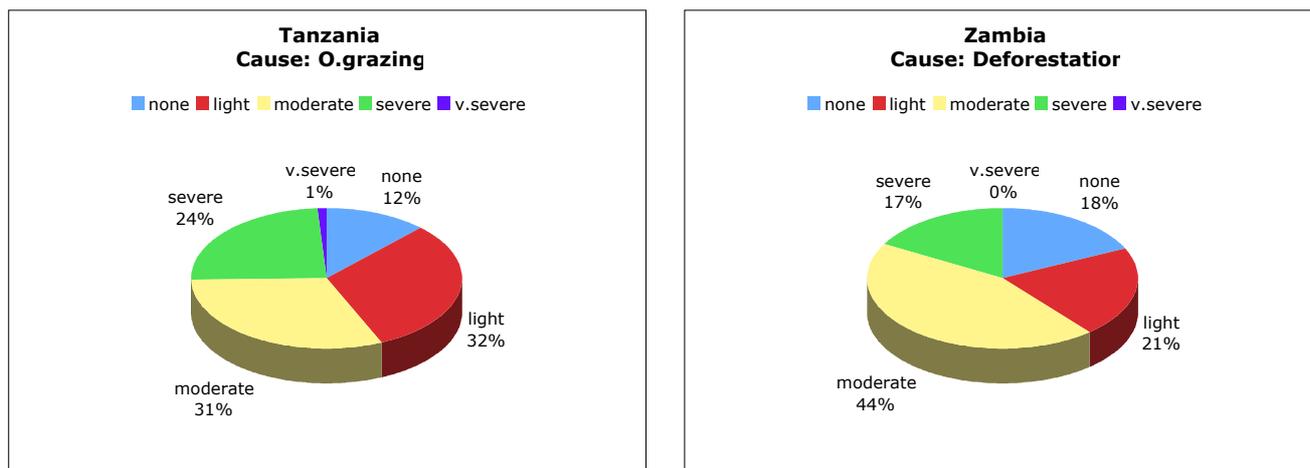


Figure 4 b: Proportions of categories of land degradation (mostly due to overgrazing in case study countries (Ristori, 2009).

Soil organic matter is primarily affected and it is generally believed that rapid microbial decomposition, due to high temperatures, is responsible for low organic Carbon levels (generally less than 0.8%) in tropical Drylands soils. However, photochemical decomposition could be an important, additional factor since intensity of sunlight in these areas is high and soils remain barren and exposed for much of the year. Moreover the real content of active organic Carbon can be even lower, because the presence of Charcoal, a short and mid-term inert material, that can account in some Dryland areas, for more than 50% of resulting organic soil Carbon, because field and pastures burning is a common practice considered a mean to increase soil productivity. It can be expected that an appropriate introduction and management of bio-fuel crops can successfully contrast land degradation particularly by returning crops residues to soil, thus improving soil organic Carbon content, quality and turnover.

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