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Policy: The journal publishes articles about the recent research achievements within the Development Studies, Environmental Studies, and Foresight. The goal of this journal is to track the development tendency of these fields of expertise and to make contributions to the development of the subjects.

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Front page: This satellite image shows an area 13 km east of the city of Mafraq in northern Jordan. Sitting geologically between the Syrian Desert and volcanic Hauran plateau, the area experiences a desert climate. The light-coloured area is the Zaatari Refugee Camp, measuring some 3 km across. Located just over 10 km from the border with Syria, the camp is currently home to over 100 000 people displaced by the conflict in the neighbouring country. This image was acquired on 5 June 2013 by the Korea Aerospace Research Institute's Kompsat-2 satellite.

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DEF journal

What do young and brilliant minds think about Development, Environment and Foresight?

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Dear colleagues,

You have the opportunity to read the fourth issue of the Development, Environment and Foresight journal, published by the Department of Development Studies at Palacký University, Olomouc, Czech Republic.

Albert Einstein once said, "No problem can be solved from the same level of consciousness that created it."; to honour his quote, we have decided to dedicate this issue to our young colleagues, PhD candidates and students, as we strongly believe that there is potential in their work and their ideas. Therefore, you will find three papers in this issue, written by brilliant young minds in the areas of development, environment and foresight.

In the first paper Chukwudi Nwaogu and his colleagues focused on the sustainable agroecosystem management of maize in the Sub-Saharan region. Based on their research, the appropriate soil resource management processes have been demonstrated to be catalysts in restoring soil fertility and increasing food productivity in the area of Guinea Savannah.

The second paper, authored by Lenka Voleníková and Zdeněk Opršal, describes the role of urban agriculture in household wellbeing and uses the case study of community-based urban agriculture in Ndola, Zambia. Although urban agriculture has attracted the attention of various scholars in recent years, there are relatively few studies from the region of southern Africa. In the paper the authors confirm the positive influence of urban agriculture on household wellbeing.

The last paper of this issue is authored by our first year student from the International Development Studies Bachelor programme, Anna Lodinová. In her essay she has focused on the application of biometrics as a means of refugee registration by the UNHCR. Anna concludes her essay by saying that the application of biometrics to the registration of refugee and asylum seekers has markedly improved national and international efforts to promote their welfare, and the impact has been felt directly (refugee camps) and indirectly (addressing fraud and security concerns). Nevertheless, this is also a means of personal information exposure, an opportunity for misuse and a possible weapon for enemies. Thus, the concerns that have been raised are justified and further debates, security measures and overall improvements should be made to the process, in order to eliminate defects.

With this issue we would like to motivate and invite other authors to contribute to the knowledge and expertise in the areas of development, environment and foresight by sending their submissions to the editorial board of the DEF journal. The aim of the journal is to cultivate academic discussion in the scope of the journal as well as beyond its borders.

I hope you enjoy reading this issue.

Jiří Pánek // member of the editorial board

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Soil dynamics, conservation and food supply in the grassland ecological zone of Sub-Sahara Africa: The need for sustainable agroecosystem management for maize (Zea mays)

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Abstract

To a large extent vegetation and its management determine soil quality and this consequently influences agricultural production. These factors and the links between them are among the primary bases for socioeconomic and environmental sustainability. Grassland is a key resource which is valuable for humans, animals and the environment in the supply of food, feed and other ecosystem services. The role played by the African savanna-grasslands can never be overemphasized. This paper focuses on agroecosystem management techniques and their effects on soil and on food provision in the Guinea savanna ecological belt of Nigeria. Firstly, the study analyzed reviews on the production trends in maize growing in Sub-Sahara Africa (SSA). Secondly, the authors carried out research which aimed at examining the variations in soil nutrients and crop yields as mediated by anthropogenic grassland management methods in the Northern Guinea savanna of Nigeria. Data were collected from four states (Niger, Kaduna, Bauchi and FCT-Abuja) located in the agro-ecological zone. In each state, four plots were designated as Plots 1, 2, 3 and 4, each representing one of the agro ecological practices of Fallow, Slash & Burn, Extensive Grazing, and Intensive Grazing. Topsoil (0-15cm) samples were collected from each plot and analyzed for their contents. Maize was cultivated and harvested over three growing seasons and the yield from each plot was measured. The results revealed that the extensive grazing plot produced the highest maize yield, while the slash and burn plot had the lowest. The effects of the soil nutrients as mediated by the treatments, significantly influenced the yield. It was recommended that Agricultural Extension Agents be deployed in the region in order to educate the rural farmers about the best management practices for increasing the food supply and achieving sustainable development.

Key words: Agroecosystem management, soil conservation, maize, Guinea savanna-grassland, Africa

Introduction

In many African and other developing countries there has been a rapid growth in population. Optimistically, this has required complementary sustainable increases in food production in order for these countries to attain food security. Unfortunately, at present there are serious threats to agriculture, mainly due to poor and unfavorable agroecosystem management techniques, which have reduced soil fertility and the productivity of agricultural land in these regions (Slaymaker, 2002).

Economic and environmental developments are significantly related to sustainable production, with the focus on the long-lasting agroecological sustainability of natural resources, especially soil, which is a primary source of food in resource-poor regions. In order to achieve global and regional goals in food security and poverty and mortality reduction, strategies are urgently needed to mollify soil degradation activities and restore the land's productive potential. This requires encouragement for the sustainable use of soil, vegetation and other related essential resources. Soil degradation in the grassland belts of Sub-Saharan Africa has strong adverse effects on agricultural production, rural livelihoods and food availability. Agriculturalists are key managers of global and local useable lands and they modify the soil and the vegetation cover (Tilman, 2002). Sustainable practices which help in promoting agroecological and ecosystem services are a priority if we are to meet the demands of improving yields without compromising soil and environmental potential and public health.

However, organic and inorganic fertilizers have significantly contributed to the green revolution by replenishing soil quality (Khan, 2007). But most developing countries import these fertilizers and they are often inadequately supplied; a major constraint for resource-poor farmers. The long-term application of fertilizers also poses a severe threat to the soil (Ahmed, 1995). Therefore, the intensification of agricultural production in these countries requires the introduction of sustainable agricultural practices in forage conservation, soil restoration (Pavlů et al, 2011) and productivity enhancement (Pavlů et al, 2013). This paper is divided into two parts: the review and the original research. The review section examined the trends and trajectories of maize production, particularly in Sub-Sahara Africa (SSA). Furthermore, the review identified some limitations to uniform, stable and increasing production in the region. The second section of the paper included the authors' own research, which consisted of a study of selected grassland management techniques and their impacts on soil nutrients and maize yields. There are many agro-management practices prevalent in the rural communities of Africa, but slash and burn, intensive and extensive grazing, and fallowing are primary practices in the Northern Guinea savannah and were applied in the study.

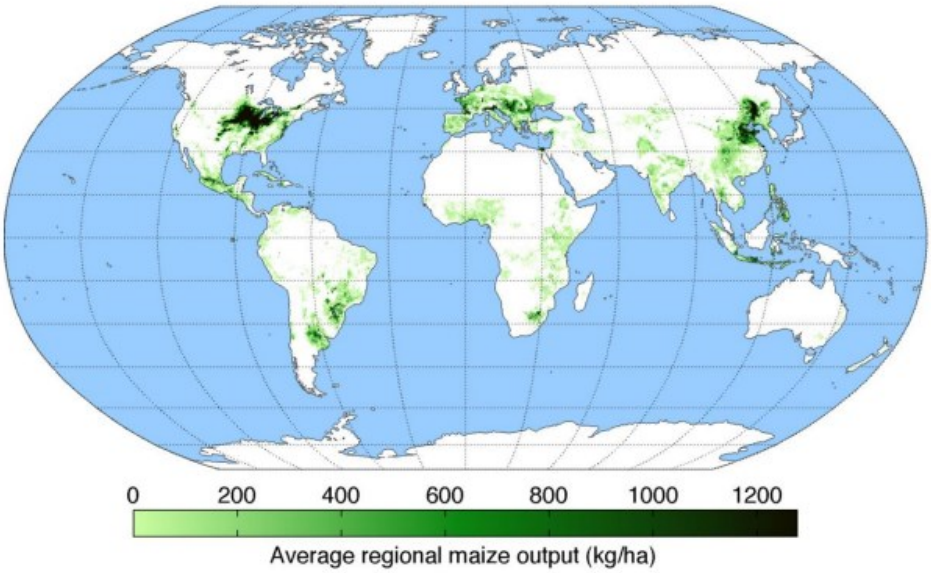
Historical and Global Trends in maize production and distribution

Maize was domesticated in the Tehuacan valley and the Balsas River Valley of Mexico about 9000 years ago. It then spread to Colombia ca. 5600BC. By the 5th century the entire

American continent had the cereal, and it was introduced to Europe through trade in the 6th century. Africa and Asia were among the continents where maize was cultivated in the late 16th and 17th centuries. There have been several varieties of maize, however, hybrid Genetically Modified strains of maize have been introduced and globally make up about 85% of the cereal, with the largest amount coming from the USA. On the African continent, Nigeria and South Africa top the list of maize production, while China dominates in Asia (Fig.1)

The worldwide production of maize is 785 million tons (per annum), with 42% coming from the largest producer, the United States. Africa produces 6.5% and the largest African producer is Nigeria with nearly 8 million tons, followed by South Africa. Africa imports 28% of its required maize from countries outside the continent. Most maize production in Africa is rain fed. Irregular rainfall can trigger famines during occasional droughts (Nwaogu, 2000).

Figure 1: World view of Maize production with Nigeria among the top in Sub-Saharan Africa (Source: FAO, 2013; Fischer,et al. 2014)



Sub-Saharan Africa: maize breeding, production and distribution

Sub-Saharan Africa (SSA) produced about 53 million tons (Mt) of maize annually from 2008 to 2010. The continent forms diverse regions which are divided by the Food and Agriculture Organization (FAO) into four sub-regions, with the major maize producing countries shown in Table 1 (Fig. 2). Maize is a staple food for many areas in eastern and southern Africa, and it is starting to be widely consumed in western and middle Africa. In general, maize remains a strategically essential food source for the SSA. A recent report indicated that the maize growing area is increasing in eastern (2.0% p.a.) and middle Africa (1.9% p.a.), is steady in western Africa and is declining in South Africa (–3.4% p.a.) (Ficher et al, 2014).

Maize, also called corn, is a cereal crop grown widely throughout the world in a range of agroecological environments. More maize is produced annually than any other grain. About 50 species exist and have various colours, textures, shapes and sizes. White, yellow and red are the most common types. The white and yellow varieties are preferred by most people, depending on which region they are from.

Maize production has a relatively long history in SSA. Maize was introduced to coastal Africa from the Americas in the 1500s and it was swiftly adopted, particularly in southern and eastern Africa. Subsequently, concerted breeding programs were established in some countries, resulting in the 1960 release in Zimbabwe of the world's first commercial single -cross hybrid, known as 'SR52. Thereafter, as development and research continued and the grains improved, two new natural heterotic groups were discovered in Kenya; (i) a local, large, white-grained synthetic cultivar, Kitale II; and (ii) a landrace, Ecuador 573, which was taken from South America to Kenya in 1959. It is important to note that this heterotic trend still forms the foundation of most Kenyan commercial maize breeding programs (Ficher et al, 2014).

Nowadays, maize breeding involved the integration of national research programs, international agricultural research centres and the commercial sector. Remarkably, most of the improved lowland tropical maize germplasm widely dominant in SSA (and suited to MME5 and MME6) originates from IITA (International Institute of Tropical Agriculture) in Nigeria. In Kenya, Zimbabwe and Ethiopia, the CIMMYT (Spanish:Centro Internacional de Mejoramiento de Maízy Trigo; English: International Maize and Wheat Improvement Centre) continues to carry out breeding programs and generates most of the mid-altitude tropical germplasm suited to MME1–4. It has been reported that hybrids constitute about 95% of all improved maize seed currently on the market (Langyintou, 2010). The cultivation of the F2 hybrid seed (the first progeny of the hybrid seed) by farmers can reach 50% in drought-vulnerable areas. In east Africa, especially Kenya and Malawi, the roles of Multinational and regional seed companies have been substantial.

On the other hand, in West Africa, the private seed sector is still developing rapidly. In this region, except for Nigeria, improved seed is still widely the domain of government parastatals and institutions. Nigeria has experienced a continuous and steady application of the hybrids marketed by private establishments.

According to the reports of Fischer, Byerlee and Edmeades: *"An increasing (and very appropriate) emphasis in breeding led by CIMMYT and IITA—and supported by the Bill and Melinda Gates Foundation—has been to improve the tolerance to drought and low nitrogen of hybrids and OPVs adapted to the broad agroecologies of SSA. Improvement in heat tolerance may also be critically important in the future"* (Ficher et al, 2014).

Figure 2: Major maize-growing regions of Sub-Saharan Africa.

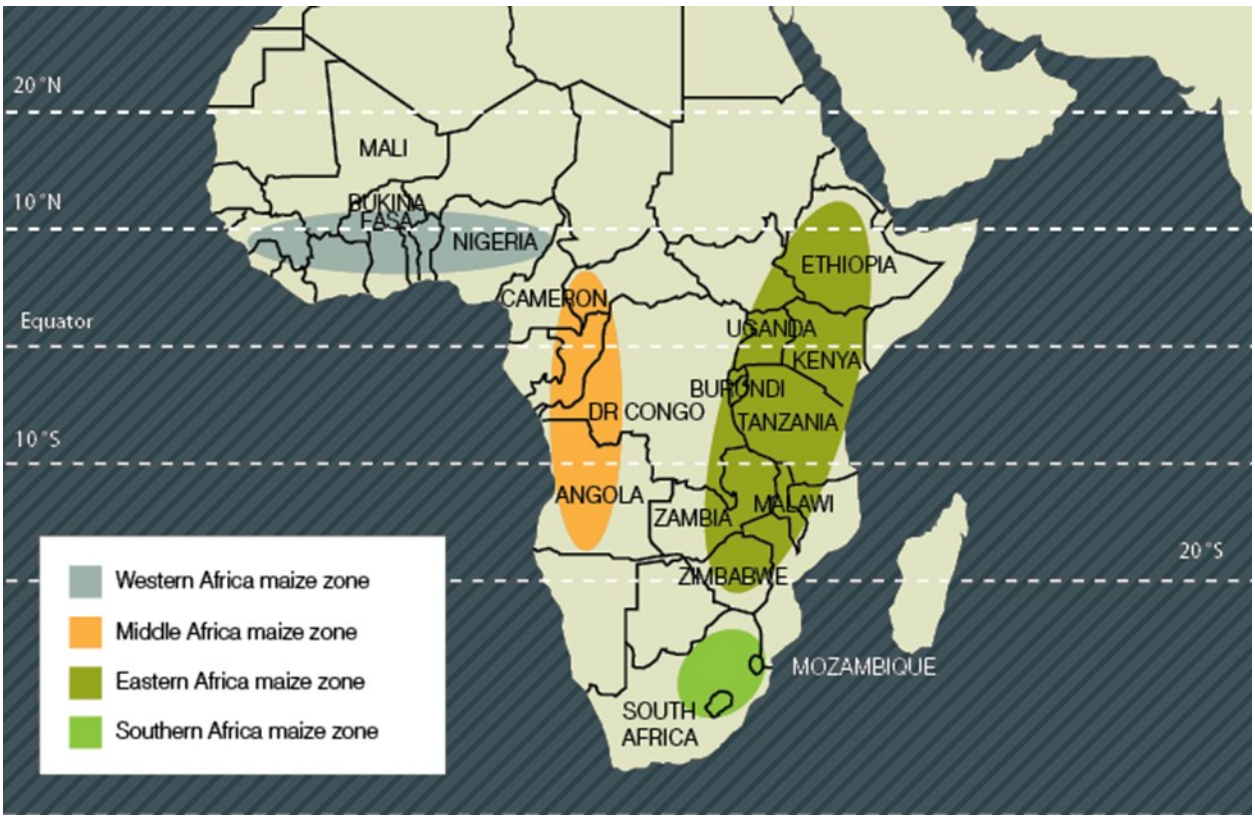


Table 1:Annual production, harvested area and farm yield (FY) data for maize in 2008–10 in selected countries of Sub-Saharan Africa, and changes in FY from 1991 to 2010, together with fertilizer applications to cropland (Source: FAOSTAT, 2013; Fischer,et al. 2014).

Country or Region	Average 2008–10			Farm yield (FY)		Coeff. Of variation (%)	Nutrients Applied[a] (kg/ha/yr)
	Production (M.tons)	Area (Mha)	Average 2008-10 (t/ha)	Gain/Year(1991-2010			
				(kg/ha)	(% of 2008-10)		
Kenya	2.8	1.9	1.5	ns −9	–0.6	13	27
Malawi	3.2	1.6	2	*47	2.4	23	29
Tanzania	4.5	3.3	1.3	ns −5	–0.4	48	5
Eastern Africa[b]	21.9	14.3	1.5	ns 13	0.8	10	10
Nigeria	7.5	3.8	2	***46	2.3	15	3
Ghana	1.7	0.9	1.8	***16	0.9	8	5
Western Africa[c]	14.7	8.3	1.8	***33	1.9	13	3
Cameroon	1.6	0.8	2	**31	1.6	19	8
DR Congo[d]	1.2	1.5	0.8	nd	nd	nd	1
Middle Africa[e]	4	4	1	***12	1.2	10	3
South Africa[f]	12.5	2.7	4.7	***142	3	23	116

**** P < 0.01, **0.01 < P < 0.05, *0.05 < P < 0.10, ns = P > 0.10*

a Ratio of nutrients applied (elemental nitrogen, phosphorus and potassium) to total cultivated area.

b Eastern Africa incorporates Burundi, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Somalia, Uganda, Tanzania, Zambia and Zimbabwe, each grows >0.1 Mt of maize annually.

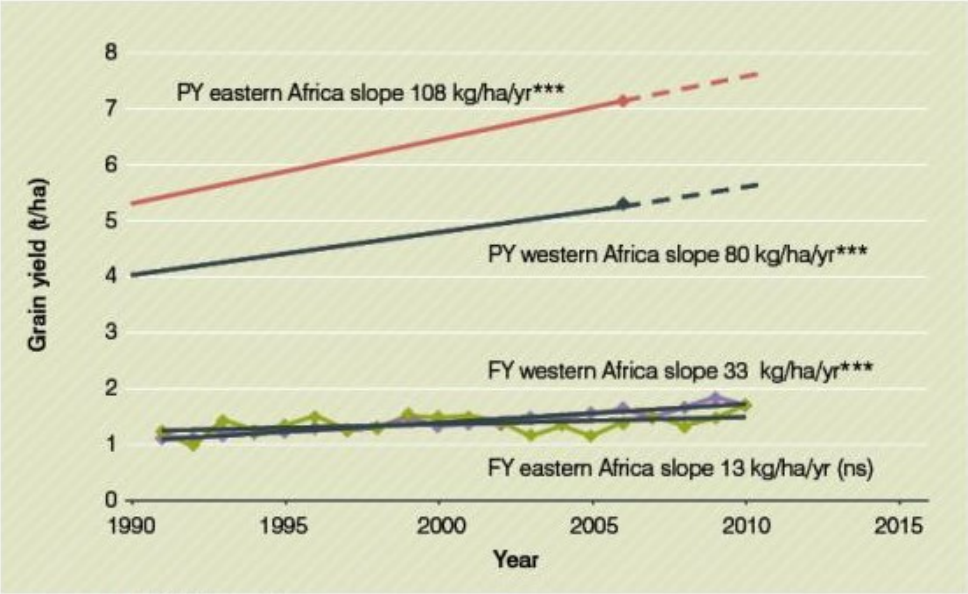
c Western Africa incorporates Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Liberia, Mali, Nigeria, Senegal and Togo, each grows >0.1 Mt of maize annually.

d nd = no reliable long-term data.

e Middle Africa incorporates Angola, Cameroon, Chad, Central African Republic, Democratic Republic of Congo (DR Congo), each grows >0.1 Mt of maize annually.

f South Africa produces 98% of the maize in southern Africa; the other countries in this region are Botswana, Lesotho, Namibia and Swaziland.

Figure 3: Farm yield (FY) for maize in Africa plotted against year, and potential yield (PY) plotted against year of release, from 1991 to 2010. PY progress is based on a 1.5% p.a. increase determined in 2006 vintage hybrids in eastern African mid-altitude zones and western Africa lowland tropics (see text) Source: FY from FAOSTAT (2013).



*ns = P > 0.10, ***P < 0.01*

Information from figure 5.4 revealed that there have been inequalities in the production of maize in Sub-Sahara Africa (SSA). However, there have been increased potential yields (PY) in the region but low farm yields (FY) have been recorded in West and East Africa over the past decade. Several biophysical and socioeconomic factors, including management systems, soils, climate, finance, farmers' qualifications and governance have been responsible for these differences. However, agroecological management practices seem to be at the top of the list. A number of the current risk management practices of rural farmers have been reported to effectively decrease maize yields at the farm level. For example, slash and burn and intercropping are popularly practiced in SSA and thus accounted for about 25% of the yield gap between FY and simulated or experimental station yields (Kibaara et al, 2008).

In order to promote, stabilize and increase maize production in all the SSA regions, four salient intervention strategies, including three agronomic and one genetic were introduced. The most important category is soil quality management. For instance, Keating, Carberry, Bindraban, Asseng, Meinke and Dixon describe the soil fertility constraint as 'overwhelming' (keating et al, 2010). Productive use of small amounts of inorganic fertilizer, along with organic sources of nutrients, has the greatest likelihood of success (Tittonel et al, 2008). However, sustainable management techniques are better while genetic improvements is another strategy (Twomlow et al, 2010).

Introduction to the Original Research

The largest proportion of maize production in Nigeria was in the south-western region, but this record of the region with the highest production later shifted to the west due to the discovery of crude-oil in the south (Ogunbodede and Olakojo, 2001). Currently there is a paradigm shift in the production of this vital cereal to the savanna belts, especially the northern Guinea savanna which can now be seen as the "Maize Zone of Nigeria". Farmers in this belt seem to prefer maize cropping to sorghum or other grains. Several reasons exist, such as the availability of streak resistant varieties for all ecological zones in Nigeria, the availability of high-yield hybrid varieties, an increase in population with the subsequent higher demand for maize, and government policies on the import of many foreign grains, including maize, might be responsible for this. As a sequel to this, local farmers have to produce more in order to supply the needs of people for daily nutrients and the demands of breweries, pharmaceutical companies, livestock owners, cereal industries, as well as the need to increase their own revenues. According to Obi, the middle and northern zones of Nigeria record the highest quantity of maize outputs because of large areas of arable-grassland and a favourable climate (Obi, 1991). These environmental conditions, integrated with highly improved yields and pest-resistant varieties, create conducive conditions for the preservation and cultivation of grains in this belt, yet management practices tend to play the largest role (Obi, 1991). To increase food supply, there is great need to improve crop production by adopting more sustainable agricultural management systems in order to enhance the soil fertility (Yanyneshet and Treydte, 2015) These systems have proved to be efficient in China (Wang et al, 2015). Several studies and efforts have been made to apply agricultural conservative measures in the region to maintain the soil quality but many of these experiments focused on either one practice or on a single locality (Wen et al, 2016). It is rare to find a study which combined the application of up to four different treatments in more than two localities covering the entire region. It follows that our study is significantly unique because it is focused on four major states in the northern-Guinea Savanna.

The objective of the study was to assess the effects of traditional management systems on the soil and on the maize yield in the northern-Guinea grassland region. We hypothesized that *"soil properties and maize grain yields are not affected by Slash and Burn, Grazing (Intensive/Extensive) and Fallow."*

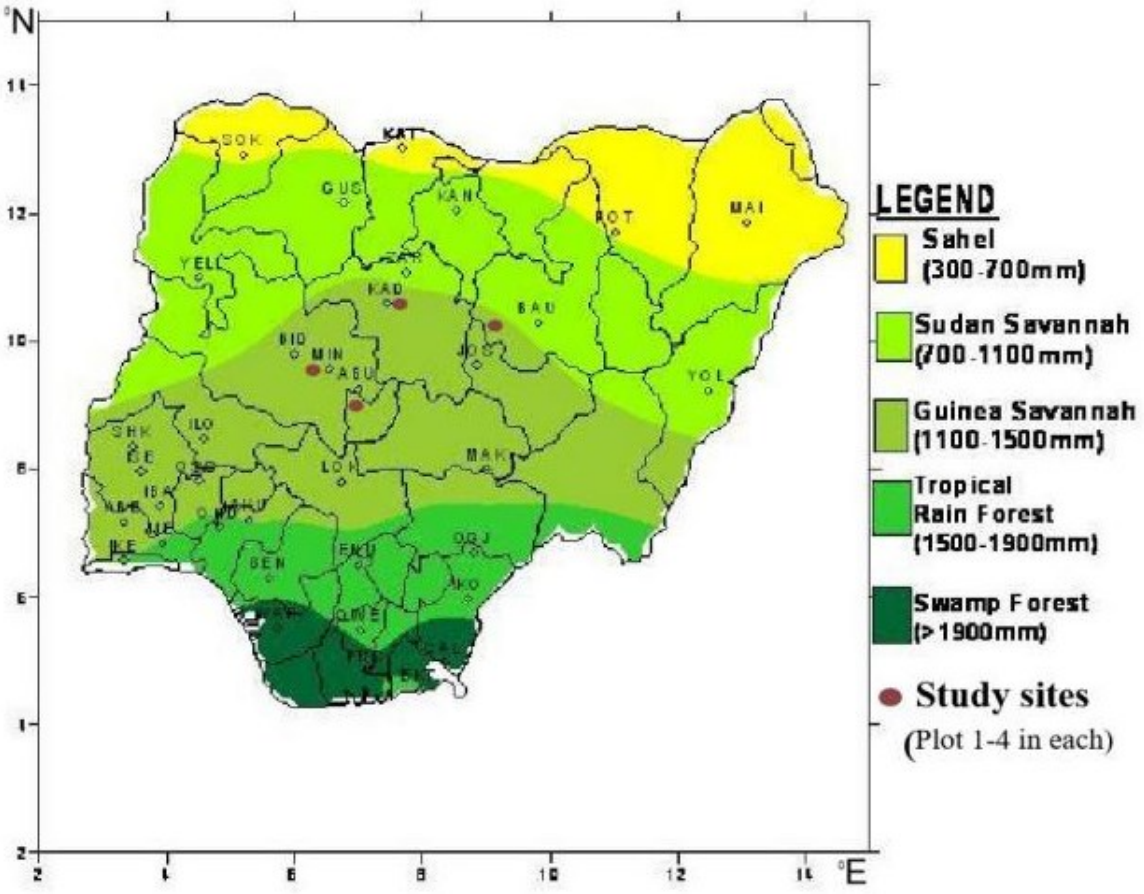
The study attempts to provide answers to the following questions: (i) What is the effect of burning on the soil and on crop yields? (ii) Do soil and yield respond differently under the two different grazing methods? (iii) How does fallowing affect the soil properties and maize grain production?

Materials and Methods

Study area

The northern Guinea Savana eco-regional benchmark area of Nigeria was the study site. It is among 6 benchmark zones representing the six ecoregions of the Ecoregional Program for the Humid and Sub-humid Tropics of sub-Sahara Africa (EPHTA)(IITA, 1996) (Manyong et al, 2001). The choice of this belt was partly because of the recent records in maize output and also because of the agroecological and socioeconomic characteristics of the belt (Manyong et al, 2001). An area of approximately 34,000,000 hectres is covered by the northern Guinea Savanna in West and Central Africa. According to Jagtap, this region is favoured with a long growing season, ranging from (150-180 days, with the following soil characteristics: Luvisols (36%), Vertisols (12.2%), Lithosols (11.3%), Regosols (8.7%), and Ferralsols (8%) (Jagtap, 1995). The region also has a favorable climate that is conducive for the growth of the grains. Four states; Kaduna, Bauchi, Niger and the FCT-Abuja were selected for the study (Fig. 4)

Fig. 4: Agroecological Zones with Study Areas in Guinea Savannah



Experimental Design and Data collection

In the northern Guinea Savanna ecological belt four sampling sites were located across four states namely; Niger, Kaduna, Bauchi and the FCT-Abuja (Fig. 4). In February 2012, four experimental sites were located in each of the four states with the help of the states' ministries of agriculture and the local agriculturists. The sites were protected from any encroachment by humans or animals until 2013 when the area was divided into four portions corresponding to the four introduced agroecosystem management methods (Slash & Burn, Intensive Grazing, Extensive Grazing, and Fallow). Each site was designated as; Plot 1 (Fallow), Plot 2 (Slash & Burn), Plot 3 (Extensive Grazing), and Plot 4 (Intensive Grazing) with an area of 2m x 2m per plot. While activities started in 2013 on the other plots, the fallow plot, which served as the control plot, was not disturbed until early 2014 when the early maize was cultivated. In this control plot the plants were cleared without burning in the preparation of the land for the seedlings. Before tillage, fire was employed to remove the litter on the slash/burn plot, while for the grazing plots the litter was ploughed back into the soil. We made sure that the same quantities of grain and the same varieties were used across all the plots, and the planting was done in the same week. Weeding was done twice during the growing season using traditional/local manual methods. Tillage was done on all the plots but there was no application of fertilizer or pesticides and no mulching or irrigation. The mean data were used from each of the plots (representing each grassland management system). In other words, Plots 1 from FCT-Abuja, Niger, Kaduna and Bauchi State were added together and divided by 4. This was repeated for every other Plot.

Soil samples were collected before and after the treatments. Two topsoil (0-15 cm) samples were collected randomly from each of the 8m x 6m monitored plots using soil augers. The collection was performed at every 5cm, was well mixed and a representation of subsample was collected. We removed the biomass residues and roots from the soil samples and air-dried them before taking them to the laboratory, where they were ground in a mortar and passed through a 2mm sieve. All chemical analyses were done in an accredited laboratory of Crop and Soil Sciences in Ahmadu Bello University (ABU), Zaria-Nigeria. The Mehlich III and Kjeldahl methods were among the techniques used for extracting and analyzing the soil samples (Mehlich, 1984). The mean of the two sub-samples from each experimental plot was applied for the statistical analyses. Crop yields: The following season in which the grassland management techniques were adopted, maize grains were planted on each plot with no fertilizers applied. The early rain in that year and the introduction of fast and High-Yielding Varieties (HYVs) meant that cultivation of the crop could occur 3 times in the year; from February-April, May-July, and August-October, representing early, mid and late seasons respectively. At the end of each growing season, the grains are harvested, the quantity is recorded and stored for each plot. The mean outputs were generated for each individual plot. Other laboratory analyses followed the standard procedures as used in the soil nutrient analyses previously conducted in the region (Essiet, 1998).

Data Analyses

To assess the effect of treatment on the soil properties and maize grain yield, repeated measures of one-way ANOVA were used, followed by a post hoc comparison-Tukey HSD test. Where the F-test was significant, a least significant difference (LSD) test was used at $P < 0.05$, if not stated otherwise, to separate the means. In other words, the use of ANOVA was allowed as all the necessary conditions were met. The relationships between yield and Ca, Mg, K, SOM, and Tot N were performed using linear regression. Pearson's correlation was used to analyze the relationship between monitored soil properties, and to measure the association between yields in a season/year under the different treatments. All the analyses were performed using the IBM SPSS statistics version 20 (IBM, 2011).

Results

Soil Nutrients Variations and Grassland Management Techniques

Fallowing slash and burn, intensive and extensive grazing were the primary treatments performed. The results of the study revealed that these grassland management systems have caused significant changes to the soil properties in the selected sites (Table 2).

Table 2: Physical and chemical properties of the soil at the study sites pre-treatment practices

Soil properties	Sites			
	FCT-Abuja	Niger	Kaduna	Bauchi
Sandy(%)	66.2	87	72.1	82.0
Silt(%)	49.3	28.6	48.4	37.7
Clay(%)	35.6	37.5	34.9	33.2
Tot. N(mg/kg)	2.3	3.03	2.47	2.51
SOM(mg/kg)	3.8	2.85	3.14	4.29
pH(H_20)	5.9	5.0	5.7	5.5
CEC(mg/kg)	2.8	3.12	4.03	3.72
Ca(mg/kg)	2.6	2.66	2.97	3.11
Mg(mg/kg)	1.9	1.29	1.98	1.83
K(mg/kg)	1.46	1.69	1.74	1.8
P(mg/kg)	1.21	1.57	1.61	1.93

Table 3: Correlation coefficients among monitored soil properties

	Sandy	*Silt*	*Clay*	*Tot N*	*Org M*	*pH*	*CEC*	*Ca*	*Mg*	*K*	*p*
Sandy	1										
Silt	-0.993**	1									
Clay	0.071	-0.172*	1								
Tot N	-0.819*	0.773**	0.467	1							
Org M	-0.826*	0.811**	-0.267*	0.448*	1						
pH	-0.864	0.837	-0.145	0.551	0.991	1					
CEC	-0.855	0.845*	-0.292	0.473*	0.997	0.988	1				
Ca	-0.909*	0.861*	0.350	0.967*	0.658**	0.744	0.675**	1			
Mg	-0.761*	0.716*	0.513*	0.994*	0.347**	0.455	0.375**	0.933**	1		
K	-0.893*	0.835	0.257*	0.830	0.836*	0.901	0.835*	0.942**	0.765*	1	
P	-0.892	0.889	0.144	0.931**	0.484*	0.554	0.530*	0.903**	0.922*	0.737**	1

**p < 0.05, ** p < 0.01 and *** p < 0.001*

Table 4: Summarized statistics on the relationships between yield under the four management systems for the four sites in 2014 and 2015

		2014			2015		
Treatment	Plot	Early Season	Mid Season	Late Season	Early Season	Mid Season	Late Season
FC	1	0.726*	0.699*	0.684**	0.611	0.631	-0.535*
SB	2	0.614*	0.049*	-0.667*	0.062*	-0.015*	0.007*
EG	3	0.891	0.884*	0.901**	0.735	0.69*	0.594**
IG	4	0.773*	0.607*	-0.631*	0.17	0.094	-0.814**

**p < 0.05, **p < 0.01; FC=Fallow/Control; SB=Slash & Burn; EG=Extensive Grazing; IG=Intensive Grazing*

The summary of the correlation analyses of the monitored soil properties which were derived during and after the treatments showed that more than 60% of the soil variables were significantly correlated (Table 3). Only the soil's pH was not significantly correlated with any other soil property.

The Cation Exchange Capacity (CEC) has a substantially significant correlation with Ca, Mg, K and P, while sandy was significantly negatively correlated with silt, total N, organic matter, Ca, Mg and K. Silt showed a very strong and significant positive correlation with Total N, organic matter and CEC. On the other hand, clay has a negative significant

correlation with organic matter and a positive significant correlation with Mg and Ca. While organic matter indicated a strong positive correlation with CEC, the relationship was not significant (Table 3).

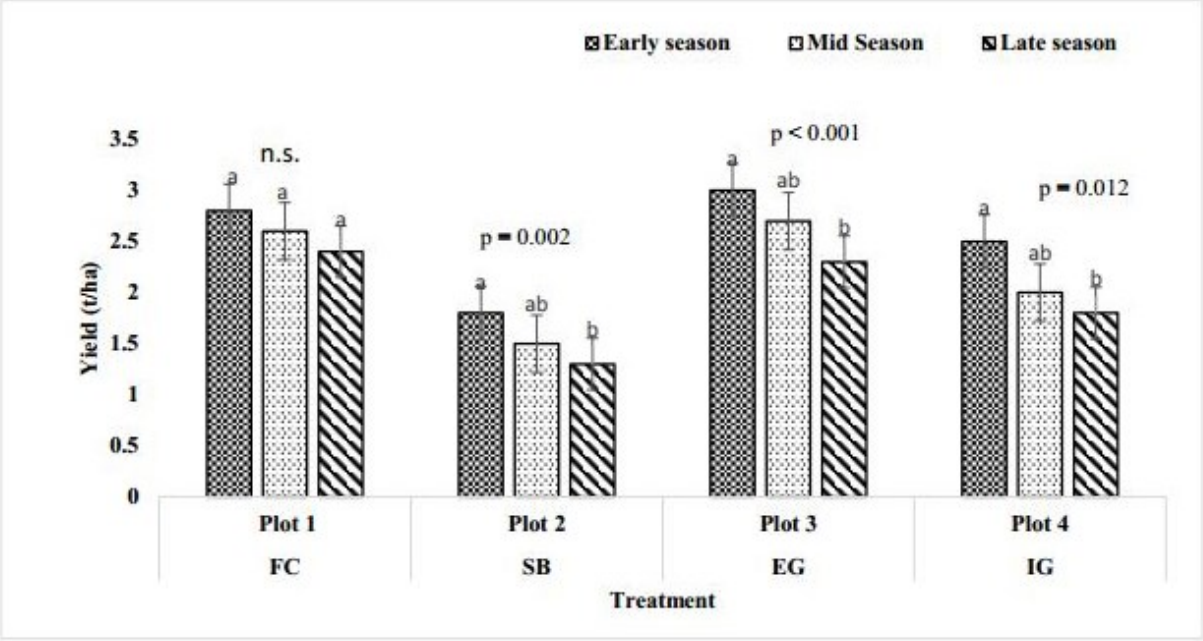
Maize grain seasonal/annual yield and grassland management practices

Generally, the late season cultivation showed strong positive and negative significant correlation in all the treatments (Table 4). Burning indicated significant correlation for all the seasons in the two years of the experiment. The early season yield for 2014 recorded the strongest correlation coefficient among the growing seasons with 0.726 (Fallow), 0.614 (Slash/Burn), 0.891 (Extensive Grazing) and Intensive Grazing (0.773).

In 2014, early season cultivation showed the highest maize yield in all the treatments (Fig.5).The extensive grazing plot favoured the grain yield across the three seasons, while plot-2 where the burning was applied before planting had the lowest grain output. The results further revealed that the significant differences in seasonal yield were recorded in all the adopted management practices except in the fallow/control (plot 1). In terms of seasonal yields, the late season tends to account for the lowest grain production in all the treatments (Fig. 5).

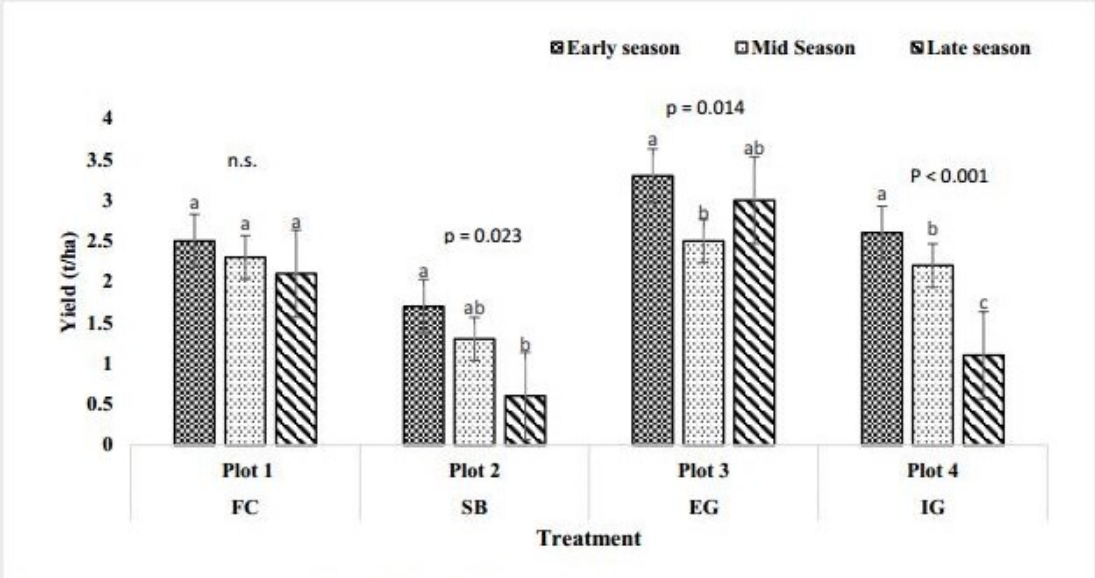
The results from 2015 revealed that extensive grazing and burning treatments have the highest and lowest grain outputs respectively (Fig. 6), corresponding to the 2014 records. The extensive grazing plot produced a contrasting result, where the late season cultivation yielded higher than the mid-season, compared with 2014. Similarly, the control plot with fallow treatment was the management system with no significant difference in the seasonal yields. Intensive grazing showed substantial significant differences ($p < 0.001$).

Fig. 5: Mean maize grain yield under the different treatments in 2014.



Yield values represent the average of two replicates. Bars indicate ± Standard Error of the mean (SE). Using Tukey's post hoc test, different letters show significant differences between treatment means (least significant difference F-test, $p < 0.05$). n.s. - results of ANOVA analyses were not significant. For Grassland management/treatment abbreviations see table 4.

Fig. 6: Mean maize grain yield under the different treatments in 2015.

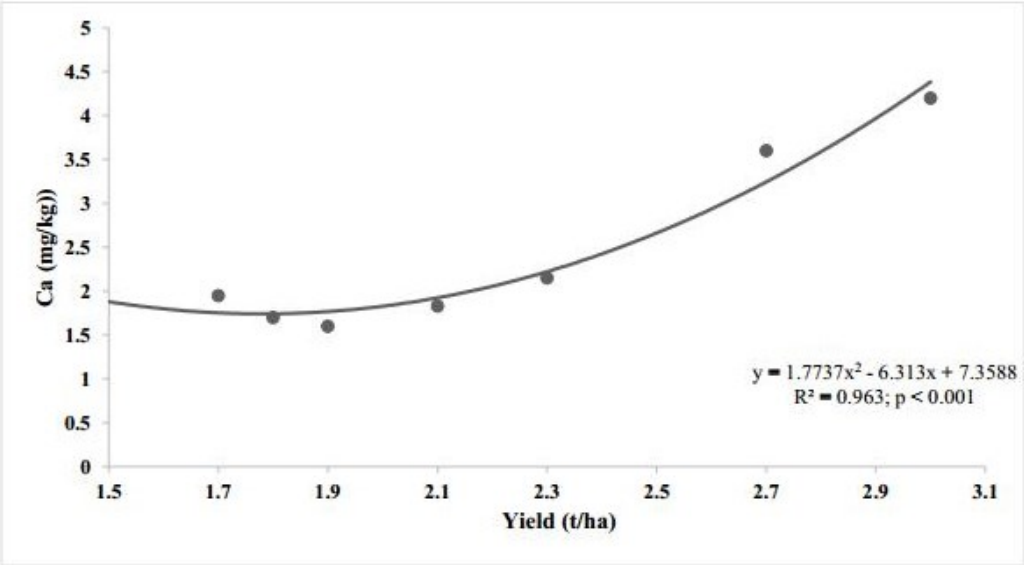


Yield values represent the average of two replicates. Bars indicate ± Standard Error of the mean (SE). Using Tukey's post hoc test, different letters show significant differences between treatment means (least significant difference F-test, $p < 0.05$). n.s. - results of ANOVA analyses were not significant. For Grassland management/treatment abbreviations see table 4.

Soil properties, grain yield and grassland management

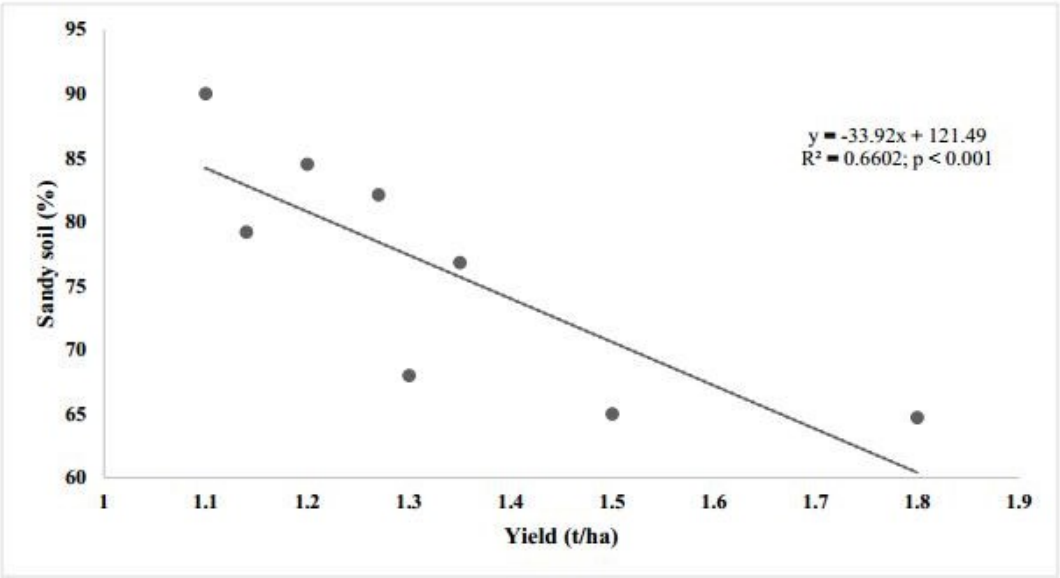
A high positive relationship ($R2 = 0.963$, $p < 0.001$) was found between Ca concentration and the maize yield under the extensive grazing treatment (Fig. 7). The polynomial-linear regression between Ca and yield was significant, proving that the concentration level of Ca in the extensive grazing farmland was favourable for the maize.

Fig. 7: Relationship between mean Ca concentration and Maize grain yield under Extensive grazing.



Maize grain yield increased with a decrease in sandy soil percentages in the burnt treatment plot (plot 2). However, a strong correlation with a significant relationship was recorded between the yield and the percentage of sandy soil in plot 2 (Fig. 8). A high percentage of sandy soil tends to decrease the silt and essential nutrients by promoting soil erosion, high evaporation and leaching.

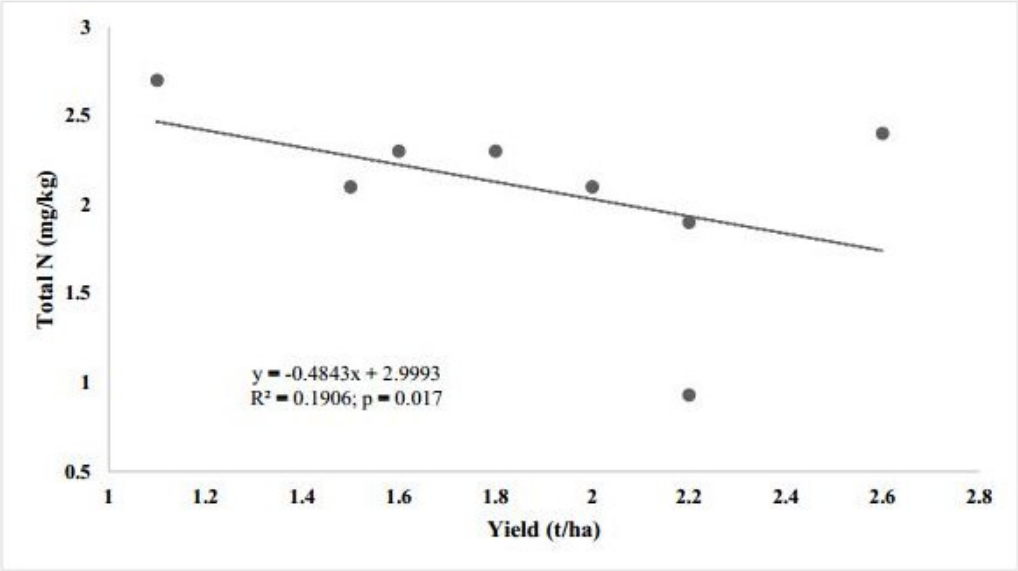
Fig. 8: Relationship between mean Sandy Soil concentration and Maize grain yield under Plot 2 (Slash & Burn).



However, a relationship existed between the mean total N concentration and maize grain yield (Fig. 9) in the intensive grazing treatment plot, but the relationship was negatively weak ($R^2 = 0.1906$).

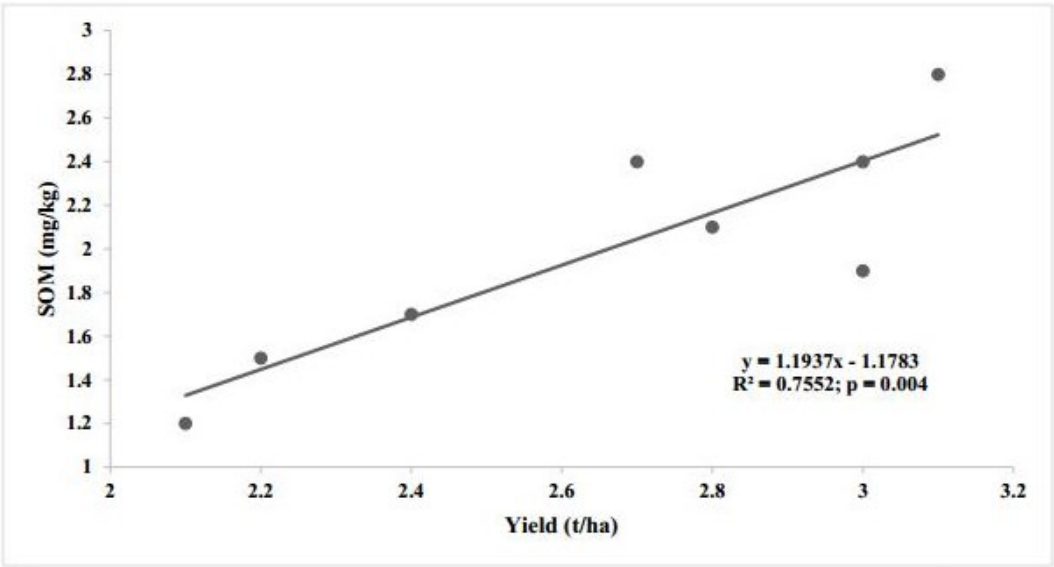
It is remarkable to discover that a decrease in total N has a slight positive effect on the maize grain yield. It is assumed that other factors, including management practices, availability of other soil nutrients and environmental parameters could be responsible.

Fig. 9: Relationship between mean Total N concentration and Maize grain yield under Plot 4 (Intensive Grazing).



The fertility of the soil to a large extent depends on the available soil organic matter (SOM) which consequently has a vital role in crop productivity. The relationship between the mean SOM concentration and maize yield under the fallow treatment was significant ($p = 0.004$) for the two years (Fig. 10). A strong positive relationship ($R2 = 0.755$) revealed that the optimal concentration of SOM in the fallow plot was substantially conducive for the growth of maize.

Fig. 10: Relationship between mean Soil Org Mat (SOM) concentration and Maize grain yield under Plot 1 (Fallow).



Discussion

Soil properties, grain yield and grassland management

The grassland management system to a large extent influences the quality of soil, which consequently affects yield in an area. The extensive grazing showed that the extensive activities of the herbivores were favorable for the soil. The extensive grazing plot 3 has proved that it has the most required soil nutrients with a higher percentage of silts and organic matter and better CEC. The fallow plot (i.e. control plot) tends to share almost the same soil and yield characteristics as the intensive grazing farmland (Fig. 5). On the other hand, the burnt plot seemed to have suffered from the effects of the heat. This might have led to the loss of essential soil elements such as silt, N, Ca, P, K, Mg and organic matter with the increased sandy percentage leading to a continuous decline in yield (Fig.8). The impacts of the human grassland agroecosystem management methods on the soil nutrients were obvious and this in turn determined the rate of the crop yields. For instance, the relationship between yields and organic matter was significant ($R2 = 0.755$; $p = 0.004$), which enhanced maize grain yield in the fallow plot. Several studies have been conducted on the significant relationships between crop yields and soil fertility (Pavlu et al, 2013; Marschner, 1995; Hejcman, 2010). The role of base cations, including Ca, on growth and vegetative development was emphasized in the study by Dijkstra in northeastern America (Dijkstra, 2003). In our study, Ca concentration has similarly been revealed as an essential element in maize yield (Fig.7). The study stated that the limitation of any essential soil nutrients poses a great threat to the plants' health.

Grassland Agroecosystem Management Practices and Crop Yields

Four different grassland management methods (Slash and Burn, Intensive grazing, Extensive grazing and Fallowing) were applied in the study on the impacts of soil, eco-anthropogenic management and yield. The results revealed that the sample plot 2, where slash and burn was primarily practiced before cultivation, yielded the lowest maize output (Fig. 5). It was further discovered that plot 3 (involving the Extensive grazing method) produced the highest yield, while the control plot (plot 1), which was allowed to lie fallow before cultivation, also had good yields (Fig.6). Grassland management systems have been highlighted as a core factor in determining the productivity of this biome. A study by Tittonell et al (2008) revealed the unparalleled values of sustainable soil and land resource management in sustaining soil potentials for higher productivity in Sub Sahara Africa. Other past studies have stated that it is better to manage the soil sustainably through the adoption of improved management measures than to rely on inorganic fertilizer application (Chivenge et al, 2011). The study further stressed the dangers of the overuse of fertilizer as regards the soil and crop yields, especially with the recent increased demand on agricultural products. Other studies have reported that proper soil management has a high tendency to boost production (Khan et al,2007; Slaymaker, 2002; Ahmed,1995), whereas inappropriate management techniques result in soil degradation and this may

require long-term remediation or the damage could be irreversible (Tilman et al, 2002; Fischer et al, 2014; Tittonell et al, 2008; Chivenge et al, 2011). However, the findings of our study were in accord with previous research (Bahr et al, 2014; McGrath et al, 2001; Ewel et al, 1981). This is because of the negative impacts of burning, which can be further explained as the killing of the soil microbes and the indirect consequences of rainfall and temperature intensities (Savadogo et al, 2007). On the contrary, several other studies disagree with our results and conclude that the ash materials from the burnt plant material adds substantial nutrients to the soil (Nye and Greenland, 1960; Giardiara et al, 2000; Hamer et al, 2013).

Conclusion

The Guinea Savannah especially the northern belt grassland has the potential for high production of maize and other cereals. Extensive grazing and fallow plots showed higher maize grain productivity than the other grassland agroecosystem management practices. Slash and burn has severe degradable effects on the soil quality. Appropriate soil resource management processes have been demonstrated as catalysts in restoring soil fertility and increasing food productivity in the area. In order to supplement and compensate for the limitations of fertilizers in this region, and the application of improved and sustainable grassland management methods should be a priority. In Nigeria and other SSA, cereal crops, especially maize, are one of the top staple foods and are used as food for African people and feed for their livestock. The grain is also of high economic importance in domestic and international trade and revenue generation. Maize has provided a strong economic boost for sustainable development by increasing and improving people's livelihoods and government sources of foreign exchange. Industrially and socio-culturally, products from maize are of great significance for the chemical, biofuel, medical and food companies. Traditional methods of farm management such as slash and burn should be discouraged among rural farmers. This could be done by educating the agriculturists through the Agricultural Extension Agents. Most of the farmers are novices concerning best management practices. The Nigerian Federal Ministries of Agriculture and Natural Resources, FAO, other international organizations and NGOs should financially, technically and materially support this developmental step.

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The Role of Urban Agriculture in Household Wellbeing: Case Study of Community-Based Urban Agriculture in Ndola, Zambia

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Abstract

This paper investigates the role of community-based urban agriculture in household well-being in Ndola, Zambia. Although urban agriculture has attracted the attention of various scholars in recent years, there are relatively few studies from the region of Southern Africa. The research confirms the positive influence of urban agriculture on household wellbeing. Farmers appreciate that agriculture-based activities are a promising option for sustaining their livelihoods, in terms of food intake and income generation.

Moreover a spill-over effect occurs due to the ability of farmers to provide small job opportunities for people living in their neighbourhood. On the other hand, farmers face various constraints in the form of limited access to food markets, crops marketed via middlemen, low diversity of planted crops and low levels of savings. Better organization of farmers and legal recognition of their cooperative may help to tackle these problems.

Key words: urban agriculture, community, household wellbeing, Zambia

Introduction

Urban agriculture has attracted the attention of various scholars in recent years and they consider this concept to be a viable strategy in ensuring urban food security (e.g. Armar-Klemesu, 2000; Maxwell, 1995; Mwangi, 1995; Tinker, 1994), in enhancing the economic situation of the urban poor (e.g. FAO, 2007; Moustier & Danso, 2006; Nugent, 2000) and in improving the local environment (e.g. Cofie et al., 2006; Deelstra & Girardet, 2000; Smit & Nasr, 1992). Smit et al. (2001) add that urban agriculture can bring economic potential to areas which are not suitable for commercial purposes. Urban agriculture is also seen as a significant employer, especially in developing countries. For instance, FAO (2007) states that more than 200 million people are involved in market-oriented urban agriculture, thereby providing 15 – 20% of the global food supply. Mougeot (2000) suggests an even higher figure of nearly 800 million urban dwellers being involved in agriculture. It is estimated that more than 40% of all African urban households are engaged in farming (FAO, 2012). Nugent (2000) states that urban agriculture represents one of the possible self-employment strategies in cities which are not able to satisfy job demand.

However, the concept of urban agriculture has its limitations. The key issue is household assets, mainly in the form of land (as one of the key forms of capital in the agriculture sector). In this respect Bryld (2003) states that only 20 % of all urban agriculture is located on privately owned land. Therefore food production is significantly threatened by insecure land tenure. Moreover, the viability of the concept of urban agriculture relies on urban policies and the attitude of local governments. This is particularly relevant in African cities, where urban agriculture is restricted by numerous laws and by-laws (Mubvami & Mushamba, 2006). Some authors also warn against the health risks connected with food production within urban areas (Smit et al., 2001; Armar-Klemesu, 2000; Cofie et al., 2006; Brown & Jameton, 2000).

Some aspects of urban agriculture are linked to other approaches to development: *community-based development and participation*. Researchers, international agencies and non-governmental organizations see communities as being the impetus for development in terms of poverty alleviation, empowerment, raising social capital and sustainability (Mansuri & Rao, 2004). Typically, this process has two major goals: to improve the well-being of all community members and to involve all members in the process (Nikkhah & Redzuan, 2009). *Community-based urban agriculture* and *community gardens* share similar goals to community-based development and therefore can be seen as one of the numerous approaches to community-based development.

This paper focuses on community-based urban agriculture as one possible livelihood strategy in an urban environment. The first part of the paper discusses the concept of community-based urban agriculture, mainly in the context of sub-Saharan Africa. The second part of the paper is devoted to the case study of the farmers' community in Ndola, Zambia.

Community-based urban agriculture

Guitart et al. (2012) state that despite the existing research on community-based urban agriculture there is no standardized definition of this concept and authors frequently see the term as self-evident. However, De Neergaard et al. (2009) characterize community-based urban agriculture as having shared access to water resources and common land tenure. Smit et al. (2001) add that community members are responsible for their own plots but they share the responsibility for water and electricity supply, security, fences, pathways etc. Finally, Smit & Bailkey (2006) suggest that community-based urban agriculture mainly provides social interaction which leads to the empowerment of the community assets. They also see cooperation within the community as the most valuable element.

The research of Guitart et al. (2012) shows there is a lack of peer-reviewed papers concerning community-based urban agriculture in developing countries. However, community-based urban agriculture in Africa and other developing regions has been covered in a number of case studies. These papers predominately focus on community gardens which provide improved food access and increased economic opportunities to various dis-

advantaged communities. The establishment of community gardens is usually initiated by external bodies rather than by the community. A typical example of community-based urban agriculture is a garden for people suffering from HIV/AIDS and their relatives. People affected by the illness are forced to change their dietary habits to ensure proper mineral and vitamin intake; in this way HIV/AIDS strongly influences households' food security mechanisms. Additionally, infected household members are not able to work and generate money, thus they do not contribute to the budget (Wills et al. 2009). The participation of HIV positive individuals in community gardening can help them and their families to improve food intake and nutrition. There are also other dimensions: stigma removal, the inclusion of HIV positive people in society and the educational benefits.

One example is the Ubuntu Foundation, which has started a gardening project in a health clinic for HIV positive people in Port Elizabeth, South Africa. This project brings the clients of the clinic and the local community together. The garden provides nutritional and economic support to those undertaking antiretroviral therapy – almost 60% of the yield is consumed by the clients while the rest is sold in markets (Lief, 2007). Mubvami & Manyati (2007) stated that the collaboration between HIV-affected people and the rest of the population was important. They revealed that this activity is fundamental for removing the stigma in communities affected by HIV/AIDS. Moreover, the time spent together can serve as a learning ground about HIV/AIDS issues. On top of that, these projects can provide employment opportunities for those often discriminated against in the labour market, therefore reducing their vulnerability.

Community gardens are quite often adjacent to schools, churches, prisons and community centres. School gardens enable schools to provide part of their meals for schoolchildren. At the same time, students learn new practical skills (Smit et al., 2001). The Kampala School for the Physically Handicapped accommodates 100 pupils with various disabilities. The children participate in farming activities according to their abilities. This is an innovative idea and disabled students can be subsistent in terms of food provision while learning skills which can be useful in the future (Rutt, 2007). Furthermore, community-based urban agriculture can even be found in densely populated neighbourhoods. Therefore one of the challenges for community-based urban agriculture is the competition between agricultural land and land for construction. According to some authors, initiatives of *sack/bag gardening* could be a solution which may facilitate farming within urban communities. Churches and local NGOs usually supply bags, old containers, soil and seeds as substitutes for regular vegetable plots. These small food sack gardens help poor communities to provide part of their own diet and also to strengthen their social capital. by learning new knowledge and by social networking (see e.g. Pascal & Mwende, 2009; Jansen, 2009; Radice & Welly, 2009).

Even though the case studies mentioned above have different backgrounds, it is still possible to find some common characteristics. All the projects aim to enhance the quality of life of disadvantaged communities which are usually dependent on food transfers and other

forms of donation. Community-based urban agriculture decreases their dependency on external resources and community members are also able to create additional funds. The ownership of the project is distributed amongst the participants. Such cases support the suggestion of Smit & Bailkey (2006) that community-based urban agriculture strengthens community awareness of solidarity.

Finally, community-based urban agriculture can take the form of informal groups of famers and cooperatives. While informal groups can be seen as the first step in community institutionalization, the establishment of cooperatives is the final stage of the process. According to Birchall (2004), all cooperatives should adopt the spirit of self-help, responsibility, democracy, equality, solidarity and justice and an awareness of collective action. Basically, economic profit is not the major purpose of the cooperatives. They strengthen the potentials of individuals within the collective and enable cooperative members to achieve benefits which would not be achievable for individuals: entering official markets and selling products at higher prices. Ortman & King (2007) conclude that the facilitation of access to the inputs and product markets is the major driver in the establishment of the cooperative. Poor (urban) farmers are very often limited in their productivity because of inappropriate access to the inputs, credit, high transaction costs and other constraints of the market. Cooperatives should be capable of dealing with these problems of the poor farmers as they are officially recognized by the government. Paradoxically, Birchall (2003) impugns the role of cooperatives in poverty reduction. He concludes that, after the establishment of a cooperative, the poorest people are discouraged from participating while middle income individuals are predominant among the members.

Case Study: Farmers of Chipulukusu

The purpose of this paper is to introduce the community of the Chipulukusu Vegetable Growers Society. The case study aims to introduce urban agriculture in Ndola with a special focus on the farming site in Chipulukusu. Furthermore, the research explores the farmers' socio-economic background and their motivation for undertaking urban agriculture, as well as the functioning of their community and the implications for their well-being. The case study also examines key features of the informal group of farmers who were considering the establishment of formal cooperation. Although the community of Chipulukusu farmers is not a legal entity, the Ministry of Agriculture and the Cooperative in Ndola were aware of the activities carried out by the group. Therefore a significant effort was made by the community to achieve official recognition through the establishment of a cooperative.

Primary data were obtained during field research in the summer of 2013. Different qualitative methods were used during the research. In the initial phase, observation and key informant interviews with officers from the Ministry of Agriculture and the Cooperatives were carried out. The research was based on in-depth semi-structured interviews and fo-

cus groups. The findings of the field research were complemented by the analysis of official documents issued by the Ndola City Council. The data on the socio-economic situation of the individual farmers were researched in the interviews. This method was chosen intentionally so farmers could feel more confident about the information they provided. For the evaluation of the farmers' community and the interaction within the community, the focus group method was chosen. Most of the activities were conducted with the assistance of an interpreter. This fact might lead to a distortion of the information gained.

Research Site

With a population of more than 450 000 (CSO, 2011), Ndola is the third largest Zambian city and the administrative centre of Copperbelt province. Copperbelt province is a traditional copper-mining region and has the highest urbanization rate in Zambia. The urbanization process started with the mining boom at the beginning of the 20th century, which has continued until today (Potts, 2005). The Copperbelt area as a whole (especially Ndola) was hit by the economic crisis caused by the liberalization of the economy, which led to the collapse of the economy in the late 1990s and to the closure of many companies in the region (MDP-ESA & RUAF Foundation, 2008). The decline in the economy resulted in a rise in unemployment and an increase in poverty (Phiri, 2009). Kalemba (2013) estimates that 14.5% of Ndola's population lives in the low-income areas, where the unemployment rate is 71.7%. Despite the crisis, Ndola remains an important economic centre in Zambia; a country highly dependent on the mining industry (World Bank, 2015)

Chipulukusu is the oldest and the largest township in Ndola, with a population of 32 000. The majority of its inhabitants are unemployed or work in the informal sector. The most common economic activity is retail sales (Kalemba, 2013). Furthermore, over 500 households have chosen small-scale market oriented urban agriculture as their survival strategy. The number of urban farmers is highest in the city (Phiri, 2009). Urban agriculture is a traditional activityin Chipulukusu. The fields around the township are located in the flood area which is not suitable for construction works or any other economic activities. This fact supports the statement of Smit et al. (2001) that urban agriculture may enhance the productivity of areas with low economical potential. The majority of the farming activities in Chipulukus take place on land belonging to the Ndola City Council and there is no legal land tenure in the area (Mwitwa, 2008). Most fields are located on the edge of the township and only a minority of Chipulukusu dwellers cultivate small plots – usually in the form of kitchen gardens – in the built-up area.

State of Urban Agriculture in Ndola

The economic crisis at the beginning of the 21st century has had many implications for Ndola's dwellers and it was one of the driving forces behind the boom in urban agriculture. Interestingly, households from a range of income groups are engaged in urban agriculture, although in different forms. According to an official from the Ministry of Agriculture and Cooperatives (MACO), backyard gardens or kitchen gardens are typical for

middle and high-income areas, while the cultivation of open space is found in low-income areas. Subsistence production predominates among gardeners; open space farming is usually market-oriented.

In contrast with the views of Mubvami & Mushamba (2006), who see urban policies in many African cities as restrictive, Ndola can be seen as a prime example of a city where the attitude of the local governments and their policies have changed over a few years. Before 2008, agricultural activities balanced on the edge of illegality in Ndola. However, in 2008, Ndola City Council, RUAF Foundation and MDP-ESA set up the Multiple-Stakeholder Platform, in order to address the need for a policy which would govern agricultural activities within the city. The platform came up with two key documents: *Urban Agriculture Strategy Agenda and Urban and Peri-urban Agriculture Policy* (see RUAF Foundation, 2016). This initiative has led to the official and full recognition of urban agriculture in the city. Since then, Ndola City Council and the Ministry of Agriculture and Cooperatives have supported farming activities in Ndola. In addition, RUAF Foundation and MDP-ESA (2008) issued a report; *Summary of Key Issues and Recommendations on Urban Agriculture*, which summarizes the major challenges related to urban agriculture. The report mainly highlights water and land accessibility issues, and the position of Ndola City Council towards urban agriculture. Missing and unclear land titles were identified as one of the main challenges for agriculture in Ndola. It is often the case that the farmers lack land titles for the land they cultivate – the landowner is either unknown or in many cases the land belongs to the Ndola municipality. In Chipulukusu there are more mechanisms for farmers to gain access to land for agriculture: some farmers have "inherited" their plots while others have had to buy or rent plots. It must be emphasized that despite the land belonging to the Ndola municipality, the farmers treat the land as their own. Those who lack financial capital may decide to start cultivating unused land.

Chipulukusu farmers mainly grow varieties of leafy vegetables, such as rape, Chinese cabbage, spinach or pumpkin leaves. Some of the farmers also cultivate maize as a "cash crop". Despite the fact that the farmers belong to the low-income group, the use of agrochemicals is common, while the use of organic manure is quite low. There is no mechanization in the vegetable production and all the work is done manually. Crop production is carried out in open space outside the township, while poultry breeding takes place in the built-up area. Nevertheless, poultry is relatively rare in the area as it requires higher capital inputs.

Who are the farmers of Chipulukusu?

All the farmers participating in the research were residents of Chipulukusu. There were 18 respondents in total, 11 men and 7 women. Households with male heads and with female heads were present. The average household had seven members and the age of the farmers ranged from 20 to 69. The majority of households were dependent on farming. Men saw urban agriculture mostly as a full time occupation and only two male

respondents had another occupation. One of them worked in the formal sector while the other owned a small shop. The attitude of women to the farming differed according to their role in the family and their life situation. While some of them helped their husbands, others had their own plots. The female landowners were also the heads of their households as they were widowed or divorced. Although men slightly predominated in the research sample, the total proportion of women farmers is questionable, considering the high number of women working in the fields as part of the hired workforce.

According to the respondents, the main motivation for agricultural activities is stable income generation. The majority were involved in or had experience of formal and informal jobs. The farmers agreed that every time they were employed (regardless of whether it was in the formal or the informal sector), their income was too low and was usually received after delays. Thus all respondents recognized that urban agriculture was the most secure form of employment, with a stable level of income. Some of them also stated that urban agriculture is a kind of insurance policy in case of job market failure. The farmers' motivation fully supports the statement by Nugent (2000) that urban agriculture is a viable survival strategy for urban poor.

Income gained through farming differed according to the type of crops. The average weekly gross income ranged from 60 – 120 ZMK (Zambian Kwacha, 1 USD was, at the time of the research, equivalent to 6.5 ZMK), depending on the size of the plots. The most profitable crop was maize, reaching its highest value during the dry season, when farmers could earn as much as 400 ZMK per week. Conversely, the lowest income, around 35 ZMK per week on average, was generated by the sale of leafy vegetables. Revenues also depended on the farmers' abilities, knowledge and capital inputs. Leafy vegetables do not require any special knowledge regarding the lifecycle of the plant and inputs are very low. Maize and tomatoes are the most demanding plants, with a large need for capital inputs in terms of agrochemicals and agricultural skills. Crop marketing is another challenge because farmers who do not sell their produce directly use the services of middlemen. Such marketing of the products has caused significant financial losses. The farmers were aware of this issue but the majority argued that it was more time effective than to sell the crops on their own. Another problem was the farmers' insufficient access to food markets. There is also a high competitiveness among the farmers as long as their production is highly unified.

Income generated by urban agriculture was spent on food and other expenditures. While farming contributed to part of the household diet, the rest, such as mielie-meal and other foods, had to be purchased. Other spending covered agricultural inputs: seeds, fertilizers, pesticides and any additional paid workforce. Finally, most of the farmers were able to send their children to school, thus investing their income in education. This implies that only a little of the earnings was saved and many farmers spent more than they earned.

Community and the Cooperative

At the beginning of the research, clarification was needed on what the farmers meant by the term *community*. All of them understood community as something present and something they belong to. It was also perceived as kind of social safety net. Farmers defined community in different ways, yet with the same conclusion: community is a *place where people live and work together, knowledge is spread and ideas are shared*. *Community members help each other when something happens*. At the time of the research, each farmer acted as an independent unit and the cooperation among farmers was on an occasional basis. The community only collaborated when it was necessary, for maintenance and the improvement of the basic infrastructure of the field area, such as cleaning the irrigation channels and, in the case of civil patrols, protecting their crops. Some members also held regular meetings to set the prices of maize and tomatoes, the idea being to reduce the competition among farmers. All these aspects were also seen as the most important advantages of the work within the community. Other benefits included the transmission of information, knowledge and the additional sharing of the workforce. Even though the relationships within the community were weak and the cooperation was on a low level, the exchange of knowledge and the mutual help between the farmers strengthened the community assets, as suggested by Smit & Bailkey (2006) in their work focused on community-based urban agriculture.

Despite the fact that the community was not collaborating on the basis of a cooperative, the idea of its formation was viable for some individuals. All the farmers were aware of the process required for the formation of a cooperative. At the beginning of the process, farmers have to elect a transparent leadership and pay membership fees. After that, the members need to set up bylaws and a business plan for the cooperative. When these conditions are fulfilled, the cooperative is registered at the Ministry of Agriculture and the Cooperatives in Ndola. This process also brought some significant challenges and some distrust for the community. Mostly, the farmers were afraid of poor leadership and a contest for power. Some also suffered a reduction in their financial assets due to obligatory membership payments, and this was without any certainty of the cooperative's success. Finally, respondents expressed doubts about the fair and equal distribution of duties among members of the community due to the perceived laziness of some individuals. .

Although the respondents did have some concerns regarding the establishment of a cooperative, the farmers are still willing to undertake the process of establishing the cooperative. The members were informed of the benefits of the process. Official recognition for the community would help farmers obtain land titles and would enable the extension of activities in terms of access to formal food markets and better marketing options. Finally, the cooperative would be authorized to purchase agricultural inputs for subsidised prices, and to have a bank account and receive loans. Beyond these direct benefits arising from governmental support, another advantage of improved community management is in place. Farmers were calling for a better distribution of work and crop diversification.

Some farmers also mentioned that a cooperative can provide employment opportunities for other Chipulukusu residents. Finally, the farmers believed the cooperative could potentially bring additional income.

Conclusion

Community-based urban agriculture is a world-wide phenomenon which is difficult to define. The majority of authors dealing with the issue focus their research on the involvement of disadvantaged groups in community gardening. These projects are usually initiated by NGOs, churches, schools, community centres and other civil society organizations. People participating in such activities are not farmers in the true sense of the word. The main aim of these community projects is the empowerment of the participants.

The case study of Ndola, Zambia maps the situation of the farmers' community in Chipulukusu, the largest and oldest township in the city. The farmers involved in the research are typical representatives of poor people engaged in urban agriculture. The findings of the research confirmed the positive influence of urban agriculture on household wellbeing. Farmers commonly agreed that agriculture is the most promising option for sustaining their lives, in terms of food intake, income generation and the opportunity to improve their situations. Additionally, farmers are also able to provide small job opportunities for people living in their neighbourhood. Nevertheless, farmers had to face various constraints, such as limited access to food markets, marketing their crops via middlemen, low diversity of crops and low level of savings. Possible solutions to these issues include the better organization of the farmers, their official recognition and the establishment of a cooperative.

Although the farmers are not organized as an officially recognized legal-body, there is strong potential for the establishment of a cooperative. The community members were aware of the benefits and the risks associated with the establishment of a cooperative. Despite this, the farmers could see that there would be benefits from the increased institutionalization of the community. The most pronounced advantages of the cooperative were access land titles to the cultivated land, governmental subsidies and better access to markets.

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Application of biometrics as a means of refugee registration: focusing on UNHCR's strategy

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Abstract

In 1950, the United Nations established the United Nations High Commissioner for Refugees (UNHCR), which claims credit for essential involvement in refugee issues. UNHCR teams have worked with several standard registration systems which, however, have still needed improvements. The search for the ideal system resulted in the establishment of the registration scheme – Project Profile, which became the basis for the proGres platform. UNHCR and Microsoft developed a mobile registration database, the proGres Refugee Registration Platform, which provided refugees with new identification documents. In 2006, the UN OIOS (United Nations Office of international Oversight Services) published a report which suggested combining fingerprinting with the new database. The UNHCR officially announced its policy of biometric refugee registration in 2010 and introduced the registration technology in collaboration with several organisations. In addition, the team implemented iris scans into specialized ATMs in Jordan. The most recent registration technology, BIMS (Biometric Identity Management System), was field tested in Thailand in July 2015. The overall outcome was very impressive and the UNHCR plans to continue the application of the technology in the future. The author believes that biometrics contribute to the promotion of national welfare and sees concerns and ethical objections as legitimate, while also recognizing that these issues may contribute to the elimination of defects in the system.

Key words: technology, BIMS, recognition, privacy

Introduction

Conflicts, natural disasters and social differences have always interlaced human existence. The European refugee crisis has become one of the major events of the 21st century. Refugees from Africa, Asia and the Middle East have been fleeing their native countries to escape war, poverty, famine and other disasters, and to seek safety and economic opportunities. Several humanitarian organisations and many volunteers acted fast to ensure safe passage and provided basic aid. However, the entire process still needs improvements in coordination, long-term aid and record keeping.

Refugee registration is crucial to the monitoring of identification data, state of health and number of refugees. Registration ensures that records are kept of their status, and it helps protect refugees against forced return, arbitrary arrest and detention. It can provide access to aid services and assistance and foster freedom of movement to help their inde-

pendence. The registration of children helps prevent military recruitment, keeps families together and assists the UNHCR in re-uniting separated children with their families. (UNHCR, UNHCR - Registration 2001 - 2015)

Biometric refugee registration has had positive responses. However, strong concerns have been raised as well and most cannot be overlooked. According to several experts and reports, the main negative features of biometrics are in maintaining informational and physical privacy and accepting religious objections. Experts worldwide have been working on reducing potential concerns and defects in the system, and are preparing to present "rapid" DNA testing for refugees. A new identification smart card and mobile application has already been launched.

Refugee registration

The United Nations has been significantly engaged in refugee issues since the wake of World War II and established the United Nations High Commissioner for Refugees (UNHCR) in 1950 (UNHCR, UNHCR - the history of UNHCR 2001 - 2015). The former Portuguese Prime Minister, António Gutteres, was elected High Commissioner in 2005 and the UNHCR intervened in numerous refugee crises worldwide under his leadership. The current High Commissioner, Filippo Grandi, was elected on 1st of January to serve a five-year term until 31st December 2020 (Agency 2016). The UNHCR has twice won the Peace Nobel Prize (UNHCR, UNHCR - the High Comissioner 2001 - 2015).

Biometrics

The term "biometrics" either refers to biological or physiological characteristics which can be used for automatic recognition, or it refers to the automated process of recognizing individuals based on such characteristics (National Science and Technology Council (NSTC) 2006). These characteristics include fingerprints, facial structure, iris or retinal patterns, deoxyribonucleic acid (DNA), voice and signature (Ng 2006). The collection of biometric information from individuals is called enrollment (National Science and Technology Council (NSTC) 2006). It can take place in a variety of settings and need not be voluntary, as in cases where an individual is recorded by a camera fitted with facial recognition technology (Thomas 2005). Biometrics have therefore become a powerful technology, not only for criminal, employee and security records, but also for refugee registration (Museum 2014).

UNHCR: standard registration procedures

Many UNHCR field offices have developed their own registration systems based on local requirements. The Field Based Registration System (FBARS), including a repatriation module, was developed as part of the UNHCR Registration Guide which was issued in 1994. The system captured basic refugee bio-data and allowed simple reporting. The Registration of Individual Cases System (RICS) was a system for the registration of individual refugees and was predominantly used in urban contexts. The system also included, in addi-

tion to detailed bio-data, modules on assistance and status determination. Both systems had an attached photo module, however they did not include other identification or ID card production capabilities. Microsoft donated 100 field registration kits; self-contained transportable registration systems, to the UNHCR during the 1999 Kosovo crisis. The kit produced ID cards containing a photograph, signature and two-dimensional bar-code including the coded refugee bio-data. The Electronic Resettlement Information Submissions System (ERISS) was developed under the auspices of the UNHCR Resettlement Section and was introduced in selected countries in 2000. The system led the user through the resettlement process and the file format was electronically submitted. (Deloitte and Touche 2001)

In October 2001, the Executive Committee of the UNHCR issued Conclusion No. 91, relating to refugee registration. The Conclusion reaffirms the importance of registration as a protection tool and sets basic guidelines for all registration processes. It also represents an agreement between the UNHCR and governments on how to conduct registration activities and the operational standards that apply (Project Profile 2003). As a key response to both protection and operational challenges, a standardized registration process and new database application “Project Profile” (providing data disaggregated by age, sex and other factors) was introduced by the UNHCR and a Microsoft team (Helen Deresky 2012) (UNHCR, Report of the United Nations High Comissioner for Refugees 2005).

Project Profile

As the Kosovo refugee crisis unfolded, a group of Microsoft employees contacted the UNHCR and offered their time and technical knowledge to cooperate on the development of a mobile registration system which would provide refugees with new identification documents. Upon analysis of refugees’ needs, it was found that beyond the most basic ones, the people were left without their homes and identity papers. As a result they were completely unprotected. The UNHCR suggested that Microsoft could help resolve these problems by providing technology in the form of software and hardware. This was to become an important partnership for both the UNHCR and Microsoft. The companies involved worked pro bono to establish the refugee registration scheme Project Profile, which had by then become the real solution to the UNHCR’s first problem analysis.

Project Profile was rolled out in the summer months of 2004 in various refugee camps, and Microsoft employees were encouraged to volunteer (Helen Deresky 2012). Project Profile teams introduced new registration tools and trained staff in 30 countries with 20 operations targeted for implementation during 2005. The new system contained individual registration records for an estimated two million refugees and other people of concern. The focus was on the need to expand the issuance of individual documentation and the further development of the new proGres registration software included a fingerprint biometrics facility to detect and prevent multiple registration in selected locations (UNHCR, Report of the United Nations High Comissioner for Refugees 2005). Other objectives included the development and redesigning of simple tools such as standard cards, forms,

software and biometrics in order to make registration tasks more uniformed and effective. (Nations 2004) In addition to launching Project Profile, the Profile team also developed the proGres registration platform. The platform allowed staff to maintain and update relevant refugee data and could be adapted (UNHCR, UNHCR - Registration project improves profile of refugees in Mozambique 2004).

UNHCR: proGres Refugee Registration Platform

Project Profile evolved into the proGres database where refugees are systematically registered and the data is eventually used for the administration of the status determination process. To grant refugee status, host countries required an initial eligibility interview and application, a follow up interview, a committee review and final government approval - all of which were tracked via proGres. Once status had been granted, proGres had the capacity to issue identification cards, to record addresses and voluntary repatriation forms and to identify individuals with special needs. (Microsoft 2015) The new software programme was tested in Turkey and Ghana before the current series of training sessions in the field (Hub 2015). Therefore ProGres was the basis for refugee registration innovation.

UNHCR has been attempting to globally deploy biometric tools, including fingerprinting and iris recognition, since 2003, with some success (UNHCR, PowerPoint Presentation - 1700_Hopkins_Hughs.pdf 2014). The United Nations Office of Internal Oversight Services (UN OIOS) issued a report in 2006, titled “Audit of Project Profile: Executive Summary”, relating to the UNHCR, and one of the first references concerns combining the proGres database with biometrics. “Fingerprinting technology has been attached to the core proGres system as an additional function; it was sponsored by the Dutch Government and developed by HSB Netherlands. While biometrics is seen as a very valuable tool for validating the registration process, it is a costly method to use. Further consideration of the use of the feature is therefore necessary and the Project Profile team should clarify in which situations the use of biometrics is recommended.“ (OIOS 2006). In 2010, the UNHCR assembly announced its policy on biometrics in refugee registration and verification processes (UNHCR, PowerPoint Presentation - 1700_Hopkins_Hughs.pdf 2014). Since then, the UNHCR has signed several contracts, initiated new cooperation and upgraded their technology, for instance with the IrisGuard cooperation in 2014: IrisGuard announced that the UNHCR had adopted the company’s iris recognition identity technology to bolster the proGres Refugee Registration Platform.

Using an iris recognition system linked to ATMs, the UNHCR created an innovative aid distribution network that gave more than a third of the unprecedented 630,000 refugees in the country access to vital monthly cash assistance (Inc. 2015) (Vrankulj 2014). Instead of receiving food packages, money vouchers or bank cards from UNHCR, Syrian refugees with data in the iris-identification system received a monthly text informing them that money had been placed in their accounts. They then used a specialized ATM owned by the

Cairo Amman Bank and rather than inserting a card and punching in a pass code, they waited for recognition by a specialized iris camera. Once their ID was recognized, they could withdraw their monthly allotment of cash. John Daugman, professor of computer vision and pattern recognition at the University of Cambridge and the inventor of Iris-Guard's technology, says that individuals do not have to remove their glasses or contact lenses to be identified by the iris camera. However, linking iris technology with aid in all refugee settings still poses significant challenges; setting up such a system requires a functioning banking system, a functioning rule of law and good connectivity that allows the images of irises to be matched against an online database. The technology must also be culturally acceptable – which is not a simple task. (Maron 2013)

UNHCR: Biometric Identity Management System (BIMS)

Since 2013, BIMS has been tested under a variety of field conditions and 17,000 refugees were enrolled in the system during initial pilot tests in Malawi. During January and February 2015, DPSM (Division of Programme Support and Management), DIST (Division of Information Systems and Telecommunications) and Accenture Consulting completed development of the UNHCR's new biometric identity management system (BIMS). The final field test was conducted in Thailand. The record is available on YouTube (UNHCR, Biometrics Innovation for Refugees in Thailand - YouTube 2015).

BIMS leverages the Unique Identity Service Platform (UISP) technology from Accenture, and is the UNHCR's primary contractor, using fingerprint, iris and facial recognition and storing identity information in a central global database. This means that no matter where the refugees are, whether they have an identification document or not, they can be sure that they will not be lost down administrative holes or mistaken for someone else. (Counter 2015)

The new system rapidly registers, prevents duplicating, and verifies the identities of refugees, ensuring that the right people receive assistance where and when they need it. It also operates under a wide range of infrastructure conditions and can provide numerous operational and protection benefits to existing identity management practices. Unlike previous UNHCR biometric systems, BIMS captures and stores all fingerprints and iris scans from refugees and others of concern. Capturing these multiple characteristics, rather than relying only on fingerprints, for example, allows a more complete coverage of the population and therefore more accurate identification of people. While benefiting from an online system architecture, BIMS has also been designed to work seamlessly when no Internet connection is available due to weak connectivity. BIMS also comes in a portable mobile configuration which uses a conventional laptop and requires no extra source of power to use the USB driven fingerprint scanners, iris scanners and webcams.

After enrolment, refugees and others of concern only need to present two or more biometric elements (e.g., two fingers, two eyes, or a combination) and BIMS is able to ascertain their identity within seconds. The time for identity checks during the roll out in Thai-

land was, on average, five seconds and each refugee received an encrypted smart card with their family's bio data and photographs (UNHCR, UNHCR - Biometric Identity Management System 2015) (Accenture 2016) (Tan 2015). The overall impressive results from BIMS are available through the Accenture Client Study (Accenture 2016). The UNHCR plans to capture refugee biometrics in up to 10 countries in 2015 and in all operations by 2018. (U. T. Biometrics 2015)

Ethical and technical issues of biometrics

Many issues under discussion concerning biometric registration relate to individual rights, such as protection of personal data, confidentiality, personal liberty and the relationship between individual and collective rights. Biometrics is one of the most significant examples of the complexity of meeting individual and collective needs. Discussions inevitably lead to questions related to personal, social and collective identity which, according to some authors, are essential study domains for contemporary sociology (Jonietz 2004). Biometric systems take identity assurance beyond something you have or something you know to something you are (J. D. Woodward 2004). According to a comprehensive report by the RAND Institute published in 2001, there are three areas of ethical and social concern raised by biometric technology: informational privacy, physical privacy and religious objections.

With "informational privacy" the report refers to function Creep (the gradual widening of the use of a technology or system beyond the purpose for which it was originally intended, especially when this leads to potential invasion of privacy) (Collins 2016), tracking and data misuse. For instance - after more than a decade of biometrics, the UNHCR still does not have a publicly available policy that sets the terms and conditions for its use concerning sensitive questions, such as with whom the biometric data the UNHCR collects will be shared. The UNHCR stated: 'Biometrics will be used at the UNHCR's discretion. Whether or not the UNHCR exchanges data with partners is not relevant.' (Jacobsen 2016).

The report also raises "physical privacy" concerns and distinguishes three types of risk: the stigma associated with some biometrics, the possibility of actual harm to the participants by the technology itself and the hygiene of the biometric devices. Religious objections were raised by some Christian groups that consider biometrics to be a brand of Evil (Woodward, a další 2001). Groups in Alabama such as the Christian Coalition, Southern Christian Leadership Conference and the American Civil Liberties Union, vigorously protested against efforts to place a fingerprint biometric on all driver's licenses. It is not expected that religious objections will be widespread, however such objections must be taken seriously due to the societal and legal emphasis on respect for sincerely held religious beliefs (John D. Woodward 2001).

Biometrics is, by its very nature, intrinsically linked to what makes us 'human', as it brings together the various elements which make up our respective and unique identities (gender, skin color, ethnic origin, etc.). It has been argued that the collection, analysis and

storage of such innate and personal data is “de-humanizing” as it reduces the individual, the human being, to a number, and that leaves us with linked ethical and moral questions (International 2015). A sharp debate has emerged over whether biometric technology offers society any significant advantages over conventional forms of identification and whether it constitutes a threat to privacy and a potential weapon in the hands of authoritarian governments. Biometric technology needs democratic accountability and ethical scrutiny. Democratic accountability starts with a willingness to listen to the voices others. Ethical scrutiny begins with care for others, to relieve and to prevent their suffering. This is the lesson taught by traditional bioethics. One should now apply such a lesson to biometric technology. Public discussions on the benefits and drawbacks of biometric technology have been lamentably lacking. Such discussions are now mandatory (Mordini a Petrini 2007). A UNHCR article quotes Congolese refugee Olivier Mzaliwa saying: “I can be someone now. I am registered globally with the UN and you will always know who I am.” Even assuming that Olivier has been well-informed about the possible downsides to his registration (which seems doubtful, since even the UNHCR staff are not aware of these issues), he no longer has any control over this data about himself – and it is doubtful he has the means to regain control of it or even to find out how the data is being used. There is still a massive accountability gap. (Currion 2015) Further thorough analysis of biometric registration issues can be found in research papers and publications by the specialized project researcher[1] Katja Lindskov Jacobsen.

The U.S. has already been preparing for another technological leap: so-called “rapid” DNA testing. DNA tests for refugees and other immigrants are controversial because they can reveal deeply buried family secrets about parentage. They are extremely intrusive and, compared to other methods, very expensive. Critics also say they impose a narrow “nuclear” conception of family that is tone-deaf to the reality of refugee life, where people often care for unrelated children whose parents may be dead or missing. The U.N. has said DNA testing should be used as a last resort for refugees. Nonetheless, DNA testing has been embraced by U.S. refugee and immigration agencies to determine whether people within a family are indeed genetically related. This has been done with the aim of stymying fraud and child trafficking.

A senior resettlement officer with the U.N., Larry Yungk, said he is somewhat baffled by the overwhelming concern about security risks associated with refugees coming to America, since refugees are already rigorously screened. The process takes about two years and entails detailed interviews, three levels of background checks, three fingerprint screenings, contagious disease screening and cultural orientation. Yungk also added: “We do not fault people for worrying about security, but at the same time this is a highly secure process.” (Worth 2015).

Conclusion

The United Nations High Commissioner for Refugees is one of the most significant entities involved in the European refugee crisis, however the crisis is not only a matter of a few years. Researchers from diverse parts of the world have been working on technologies to facilitate the migration process over many years and still continue. The UNHCR has already launched a new biometric identity card for refugees in June 2016 in an effort to combat identity fraud and counterfeiting. The card includes a number of enhanced security features including 3D holograms, bar codes and a large “Secure Quick Response” (SQR) code. “To enable law enforcement authorities and others engaged in the UNHCR’s protection and assistance work to scan the SQR and verify a card’s authenticity, UNHCR Malaysia has launched the UNHCR VERIFY-MY application,” said UNHCR representative to Malaysia, Richard Towle. The UNHCR is working on more improvements and innovations in the registration systems (Mayhew 2016) (P. Biometrics 2016).

Application of biometrics to the registration of refugee and asylum seekers has markedly improved national and international efforts to promote their welfare, and the impact has been felt directly (refugee camps) and indirectly (addressing fraud and security concerns) (Farraj 2011). Biometrics has dramatically decreased the amount of fraud in the distribution of aid, it has saved refugees long waits in receiving benefits and it has reduced the possibility of the radicalization of vulnerable refugee populations. (Soliman 2016) Yet, it is also a means of personal information exposure, an opportunity for misuse and a possible weapon for enemies. Thus, raised concerns are justified and further debates, security measures and overall improvements should be made to the process in order to eliminate defects.

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[1] Experimentation in humanitarian locations: UNHCR and biometric registration of Afghan refugees or The Politics of Humanitarian Technology: Good intentions, unintended consequences and insecurity.

Master programme International Development Studies
Olomouc, Czech Republic

Master's programme International Development Studies taught in English is first of its kind in the region of Central and Eastern Europe and is open to students from all parts of the world. It is a two-year, full-time programme designed not only for bachelor students with development studies background but also for students from related fields who are interested in international development. Annual fee is 3000 EUR. Number of scholarships are offered by university and by other institutions.

The programme provides students with key knowledge and skills for a deeper understanding of problems affecting developing countries and the policies of international development. Study plan is based on four main pillars:

- Theoretical Background – compulsory courses focused on Development and Geography, Economics and Environmental Issues
- Methodological Background – elective courses focused on Quantitative and Qualitative Methods
- Regional Orientation – elective courses focused on Development Opportunities of Africa, Latin America, Southeast Asia, and Middle East and Central Asia
- Practical Focus – practically oriented elective courses, for example Project Management or Internship

Upon successful completion of the programme students will be equipped to work in the field of international development in public sector, private industry, as well as in governmental and non-governmental organizations at both national and international levels.

For more information about the programme and entry requirements for potential students, please visit www.development.upol.cz/ids.

Master programme Foresight, Environment and Development
Olomouc, Czech Republic

The aim of the Foresight, Environment and Development program is to prepare foresight-focused professionals for careers in environmental and developmental policy and practice. The duration of the program is 2 years. Students will be awarded the title of “Magister, abbreviated as “Mgr.” which is equivalent to the Master of Science (M.Sc.). The Foresight, Environment and Development program is the first of its kind in the Czech Republic and in the region of Central and Eastern Europe. Annual fee is 3000 EUR. Number of scholarships are offered by university and by other institutions.

Foresight is the ability to describe what may happen or may be needed in the future, while considering the future as something that we can create or shape. Foresight assumes that the future is not pre-determined, but that it can evolve in different directions. Foresight includes thinking about the future, debating the future and shaping the future, using participatory and multidisciplinary approaches.

Development is a branch of social science that addresses issues in development policy and practices. Environment is an academic field that systematically studies human interaction with the natural world, particularly the factors that have an influence on human wellbeing and sustainable development.

For more information about the programme and entry requirements for potential students, please visit http://www.development.upol.cz/english/study/fed-master-program/.

Erasmus Mundus Joint Master Degree in International Development Studies
Olomouc, Czech Republic

The Erasmus Mundus Joint Master Degree in International Development Studies (GLODEP) is a two-year multidisciplinary master program in development studies, with an economic grounding and policy perspective. In the course of the program all students spend the first semester at Palacky University (Czech Republic), the second semester at the University of Auvergne (France) and the third semester at the University of Pavia (Italy). In the fourth semester students conduct internship or research stay and write their thesis.

The aim of the program is to prepare professionals in the field of development policy and practice. It provides the students with comprehensive knowledge and skills to analyze development issues and to design and promote development policies at national, regional and international levels. Two features characterize the program. First, it links the areas of development studies and development economics, offering insights from economics and other fields, such as geography, environmental studies, and political science. Second, the applied character of the program is reflected in the course contents where the policy (project) dimension is emphasized.

The program is launched with the first intake of students in 2017. Around 20 EMJMD scholarships are available. For more information about the program and the admission please visit www.glodep.eu.

GLODEP is organized with the support of the Erasmus+ Programme of the European Union.

Call for Papers for the fourth issue of the Development, Environment and Foresight

Development, Environment and Foresight (DEF Journal) opens the **Call for Papers**. Researchers dealing with topics related to the scope of the journal are welcomed to submit abstracts to the editorial board.

In case you are interested in publishing in DEF Journal, please send your **abstract** (400-700 words) to Jiri Panek (**Jiri.Panek@upol.cz**).

The Development, Environment and Foresight journal is publishing articles about the recent research achievements within the Environmental Studies, Development Studies and Foresight.

The goal of this journal is to track the development tendency of these fields of expertise and make contributions in the development of the subject.

The Environmental Studies is the interdisciplinary academic field which systematically studies human interaction with the environment. The main interests are solving complex problems, and includes particularly the factors that have an influence on human´s well-being and sustainable development.

Development studies are a multidisciplinary branch of social science which addresses issues of concern to development and development areas, while focusing both on development policy and best practices.

Foresight is the ability to predict what may happen or be needed in the future, while considering the future as something that we can create or shape. Foresight assumes that the future is not pre-determined but can evolve in different directions. Foresight includes thinking the future, debating the future and shaping the future, using participatory and multidisciplinary approaches.

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Normal paper length is around 5000-8000 words. Very short papers are unlikely to be complete and will be rejected. Excessively long papers will subject to careful scrutiny - and authors can expect to be asked to reduce the length. If necessary, you may choose to split a paper into two - but each paper must stand lone as a complete paper.

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This section is open to student papers which present cutting-edge research and trending topics.

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Normal paper length is around 5000-8000 words. Very short papers are unlikely to be complete and will be rejected. Excessively long papers will subject to careful scrutiny - and authors can expect to be asked to reduce the length. If necessary, you may choose to split a paper into two - but each paper must stand lone as a complete paper.

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These short, narrowly focused articles of contemporary interest. They are not mini-reviews.

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