

# Journal of Environmental Sustainability Advancement Research

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## AMARANTH PESTS ABUNDANCE AND DAMAGE LEVEL CORRELATES TO ENVIRONMENTAL TEMPERATURE REGIMES

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### ABSTRACT

The grain amaranth, *Amaranthus hypochondriacus* (L.), is becoming an important crop worldwide due to its nutritional value. Various pests, among them the pigweed beetle, *Hypolixus haerens*, are the major biotic factors causing low yield of grain amaranth worldwide. It has been reported in the Latin America that the beetle causes high yield loss and plant stem breakage just before grain is harvested. The present study evaluated injury level of both foliar and stem damage pests on eight varieties of *A. hypochondriacus*, namely KAM 201, Kisii Brown, KSC, Kisii White, KAM 114, KAM 105, KAM 106 and KAM 115 during two seasons of production at Katumani and Kiboko in the low midland regions of Kenya. Both bollworm and leaf miner larvae were found to be the common foliar pests, although they caused no significant ( $P > 0.05$ ) yield loss in *A. hypochondriacus* varieties at the two sites. Stem tunnel length of beetle *H. haerens* correlated to environmental temperature where the hotter Kiboko site had highest stem damage. The same hotter Kiboko site of low midlands five (LM5) was drier ( $43.7 \pm 15.9$  mm,  $28 \pm 2^\circ\text{C}$ ) than the cooler Katumani zone of low midlands four (LM4), which was relatively wetter ( $57.1 \pm 13.8$  mm,  $24 \pm 2^\circ\text{C}$ ). Highly significant ( $P < 0.05$ ) yield resulted in chemical treated plots than in control ones for most varieties. Beetle stem tunnel length inversely correlated with yield of most varieties punctuated by climatic conditions. The stem damage levels at the cooler zone were lower by 35%, 42% and 47% in comparison to those from the hotter zone (LM5). The wetter and cooler zone (LM4) had lower stem damage and subsequently 5-9 times higher grain yield than the hotter zone LM5. In conclusion, considerations of the environmental factors in each agro-ecological zone would lead to right timing of insecticide spray for management of the pests of grain amaranth to prevent yield loss.

**Key words:** Bollworm larvae; Foliar damage; Leaf miner; Pigweed beetle; Stem damage; Tunnel length

## Contribution of Multi-Purpose Pumpkin (*Cucurbita moschata* Duch.) to the Economy of Selected Kenyan Small-scale Households

*Kiharason, J.W.<sup>1</sup>, Isutsa, D.K.<sup>1,2</sup> and Ngoda, P.N.<sup>2</sup>*

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### ABSTRACT

Kenya's agricultural sector has generally been affected by repeated delays in rains that suppress farming. Farmers should therefore grow other non-staple crops which can do well with minimal rainfall. Pumpkin is one such crop that is drought-tolerant and requires very little care and labour. Majority of households do not utilize pumpkins regularly, although it is a multi-purpose food crop capable of forming basis for income and various commodities, including snacks, bakery products, and infant weaning foods. The present study established pumpkin's socio-economic impact in households and extent of cultivation and sale. A cross-sectional survey using a semi-structured questionnaire was administered to 385 households in Nyeri County of Kenya. Results showed that majority of households earned low income, with 56.3% earning less than KSh. 12,000 per month. Pumpkin was grown by 71.4% of the households, but contributed to livelihoods of only 4.2% households. There was a high correlation between the number of pumpkin plants cultivated and amount of income received from pumpkin sale,  $r(16) = 0.510$ ,  $P = 0.043$ . Pumpkin fruits contributed very little to income of the households and were not yet tapped to improve food security and livelihood of people in the area. Improving marketability of pumpkin could increase its demand, production level and sale to generate income for many resource-poor households.

**Key words:** Food security, Fruits, Income, Kenya, Nutrition security, Socio-economic impact

## PREFERENCE OF NAPIER GRASS, TITHONIA (*Tithonia diversifolia*) AND SAPIUM (*Sapium ellipticum*) AND THEIR NUTRITIVE CONTENT AS FORAGES FOR SHEEP IN KENYA

Maragara, E.N.<sup>1</sup>, Wahome, R.G.<sup>2</sup>, Badamana, M.S.<sup>2</sup>, Musalia, L.M.<sup>3</sup> and Njoka, E.N.<sup>3</sup>

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### ABSTRACT

There is limited information on preference of tithonia (*Tithonia diversifolia*) and sapium (*Sapium ellipticum*) as forages for sheep in Kenya. This study compared the preference of napier grass, tithonia and sapium as forages for sheep. It had five (one and half year old male sheep) selected on the basis of uniformity in live weight, averaging 23 kg. The sheep were housed in individual pens (metabolic unit), measuring 1.5m x1.5m x2.0m and mounted on the concrete floor at Kenya Agricultural and Livestock Research Organisation, Embu. The feeding period lasted for 10 days. Data were collected and recorded for 5 days. A sample of each offered and refused experimental diet was collected and recorded for 5 days and oven-dried for determination of moisture content, crude protein, ash content, neutral detergent fiber, acid detergent fiber and acid detergent lignin. The neutral detergent fibre levels for wilted napier grass, tithonia and sapium fodder were 80.1%, 33.57% and 39.52%, respectively. The acid detergent fiber levels for wilted grass, tithonia and sapium hay were 43.58%, 27.98% and 22.4%, respectively. The acid detergent lignin levels for the napier grass, tithonia and sapium were 6.12%, 11.3% and 8.87%, respectively. Napier grass, sapium and tithonia forages were preferred by the sheep in this order, with an average daily intake in kg/DM of 0.26, 0.11 and 0.18, respectively. Knowing preference of the forages could assist in their utilization in improvement of sheep nutrition and productivity.

**Key words:** Ruminant animals, Corriedale sheep, Neutral detergent fiber, Acid detergent fiber and lignin

## COPING STRATEGIES AND OPPORTUNITIES FOR CLIMATE-SMART AGRO-PASTORALISM: A CASE STUDY OF NAROK COUNTY IN KENYA

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### ABSTRACT

Pastoralism is the main form of livelihood in the arid and semi-arid lands of Kenya that host about 10 million people and approximately 70% of the national livestock herd. However, livestock production is threatened by climate related hazards as witnessed by deaths, reduced dairy yields, degraded natural resources and high incidences of pests and diseases. The traditional coping strategies have been affected by persistent climatic variations and socio-economic changes that have led to increased insecurity of livelihoods. The communities have, therefore, developed other strategies to cope with the harsh climatic conditions, and knowledge of these strategies is important in addressing current and future climatic challenges. This study, therefore, assessed the pastoralists of Narok County to determine their perception towards climate change and its impacts, to identify coping strategies and to evaluate the constraints faced towards a sustainable climate-smart livelihood. The study used focus group discussions and key informant interviews from three selected regions and integrated secondary data from various sources. The results indicate that these communities had observed remarkable changes in weather patterns and high prevalence of pests and diseases over the last 10 years. These impacted heavily on productivity and food security, and worsened by current land use changes. In response, pastoralists have transformed towards agro-pastoralism with subsequent shift from communal to private land ownership. They have adopted various coping strategies by diversifying livelihoods to improve food security and reduce vulnerability. However, supporting these strategies faced various challenges, the main ones being unpredictable weather patterns and limited knowledge on soil and water management. The findings provide a framework for sustainable climate-smart agro-pastoralism and policy interventions to enhance long-term sustainable systems that will ensure food security, while simultaneously conserving natural resources.

**Keywords:** Arid and semi arid lands, Climate change, Coping strategies, Environmental conservation, Pastoralists, Narok County

## SMALLHOLDER FARMERS PERCEPTION OF CLIMATE CHANGE IMPACT ON BIODIVERSITY IN VARIED AGROECOLOGICAL ZONES IN KENYA

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### ABSTRACT

The current global warming has resulted in climate risks that include persistent droughts in tropical countries, including Kenya. Farmers are now changing their agricultural practices to cope with the drought, which is usually accompanied by variation in biodiversity. This study determined how farmers perceived the changes over a period of 30 years. Semi-structured questionnaires in Bungoma, Nakuru, Kajiado, Embu (Mbeere) and Kilifi Counties were used to collect data. Weather stations and corroborated with that of Kenya Meteorological Services provided climatic data. Results showed that rainfall fluctuated considerably and amount increased slowly over time, rainy season decreased and storms became frequent. Dry periods were frequent and annual temperatures were increasing. Some animals, plants, birds and insects had either disappeared like elephants and lions in Mbeere, butterflies and termites in all sites; mosquitoes, weevils and red mites in all sites, tortoise and scorpions in Mbeere, *Jatropha curcas* and *Lantana camara* in Mbeere increased in numbers; others emerged (great grain borer in Mbeere and Kilifi, black Indian crow in Kilifi, *Ipomoea* species in Kajiado and *Prosopis juliflora* in Kilifi). Some invasive plant species such as *Prosopis juliflora* were out-competing crops and pastures, predators were invading homesteads, carnivorous birds were becoming omnivorous and insect vectors and pests like mosquitoes and weevils were extending their habitats to former cooler areas. Farmers were harvesting and conserving water in water pans, zai pits and terraces. They were also planting fast-growing multipurpose trees such as *Senna siamea*, rearing diverse animals and growing drought tolerant crops. It was evident from this study that climate change had a severe impact on biodiversity within the stressed habitats and some species were already being replaced by aliens. It is recommended that Governmental and Non-Governmental Organizations should create more awareness and promptly support farmers to adapt and mitigate climate change challenges.

**Key words:** Biodiversity, Adaptation, Climatic Information, Alien Species

## COMMUNITY ENGAGEMENT IN NATIONAL AGRICULTURE AND LIVESTOCK EXTENSION PROGRAMME: THE CASE OF CHUKA DIVISION, MERU SOUTH DISTRICT IN KENYA

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### ABSTRACT

The study assessed the level of community engagement in an agriculture extension programme called National Agriculture and Livestock Extension Program (NALEP) in Chuka Division, Meru South District, Eastern Kenya. It focused on the community's knowledge of the programme, their participation and evaluation of the programme, including their suggestions for improving it. The total population for the study was 3840 farm families, with 2040 and 1800 farm families from Mugwe and Gitareni Locations (focal areas), respectively. Each Location was divided into 4 blocks as per the design for the implementation of NALEP. Simple random sampling method was used to obtain one block from each of the two Locations. The pre-tested questionnaires were then administered systematically at every 25<sup>th</sup> home in a block. This resulted in 20 questionnaires in each of the two Locations. Three focus group interviews were conducted; two in Gitareni and one in Mugwe. Quantitatively and qualitatively analysis of data with emphasis on descriptive analysis was done. The two communities were engaged in the programme and that only a small proportion (15%) of the participants had low engagement. The engagement was across all occupations, age and gender. The main reason given for participation was to improve their farms (82% and 74%, respectively). The organizational structure in the community affected participation. There was no significant difference in the level of engagement of the two communities. There is need to design training programmes to suit the needs of the people with flexible modes of engagement other than a 'one size fits all' approach. There is also a need for stakeholders to work collaboratively.

**Key words:** Community engagement, Participation, Collaboration, Organizational structures, Sector coordination, Community knowledge, Agricultural extension.

## INFLUENCE OF ENTREPRENEURSHIP TRAINING ON PERFORMANCE OF YOUTH SMALL AND MEDIUM ENTERPRISES IN MAARA SUB-COUNTY, THARAKA-NITHI COUNTY, KENYA

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### ABSTRACT

Small and Medium Enterprises (SMEs) provide social and economic advantages to youths who are unable to find salaried employment in the formal sector. The SMEs are widely recognized as major sources of employment, poverty alleviation and economic development. The Government of Kenya has initiated several policies to stimulate growth in small business ownership and entrepreneurship. Such policy initiatives include: the session paper number 2 of 2005, poverty reduction strategy paper of 1999-2015 and MSE Bill of 2006. The Ministry of Youth Affairs established Youth Enterprise Development Fund (YEDF) in 2007 as a source of capital for youth-registered groups to start and grow their businesses. However, many youth-owned enterprises face numerous challenges with low productivity, stagnation in growth and high failure rate. Subsequently, entrepreneurship education and training is increasingly becoming recognized as a critical element to tackle global unemployment challenges by involving the youths in business ownership and entrepreneurship. This study determined the influence of entrepreneurship training on sustainability and performance of youth-owned enterprises in Maara sub-county. Descriptive research survey design was applied on a population of 230 registered youth-owned SMEs enterprises with 147 enterprises taken as the sample using stratified random sampling method. Youths who attended entrepreneurship training performed better in their businesses. Thus entrepreneurship training was important and critical to the survival and performance of youth-owned enterprises. Thus, provision of YEDF should go hand in hand with entrepreneurship training.

**Key words:** Sustainability, Business growth/survival, Youth employment, Youth Enterprise Development Fund, Entrepreneurship training.

## STUDY OF CRUDE EXTRACTS OF *Ajuga remota* BENTH (LABIATAE) AS POTENTIAL ANTI-MALARIAL DRUG

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### Abstract

Malaria is among the killer diseases in the tropics and the parasite has been noted to develop resistance to many synthetic drugs. The objective of the present study was to screen and test for the efficacy of the crude extracts of different parts of *Ajuga remota*. Aqueous crude extracts of *Ajuga remota*, which has been traditionally used to treat fevers and malaria, were used in vivo against *Plasmodium berghei* malaria infections in mice using four-day suppressive test. Leaves, stems, roots and flowers either boiled wet in water immediately after collection or dried first before boiling in water were then injected intravenously through the tail vein of mice infected with *Plasmodium berghei* parasite. Chloroquine, a standard antimalarial drug was used as a control. On day four, parasitized blood smears were made from tail strip for determination of parasitaemia and calculation of suppression percentage. The different preparations had different percent suppressive activities against *P. berghei* parasites. The leaves had the highest antimalarial activity compared to stems, roots and flowers for wet and dry parts, respectively. The antimalarial activity of the leaves was higher than for chloroquine, a conventional drug currently being phased out. These results show that *A. remota* has potential antimalarial compounds, which need further evaluation to determine activity against human malaria parasites.

Keywords: Chloroquine, Crude plant extracts, Malaria, *Plasmodium berghei*, Parasitaemia,

## DYNAMIC MECHANICAL ANALYSIS AND THERMAL PROPERTIES OF BITUMEN-ACACIA SAP COMPOSITES

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### ABSTRACT

Bitumen binder mechanical and thermal properties have been unsatisfactory. Different synthetic binder modifiers that have been used to improve its performance have led to environmental problems such as incineration and landfill. Acacia sap, a natural and environment-friendly polymer, has been used successfully as a modifier. Composites of bitumen-acacia sap with different composition of sap percentage ranging from 0% to 62.5% cell sap were prepared by injection drawing process. The composites were analyzed by Dynamic Mechanical Analysis (DMA) for mechanical properties and Thermogravimetric Analysis for thermal properties. Storage modulus and Loss modulus of bitumen binder increased with acacia sap loading. Glass transition temperatures shifted to higher values as acacia sap loading increased. Activation energies were determined from the thermogravimetric data of the bitumen-acacia composites using the Broido model. Pure bitumen binder had the highest thermal stability. Modification of bitumen binder with 25% acacia sap loading gave optimum mechanical properties. Further studies should dwell more on understanding morphological properties of bituminous binding elements and using different kinds of natural polymers and different grades of bitumen obtained from different crudes.

**Key words:** Acacia, Bitumen, Modulus, Thermogravimetric

## DEMISTIFYING NEGATIVISM OF *Cartha edulis* (MIRAA) AND FOCUSING ON ITS RELIGIOUS, SOCIO-ECONOMIC AND EDUCATIONAL SIGNIFICANCE: A CASE OF MERU NORTH REGION IN MERU COUNTY, KENYA

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### ABSTRACT

There have been conflicting views regarding *Cartha edulis* (*miraa*) effects. *Miraa* is a plant that when consumed affects human psychological and physiological functioning and, therefore, falls under the category of abusive drugs. The National Campaign against Drug Abuse Authority and other scholars have confirmed these effects. Whereas there are numerous negatives emanating from *miraa* farming, trade and consumption, there are also immense religious, social and economic benefits derived and associated with it. This study assessed the impact of *miraa* on religious, socio-economic and educational spheres of the society in Meru North. It was motivated by conflicting views of *miraa* farmers and traders, who also happen to be churches members located within the study area, and the alleged trade income used for social and economic developments. The study used *ex-post facto* design and targeted accessible population of elders, farmers, traders, church members and pastors. A sample size of 34 persons was interviewed using questionnaires and observation schedules for elders, farmers, traders, church members and pastors. There are both positive and negative contributions brought about by *miraa* farming and trade. Although the negatives outweigh the positives in terms of both short and long-term intangible damages to individuals, family and society, there are strong social, religious and economic attachments to *miraa*. *Miraa* has assumed political dimension as the community elects leaders based on expected protection of the trade by them. Exclusive focus on negatives has overshadowed potential financial, social, educational, religious, cultural and medicinal values. *Miraa* creates a contextual foundation for communication based on diverse perceptions. However, the negative implications of *miraa*, which greatly affect consumers, marriage, schools and churches, cannot be ignored. One wonders if it can serve a better purpose and value if handled properly among the community where it is grown.

**Key words:** Demystification, Economic impact, Religious, Socio-cultural

## **CULTURAL DIPLOMACY AS SOFT POWER: A COMPARATIVE STUDY OF CHINA AND SOUTH AFRICA FROM 1990-2010**

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### **ABSTRACT**

Cultural diplomacy carries a set of prescriptions which are material to its effectual practice such as unequivocal recognition and understanding of foreign cultural dynamics and observance of the tenets that govern basic dialogue. Individual nations commonly use cultural diplomacy to improve international relations and secure agreements that cover issues like trade, investment, immigration and security. The continued evolution of cultural diplomacy depends on behavioural economics of its adherents, as people develop better understandings of each other and new mediums of dialogue. Emergence of globalization carries with it cultural erosion which directly affects relevance of cultural diplomacy; a prevalent culture would remove the need for cultural recognition and understanding, if all people identified with a common culture. This study was based on the search for better ways of forging relations between states other than the previous domination of hard power use. With the growing trend of countries 'looking-east' it is definite that China's growth has caught the attention of the world. This paper identified why it could be attributed to their intense soft power and cultural diplomacy. The study examined cultural diplomacy as a form of soft power, and how it affects foreign policy and inter-state relations. The framework used was theory of idealism, which helps explain why soft power is more effective than hard power. It used two case studies: China and South Africa. In concluded, cultural diplomacy as a form of soft power not only boosts relations but also economies.

**Keywords:** Globalisation, International relations, South-south cooperation, Security

## **GENDER MAINSTREAMING: PERSPECTIVES AND INSIGHTS IN KENYA**

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### **ABSTRACT**

Gender mainstreaming was prioritized as a mechanism to achieve gender equality by the Beijing Platform for Action in 1995. Since this Beijing meeting many institutions, the world over, have attempted to put into practice the ideas of gender mainstreaming, but the concept has not clearly been understood. While there has been some research regarding the opportunities and challenges of its implementation, very little has focused on understanding the concept, background, details and concerns of the entire topic. Through an exploratory research design and by use of documented evidence, this study sought to provide insights towards understanding the meaning and background of gender mainstreaming in Kenya. The study further explored the extent of research in the area in order to identify the gaps in the field. Literature on international, regional and national policies as well as declarations, coupled with the government and other stakeholders reports and academic research on the subject was key in the study. It is, therefore, hoped that this study provides a basis for establishing future research priorities in the area.

**Key words:** Gender Equality, Gender Mainstreaming, Inclusiveness, Policies

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