



UNIVERSITY OF
PLYMOUTH

PEARL

PHD

'Socio-economic and livelihood impacts of environmentally supportive bio-enterprise development for the agro-/pastoral communities in Samburu Heartland, Kenya'.

Wren, Susan Alison

Award date:
2012

Awarding institution:
University of Plymouth

[Link to publication in PEARL](#)

COPYRIGHT STATEMENT

This copy of the thesis has been supplied on condition that anyone who consults it is understood to recognise that its copyright rests with its author and that no quotation from the thesis and no information derived from it may be published without the author's prior consent.

‘Socio-economic and livelihood impacts of environmentally
supportive bio-enterprise development for the agro-/pastoral
communities in Samburu Heartland, Kenya’.

by

Susan Alison Wren

A thesis submitted to the University of Plymouth in partial fulfillment for the degree of

DOCTOR OF PHILOSOPHY

Department of Geography, Earth & Environmental Sciences.

February 2012.

ABSTRACT. *Name of candidate: Susan Alison Wren. Title of the thesis: 'Socio-economic and livelihood impacts of environmentally supportive bio-enterprise development for the agro/pastoral communities in Samburu Heartland, Kenya'.*

The question of agro/pastoral livelihoods adaptation is gaining attention in the rural development arena but little empirical evidence exists that has examined the performance and impact of diversified enterprises on agro/pastoral livelihoods and the environment in the ASAL, and on how to effectively support such initiatives. Additionally, there has been little evaluation of the type of behavioural patterns that agro/pastoral communities need to evolve in order to engage in such initiatives. This research study endeavours to bridge this knowledge-gap and assist the ASAL communities, NGOs, CBOs and government departments to understand the skills and resources required to develop climate-resilient, environmentally and economically sustainable bio-enterprises. This study examines the roles of bio-enterprise initiatives in enabling agro/pastoralists to develop more resilient livelihoods and incentivising positive community-led natural resource management and draws on different bio-enterprise initiatives located across the drylands of Kenya. In this study data was collected through interviews, focus group discussions and from secondary data. The analysis of four agro/pastoral bio-enterprise initiatives compares the level of success of specifically orientated development-funded support schemes. A more in-depth study was made of one of the initiatives, the BDP. Two surveys were made one year apart and secondary data was collected of the BDP impact. This highlighted the probable factors that influence the communities' up-take of these bio-enterprises. Results show that this diversification requires stakeholders and support-actors to gain a greater understanding of business development approaches. Other factors such as capacity development to ensure production meets market standards, strong linkages with ethical commercial operators, access to trade-finance and ongoing

mentoring proved to be the main drivers of success in these initiatives. The results show that the outputs of the BDP service-providing activities and the ethical trade facilities have been a major factor in the level of success achieved by the BDP.

The main policy implications that this study has shown are:

- ✚ Agro/pastoralists realise that they can improve their resilience, food security and incomes by developing bio-enterprises. If conducted using conservation practices, this is an effective conservation and drought management tool.

- ✚ Communities do not possess the necessary skills and business acumen to diversify from traditional activities.

- ✚ Due to the lack of market knowledge, business acumen and technical skills many development and government instigated rural enterprise initiatives have failed.

The commercial sector has strong transferable skills and will assist in developing bio-enterprises where commercial gains can be attained. This study has shown that where government, development and the private sector work in synergy projects are more socially, environmentally and economically successful.

- ✚ International standards and certification for sustainable harvesting of indigenous plant materials will effectively assist communities to manage their natural resource utilization and market their products more competitively.

- ✚ Women have shown that they have control over small-scale diversified activities and are able to choose how to use the revenue they have raised.

- ✚ Due to the orientation of agro/pastoralists to collective-action a wide ripple-effect can be seen from well-targeted business development assistance such as: mentoring, skills development, access to affordable trade finance/capital, improved market opportunities and value-addition.

LIST OF ABBREVIATIONS AND ACRONYMS

ABRDP: Arsi-Bale Rural Development Project

Agfax: WRENMedia's radio services for African broadcasters.

Agro/pastoral: Agropastoral and pastoral

AGM: Annual General Meeting

AFD: Action for Development

APDA: Afar Pastoral Development Association

ASAL: Arid and Semi-Arid Lands

AWF: African Wildlife Foundation

BDP: Bio-enterprise Development Programme

BfN: *Bundesamt für Naturschutz* (German Federal Agency for Nature Conservation)

CBD: Convention on Biological Diversity

CBNRM: Community Based Natural Resource Management

CBO: Community Based Organisation

CETRAD: Centre for Training & Integrated Research in Arid Lands Development

CFA: Community Forest Association

CGIAR: Consultative Group on International Agricultural Research

CIFOR: Centre of International Forestry Research

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

CoP: meeting of the Conference of the Parties to CITES/CBD

CPA: Community Protected Area

DBH: (dbh) Diameter at Breast Height

DE: Desert Edge Bio-Trading Company

DFO: District Forest Officer

DFID: Department for International Development

DRSRS Department of Remote Sensing and Resource Surveys

EPaRDA: Ethiopian Pastoral Research and Development Association.

ENSO: El Niño/La Niña-Southern Oscillation

FAO: Food and Agriculture Organization

FEWS: Famine Early Warning System

FMP LWF: Forest Management Programme

FORREMS: Forestry Range Rehabilitation and Environmental Management Strengthening

GEF: Global Environmental Fund

GHG: Green House Gas

GL-CRSP: Global Livestock Collaborative Research Support Program
GPS: Global Positioning System
GTZ: *Deutsche Gesellschaft für Technische Zusammenarbeit* (German Society for Technical Co-operation.)
GoK: Government of Kenya
HM: Holistic Management
IBS: Institute of Behaviour Science
ICRC: International Committee of the Red Cross
ICIPE: International Centre for Insect Physiology & Ecology
ICS: Internal Control System
IDS-FAC: International Development Studies – Future Agriculture Consortium
IFAD: International Fund for Agricultural Development
IFOAM: International Federation of the Organic Agriculture Movements
IIED: International Institute for the Environment and Development
IIRR: International Institute of Rural Reconstruction
ILO: International Labour Organisation
IMO: *Institut für Marktökologie*, Switzerland
ISSC-MAP: International Standard for Sustainable Wild Collection of Medicinal, Aromatic Plants
IUCN: International Union for Conservation of Nature
KEBS: Kenya Bureau of Standards
KEFRI: Kenya Forest Research Institute
KFS: Kenya Forest Service
KWS: Kenya Wildlife Service
LWF: Laikipia Wildlife Forum
MAP: Medicinal and Aromatic Plants
MDG: Millennium Development Goal (UN)
MoNK: Ministry of Northern Kenya (and the ASAL)
MRC: Mpala Research Centre
NARC: National Rainbow Coalition NEMA National Environmental Management Authority
NCAR: National Centre for Atmospheric Research
NGO: Non-Governmental Organisation
NKIF: Northern Kenya Investment Fund
NMK: National Museums of Kenya
NRM: Natural Resource Management

NRT: Northern Rangelands Trust
NTFP: Non-Timber Forest Product
ODI: Overseas Development Institute
OSSREA: Organization for Social Science Research in Eastern and Southern Africa
PARIMA: Pastoral Risk Management Project
PIM: Participatory Impact Monitoring
PROTA: Plant Resources of Tropical Africa
PFM: Participatory Forest Management
PFMP: Participatory Forest Management Plan
PPG: Pastoralist Parliamentary Group
SEB: Society of Economic Botany
SNV: Netherlands Development Organisation
SSA: Sub-Saharan Africa
TIPP: Turkana Integrated Pastoral Programme
UN: United Nations
UNDP: United Nations Development Programme
UNESCO: United Nations Educational, Scientific and Cultural Organisation
UNEP: United Nations Environment Programme
UNICEF: United Nations Children's Fund
USAID: United States Agency International Development
WHO: World Health Organization
WRUA: Water Resource User Association
WWF: World Wildlife Fund

1. LIST OF CONTENTS

Chapter 1: Background and rationale

- 1.1 Overall background and rationale
- 1.2 Justification of this study
- 1.3 Aims and objectives of the study
- 1.4 Main research questions
- 1.5 Conceptual background
- 1.6 Study location
- 1.7 Structure of the thesis

Chapter 2. Literature review

- 2.1 Introduction
- 2.2 Causes of poverty and famine in the pastoral regions of Africa
- 2.3 Drivers of diversification and challenges
 - 2.3.1 Emerging diversification strategies
 - 2.3.2 Diversification challenges
 - 2.3.3 Increasing conflict and insecurities
 - 2.3.4 Formal versus informal trade
 - 2.3.5 Formation of groups and cooperatives
- 2.4 Is pastoralism a major cause of environmental degradation?
- 2.5 Government response to pastoral poverty
- 2.6 Development sector and the pastoral plight
- 2.7 Concept of incentive-led community-driven conservation.
- 2.8 Gender relations and participation in income generation activities
- 2.9 Potential for bio-enterprise development to drive positive socio-economic and environmental change
- 2.10 Conclusion. Main research gaps that shape this study

Chapter 3: Research methods

- 3.1 Introduction
- 3.2 Research concepts and approaches
 - 3.2.1 The characteristics of quantitative and qualitative research methodologies
 - 3.2.2 Case study approach
 - 3.2.3 Participatory research methodologies

3.3 Selecting the research strategy

3.3.1 Orientation and approach

3.3.2 Examination of the wider study setting

3.3.3 Central study

3.3.4 Presentation of the results 3.3.5 Positionality and ethics

3.4 Sampling strategy

3.4.1 Sample frame

3.4.2 Tools, sampling and validity in participatory methods

3.4.3 Tools, sampling and validity in environmental impact assessment methods

3.4.4 Measuring change

3.4.5 Developing and using the questionnaire

3.4.6 Data entry and analysis

Chapter 4. Description of the study area

4.1 Arid and Semi-arid Lands (ASAL)

4.1.1 General characteristics and classifications:

4.1.2 The ASAL in Eastern Africa:

4.2 National setting – the ASAL of Kenya

4.3 Description of the study region

4.3.1 Samburu Heartland

4.3.2 Samburu District

4.3.3 Mukogodo District

Chapter 5. Costs and benefits of relevant case studies.

5.1 Introduction and methodology

5.1.1 Context and scope of this chapter

5.1.2 Methods of evaluating the different bio-enterprise initiatives

5.2 Case studies of the bio-enterprise initiatives in Kenya

5.2.1 Case Study 1: Mwingi Organic Beekeepers Association, Mwingi, Kenya

5.2.2 Case Study 2. Rumuruti Aloe Women's Group, Laikipia, Kenya

5.2.3 Case Study 3: MakaaZingira Eco-Charcoal, Kilifi, Kenya

5.2.4 Case Study 4: Baringo Aloe enterprise development, Kenya

5.3 Impacts of bio-enterprise initiatives on the livelihoods of communities

5.3.1 Impacts on rural livelihoods in terms of increased incomes

- 5.3.2 Impact on human and organisational capacity
- 5.3.3 Ability of these bio-enterprises to incentivise communities to manage natural resources
- 5.4 Identifying the determinant factors for the success or failure of these initiatives
 - 5.4.1 Perception and experiences of the target beneficiaries
 - 5.4.2 Motivation and rationale of the initiators
 - 5.4.3 Comparative analysis of the case study initiatives
- 5.4 Longer term impact of the existing initiatives
- 5.5 Informing the design of future bio-enterprise initiatives
- 5.6 Conclusion

Chapter 6. Central case study: Bio-enterprise Development Programme (BDP).

- 6.1 Introduction
 - 6.1.1 Context
 - 6.1.2 Methodology
 - 6.1.2.1 Approach and purpose
 - 6.1.2.2 Case study area and sample group selection
 - 6.1.2.3 Data collection and sampling.
 - 6.1.3 Background
- 6.2 Issues and assumptions that formed the programme's design principles
 - 6.2.1 Main issues perceived as hindering expansion of bio-enterprises in the Samburu Heartland
 - 6.2.2 Justification for development-sector support to commercial bio-enterprises
 - 6.2.3 Producer group structures and business operating capacity
 - 6.2.4 Bio-enterprises development based on sound business principles
 - 6.2.5 Ensuring environmental sustainability
 - 6.2.6 Initial scoping exercise and feasibility study that informed the programme design
 - 6.2.7 Central design focus of the BDP
 - 6.2.8 Developing the business operating and trading structure, Desert Edge (DE).
 - 6.2.9 Infrastructure and product development
- 6.3 Baseline survey of the selected research groups targeted by the BDP
 - 6.3.1 Group history, governance and composition
 - 6.3.2 Summary of the baseline information of producer groups targeted by the BDP

- 6.4 Impact of the BDP after 18 months of implementation (Nov 2009 – June 2011)
 - 6.4.1 Uptake of the BDP activities and level of collaboration
 - 6.4.2 Extension performance
 - 6.4.3 Incomes of selected groups in Kirisia and Mukogodo from developing bee enterprise
 - 6.4.4 Up-take of payment system
 - 6.4.5 Commitment of selected groups in Kirisia (based on honey enterprise)
 - 6.4.6 Key impacts

Chapter 7. Perceptions of increased pressure on natural resources

- 7.1 Introduction
- 7.2 Methodology for the case study
 - 7.2.1 Design of the case study
 - 7.2.2 Case study area and sample group selection
 - 7.2.3 Data collection and sampling
 - 7.2.4 Scoring
- 7.3 Background and past research findings
 - 7.3.1 Environmental, socio-economic and administration status of Kirisia Hills
 - 7.3.2 Research findings of the increasing pressure on natural resources in the Leroghi Forest Reserve, 2004-2010. World Wildlife Foundation-UK, 2005
 - 7.3.3 Kirisia forest survey and assessment report, AWF. 2008.
 - 7.3.4 Ecological survey of Kirisia Forest. BDP 2009.
 - 7.3.5 Survey of community awareness of the conservation status of the Forest Reserve
- 7.4 Case Study Findings: Perceptions of pastoral communities and users groups of the value and status of the natural resources within the Kirisia Hills region.
 - 7.4.1 Perception of the ecosystem, its value and sustainability
 - 7.4.2 Perception of changing climatic conditions
 - 7.4.3 Food security and coping strategies
 - 7.4.4 Attitudes towards the future
 - 7.4.5 Perceived skill level
- 7.5 Comparison of the observations between this case study and previous research studies
 - 7.5.1 Quantitative findings
 - 7.5.2 Qualitative findings - Perceptions of the communities
 - 7.5.3 Community empowerment to affect change

Chapter 8. Major factors that have affected the adoption of bio-enterprises

8.1 Introduction

8.1.1 Context

8.1.2 Methodology

8.1.2.1 Methodology used to analyse the major factors that have affected the selection and adoption of bio-enterprise by the communities

8.1.2.2 Methodology used to research the major factors that have affected the selection of approaches by the development agents

8.1.3 Background

8.2 Major factors that have affected the selection and adoption of bio-enterprises by the communities

8.2.1 Awareness

8.2.2 Attitudes

8.3 Major factors that have affected selection of approaches by the development agents

8.3.1 Approach and orientation of the organisation

8.3.2 Awareness of the opportunities and methodologies of using bio-enterprise as a development tool (cost-benefit / risk)

8.3.3 Experience and skills of the management and field staff

8.4 Major factors that have affected the selection of approaches of bio-enterprises by the Kenya Government.

8.4.1 Approach and orientation

8.4.2 Awareness

8.4.3 Experience and skills

8.5 Major Factors that have affected the selection of approaches of bio-enterprises by the commercial sector

8.5.1 Orientation and awareness

8.5.2 Experience and skills

8.6 Relationship between perceptions of the central actors towards bio-enterprises and how can these be enhanced to encourage wider up-take.

8.6.1 Approach and orientation of the organisation.

8.6.2 Awareness of using bio-enterprise as a development tool

8.6.3 Relevant experience and skills of the management and field staff

8.7 Supporting innovation

8.8 Conclusion

Chapter 9. General discussion

9.1 Comparative analysis of the case studies.

9.1.1 Assisting livelihoods change in the ASAL through the Bio-enterprise approach.

9.1.2 Causes of poverty and famine in the pastoral regions of Africa

9.1.3 Drivers of diversification and challenges

9.1.4 Is Pastoralism a major cause of environmental degradation?

9.1.5 Developments sector and the pastoral plight

9.1.6 Concept of incentive-led community-driven conservation.

9.1.7 Gender relations and participation in income generation activities

9.1.8 Potential for bio-enterprise development to drive positive socio-economic and environmental change

9.2 Summary of the comparative observations

Chapter 10. Conclusions and policy implications

10.1 The Argument

10.2 Research analysis used and results.

10.2.1 Specific research analysis used

10.2.2 Specific results

10.3 What were the assumptions?

10.4 Key conclusions

10.5 Key implications for all sectors

10.5.1 Impact of bio-enterprise development on rural livelihoods and food security

10.5.2 Ability of bio-enterprises to provide tangible incentives for rural communities to manage natural resources positively for longer-term environmental gain

10.6 Main policy implications

10.7 Limitations and further research

10.7.1 Limitations of the research

10.7.2 Suggestions for further research in the study areas

10.8 Relevance to other situations

Appendix Section

Appendix 1. Selection criteria interview guide

Appendix 2. Focus group and key informant interview guides.

Appendix 3. Household survey questionnaire

Appendix 4. Summary of informants and respondents interviewed per main topic area and sampling techniques.

List of abbreviations and other functional parts of the whole thesis, List of references/bibliography and publications.

2. LIST OF TABLES AND ILLUSTRATIONS

2.1 List of Figures:

Figure 1.1 Sustainable livelihoods approach (compiled by IIDS, 1999)

Figure 1.2 Flow diagram of the structure of the thesis.

Figure 4.1 Regional inequalities in Kenya (compiled by the GoK, 2007)

Figure 4.2 Samburu Heartland Conservation Context (compiled by AWF)

Figure 4.3 Kirisia Forest and surrounding land tenure (compiled by AWF)

Figure 4.4 Livelihood systems around the Kirisia Forest (compiled by AWF)

Figure 4.5 Land tenure/Land use map of Laikipia and Mukogodo area (compiled by CETRAD)

Figure 4.6 Mukogodo forest and group ranch divisions (compiled by KEFRI, 2006)

Figure 4.7 Grazing movements of livestock in Laikipia (compiled by LWF)

Figure 5.1 Districts in Kenya where the case studies are located.

Figure 6.1. BDP Business flow.

Figure 6.2 Perceived roles of extension officers (%)

Figure 6.3 How useful is the service provided by the extension officers?

Figure 6.4 How can the service be improved?

Figure 6.5: Honey supplies according to gender

Figure 6.6. Proportion of respondents with individual bank accounts (%)

Figure 7.1 Comparison of the forest cover in Leroghi Forest Reserve: 1986 and 2000.

Figure 7.2. Distribution of answers for each statement

Figure 7.3. Components of a healthy environment (%)

Figure 7.4. Reasons for the forest health to be maintained

Figure 7.5. Perceived importance of bees (%)

Figure 7.6 Awareness according to education level (%).

Figure 7.7. Changes due to climate (%)

Figure 7.8. Detected effects on the household (%)

Figure 7.9 Proportion of group members who think something can be done about climate change

Figure 7.10 What are group members doing to mitigate climate change impacts?(%)

Figure 7.11 Short term food coping strategies / frequency used in last two dry seasons %

Figure 7.12 Proportion of respondent who agreed/disagreed with the statements.

Figure 7.13 Skill level according to production aspects (%)

Figure 8.1 Perception of the BDP after one year

Figure 8.2 Group members' role (%)

Figure 8.3 Perceived change in income, production and investment from beekeeping (%)

Figure 8.4 Top scoring challenges for increasing their business potential (%)

Figure 8.5 Link between training and income change (%)

Figure 8.6 Level of decision power (% women)

Figure 8.7 Distribution of answers about women assertiveness and confidence levels (%).

2.2 List of Tables:

Table 3.1 List of group selected and their location.

Table 3.2 Environmental data collection sheet

Table 3.3 Measuring change.

Table 4.1 Land Designation

Table 5.1 Criteria for successful bio-enterprises, as per case-studies

Table 6.1 Kirisia - Number of respondents and gender 2009 and 2010

Table 6.2 Mukogodo - Number of respondents and gender 2009 and 2010

Table 6.3 Method and sampling technique used for each impact area and indicator investigated

Table 6.4 Analysis of the barriers, assets to progress and the sector opportunities.

Table 6.5 Factors that were used to assess the suitability for selection of bio-products.

Table 6.6 Example summary on governance and business status of the groups

Table 6.7 Commitment to production of good quality honey (%)

Table 7.1 List of group selected and their location

Table 7.2. Number of respondents surveyed per group

Table 7.3 Sampling technique used for each impact area and indicator investigated.

Table 7.3. Summary of findings from the former research studies of Kirisia Forest.

Table 7.5 Food security - severity and frequency scales

Table 8.1 Number and percentage of respondents and gender in 2010
Table 8.2 Sampling technique used for each impact area and indicator investigated.
Table 8.3. Livelihood diversification factors
Table 8.4 Organisational orientation of the selected NGO and CBO respondents
Table 8.5 Example of Oxfam-GB implementing partners
Table 9.1 Comparative observations: Causes of poverty and famine
Table 9.2 Comparative observations: Drivers of diversification and challenges
Table 9.3 Comparative observations: Is Pastoralism a cause of environmental degradation
Table 9.4 Comparative observations: Development sector and the pastoral's plight
Table 9.5 Comparative observations: Incentive-led community-driven conservation
Table 9.6 Comparative observations: Gender relations and participation.
Table 9.7 Comparative observations: Potential to drive positive change.

2.3 List of Photographs

Photograph 1. Domestication of indigenous aloe in Laikipia county

Photograph 2. Honey harvesting equipment and protective clothing provided by the BDP

Photograph 3: Illegal charcoal production in Mukogodo Forest Reserve.

Photograph 4. Meeting of Maasai elders to discuss the benefits of working with the BDP

Photograph 5: Samburu women harvesting honey from log hive during practical training.

ACKNOWLEDGEMENTS

This research study could not have been completed without the moral and professional support of a number of people. This study has been made possible by the tireless and expert input of the supervisors. I could not have completed the task without their support and encouragement. For this I am extremely grateful and give sincere thanks to my supervisors Dr Sanzidur Rahman and Professor Mick Fuller, and for the enthusiastic and consistent mentoring of Dr Suresh Raina. I wish to thank and fully acknowledge the input of the monitoring and evaluation expert, Dr Delphine Malleret-King. Her understanding and insight into the environmental and social characteristics and conditions within these remote, fragile and often insecure areas has greatly enhanced the work. I also give my thanks and gratitude to Robert Wells who has kindly taken the role of proof-reader, for his steadfast patience, encouragement and unwavering support.

The Bio-enterprise Development Programme (BDP) is a fundamental component of this research and the full co-operation of the programme senior management staff has been a major factor in enabling a major part of this study to be conducted. I extend grateful thanks to the senior management of BDP, and also of the Laikipia Wildlife Forum and Africa Wildlife Foundation who have provided access to programme reports and the use of maps. I wish also to extend my gratitude and thanks to the Ministry of Northern Kenya, CETRAD and Mpala Research Centre for their permission to include their maps within this thesis. I am deep appreciative of the time and interest that the other individual sources have given, which has enabled me to complete all the interviews I required for this study. I wish to thank and fully acknowledge the support and facility provided to me by the International Centre for Insect Physiology and Ecology (ICIPE). I am particularly grateful to Dr Christian Borgemeister for his care and belief in my abilities, and for enabling my attachment as visiting scientist to ICIPE. Also to Dr Raina who has generously installed me in his department. Lastly, I wish to thank my dear daughter, Isabella, and the rest of my family for their unwavering trust and acceptance of the very many long hours I have invested in this research study.

AUTHOR'S DECLARATION

At no time during the registration for the research degree- PhD under the Department of Geography, Earth & Environmental Sciences at the University of Plymouth has the author been registered for any other University award without prior agreement of the Graduate Committee. This study was self financed. Relevant scientific seminars and conferences were regularly attended at which work was presented; external institutions were visited for consultation purposes and several papers prepared for publication.

Publications (or presentation of other forms of creative and performing work):

- Published article in the special edition 'New Avenues for Pastoral Development in SSA' within the European Journal of Development Research. "The struggle to diversify rural livelihoods: Bio-enterprise initiatives and their impacts on agro-/pastoral communities in the drylands of Kenya".
- Editor for the GEFDOC , Global Environment Fund, UN. March 2011 KEN10406: "Sustainable Charcoal Production and Bio energy Technologies to Reduce GHG Emissions and promotion of Income Generating Activities for livelihood improvement in Arid Lands of Kenya". Partners: ICIPE, KFS, Ministries of Agriculture and Livestock Development, CFAs, IFAD loan programmes, Min of Forestry and Wildlife, Min of Energy and the Min of Local Government.
- Published article in the '*Annual Review of Entomology*' "Forest Habitat Conservation in Africa using Commercially Important Insects". Vol. 56: 465–485. Suresh Kumar Raina, Esther Kioko, Ole Zethner, Susie Wren. www.annualreviews.org/toc/ento/56/1
- Published article in the Global Environmental Fund Annual Review. Co-Author. "Commercial Insects and Climate Change Mitigation". ICIPE.
- Published paper "Structural and procedural properties important in promoting bio-enterprises as alternative livelihoods to pastoral and agro-pastoral livelihoods". Chinwe Ifejika Speranza and Susie Wren. 'Future of Pastoralism in Africa' proceedings document, from the conference March 21st – 23rd, 2011, Addis Ababa, Ethiopia. Published on the IDS website. www.ids.org
- Invitation to contribute to the forthcoming Open Access book, "Ecosystem", ISBN 979-953-307-530-2. Published by InTech - Open Access Publisher covering the fields

of Science, Technology and Medicine. The contribution to this book will be based on our paper "Forest habitat conservation in Africa using commercially important insects". Publication of the book is scheduled for mid 2012. It will be abstracted and indexed in the major repositories and indexing databases.

www.intechweb.org/welcome/ee698d03ccce547bc8cdb4f13ebb282/sraina@icipe.org

- Provided an interview for the Agfax service www.agfax.net
- Provided an article for the online magazine New Agriculturist www.new-ag.info.

Presentation and Conferences Attended:

- Presentation at the conference 'Development and Pastoral Livelihoods'. Co-funded and hosted by CARE and Save the Children US. Nairobi
- Presentation at the international conference convened by IDS, UK. 'Future of Pastoralism in Africa' Conference March 21st – 23rd, 2011, Addis Ababa, Ethiopia. Topic: "Promoting bio-enterprises as alternative livelihoods to pastoral and agro-pastoral livelihoods". <http://www.future-agricultures.org/index.php>. This is now included in the IDS publication: Catley, *et al.*, (2012).
- Presentation of a paper 'Benefits of conserving bee pollinators for pollination services to boost wild harvest in the forest and crop security in the farmland' at the 'The First Africa-Wide Workshop on Strategic Partnership Networking in Bee Health and Pollination Services For Food Security In Africa' International Centre for Insect Physiology and Ecology (ICIPE). African Insect Science for Food and Health, Nairobi. 10th to 19th October 2011. www.icipe.org
- Facilitate and chair of one session within the conference above. Theme: Bee Health and Pollination Services for Food Security in Africa. Presentation provided.
- Presentation at the introduction and launch of Society of Economic Botany [Kenya Chapter] (SEB-Kenya, 23rd of June, 2011 at the University of Nairobi, Kenya.
- Facilitation and presentation at the workshop; 'Livestock, land the changing political economy of pastoralism in Laikipia: Pathways to strengthen pastoralist livelihoods'. Held in Kenya, September 15-16th 2011. DFID-funded Future Agricultures Consortium (FAC) and Desert Edge (DE). The purpose of the workshop was to critically reflect on the findings of a study on innovative pastoralist responses during the 2009 drought crisis in Laikipia and Samburu.

- Facilitation and presentation at the workshop in Kenya, August 2011, LWF Lecture Series ‘Sustainable Commercialisation of Indigenous Plant Species in Kenya’. 15th August 2011. Convened by DE and LWF www.biotrade.co.ke
- Presentation to the Ministry of Northern Kenya (MoNK). “The Opportunity for Bio-enterprise Development in the ASAL of Kenya”. March 2011.
- Facilitation and presentation at the policy workshop: ‘Strengthening pastoral livelihoods in Northern Kenya: Exploring the potential of bio-enterprises. Held in Kenya, February 23rd 2012. Focus discussion on the opportunities for increasing socio-economic and environmental benefits from indigenous natural products. The policies and institutions as well as development inputs and commercial sector involvement required to promote the growth of these enterprises. Organised by the FAC, MoNK and DE.

External Contacts:

Some of the central contacts that were established during the study include:

Dr Chinwe Ifejika Speranza

Dr Delphine Malleret-King

Dr Tobias Hagmann

Dr Christian Borgemeister

Dr Anthony King

Dr Jeremy Lind

Klaus Durbeck

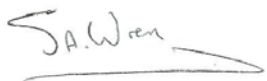
Maria Dodds

Anne Powys

There are very many other contact that were established during the study from government, development, commercial and civil sectors.

Word count of main body of thesis: 79,853

Signed:



Date: 25th July 2012