

**ASSESSMENT OF INSTITUTIONAL CAPACITY AND ADOPTION OF FORESTRY  
INNOVATIONS IN KENYA**

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A Thesis Submitted to the Graduate School in Partial Fulfilment for the Requirements of the  
Degree of Doctor of Philosophy in Natural Resources Management of Egerton University

**EGERTON UNIVERSITY**

**November, 2016**

## DECLARATION AND RECOMMENDATION

### DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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## **DEDICATION**

This Thesis is dedicated to my wife Lora, daughter Marion, and sons Fabian and Steve. I am greatly indebted to you for your prayers, encouragement and support as I took this long walk to making this Thesis a reality. In a special way, together we started at Egerton and together we crown it at Egerton.

## ACKNOWLEDGEMENTS

Writing this thesis has been a continuous learning process both academically and professionally, to which I give thanks to God for *His Gift of Life*. My sincere gratitude goes to Egerton University for giving me an opportunity to study at this premier institution. I would like to express my sincere gratitude to my Supervisors Dr. Gilbert Obwoyere Obati and Prof. Fredrick Ugwe Ngesa whose encouragement, diligent guidance and support were invaluable throughout these years. I am also indebted to the late Prof. Moses Karachi who helped me to lay the foundation of this thesis – RIP.

I would like to thank all the Heads/CEOs and staff of the 51 institutions who allowed and assisted me to collect data from their institutions, without which there would have been no thesis.

I would like to extend my sincere gratitude to Dr. Paul K. Konuche (former Director) and Dr. Ben E.N. Chikamai (current Director) of the Kenya Forestry Research Institute (KEFRI) for their encouragement, patience and unfailing funding support over the years I went through this study programme. I also acknowledge the contributions of my colleagues Dr. Phaniel Oballa, Dr. Joshua Cheboiwo, Hans Osawa, Samuel Mwaura, Nancy Bor, Mariam Karanja, Oscar Kambona and Esther Manyeki.

Writing this thesis is one thing, but equally important is having its manuscripts published in a journal, for this, Dr. Ken Shimizu your financial support is highly appreciated.

To all those who have contributed in one way or another but not specifically mentioned, I say a special thank you.

## **ABSTRACT**

Kenya's forest sector is undergoing major changes, which are attributed to the rapid depletion and degradation of natural resources, as well as viable actions on remedial measures. The demand for forest products and ecosystem services continue to increase against a declining supply from afforestation, reforestation and the dynamics of work. This emerging challenge necessitates improving the institutional capacity of organisations that are involved in, or support forest conservation activities. It is increasingly recognised that a combination of factors, which include inefficient operational capacity, contributes to the low levels in adopting forestry innovations. This implies that there are limited possibilities to achieving an enhanced adoption of forestry innovations over time. There is therefore, a need to identify the knowledge gaps and quantify the interactive influence of institutional capacity on adoption of forestry innovations over time. The main objective of the study was to analyse institutional capacity and adoption of forestry innovations across relevant institutions in Kenya. The study dealt with 51 main institutions involved in, or support conservation activities, of which 32 were public, 15 non-governmental, and 4 private. Stratified purposive sampling was used due to the heterogeneity of the institutions involved in conservation. Primary data were collected using a structured questionnaire to examine the following capacity indicators: human capital, conservation interactions, training interactions, research interactions, user interactions, internal interactions, non-salary incentives, salary incentives, technical support, published outputs, electronic media output, conservation management, conservation investments, and facilities at empirical level. Conceptually, the indicators were categorised as tangible and intangible variables at operational level. Their interactive variables constituted the theoretical level expressed as visible adoption of forestry innovations. The analytical model used, which was based on quartile statistics, established what accounted for the differences in capacity variation as expected variation region or the common cause and the unexpected variation region or the special cause, which should be investigated and acted upon. Embracing the approach confirmed the model as appropriate quantitative analytical framework for assessing and articulating elements of institutional capacity and adoption of forestry innovations across the relevant institutions in Kenya. Evidently, the study reiterates that to overcome institutional capacity gaps and respond to conservation paradigm shift, relevance, engagement, and commitment of all stakeholders is imperative.

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## ABBREVIATIONS AND ACRONYMS

ASK	Agricultural Society of Kenya
CBS	Central Bureau of Statistics
CEO	Chief Executive Officer
CFAs	Community Forest Associations
CIFOR	Centre for International Forestry Research
CTA	<i>Centre Technique de Cooperation Agricole et Rurale</i> (Technical Centre for Agricultural and Rural Cooperation)
ERSWEC	Economic Recovery Strategy for Wealth and Employment Creation
FAN	Forest Action Network
FAO	Food and Agriculture Organisation
FD	Forest Department
FFS	Farmer Field School
GoK	Government of Kenya
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IUCN	The World Conservation Union
JICA	Japan International Cooperation Agency
KALRO	Kenya Agricultural and Livestock Research Organisation
KARI	Kenya Agricultural Research Institute
KEFRI	Kenya Forestry Research Institute
KEMRI	Kenya Medical Research Institute
KFS	Kenya Forest Service
KIPPRA	Kenya Institute of Public Policy and Research Analysis
KMFRI	Kenya Marine and Fisheries Research Institute
KNBS	Kenya National Bureau of Statistics
KWS	Kenya Wildlife Service
LBVC	Lake Victoria Basin Commission
MENR	Ministry of Environment and Natural Resources
MFWL	Ministry of Forestry and Wildlife
MoA	Ministry of Agriculture
NASEP	National Agricultural Sector Extension Policy
NEMA	National Environment Management Authority

NGOs	Non-governmental Organisations
NFP	National Forest Programme
OECD	Organisation for Economic Cooperation and Development
PELIS	Plantation Establishment and Livelihood Improvement Scheme
PESTLEG	Political, Economic, Social, Technological, Legislative, Environmental and Governance
PFM	Participatory Forest Management
PRA	Participatory Rural Appraisal
RAES	Rural Afforestation Extension Scheme
RDFN/ODI	Rural Development Forestry Network/Overseas Development Institute
RoK	Republic of Kenya
SPSS	Statistical Package for the Social Sciences
SWOT	Strength, Weakness, Opportunity and Threat
ToF	Trees On-farm
TRFK	Tea Research Foundation of Kenya
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States of America Agency for International Development
USAID-CDIE	United States of America Agency for International Development-Centre for Development Information and Evaluation
WWF	World Wide Fund for Nature

## **CHAPTER 1 INTRODUCTION**

### **1.1 Background Information on Forest Resources**

Globally, the role of the forest sector is undergoing major changes attributed to the rapid depletion and degradation of natural resources (FAO, 1997; 2003a; 2003b; Garg *et al.* 2006; Underwood, 2007; FAO, 2012; 2016) as well as vulnerability to climate change (GoK, 2013b). The demand for forest products and ecosystem services continue to increase (FAO, 2009; UNEP, 2009). The changes and emerging challenges have necessitated improving: i) the institutional arrangements or formal and informal norms that provide the interactive framework of goals and incentives within which organisations and people operate, and ii) the institutional capacity or the way resource needs are directed and operationalised towards common objective or benefits to enhance the sector's resilience (Kowero and Spilsbury, 1997; Spilsbury *et al.* 2003; GoK, 2003; Nilsson, 2004; Koech, 2006; UNEP, 2006; Ochieng', 2008; GoK, 2014). In the context of the study, 'institutional capacity' is not just about ability to attract or perform but also to impact positively on the end users. Compliance should be manifested as adapted to, and in enhanced adoption of forestry innovations.

Kenya's forest resources directly and indirectly support economic growth, other productive sectors and sustainable rural development (Korten, 1992; MENR, 1994; GoK, 2003; 2005a; UNEP, 2009; GoK, 2013a). Forests are important components in strategies for adapting to climate change (FAO, 2013; 2016). Climate change is a cross-cutting issue and therefore, requires special institutional arrangements. Further, forest activities contribute directly and indirectly about 3.6 % of Kenya's Gross Domestic Product (GDP), (Konuche, 2002; UNEP, 2012; MFWL, 2013a; KFS, 2015). Kenya's estimated annual earnings from forest products and services is in excess of Ksh. 20 billion while employing over 50,000 people directly and 300,000 indirectly (KFS, 2015). It is higher when indirect roles or social costs are quantified and contributions from the informal sector are considered (IUCN, 2001; MENR, 2006a; Nyangena, 2008; UNEP, 2012; MFWL, 2013a).

The current dismal, dispersed, and degraded status of Kenya's closed canopy forest cover and biodiversity in state, county and private land are a well-documented national concern (MENR, 1994; UNEP, 2001; GoK, 2003; Kenya Forestry Research Institute (KEFRI), 2005; GoK, 2005a; MENR, 2006a; 2006b; Situma, 2008; GoK, 2010a; Simiyu, 2012). The 1.7% closed canopy forest



cover (UNEP, 2001; 2002) and under-valuation are manifested and constrained by a combination of factors, which have created forest resource gaps and inadequate opportunities for synergies.

The factors include: unsustainable consumption and production patterns; weak governance and enforcement of policies as well as legal frameworks (Act!, 2015); institutional and structural inertia; inadequate institutional capacity development (GoK 2010a); low level adoption of forestry innovations; a deficient empirical information base; low funding and imbalanced public investment; low capacity to overcome after-effects from the loss of staff to other institutions and retrenchment; (IUCN, 2001; FAO, 2005; KEFRI, 2005; Kowero *et al.* 2006; Langat *et al.* 2015); reforms to reduce budgetary deficits; fragmented and unsustainable programmes; inadequate technological innovations and information to nurture and sustain local needs (FAO, 1997); most donor support allocated to fund “technical” expatriates and own specific priorities; increasing population and poverty levels (GoK, 1999; Central Bureau of Statistics (CBS), 2005; Temu, 2006); decline in the forest and agriculture sector performance (MENR, 1994; GoK, 2003; Ministry of Agriculture (MoA), 2005; GoK, 2005b; MENR, 2006a; Nair, 2006); and dynamic land use factors (Cheboiwo, 1991; FAO, 2016).

Conceptually, most of these challenges are familiar and linked to the way in which tangible and intangible resources are directed at institutional level to influence visible adoption of forest innovations. Evidently, the challenges continue to undermine the Kenya Government’s initiatives to achieve sustainable management and conservation of the country’s forest resources. Nevertheless, the spirit of our times requires a paradigm shift as well as a need for pragmatic and flexibility in the way institutions approach forest conservation. There are various legal provisions some constitutional or statutory, urging a change in approach, in favour of forest conservation and management. Articles 42, 69 and 70 of the Constitution (GoK, 2010b) are singled out for emphasis.

The initiatives are embraced and articulated in the National Development Plan 2002-2008, the Economic Recovery Strategy for Wealth and Employment Creation 2003-2007, Kenya Vision 2030 on Transforming National Development, Second Medium Term Plan 2013 - 2017 (GoK, 2013a), relevant national development and institutional strategic plans. Some of the endeavours are also stipulated in international conventions. This is because the sector’s performance is also gauged along international standards of management such as the Agenda 21, the Biodiversity

Convention, the Millennium Development Goals (MDGs) and currently, the Strategic Development Goals (SDGs), (GoK, 2003; MENR, 2006a; UNEP, 2006; GoK, 2007; 2010a).

Kenya's forest cover has been variously cited as: 1.7% by UNEP, 5.6% by FAO and 6.99% by UNFCCC (MFWL, 2012; GoK, 2013a; MFWL, 2013b; GoK 2014; KFS, 2015). However, depending on the source of statistics, it is still below Africa's forest cover of 9.3%, the recommended 10 % minimum international standard and constitutional requirement (MENR, 2006b; FAO, 2010; GoK, 2014). In particular, gazetted forests cover 1.24 million ha of which 141,000 ha are industrial exotic plantations, which supply wood materials to the forest based industries, 9.3 million ha are under farm forestry as trees on-farm (ToF), 37.6 million ha are covered by woodlands and bushlands in the ASALs, 60,000 ha are under mangrove forest and approximately 150,000 ha are under bamboo forests (GoK, 2013a).

Nevertheless, the dismal status of forest resources constitutes a direct threat to the "quality of life" (Soubotina, 2004), environmental resilience and sustainable development (GoK, 1999; 2003). The risk of resource degradation and water security is linked to forest cover (UNEP, 2009; GoK, 2013b). Deforestation deprives Kenya's economy about Ksh. 6 billion annually (GoK, 2013b; MFWL, 2013a). The effects of forest degradation in Kenya's five water tower catchments are already being felt across the country as much as the potential fuelwood deficits of 7 million m<sup>3</sup> by the year 2020 (MENR, 1994). Significant deficit will manifest itself in increasing demand for fuelwood (KEFRI, 1999) leading to accelerated deforestation and environmental degradation (KEFRI, 2005) due to low and variable levels of adoption of forestry innovations.

Agricultural and ecotourism activities, which are significantly dependent on forest-related resources, are likely to decline. Similarly, institutional capacity is likely to decline as forest-related investments decline hence influencing adoption of forestry innovations. The recognition of the serious threats posed by climate change further complicates potential responses and gains so far achieved towards sustainable development (GoK, 2010c; 2013a). Evidently, closing these gaps will require deliberate measures and innovation.

It is imperative that all stakeholders have a responsibility to contribute to addressing the challenges facing the forest sector in endeavours to sustainably conserve and expand Kenya's diverse forest resources (GoK, 2010a; 2010c). Mitigating measures require coherent and integrated approaches and processes that are participatory and extend beyond the mandate, scope

and capabilities of any single institution (Unasyilva, 1998; Lelo *et al.* 2000; Anyonge, 2002; Gatundu, 2003; GoK, 2003; FAO, 2005; GoK, 2005a; KEFRI, 2005; MENR, 2006a; 2006b; Koech, 2006; UNEP, 2006; FAO, 2016).

The traditional institutions dealing in forestry have to embrace and interact with other stakeholders than before to adapt for the future. There is an equally increasing pressure to improve the internal and external management systems to reinforce the contribution of forestry extension through adoption of forestry innovations in poverty reduction, food security, environmental resilience and sustainable rural development.

Adoption of forestry innovations and conservation practices just like performance is a function of three key elements, namely: knowledge and skills (technical content; process); an enabling environment (internal and external settings); and incentives or motivation (Mukolwe, 2006; Pannell *et al.* 2013). However, Rogers (2003) contends that diffusion of innovations is the most widely used framework to explain and predict adoption of new technologies. The extent to which an institution is capable of directing its resources and competencies, tangible and intangible towards the resolution of its challenges, internal processes and organisational capital is a pre-requisite for providing a common vision, strategies, approaches, local actions and simplified procedures for enhancing adoption of forestry innovations. This is inevitable if it has to intensify and diversify; benefits from tree products and services, income generating opportunities and enhance environmental resilience in the context of improving the quality of life and sustainable rural development (Johnson *et al.* 2011).

It is evident that institutional capacity matters because it provides foundation for performance. Such performance is embraced in Kenya's Vision 2030, which targets the planting of at least seven billion trees to address food, water and energy security. The Constitution of Kenya 2010, also provides for maintenance of at least 10% tree cover of the land area as a performance measure (GoK, 2013b). Imperatives to institutional capacity include the need to: i) understand past and prevailing capacity characteristics; ii) build an objective analytical framework to assess and link capacity to pragmatic forest conservation development and adoption mechanisms across relevant institutions, iii) establish conservation resources and outputs that inspire adoption actions of forestry innovations, and iv) integrate adoption as an imperative development initiative need (Karlsson, 1998; Kenya Agricultural Research Institute (KARI), 2000; 2005; KEFRI, 2005; Kowero *et al.* 2006; UNEP, 2006).

## **1.2 Statement of the Problem**

There is an increasing recognition that a combination of factors contributes to the low levels in adopting forestry innovations in Kenya. Institutional capacity is one of the core factors that directs and operationalises resource needs and use towards a common objective or measurable benefits related to adoption of forestry innovations. This implies that there are limited possibilities to achieving an enhanced adoption of forestry innovations over time, without an efficiently operational institutional capacity. Different levels of institutional resource needs and use have led to the urge to analyse the knowledge gaps and to quantify the interactive influence of institutional capacity on adoption of forestry innovations across relevant institutions. The knowledge gap is also partly constrained by lack of a quantitative analytical framework to assess and link institutional capacity data to enhancing adoption of forestry innovations. This inability continues to constrain the potential synergies and efficiencies of relevant institutions as avenues for expansion and conservation of Kenya's diverse but dismal, dispersed and degraded forest resources. The purpose of this study was to analyse the dynamics and limitations that exist within the institutions their ability to enhance adoption of forestry innovations.

## **1.3 Study Objectives**

### **1.3.1 Broad objective**

To analyse institutional capacity and adoption of forestry innovations across relevant institutions in Kenya.

### **1.3.2 Specific objectives**

A pre-requisite to analysing institutional capacity is the need to focus on institutions in their context. Conceptually, the context is linked to the following specific objectives, to:

- i) Assess the quantity and quality of human resource needs involved in promoting adoption of forestry innovations across relevant institutions.
- ii) Examine information available to the institutions for enhancing adoption forestry innovations.
- iii) Establish the level interactions in the institutions linked to enhancing adoption of forestry innovations.
- iv) Establish the level of incentives in the institutions that would enhance adoption of forestry innovations.

- v) Determine the adequacy of support facilities in the institutions for enhancing adoption of forestry innovations across relevant institutions.

#### **1.4 Research Questions**

Conceptually, the institutional context is linked to the following research questions:

1. What quantity and quality of human resource needs would have influences on adoption of forestry innovations?
2. What available information would have influences on adoption of forestry innovations?
3. How does the levels of interactions affect adoption of forestry innovations?
4. What and how do incentives available affect adoption of forestry innovations?
5. Does availability and adequacy of support facilities, affect adoption of forestry innovations across relevant institutions?

#### **1.5 Significance of the Study**

Adoption of forestry innovations is achievable while institutional capacity is a pre-requisite to an enabling environment for enhancing adoption of forestry innovations. However, understanding of what makes it happen emanates in part from the need for:

##### **1. Enhanced knowledge, relationships and interactions in conservation interactions**

Institutional capacity assessment is an intervention. It offers an opportunity to appraise, articulate, improve and respond to challenges associated with efficient use of resources and adoption both quantitatively and qualitatively across relevant institutions. Such knowledge and framework that provides an analytical and objective link between institutional capacity and adoption of forestry innovations in Kenya, is weak or lacking and would be enhanced. The knowledge generated will contribute to science and inform policy to improve in allocating adequate resources to enhance adoption of forestry innovations.

##### **2. Creating opportunities for comprehensive partnerships**

Reforms, changing paradigms and capacity gaps have created additional demand for capacity development, learn and adapt and the need to work through comprehensive partnerships (MENR, 1994; GoK, 2003; FAO, 2005; Kobia and Mohammed, 2006; GoK

2010a). Partnership initiatives represent a truly collective mechanism for expanding the scope and size of implementation efforts (Desai, 2002; FAO, 2003b).

### **3. Linking capacity to quality, competence and multiple interests**

Adoption of forestry innovations should be integrated within communities' goals and aspirations. Relevant institutions are challenged to provide such leadership and solutions on demand to choices. This calls for a capacity that would accommodate the multiple interests in forestry (Cohen and Wheeler, 1997; Unasylva, 1998; GoK, 2003; Mulwa and Nguluu, 2003; Nightingale, 2003; Koech, 2006; World Wide Fund for Nature (WWF) 2006). Such capacities must set out a progressive procedure(s) and accompanying tools, which also reflect competencies.

### **4. Giving a human face to environmental issues**

The role of conservation interactions through forestry extension in improving the quality of life, enhancing environmental resilience and sustainable development is assuming significance in Kenya (MENR, 2006a; 2006b). Conservation through extension gives a human face to environmental issues and is part of a continuing education process. Enhanced adoption of forestry innovations is linked to this benefit.

## **1.6 Scope, Limitations and Assumptions**

### **1.6.1 Scope of the study**

This study assessed the availability and accessibility of 14 elements of institutional capacity associated with enhancing adoption of forestry innovations in Kenya. It attempted to analyse allocative and operational differences in delivering or supporting conservation of forest resources across 51 relevant institutions in Kenya. The institutional capacity assessment framework used in the study context, presented an opportunity to quantify the in-flow of resources and response to operational efficiency measures, which culminates in enhanced adoption of forestry innovations across relevant institutions.

### **1.6.2 Limitations of the study**

A number of limitations were associated with the study in general, and more specifically with the scope and methodology adopted. They included:

1. Coverage of institutions was limited to the public, NGOs and private sectors because of their frontline role in forest-related conservation service delivery.

2. There are few conservation surveys, reviews and documented literature related to institutional capacity assessment by means of quantitative indicators.

### 1.6.3 Assumptions of the study

This study was conducted based on the following assumptions:

1. “Institution” and “organisation” as well as “Conservation” and “Extension” are ordinary words. However, this study was not making a choice of preference of either and opted to apply the terms interchangeably as in institution (al)/organisation (al) and conservation or extension interactions.
2. “Adoption of forestry innovation” and “adoption of conservation practices” are used interchangeably.
3. The model used has capacity to capture essential data for study.
4. Questions, data and information required were within the respondent’s ability to respond.

## 1.7 Definition of Terms

The following terms were defined in the context of this study.

**Adoption** connotes approval of – a plan, technique, method or innovation. Approval includes willingness and measure to promote, increase or create by fully exercising ones abilities. As a method, adoption refers to the decision to **start and to continue** using a particular method, innovation, or to show a particular attitude towards an idea, innovation and supporting system (Van den and Hawkins, 1996). In the context of this study, adoption refers to a process of social learning leading to self-empowerment for meaningfully engaging in local actions of choice.

**Capacity** refers to the ability to efficiently and effectively perform tasks and produce desired outputs, to define and solve problems, and to make informed choices and decisions.

**Capacity assessment** refers to the process that facilitates establishment of status of the capacity of various institutional characteristics and operations. It leads to informed analysis on the internal (strengths and weaknesses) and external (opportunities and threats) environments influencing the institution performance or impact. According to Mulwa and Nguluu (2003) refers to it as “a tool to help the organisation grow”.

**Capacity building** is central to the working of institutions for sustaining development initiatives by enhancing knowledge, skills, attitudes, and practices to cause similar effect on those served. It is about a structured process of enabling people to engage in the process of

transforming their own lives, institutions and own societies (Eade, 2000; Mulwa, 2005; Njuki *et al.* 2006).

**Conservation:** Is viewed simply as the planning, cultivation (production), management, restoration and sustainable use of, particularly forests, trees, shrubs and associated plants within the agricultural landscape, natural ecosystem and human settlement.

**Conservation interaction** refers to dissemination and sharing of information, knowledge, practical skills and experiences as a key driver of conservation initiatives. In this study, the terms are used interchangeably with extension.

**Extension** in the context of this study, refers to the productive involvement of rural communities in the application of innovations either directly or indirectly. The word is derived from two Latin words “*ex*” meaning “out” and “*tensio*” meaning, “stretching”. An equivalent expression in German is “*beratung*”, which literally means “advice or counsel” (Singh, 2006).

**Forestry** refers to the science of establishing, tending, utilising and protecting forest and tree resources, and includes the processing and use of forest and tree products (Republic of Kenya, 2005).

**Forestry extension** refers to a systematic process of the exchange of ideas, knowledge and techniques leading to mutual changes in attitudes, practices, knowledge, values and behaviour aimed at improved forest, tree management and utilisation. Forestry extension puts innovation to its practical end (FAO, 1996).

**Forest-related extension** is similar to forestry extension except that the unit of reference is multi sectoral – public and private sectors, non-governmental and community based organisations as well as donors and international development agencies. It is amenable to multiple forestry interests.

**Forest resources** means anything of practical, commercial, social, religious, spiritual, recreational, educational, scientific, substance, or other potential use to humans that exist in the forest environment, including but not limited to flora, fauna and microorganisms (Republic of Kenya, 2016).

**Governance** is the quality of the decision-making process rather than a political structure or perspective. Good governance practices improve institutional growth (UNEP, 2006).

**Human capacity** refers to individuals with skills to analyse development needs, design and implement strategies, policies and programmes, deliver services and monitor results (World Bank, 2005).



**Human capital** is the accumulated knowledge, skills and abilities of the employees in an institution as identifiable expertise and intelligence (Armstrong, 2005).

**Impact(s)** are the visible positive or negative changes produced directly or indirectly, as a result of the implementation of an activity. Impact also refers to values, objective knowledge, information and attitudes of the beneficiaries achieved.

**Innovation** refers to an idea, practice, object, or way of doing what has been introduced or established (Rogers, 1995; KEFRI, 2007; Kiptot, 2007). As implied, forest innovations are dynamic, incremental over time and recommended for widescale adoption and impact. Kaudia (1996) apply the terms ‘innovation’ and ‘technology’ interchangeably. This study also makes no preference over the term ‘intervention’ and applies it interchangeably.

**Institutional arrangements** refers to the formal and informal norms that provide the framework of goals and incentives within which organisations and people operate. It is the central thread that knits internal and external institutional interactions to create a measurable impact.

**Institutional capacity** refers to the way resource needs are directed and operationalised towards common objective or benefits related to adoption of forestry innovations. It is not just about ability to attract or perform but also to impact positively on the end users. It constitutes an institute’s fundamental strength.

**Intangible resources** or “intellectual capital” consists of the human, social and institutional capital. It provides for the process through which knowledge combines and interacts in different ways, thus a set of critical pillars of capacity (Armstrong, 2005).

**Intellectual capital** comprises the value of all relationships both internal and external to the institution and values such as goodwill, corporate image and approaches (processes) Armstrong (2005). The components include human, social and organisational capital.

**Knowledge gaps** are as drawn between what an institution both qualitatively and quantitative knows, needs to know and whether the knowledge to close the gaps is available internally or externally to enhance adoption of forestry innovations.

**Organisational capacity** refers to groups of individuals bound by a common purpose, with clear objectives and internal structures, processes, systems, staffing and other resources to achieve them. It may also refer to the ability and capability of an institution to manage its own affairs and attain reasonable levels of performance and effectiveness in meeting its mission and set goals with minimal or no external support.

**Organisational capital** refers to the institutionalised knowledge it possesses and manages. It is stored in databases, manuals and publications (as print, digital or electronic) as well as demonstrations (plots, specimen) (CTA, 2004) refers to it as the institutional memory.

**Organisational resources** may be categorised into two main components as tangible and intangible.

**Performance** refers to the way in which institutions, teams and individuals get work done. (Armstrong, 2005). As a multi-dimensional construct, it is a function of knowledge and skills (technical content, process), environment (internal and external-institutional setting) and motivation or incentives.

**Quality of life** refers to people's overall well-being or standard of living (Soubotina, 2004). It is difficult to measure whether at individual, community or national level because it includes tangible components like the quality of environment and economic factors.

**Social capital** or connectedness is the stock and flow of knowledge derived from networks of relationships and interactions within and outside an institution (CTA, 2004; Armstrong, 2005). As a link, it may affect the avenues, which decisions and information are passed.

**Tangible resources** comprise of financial, physical (infrastructural) and sectoral systems.

**Technology** is a term derived from the Greek words “*tekhnê*” meaning an art or craft and “*logia*”, meaning area of study. In this context, it refers to the skills, practice, description, information or terminology of the applied science, which have a forest-related practical value or industrial use (Ascough, 1994; Walker, 1988; Kiptot, 2007).

**Technology transfer** is a subtle concept, with both functional and institutional meaning. However, in this context, it refers to a non-linear flow from one production locus to another, of systematic knowledge, skills and equipment to manufacture a product and/or apply a process to generate a product or service (Mugabe and Clark, 1998). Accordingly, it implies a system where various inter-related components of technology are rendered accessible to the end-user (farmers).

## **CHAPTER 2 LITERATURE REVIEW**

### **2.1 Introduction**

A basic attribute to socio-economic and environmental development is access to basic needs and sustainable use of public resources, especially trees, forest and woodland resources. FAO (2012) contends that one of the most important contributions that forestry has made to human enlightenment is the concept of sustainability. Therefore, forest resources must be actualised and sustained through emancipating institutions and the stakeholders to be self-reliant, self-evaluating and proactive (Anderson and Farrington, 1996). Nevertheless, articulating and assessing institutional capacity to respond to the conservation paradigm shift still pose conceptual and practical difficulties, hence infuses the debate on adoption of forestry innovations and feedback challenge in Kenya's forest sector.

### **2.2 Conservation Paradigm**

One of the most important concepts underpinning this thesis is "conservation". Elliot (1996) explored how paradigms of forest conservation and utilisation could have evolved over time. He concludes, "Conservation means different things to different people, hence it is subject to a wide variety of interpretation". The Macmillan Dictionary of Environment (Allanby, 1993) defines conservation as "the planning, production, management and sustainable use of natural resources to ensure their wide use within the natural ecosystem". Park (2008) contend that there are many arguments in favour of conservation because of the emphasis on positive management, not simply preventing environmental change as it the case with preservation.

In this study, conservation is viewed simply as the planning, cultivation (production), management, restoration and sustainable use of, particularly forests, trees, shrubs and associated plants within the agricultural landscape, natural ecosystem and human settlement. Dissemination of information, knowledge, practical skills and experiences is considered as a key driver of conservation initiatives and interactions.

The fact that tree resources are finite emphasises the need for their conservation within sustainable land use management systems. Such systems must be capable of incorporating: i) biophysical, ii) prevailing socio-economic diversity in the affected locations or zones and iii) have

capacity to capture natural succession processes, which sustain trees, forests and woodlands. In essence, the specific land use management system should provide and sustain a higher or similar output per unit area, with similar or less resource inputs, to be acceptable to the stakeholders. The greatest untapped conservation resources in Kenya are human endeavour and ingenuity.

### **2.3 Forest Management and Conservation Systems**

The need to disseminate information to guide and sustain forestry development in Kenya was realised in 1934 when the first Kenya Forest Bulletin was published (KEFRI, 1990). However, formal forest management in Kenya began in 1902, when the colonial government established the Forest Department (MENR, 1994; Ongugo and Njuguna, 2004; Wandago, 2006). The East Africa Forestry Regulations 1902 was published at the same time. Most major forest blocks in Kenya were reserved as forest areas in 1908 and 1932. The Forests Ordinance of 1911 strengthened the Forestry Regulations and allowed the appointment of selected farmers with forestry interests who did valuable work in forest conservation. Kenya's first comprehensive forest legislation was the Forests Ordinance of 1942.

Pre-independence forest policy was published as the White Paper No. 85 of 1957. In 1964, the Forests Ordinance was amended and adopted as the Forests Act (Cap 385). The Forests Act Cap 385 has since been repealed by the Forests Act No. 7 of 2005. The Forests Act is commended for the on-going forest sector governance reforms and unlocking the interaction constraints imposed by the old Forests Act (Cap 385). It has not only created the Kenya Forest Service (KFS), but also put in place appropriate management structures at various levels, formation of Forest Conservancies, appointment of Forest Conservancy Committees and Community Forest Associations (CFAs). The Forest Conservation and Management Act No. 34 of 2016 (Republic of Kenya, 2016), repeals the Forests Act 2005, thus strengthening the capacity to respond to forest conservation and management paradigm shift.

Post-independence Forest policy was adopted as the Sessional Paper No.1 of 1968. The Government of Kenya's Sessional Paper No. 1 of 1986 on "Economic Management for Renewed Growth" reinforced the latter by reinstating that the growth future of the forest sector would depend on the application of scientific knowledge to generate and improve innovations as well as apply them in production. Two major attempts (in 1994 and 2006) have been made to revise the 1968 Forest policy but none is yet an official government Forest policy. Both pre-independence

and immediate post-independence Forests Act and Policy focused on protection and productive functions of the forests within designated forest areas. These functions received World Bank support funds from 1970 to 1988, focusing on the development of industrial plantation forests. Characteristically, both displaced traditional forestry governance structures, excluded community involvement and relied heavily on State machinery for the management of the sector (Koech, 2006; Wanyiri and Bundotich, 2006).

Pre-independence afforestation and soil conservation in institutions, water catchment areas, hilltops, pastoral and farm lands got support from the initiatives of the missionaries, the African Land Development Programme (ALDEV) and the Sywnnerton Plan (Sywnnerton, 1954; Cheboiwo, 1991). However, support and experience under different tenurial arrangements remained minimal.

Conservation and forestry extension activities geared towards individual farmers, first came on the agenda of the Forest Department in 1971, when the Rural Afforestation Extension Scheme (RAES) was established in Kenya. The RAES was started as a network of tree nurseries mandated to meet the need for useful tree seedlings among the rural communities (Tengnäs, 1993). Although the achievements are commendable, for example, increased number of tree nurseries in the country from 364 in 1982 to 1,000, producing 100 million seedlings annually (KEFRI, 1990) most trees on-farm are still of low commercial value, while institutional capacities must be enhanced in line with public expectation to confirm with devolvement of forest management to the county and community level (GoK, 2005a; Republic of Kenya, 2016).

The World Bank issued its Forestry: Sector Policy Paper, which triggered a major shift in its forestry activities from industrial forestry towards environmental protection and meeting community needs (World Bank, 1978). This shift reflected the role of forestry in development. In 1978, the 8<sup>th</sup> World Forestry Congress themed “Forests for the People” and the 1979 FAO World Conference on Agrarian Reform and FAO community forestry initiatives in south-east Asia (Arnold, 1992) gave impetus to evolving forestry extension.

The mid 1970s and 1980s saw initiation and development of forest-related extension programmes at the “grassroots” in developing countries, including Kenya, funded through bilateral support at national and local levels (FAO, 1978). Some of the initiatives, which were mainly driven by the development partners included: the RAES funded by Government of Switzerland; Sweden

extended a similar support in covering parts of Nyanza and Machakos; Denmark supported forest-related extension in parts of Taita-Taveta and Nyanza; Japan supporting social forestry in Kitui, Mbeere and Tharaka; Finland supported forest-related activities in Nakuru, Nyandarua, and Laikipia and Norway in Turkana; United Kingdom and Australia supported forest-related activities in the dry parts of Eastern and Rift Valley Provinces; as Germany supported institutional strengthening of the Kenya Forestry College and KEFRI's research and development in tree seed activities, as well as the Special Energy Programme to address the fuelwood shortage during the petroleum crisis of the late 1970s and 1980s.

The International Centre for Research in Agroforestry (ICRAF) created a Development Division in late 1990s, whose mandate was to speed adoption of agroforestry technologies, policies and institutional innovations. The Government of Kenya established the Permanent Presidential Commission on Soil Conservation and Afforestation to coordinate soil conservation and afforestation activities in 1980. It can be argued that these initiatives advanced the contribution of forestry extension in rural development with an emphasis on production and utilisation of fuelwood, poles, and fodder as well as soil conservation and soil fertility improvement. Efforts and benefits of KFS to partner with Community Forest Associations (CFAs) are gradually being realised in sustainable management and conservation of forests. Today, conservation interactions through forestry extension and advisory services continue to evolve through agroforestry, farm forestry, social forestry, farmer field school (FFS) and stakeholders' initiatives. It is observed that FFS has brought a new dimension to forestry extension and created a systematic extension management system (FAO *et al.* 2011).

In contrast, the agricultural sector extension is relatively old and well established in the Ministry of Agriculture (GoK, 2005b; MoA, 2005). The National Agricultural Sector Extension Policy (NASEP) emphasises government's commitment in this sector. The forest sector has yet to have a comprehensive policy since 1968, hence, a 'Forestry Extension Policy' is remote indeed. It is appreciated that agricultural sector extension continues to provide a model for the development of forestry extension in Kenya. The current extension system is a product of progressive evolution in extension management practices and entry of NGOs, private sector and civil society in response to changes in economic policies. The point of convergence with forestry is the word "extension", whose usage is derived from an educational development in England in 1850 (Jones and Garforth, 1998). However, Boon (1989) contends that it is non-formal and voluntary.

Conservation interaction theory and practice has evolved through four concepts, namely: transfer of technology and market-oriented extension in the 1960s and 1970s; farming systems research and participatory technology development in the 1970s and early 1980s; facilitation of participatory and social learning in the 1990s; and embracing partnerships in the 2000s (Tengnäs, 1993; FAO, 1994; Anderson and Farrington, 1996; Desai, 2002; FAO, 2005).

## **2.4 Forest Conservation Innovation Needs**

Wanjiku *et al.*, (2013) identifies and analyses at least 46 different priority objects, knowledge, activities and process (innovation/technology) needs of end users in different eco-regions of Kenya. The different eco-regions are defined by drainage systems, land form and climate. The level of awareness and adoption of innovations (Wanjiku *et al.* 2013) varied from one eco-region to the other depending on the dissemination system used, such as through participatory forest management, focal area approach, farmer to farmer and farmer field schools extension methodologies, training, open and field days as well as Agricultural Society of Kenya (ASK) Shows. However, it should be noted that little could be achieved if innovations do not go beyond displays.

Wanjiku *et al.* (2013) further contends that 77-88% of the stakeholders in different regions of Kenya are aware of the forestry and allied natural resource innovations or technologies. However, the level of adoption is informed by the understanding of what makes it to happen. As Wanjiku *et al.*, (2013) did not capture the level of education of the stakeholders, the trend observed suggests that the education level could be of significance in adoption of innovations within the respective eco-regions. Ngesa *et al.* (2003) observed that better educated individuals tended to adopt innovations much faster, thus implying a rapid impact. Nevertheless, we live in a multilingual society where inadequate translation and interpretation of the technical terms to the stakeholders (Bernacka, 2012) could still undermine effective adoption of forestry innovations or conservation practices.

## **2.5 Operational and Adaptive Capacities**

A conservation system that is not in touch with its clientele is now considered irrelevant (Muyangu and Jayne, 2006). Both UN Resolution 62/98 and FAO (2013) advocate for sustainable forest management (SFM) as a conservation measure because it does not only provide the needed

implementation framework, but also can be applied in all types of forest regardless of management objective(s). Therefore, forest conservation and management organisations in Kenya have evolved along this concern from one inherited from the colonial era. Organisational development has despite the many challenges aimed at creating appropriate self-supporting management structures with effective follow-up and inter-institutional linkages, particularly in forest conservation through extension. Kenya Forestry Master Plan (KFMP) 1995-2025 provides a proposal of profound organisational changes needed. It also proposes partnership need for support and a framework for re-orientation of the sector. However, availability of reliable data to direct the sector development proposals lags behind other initiatives.

The forest sector development landscape is rapidly being transformed by global, regional, national and local factors (WWF, 2006; Kowero *et al.* 2006; Nair, 2006; UNEP, 2006; FAO, 2009). Although KFMP has progressively continued to serve its purpose, the National Forest Programme (NFP) process has been in progress to review the KFMP 1995-2025 and develop a ten-year plan in the framework of international agreements. The NFP is a long-term phased process, structured in themes and aimed at ensuring sustainable management of forests (KEFRI, 2013).

The trigger factors include legal provisions, pressure for greater performance from fewer resources, and the need to work harder and smarter with fewer resources as well as the need to accommodate multiple interests to forestry development as emphasised by Kenya's National Forest Programme. The emerging scenario is presenting new challenges to the stakeholders with "multiple interests and tasks" in forest-related resources (Unasyuva, 1998). The capacity challenge is not only personal, professional and institutional but also interdependent (Engel, 1994; MENR, 1994; Anderson and Farrington, 1996; Cohen and Wheeler, 1997; Anyonge, 2002; GoK, 2003; CTA, 2004; GoK, 2005; World Bank, 2005; GoK 2010). The challenges imposed are that:

- Change as in paradigm shifts is an inevitable phenomenon and that actions and solutions are realised through meaningful change (Chambers, 1997).
- No single policy will trigger meaningful change alone. A comprehensive approach is needed to address development and subsistence needs.
- Success or failure of forest conservation institutions is rooted in innovations and processes that are socially inclusive and responsive to the dynamic socio-economic settings (food security, quality of life, support resources) and biophysical environment.



Investment in tangible (physical, governance, financial) and intangible (intellectual capital – human, social, organisational) resources should encourage change and institutional growth (Armstrong, 2005; World Bank, 2005). Institutional growth implies a setting or environment that appreciates and rewards good outcomes, encourages initiatives towards providing innovative solutions to common challenges, diversifies the skills mix (CTA, 2004) facilitates strategic partnerships and embrace synergies. Chambers (1997) is full of praise and astonishment of analytical abilities of the resource poor. This is a challenge that conservation-related institutions must not only contend with but also have to develop the capacity to respond to the changing attitude of stakeholders (UNEP, 2006).

FAO's effort in forest conservation through extension is to promote problem solving and participatory multi-stakeholder approaches to enhance the contribution of trees and forests to sustainable land use and food security. Kenya's constitution dispensation, Vision 2013, Forest Policy 2014 and Forests Act No. 7 of 2005 are all committed to the changing role of forest conservation service delivery in Kenya. Oeba *et al.* (2012) asserts that extension service, significantly influenced adoption of forestry innovations. This was observed especially among farmers whose capacity to plant and retain trees on-farm had been enhanced through extension (at about 2.2 times higher) compared to those who had not acquired similar technical skills. In addition, climate change is a cross-cutting concern, which requires special institutional arrangements. This implies that a strengthened institutional capacity is an imperative for informed decision-making environment in which an innovation is expected to make an impact. It is also contended that a key pathway by which innovation is expected to have an impact is through adoption of anticipated products leading to productivity gains, however, adoption should begin with exposure following the standard sigmoid curve through awareness, understanding and action continuum.

Emphasis is placed on partnerships that facilitate access to markets and market information as well as involving the local communities in sustainable forest management. Involving local communities is not a new initiative in Kenya, but only in legal context (MENR, 2006b). The provision will be important especially in the development and application of criteria and indicators at the forest management unit level (Rural Development Forestry Network/Overseas Development Institute (RDFN/ODI), 1998; Anyonge, 2002; FAO, 2003; 2005). Examples include, Participatory Forest Management (PFM) piloted in Arabuko Sokoke Forest (Ongugo and Njuguna, 2004) and the Plantation Establishment and Livelihood Improvement Scheme (PELIS).

Involving the local communities, private sector and NGOs is an important operational policy and legislative shift in forest-related resource management (GoK, 2005a; MENR, 2006b; Nair, 2006; FAO, 2009). The changes have implications on how conservation through extension is managed, contents applied, approaches and methods are articulated and linked to key stakeholders, as well as on opportunities for financing conservation service in Kenya (MENR, 1994; GoK, 2005b). Operational capacity challenges of conservation-related institutions, should embrace creativity to motivate conservation conditions and trends, hence the desired impact.

Although both Forests Act No. 7 of 2005 and Forest Conservation and Management Act 2016 have no established definition of "forestry extension", they provide for a well-defined area of its development. Furthermore, success of conservation related development cannot only be determined on the basis of outcomes on the ground alone, but also on outcomes on the ground that were the result of efficient and effective institutions.

## **2.6 The Institutional Dilemma**

Institutional dilemma is imposed by the legislative, policy, governance, disciplinary fragmented information and capacity development issues, which underpin performance and adoption of forestry innovations (Gatheru and Shaw, 1998; Koech, 2006; Owino, 2007; Pannell *et al.* 2013; Act!, 2015). At the national level, if a solution to our environmental and natural resource management challenges is to be found in the number of institutions a country has, then Kenya need not worry. Kenya has national institutions, international agencies, NGOs, community based organisations (CBOs), networks and the private sector, specifically for most known biophysical and socio-economic component of the environment. Evidently, each institution has its own set of policies, mandate, regulations and laws governing its operations. In addition, despite decades of deliberations, Kenyans still view the environment as a sectoral concern of experts (GoK, 2003; 2010a).

In his foreword to the publication on Global Environment Outlook, the former UN Secretary General Dr. Kofi Annan added to this observation. He contends "despite the wealth of technologies, human resources, policy options, technical and scientific information at our disposal, humankind has yet to break decisively with unsustainable and environmentally unsound policies and practices" (Annan, 2002). Dolan (2006) laments many extension systems have been tried but all have met with limited success. In Australia, Underwood (2007) argued against the

replacement of the professionally-led way in which forest management plans were being developed by the process-based stakeholder analysis. This has instead resulted into inefficiency, non-self-correcting plans because the people preparing the plans were not the ones implementing them, time consuming and more about appeasing pressure groups than providing a blueprint for action.

Owino (2007) faults developing of the environment and conservation policies and their supportive legislation separately, thus resulting into contradictions, some of which are likely to create difficulties in implementing the respective new provisions. Owino (2007) cites as an example, Kenya's new legislation on forests that was enacted before a Forest policy was drafted and adopted as unfortunate. In this respect, beneficial synergies are forgone. LVBC (2013) laments parliament's inaction to endorse a new Forest Policy despite its sound basic principles, elements and initiatives. This effectively negates its good intentions to conserve natural resources and strengthen institutional reforms within the sector. Odera (2006) reports on: i) inaction and passivity of the Kenya Forestry Society to promote professionalism; ii) poor interpersonal relations among foresters, and iii) tainted image of forestry in national development. Underwood (2007) and Odera (2006) concur that systematic weakening of any institution finally leaves residual remnants that cannot keep the dynamics of the institution alive, hence suggests that Kenya's forests can only develop through assured critical professional leadership, strategic alliance and partnerships. Koech (2006) supports such views but also observes that the current systems of forestry education are not sufficiently relevant, while investment in forestry education and training has declined over time. Koech (2006) also commends the NGOs and private sector contribution to forestry education and training but observes that it is limited and ad hoc.

MFWL (2012) decries the inadequate resources to support on-going reforms within KFS, hence forest sector. There is sufficient evidence in the financial statements indicating substantive deficits against the respective annual budget allocation, among institutions directly or indirectly in this sector. Accordingly, insufficient resource is a key challenge to operational efficiency because it weakens institutional quality, which affects the enabling environment for accelerating and sustaining adoption of forestry innovations, hence realising sustainable forest management.

Kowero *et al.* (2006) singles out capacity for forest management as probably the most limiting to effective conservation and utilisation of Africa's forest resources. Similarly, MENR (1994) observed that inadequate institutional capacity was a potential barrier to creating effective vertical

and lateral integration of partners to enhance synergy and efficiency in adoption of forestry innovations. A vital interface has yet to be created to improve performance and adoption of forestry innovations. As a result, both efficiency and effectiveness of relevant institutions in Kenya are challenged by:

- i) Unclear vision, purpose and value of the extent to which the available conservation capacity are availed, allocated and evaluated.
- ii) Absence of a well synthesised analytical tool for determining the strategic aspects and responses of conservation capacity by using quantitative indicators to support institutional decisions and actions.
- iii) Preparedness of conservation interactions to inform policy and embrace creativity to motivate conservation process, hence performance and impact.
- iv) Need to overcome after-effects of human resource needs due to employment ban, devolution and continued erosion of technical and managerial capacity by HIV/AIDS.
- v) Restrictive government employment policy.
- vi) Low prominence given to the contribution of the informal forest sector despite its importance in the national and local development agenda.

## **2.7 Conditions for, and Approaches to Measuring Adoption of Forestry Innovations**

A major condition for adoption of forest innovations is a value or demand for forest products and services as well as the willingness of the beneficiary to pay or comply. This explains why behavioural and cognitive theories are important pillars of adoption. Concurrently, it implies that adoption of forestry innovations is a development issue. Its influence begins at household level and progressively “scaling up” to the national level (Cooper and Denning, 2000). The values of embracing adoption include the promise of: (i) economic returns; (ii) ownership; (iii) better environmental impact of the landscape; (iv), capacity building; (v) resource endowment; and (vi) demonstrating the influence of investing in technology development. It is evident that most of these values are non-technical as Pannell *et al.* (2013) highlights the relative importance of economic factors as a driver of adoption. Eveland (1979) contends that there are many other embodiments of adoption and each will make sense within the value system of the beneficiaries that use it. Adoption is also a culture of hard work, building relationships and inspiration to attain what one worked hard for through awareness, understanding and action (Mukolwe, 2006). Rogers (2003) presents five determinants of adoption to include perceived attributes (comparative advantage, complexity, trialability and comparability), type of innovation decision,

communication channels, social system (norms, network interconnectedness) and efforts of promotion. Kaudia (1997) presents the interactive nature of factors that influence the diffusion of social forestry innovations involving tree species and their integration in existing farming systems in the semi-arid areas of Kitui. Research institutions are challenged to ensure that their findings or innovations are adequate, appropriate, accessible and responsive to the needs of the beneficiaries (Thornton *et al.* 2000; KARI, 2005; KEFRI, 2005; Temu, 2006; Pannell *et al.* 2013).

Adoption of innovations has remained the major yardstick for determining the success or impact of agricultural extension services on the intended beneficiaries (Ovwith, 2013). It is appreciated that forestry extension services, which are not as established, have evolved alongside this understanding and practice (GoK, 2005b; MoA, 2005). Uncoordinated approaches to measurement of adoption propelled Ovwith (2013) to develop a scaled framework using the Sigma scoring method for measuring adoption, which consists of awareness, interest, evaluation, trial and adoption as first proposed by Rogers (2003). The need to study how to measure adoption on its own, relative to: i) available packages of innovations or technologies as described by Parwada, *et al.* 2010; Wanjiku *et al.* (2013); ii) diversity and contribution of each study institution; and iii) specific requirements to measuring adoption beyond the survey study tool, is imperative. However, the scope of this study remains within the context of the institutional operational capacity described by the 14 institutional capacity elements, other than beneficiaries or adopters.

## **2.8 Capacity Assessment Initiatives**

Capacity is important because of its relationship with performance (OECD, 2006). Hence, reinforcing the understanding of the link between the elements of institutional capacity and adoption is key to this study. To this end, institutional visibility is enhanced with results. This implies that there is need to determine, use and appreciate the determinants of performance in relation to transforming innovations into products and services. Therefore, capacity assessment is imperative in addressing institutional capacity gaps and operational characteristics (USAID-CDIE, 2000; Ragasa *et al.* 2010) influencing adoption of forestry and agricultural innovations. Assessment also leads to informed analysis of the strengths, weaknesses, opportunities and threats (SWOT) that shape forestry agenda beyond protected areas. In addition, the SWOT elements must now be meaningfully accounted for as being of a political, economic, social, technological, legislative, environmental, and governance (PESTLEG) dimension. However, it is observed that

omission of component “G” to read PESTLE by choice or not could undermine the emphasis on good governance in conservation issues. A comprehensive institutional capacity assessment within internal and external environment include, but not limited to the following areas: (i) legal status; stakeholder support and institutional identity; (ii) institutional instruments of governance - vision, mission, goals, objectives, values and strategies; (iii) personnel management and staff welfare policies; (iv) administrative systems and procedures; (v) financial management systems; (vi) governance and management styles and structures; (vii) human resource capacity-knowledge, skills, abilities and attitudes or competency levels; (viii) sustainability in material and financial resource base; (ix) external relations, networking and linkages; (x) programme impact and methodological efficacy; (xi) community/stakeholder participation; (xii) gender sensitivity and fairness (Mulwa, 2004; Armstrong, 2005; Mulwa and Nguluu, 2005); (xiii) extension service and enterprise development (Ngesa *et.al.* 2003); (xiv) infrastructure; equipment, technical assistance and knowledge transfer (EuropeAid, 2005), and (xv) outputs (Kowero and Spilsbury, 1997; Evanson, 1998; Spilsbury *et al.* 1999; Thornton *et al.* 2000; USAID-CDIE, 2000; Spilsbury *et al.* 2003; Ragasa *et. al.* 2010).

Different institutions and authors have undertaken and presented well documented works and adoption of innovation concepts in the following areas: Looking at the constraints affecting better performance in Nigeria’s agricultural research organisations (Ragasa *et. al.* 2010). Assessing of institutional priorities (Thornton *et al.* 2000; CTA, 2004; EuropeAid, 2005); Adoption of agroforestry technologies among small-holder farmers in Zimbabwe (Parwada *et. al.* 2010); Factors influencing adoption speed of soil fertility management technologies in Western Kenya (Odendo *et. al.* 2011); Determining the success or impact of agricultural extension services on the intended beneficiaries (Ovwith, 2013); Understanding and promoting adoption of conservation practices (Pannell *et al.* 2013); A study of extension service delivery to small and medium size manufacturing firms in Nairobi (Ngesa *et al.* 2003); Assessment of innovations, aspects of adoption and impacts at farm and community level (Kiptot, 2007); Investigating factors that affect farmers; adoption of information and communication technologies for accessing agricultural information (Ombati, *et. al.* 2007); Business management (USAID-CDIE, 2000): Interest in the capacity of trees and shrubs to ameliorate soil fertility as well as fodder Kiptot *et al.* 2006; Mugwe *et al.* 2006; Ndufa and Poulton, 2006); and Agroforestry (Cooper and Denning, 2000; Franzel *et al.* 2001; Noordin *et al.* 2001; Anyonge *et al.* 2001; Wamuongo *et al.* 2001; Franzel and Scherr, 2002). Most of these studies are related to production system performance as opposed to institutional capacity for such systems and limited to selected local communities (Pretty, 1995).

Despite the works, a feature of the adoption literature is its disciplinary fragmentation, which Pannell *et al.* (2013), attempted to harmonise.

Institutional capacity studies can be thought of as interventions to drivers of change. They assist in identifying and enhancing efficiencies. Goldstein and Ford (2005) observe that successful interventions are characterised by highly motivated people. It takes account of interactions within the internal and external environment of the respective institutions, justify past actions and support new proposals. Mulwa and Nguluu (2005), Mulwa (2003) and Ngesa *et al.* (2003) prescribe a rating scale approach, which is largely qualitative. They adopt a combination of the 4-point Likert scales (Likert, 1932) and the 4-7 point scale adjectivally Semantic Differential Test (Osgood *et al.* 1957; Osgood *et al.* 1975). The results are presented as an average score and graphically in a “radial spiderweb” design. USAID-CDIE (2000; 2011) use similar approach but without the graphical presentation. Rollinson and Broadfield (2002), contend that the scaling technique is most widespread, simple and cost-effective, which could be wider with the availability of modern computer technology. However, its use is limited as quantification of resources, relationships and interactions between the variable is minimal. The methodology by Kowero and Spilsbury (1997), Spilsbury *et al.* (1999) and Spilsbury *et al.* (2003) is preferred as quantification of variables is at the core of institutional capacity assessment.

Other alternative approaches used to evaluate technical assistance projects, institutional capacity, priority setting and developing strategic plans often include the use of an external review team, checklists and occasionally *ex post* evaluation of impacts (Thornton and Odera, 1998; Thornton *et al.* 2000; Mukolwe *et al.* 2002; CTA, 2003; World Bank, 2005). The impact of conservation interaction programmes implemented in a particular locality has often been used to provide information on conservation capacity and benefits accruing to the beneficiaries. USAID/CDIE (2000; 2011) contends that where institutions meet at least 80% of their targeted improvement, is a measure of institutional strength and quality.

It is apparent that output of explained examples must have been informed by simple, concrete and measureable data and information (Cheung, 2012). This implies that comprehensive data underpins realisation of institutional potential, hence enhanced adoption of forestry innovations beyond 10% desired on-farm tree cover in Kenya.

## **2.9 Theoretical and Conceptual Framework**

### **2.9.1 Theoretical framework**

Conservation interactions present different challenges and emphases as avenues for expansion and conservation of forest resources. This is attributed to time scale, resource and tenure rights and institutional capacity. The processes linking institutional capacity characteristics to actions are critical to enhancing adoption of forestry innovations. The same innovation in different circumstances can produce different effects. Within the context of adoption decision theories (Ndah *et al.* 2010) knowledge of the influences is central to understanding what happens, why it happens and how to make desirable events happen, when we need to (Anderson and Farrington, 1996; Honadle, 1999).

Practical implications of the intellectual capital theory are examined as the human, social and organisational capital (Rollinson and Broadfield, 2002; Armstrong, 2005; Temu, 2006). The infrastructural, governance and financial implications are also examined within the non-intellectual capital theory. The theories as illustrated in Fig 2.1, generate five practical institutional questions: What skills has it got?, What skills does it need now and in the future?, How is it going to attract, develop and retain these skills?, How is it going to develop a culture and environment in which institutional and individual learning meets its needs and the needs of its employees takes place?, and How it can provide for both the explicit and tacit knowledge created within the institution to be recorded and used effectively to influence adoption of forestry innovation.



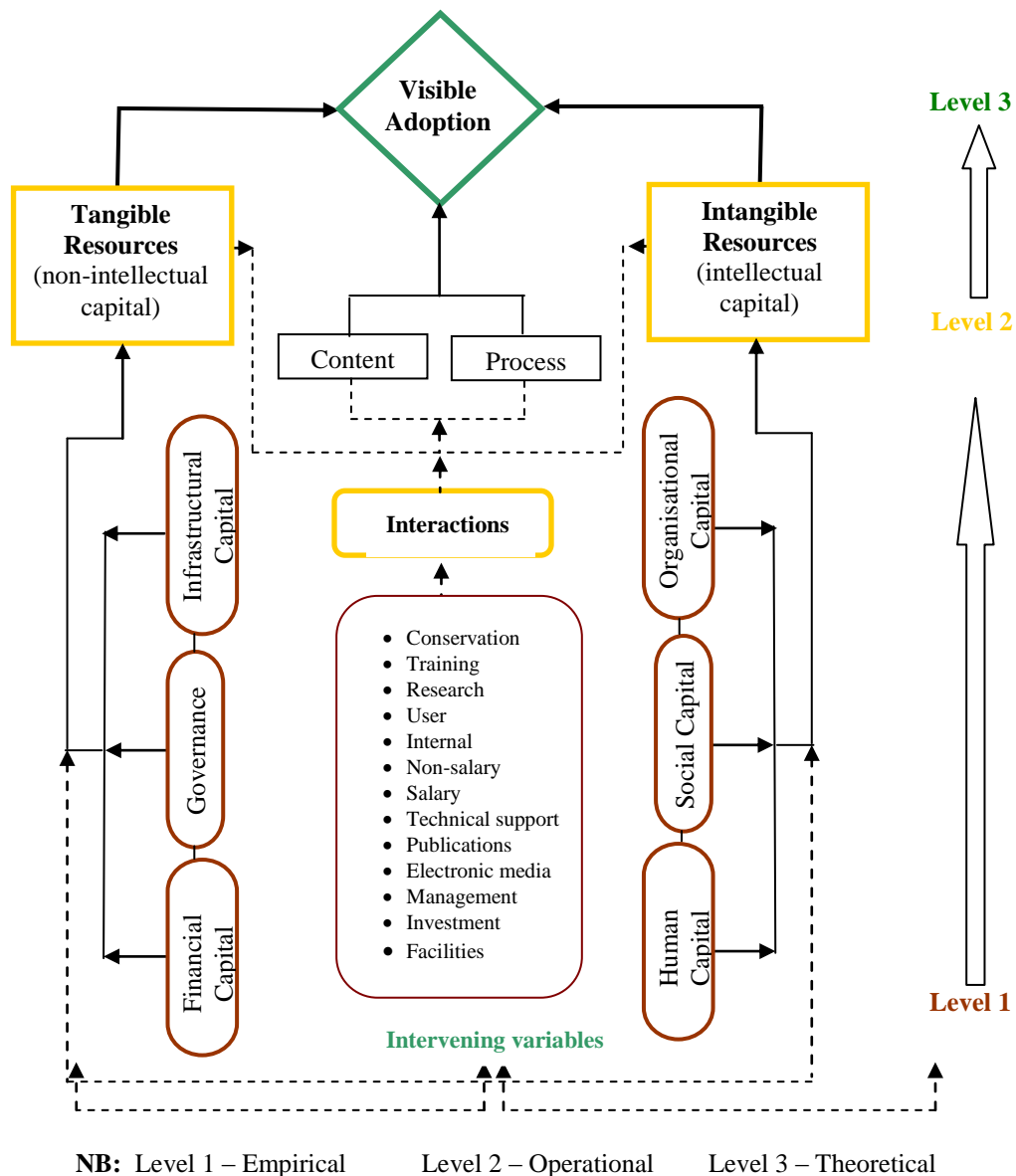


Fig. 2.1: Theoretical framework of institutional capacity

### 2.9.2 Pillars of the theoretical framework

The pillars to unlock the potential and articulate this body of knowledge in the context of institutional capacity constitute an integral component of the research design. The process was enriched by data collection and analysis of the complementarities between the interactions, processes and framework that amplifies the information, knowledge, and content base as intervening variables at the empirical level within the institution’s external and internal environment. Frankfort-Nachmias and Nachmias (2004) contend that variables are neither dependent nor independent but analytic and relate only to the study context. The outcome was expected to demonstrate the association of institutional capacity with the process of enhancing adoption of forest innovations and to induce a greater responsiveness to the practical issues facing

stakeholders. These may be positioned for impact or visible adoption at the theoretical level by engaging the respective quantitative data at the empirical level.

Inference on capacity conditions and trends was established by computing the collected data using pre-determined mathematical models, for specific, consistent, precise and objective analysis of the variability of the flow of institutional resources. What would have otherwise been an invisible association between institutional capacity and the process of enhancing adoption of forestry innovations was established across relevant institutions.

### **2.9.3 Conceptual framework**

Assessing institutional capacity of relevant institutions has several important features as illustrated in Fig. 2.2. The features converge into an objective decision-support tool, which may be transformed into actions to amplify institutional capacity outcomes (Armstrong, 2005; World Bank, 2005).

The principle theme of this conceptual framework is to recognise and link the flow of institutional resources to the dynamic needs of its internal and external environment. The institutional context in which forest-related conservation practices operate are interdependent and critical to ensuring the necessary conditions for enhanced adoption of forestry innovations. Coherence and creativity are a fundamental aspect as is ascertained by: proactively engaging the beneficiaries; management structures that are responsive to the emerging conservation interaction needs; an implementation process that integrates measures to strengthen relevant institutional capacity sequentially; and an elaborate monitoring and evaluation mechanism to monitor progress and suggest objective improvements. An established body of knowledge is needed to articulate the process as hypothesised and conceptualised.

The conceptual framework reiterates that the impacts from adoption of forestry innovations emanates from effective and efficient organisation of the forest sector, particularly institutions directly or indirectly involved in tree growing, forest conservation and forest resource utilisation. The impact which is enriched by interactions between both tangible and intangible resources on conservation interaction content and process is therefore, realised as aggregate of influence of the visible adoption of forestry innovations as advanced by this study. Consequently, the conceptual framework as presented in Fig 2.2, underscores the growing realisation that the many capacity

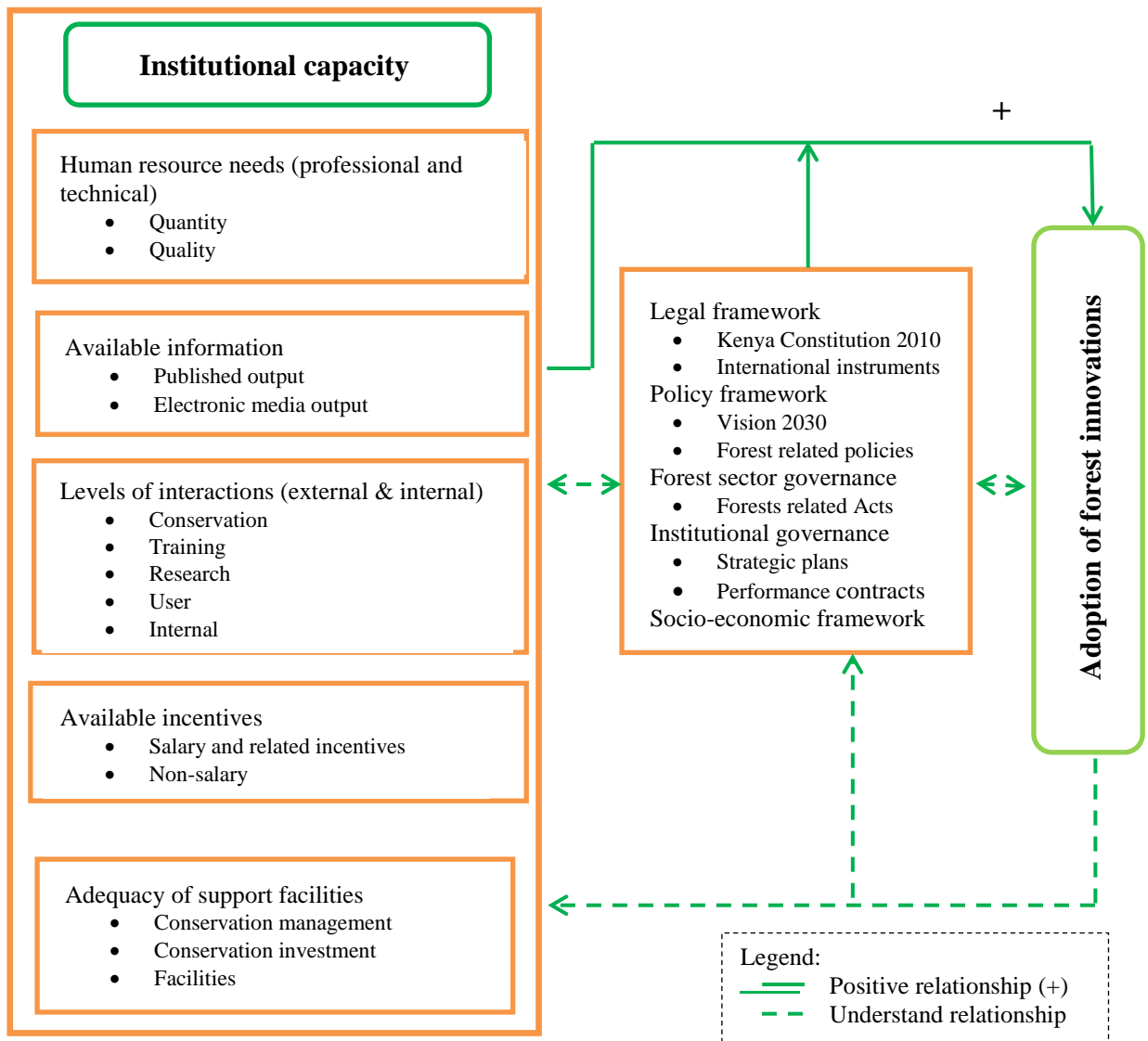
elements that constitute conservation through forestry extension development process must be inclusively planned, coordinated and implemented to influence adoption of forestry innovations.

The study conceptualised how institutional capacity determined by the human resource needs, comprising quantity and quality of professional and technical support staff; available information, comprising published and electronic media output; level of interactions, comprising conservation, training, research user and internal as derived from external and internal environment; available incentives, comprising salary and non-salary incentives; and the adequacy of support facilities, comprising conservation management, conservation investment and facilities influence adoption of forestry innovations.

In the study, positive relationships between the 14 indicators of institutional capacity and adoption of forestry innovations were envisaged. This was demonstrated by the allocative process of the presence or absence of the capacity indicators from the output of the quartile-based quantitative analytical model (Bengston *et al.* 1988; Spilsbury *et al.* 2003). Results demonstrated within the 1<sup>st</sup> and 4<sup>th</sup> quartile implied highest or common cause and lowest or special cause performance excellence. The latter implied appropriate institutional action was inevitable.

It was also conceptualised that the relationship between institutional capacity and adoption of forestry innovations was influenced by a set of intervening variables including but not limited to legal and policy framework as well as forest sector and institutional governance at national and county level.

The study, however, did not determine the back-loop on measuring adoption of forestry innovations since it would require a different framework based on specific innovation packages (Rogers, 2003; Ovwigho, 2013).



**Fig. 2.2: Conceptual framework of institutional capacity**

## CHAPTER 3

### METHODOLOGY

#### 3.1 Introduction

Forces driving adoption of forestry innovations are complex and require an equally complex analytical framework. Authority to undertake this study was granted as in Appendix 1a. Drawing from Bengston *et al.* (1988) and improvements by Kowero and Spilsbury (1997); Spilsbury *et al.* (1999); Thornton *et al.* (2000); CTA, (2003); Mulwa and Nguluu, (2003); Spilsbury *et al.* (2003); and Armstrong, (2005), a similar but improved framework was used to determine variables for enhancing institutional capacity in relation to allocative and operational efficiency.

#### 3.2 Study Area

##### 3.2.1 Location and social environment

The study area is limited to Kenya, which lies between latitudes  $4\frac{1}{2}^{\circ}$  N and  $4\frac{1}{2}^{\circ}$ S and between longitudes  $42^{\circ}$  E and  $34^{\circ}$ E. The geographic coordinates are 1 00 N, 38 00 E. Kenya, covers an area of 582,646 km<sup>2</sup>, which includes 11,230 km<sup>2</sup> as water surface cover (CBS, 2006). The altitude varies from sea level to 5,199 m. This variation and human activities influences the local climate and distribution of Kenya's biological diversity in a spectrum of ecological niches, which provide a range of products, ecosystem services and scientific value (Wass, 1995; Awimbo *et. al.* 2004; Maundu and Tengnäs, 2005). About 82 % of Kenya is semi-arid to arid while 18 % is arable (MENR, 2006b; GoK, 2013). Kenya's provisional population as at 2012 was 40.7 million people comprising about 8.8 million households (KNBS, 2013), while GoK (2013) projects a population density of 80.3 persons km<sup>2</sup> by 2017, which is likely to put more pressure on natural resources, environmental degradation (GoK, 2013) hence demand on institutional capacity to respond as appropriate. Although Kenya is an economic hub of East Africa, poverty and environment issues remain a major concern (GoK, 2003; CBS, 2005). About 80 % of the population live in rural areas and derive much of their livelihood from crop and livestock production, fisheries and forestry (Republic of Kenya, 2001).

##### 3.2.2 Forestry and water resources

Kenya's rich forestry resources can be found in its diverse ecosystems that include terrestrial and aquatic ecosystems. The national forest cover is estimated as 6.99%, which includes trees in farmland ecosystems (KFS, 2015). Evidently, this cover is significantly lower than African

countries' average of 9.3% and the universally acknowledged 10% (FAO, 2010). Nevertheless, different institutions including, KFS, UNEP, UNFCCC and FAO have used different thresholds to define Kenya's forest cover. The forest diversity can be classified into six main ecotypes, namely; the i) High volcanic and high ranges forests or the montane forests, within which Kenya's water towers are found; ii) Western plateau or western rainforests, where Kakamega is the only remnant of the tropical rainforest; iii) Northern mountains forests or the dry forests, where about 20% are considered as dryland forests and 73% as shrublands; iv) Coastal and mangroves forests; v) the Southern hills including the eastern arc mountain forests; and vi) Riverine forests. In addition to the major classifications, other forms of forests comprise the trees in the farmlands and the urban landscapes. Table 3.1 outlines Kenya's forest cover and rate of exchange between 1990 and 2010 (FAO, 2010).

**Table 3.1: Forest cover in Kenya and rate of change between 1990 and 2010**

Category of forest resource (using FAO definitions)	Area ('000 ha)				Annual Change 1990 to 2010 ('000 ha)
	1990	2000	2005	2010	
Indigenous closed canopy forest	1240	1,190	1,165	1,140	-5
Indigenous mangroves	80	80	80	80	0
Open woodlands	2,150	2,100	2,075	2,050	-5
Public plantation forests	170	134	119	107	-3.15
Private plantation forests	68	78	83	90	+1.1
<b>Sub-total forest land (total of above categories)</b>	<b>3,708</b>	<b>3,582</b>	<b>2,357</b>	<b>3,467</b>	<b>-12.05</b>
Bushland	24,800	24,635	24,570	24,510	-14.5
Farms with trees	9,420	10,020	10,320	10,385	+48.25
<b>Total area of Kenya</b>	<b>58,037</b>	<b>58,037</b>	<b>58,037</b>	<b>58,037</b>	<b>0</b>

Kenya is dependent on its water towers, which are naturally distributed within the six forest ecotypes to ensure sustained supply of fresh water for multiple uses. Access to clean and safe water in adequate supplies is a prerequisite for attainment of Vision 2030. However, this remains a challenge because Kenya's renewable fresh water per capita is estimated at 21 billion m<sup>3</sup>, which translates to 548 m<sup>3</sup> per capita per year (NEMA, 2011). In addition, NEMA, (2011) laments that 548 m<sup>3</sup> per capita per year, is below the widely accepted Falkenmark Water Stress Indicator that places the water scarcity threshold at 1,000 m<sup>3</sup> per capita per year. Evidently, this figure displays Kenya as water scarce country and that actions that would influence adoption of forestry innovations for the benefit of water sources are imperative. To achieve this goal, UNEP (2009) reiterates that Kenya should set goals such as increasing tree cover, which will help to sustain water catchments.

### **3.2.3 Profile of sampled institutions**

Institutions as presented in Appendix 1.2, have become directly or indirectly interested and involved in management, conservation and utilisation of forests in line with the stipulations of the Forests Act No. 7 of 2005 and the Forest Conservation and Management Act No. 34 of 2016. Both free enterprise and economic reforms have also led to the growth of some vibrant institutional settings such as community forest associations who are involved in conservation through forest extension. Consequently, inclusion of other stakeholders necessitates a re-orientation, common vision and engaging approaches to the way forest resources have to be managed, expanded and sustained.

The study dealt with 51 main institutions, which responded to the survey questionnaire. They are involved in, or support conservation activities in Kenya. Of the institutions, 32 were public, 15 non-governmental and 4 private. The profile of the sampled institutions is presented in Appendix 2.2. However, it is noted that Kenya Agricultural Research Institute (KARI) and Tea Research Foundation of Kenya (TRFK), have since been transformed into Kenya Agricultural and Livestock Research Organisation (KALRO), (Republic of Kenya, 2015).

### **3.3 Research Design**

To collect and analyse data from which logical conclusions were drawn, a cross-sectional comparative design was used to determine the extent institutional capacity variations influence performance (Fankfort-Nachmias and Nachmias, 2004; KIPPRA, 2005; Mathooko *et.al.* 2007). The study duration was in line with the Government of Kenya's financial years 2002/2003 to 2010/2011. Triangulation technique was used to indicate the contribution of each capacity indicator shown in Table 3.1 (Ackoff, 1962; Neuman, 1997; Gallivan, 2004; KIPPRA, 2005). The unit of study was an institution. The methodological flow used the conceptual framework illustrated in Fig. 2.1.

### **3.4 Population**

The initial survey sample frame, which included pre-tested institutions, covered N=84 legislated or registered institutions, which are directly or indirectly involved in conservation activities, as presented in Appendix 1.2. Among the 84 institutions, 13 were drawn and used to pre-test the questionnaire, thus leaving a sample frame of N=71 institutions for this study. The N=71 institutions were stratified into 8 functional categories as to include those providing service n=26,

training and research n=7, commercial n=11, higher education n=8, tertiary education n=7, financial n=4, regional development n=6 and regulatory n=2. The allocation indicates that the public sector still dominates provision of conservation advisory services in Kenya (Muturi, 1999; GoK, 2005b; Kobia and Mohammed, 2006; FAO, 2009).

### **3.5. Sampling Design**

#### **3.5.1 Sample size**

A minimum of 10 % sample size is recommended as a standard for a population of less than 100 under investigations (Neuman, 1997; Mulwa and Nguluu, 2003). To minimise sampling error and achieve a higher response, the study sample size consisted of 51 respondent institutions (70 %), drawn and proportionately allocated from a population of 71 institutions in Appendix 1.2.

#### **3.5.2 Sampling procedure**

Due to heterogeneity and difference in the numbers of institutions in each category, stratified purposive sampling was used (KIPRA, 2005). Above 20 % sampling ratio, the sampling error remains relatively constant (Casely and Kumar, 1988) hence, a sampling ratio of 68 % was used. Sample sizes were stratified by category; public, n=32; NGOs, n=15; and private n=4.

### **3.6. Instrumentation**

A structured questionnaire in Appendix 2.1 was developed and used to collect both quantitative and qualitative data on the capacity indicators for assessing institutional capacity (Neuman, 1997). The main components included; institutional information, human resources, financial resources, interactions within external and internal environment, conservation outputs, conservation management, conservation investments, facilities, and SWOT analysis. It is from these components either individually or in combination with others, that study variables were constituted. In addition, the questionnaire was complemented with focus group discussion as requested by some of the respondent institutions to enhance the completeness of responses.

#### **3.6.1 Validity**

The study attempted to ensure closeness and generalisability to what it is was purported to assess. The two types of validity measurement, namely: content and face, were observed (Neuman, 1997; Spilsbury *et al.*, 2003; Frankfort-Nachmias and Nachmias, 2004).



### **3.6.2 Reliability**

The survey and analysis instruments were pre-tested to correct bias and flaws in design. Pre-testing helps to harmonise the constitutive and operational definitions, improve the instruments and enhance validity and reliability of measurements (Fankfort-Nachmias and Nachmias, 2004). The data for pre-testing was collected from at least 15%, n=13 of the survey population N=84, but was excluded in the final study sample leaving a sample frame of N=71. Selected pre-tested institutions are marked in asterisk in Appendix 1.2. The study, therefore, strived to ensure the consistency of the data to a physical reality (Neuman, 1997; Frankfort-Nachmias and Nachmias, 2004). The study noted that while reliability was necessary, it alone was not sufficient but it had to be valid (Phelan and Wren, 2007). Therefore, an attempt was made to complement the findings by using secondary data trends derived from institutional annual reports.

## **3.7. Description and Measurement of Institutional Capacity Variables**

### **3.7.1 Description of specific indicators**

Table 3.2 describes the 14 specific indicators of institutional capacity (Bengston *et al.* 1988; Spilsbury *et al.* 2003) to enhance adoption of forestry innovations used and their link to the model equations and conceptual framework in Fig 2.2, and with the mathematical expressions used in data analysis and presenting the results.

**Table 3.2: Main indicators of institutional capacity**

<b>Indicator</b>	<b>Summary description</b>
Human resources (HR)	Captures the numbers of staff, their qualifications and level of experience
Technical support (TS)	Ratio of technical support staff to conservation staff
Published output (PO)	A weighted ratio of publications per institution
Electronic media output (EMO)	A weighted ratio of electronic media output per institution
Conservation interactions (CI)	Frequency and perceived value derived from interactions with institutions within and outside Kenya
Training interactions (TI)	Frequency and perceived value derived from interactions with institutions within and outside Kenya
Research interactions (RI)	Frequency and perceived value derived from interactions with institutions within and outside Kenya
User interactions (UI)	Staff time and budget allocated to interactions with the beneficiaries
Internal interactions (II)	The extent to which staff at all levels are informed of, and involved in, key conservation planning, implementation and review procedures
Non-salary incentives (NSI)	Frequency of use and benefits to institution in terms of retaining and motivating conservationists, for a range of non-salary incentives
Salary incentives (SI)	Level of conservation staff remuneration relative to similarly qualified professionals in other conservation activities in Kenya
Conservation Management (CM)	Scoring checklist recording the presence or absence of simple documentation relating to the basic functions of management; planning, implementing, monitoring and controlling conservation practices
Conservation Investment (CIN)	Scoring checklist recording the presence or absence of simple documentation relating to and needed for the basic functions of management; planning, implementing, monitoring, evaluating and controlling conservation activity
Facilities (FA)	Scoring checklist recording the presence or absence of simple documentation relating to and needed for the basic functions of institutional infrastructural resources or facilities
Conservation Content	Qualitative information on knowledge and information base
Conservation Process	Qualitative information on framework amplifying knowledge base

### 3.7.2 Human capital

Competent human resource or capital (HC) is a primary requirement for implementing forestry conservation programmes. Most research studies, (Cohen and Wheeler, 1997; Bengston *et al.* 1988; Spilsbury *et al.* 2003) rely on total staff numbers to reflect the available resource. In this study, the human capital reflected personnel experience, qualifications and how it was planned to optimise adoption of forestry innovations, with emphasis on Diploma and B.Sc. level personnel as key to a one-on-one contact with the ultimate beneficiaries of innovations. The following expression was used to quantify the influence of human capital:

$$HR_i = \sum(G_j + 2q_i) + 4E \dots\dots\dots 1$$

Where:

i = conservation-related institution;

G = length of service of the *j<sup>th</sup>* conservation personnel: 1= less than four years, 2 = four to ten years, 3 = over ten years;

q = highest qualification of the  $j^{th}$  conservation personnel with 0 = Ph.D., 1 = M.Sc., 2 = B.Sc., 3 = Diploma;  
 E = total number of expatriate conservation personnel in the institution.

This expression reflects the *relative worth* of conservation personnel to a conservation-related institution. This was quantified and tabulated with respect to the qualifications (Diploma, B.Sc., M.Sc., Ph.D. and Expatriate) and duration of service (<4, 4-10 and >10 years) per conservation personnel within the institution.

### 3.7.3 Technical support

Support to conservation activities in terms of technicians and administrative staff is an important conservation input. The availability of support staff allows conservationists (mainly at Diploma and B.Sc. level) to spend less time on research and administrative matters, thus increasing the effective time for conservation activities through extension. The following expression was used to quantify the influence of technical support (TS) staff:

$$TS_i = \frac{S_i}{P_i} \dots\dots\dots 2$$

where:

- i =  $i^{th}$  conservation-related institution;
- S = number of technical assistants (excluding labourers) in the institution;
- P = number of full time conservation personnel equivalents in the institution.

### 3.7.4 Conservation interactions

Conservation interactions (CI) are perceived to be instrumental in enhancing collective involvement and engagement of stakeholders, in addition to facilitating partnerships as well as development and sharing of resources. Interactions also help to create a “critical mass” of conservation personnel while contributing to build confidence among conservation personnel, institutions and stakeholders. The following expression was used to quantify the extent of conservation interactions with other institutions.

$$EI_i = w(aF + bN + cR + dO) \dots\dots\dots 3$$

Where:

- i =  $i^{th}$  conservation institution;
- F = frequency of interaction with other conservation institutions in Kenya;
- N = frequency of interaction with non-conservation institutions in Kenya;
- R = frequency of interaction with conservation institutions in Africa;

O = frequency of interaction with conservation institutions outside Africa;  
w = ratio of the number of full time conservation personnel equivalents in the  $i^{\text{th}}$  institute to the mean number of conservation personnel per institution across the sample;

a, b, c and d represent the perceived benefits defined in F, N, R and O, respectively. They took the following values: 1 = no real benefit, 2 = moderate benefit, 3 = high benefit.

The benefits were expressed by respondents with respect to the perceived contribution of the interaction to successful conduct of conservation activities. The frequency of interaction (F, N, R and O) took the following values: 0 = never, 1 = occasional, 2 = frequent.

### 3.7.5 Training interactions

Relationship between conservation staff with educational-support institutions is assumed to enhance dissemination capacity in several ways: training of conservation staff, exposure to new ideas, access to current literature as well as the possibilities for sharing of resources like libraries, demonstration plots, software, computers and other resources. The training interactions (TI) between the institutions surveyed and educational-support establishment was given by the following expression:

$$TI_i = w(eE + fQ + gS) \dots \dots \dots 4$$

Where:

- $i$  =  $i^{\text{th}}$  conservation-related institution;
- E = frequency of interaction with educational - support institutions in Kenya;
- Q = frequency of interaction with educational - support institutions in Africa;
- S = frequency of interaction with educational - support institutions outside Africa;
- e = measure of the value of perceived benefits from training interactions in Kenya (as EI above);
- f = measure of the value of perceived benefits from interactions with educational - support institutions in Africa;
- g = measure of the value of perceived benefits from interactions with educational - support institutions outside Africa;
- w = as defined earlier. This weighting is applied for the same reasons as in the EI indicator.

### 3.7.6 Research interactions

Relationship between conservation staff with research - support institutions is assumed to enhance technical capacity in several ways including: participatory technology generation and dissemination, training of conservation staff, access to current literature as well as the possibilities for sharing of resources like libraries, demonstration plots, software, computers and transport. The

research interaction (RI) between the surveyed institutions and research-support establishments was given by the following expression:

$$RI_i = w(pE + qQ + rS) \dots \dots \dots 5$$

Where:

- $i = i^{th}$  conservation-related institution;
- E = frequency of interaction with research - support institutions in Kenya;
- Q = frequency of interaction with research - support institutions in Africa;
- S = frequency of interaction with research - support institutions outside Africa;
- p = measure of the value of perceived benefits from research interactions in Kenya (as EI above);
- q = measure of the value of perceived benefits from interactions with research - support institutions in Africa;
- r = measure of the value of perceived benefits from interactions with research - support institutions outside Africa;
- w = as defined earlier. This weighting is applied for the same reasons as in the EI indicator.

### 3.7.7 User interactions

The leverage obtained from conservation funding is enhanced if conservation is demand-driven. The extent of user interaction (UI) with potential users of conservation outputs is taken as a proxy for the extent to which conservation activities is targeted to potential users. The indicator was based on the premise that ‘extent and effectiveness’ of interactions can be quantified from the time and fund an institution allocates to these activities. This was quantified by the following expression:

$$UI_i = B + wT \dots \dots \dots 6$$

Where:

- $i = i^{th}$  conservation-related institution;
- B = percentage, of annual budget associated with technology dissemination and conservation output;
- T = percentage, of staff time associated with technology dissemination and conservation output;
- w = as defined earlier.

The rationale is that the extent of ‘user interaction’ is the product of mean time per conservationist and number of conservationists in an institution. This interaction is in addition to the financial resources, available to facilitate technology dissemination and conservation output to ensure that conservation outputs produce successful outcomes for the targets of conservation.

### 3.7.8 Salary and related incentives

The monthly disposable income of relevant personnel or salary incentive (SI) is a key factor for the recruitment and retention of well-qualified staff (Cohen and Wheeler, 1997). The rate of staff turnover, the development and stability of conservation-related programmes, and staff morale in an institution may be influenced by considering how conservation personnel compare financially in relation to colleagues with similar qualifications in other institutions in Kenya. The SI indicator attempted to capture the disparities between the remuneration of relevant personnel in the surveyed institution relative to similarly qualified professionals in Kenya employed by public and private sectors or NGOs. This was quantified by the following expression:

$$SI_i = \left[ \frac{G}{\frac{\sum_{i=1}^n (H_i + I_i + J_i)}{n}} \right] \dots\dots\dots .7$$

where:

- G = Annual salaried income of a senior conservation personnel *I* in institute with at least a M.Sc. and five years of experience.
- H = Estimated annual income for employees with equivalent responsibilities, qualifications and experience in private sector organisations in Kenya relative to an employee in the *I<sup>th</sup>* institution;
- I = As above but reflecting government employees relative to employees in the *j<sup>th</sup>* institution;
- J = As for H above but reflecting NGO employees relative to employees in the *j<sup>th</sup>* institution;
- n = Number of institutions in the survey sample.

The indicator reflects the inter-institutional competitiveness in terms of salary incentives and not the total remuneration relative to the sample as a whole.

### 3.7.9 Non-salary incentives

Non-salary incentives (NSI) or benefits are important in enhancing the ability of an organisation to attract and retain the key resource of qualified and motivated conservation personnel (Cohen and Wheeler, 1997). Where an institution is not competitive with respect to salary, an attractive incentive scheme may provide sufficient compensation such as housing, medical, subsistence, communication and transport allowance. The indicator was defined as:

$$NSI_i = \sum r_j \cdot R_j \dots\dots\dots 8$$

Where:

*i* = *i*th conservation-related institution;

*R* = measure of the frequency with which the various forms of rewards are used: 1 = used occasionally, 2 = used frequently, 3 = always used;

*r* = a measure of the effectiveness of the rewards in contributing to extension personnel productivity: 0 = not effective, 1 = slightly effective, 2 = moderately effective, 3 = very effective;

*j* = types of incentives offered, which may include peer recognition awards, housing, medical, subsistence, communication and transport allowances, travel to other countries, career development opportunities, professional responsibility, training, secondment and award of additional conservation funding.

### 3.7.10 Internal interactions

Well managed conservation institutions are characterised by well-informed staff at all levels who are also involved in, key conservation planning and review procedures. Internal interactions (II) was intended to indicate the extent to which the internal processes or discussions are oriented towards the production of the conservation outputs that meet the requirements of the intended users. The indicator was expressed as:

$$II_i = \sum_{j=1}^5 (K \cdot H + \sum a_l) \dots\dots\dots 9$$

where:

*K* = frequency of use of meeting or formal procedure: 0 = never, 1 =once a year, 2 = every six months, 3 = every month, 4 = every week;

*J*= type of meeting or formal procedure, five types were used: selection of conservation projects at institutional ‘portfolio’ level; planning meetings for conservation activities at project level; discussion/monitoring of research progress at ‘portfolio’ level; and discussion/monitoring of extension progress at participatory technology development project level.

*H* = benefit derived from the meeting or procedure: 0 = no real benefit, 1 = low level of benefit, 2 = moderate benefit, 3 = high level of benefit;

*a* = participants in the meeting or procedure of category *l*, where *l* may be: administrative and support staff, managerial staff, conservation personnel/library and information specialists, and representatives of conservation-related user groups, for which *a* can take the value 1, 2, 3 or 6, respectively.

### 3.7.11 Conservation management

There is no single ‘correct’ or ‘best’ way or ‘approach’ to the management of conservation interactions (CM). Management will always be tailored to the specific challenges, problems and opportunities that are unique to each institution. Simple documentation relating to the basic

functions of management, planning, implementing, monitoring and controlling conservation activities, were used as a proxy to gauge the influence of extension management. This indicator used a ‘scoring checklist’ approach as responses to Appendix 2.1, Section 6.0. The indicator for institutional capacity was calculated using an “if” function, where responses to all questions summed up. A “yes” and “no” responses were both assigned a value of “1”. The overall difference between the sums of the two responses constituted the final response on the indicator. A greater positive value implies a higher “yes” response and *vice versa*. A zero value implies that the response is balanced or adequate.

### 3.7.12 Conservation investment

Simple documentation relating to conservation investment (CI) was used as a proxy to gauge the adequacy of investment in conservation interactions. This indicator used a ‘scoring checklist’ approach as responses to Appendix 2.1, Section 7.0. The indicator for each institution was calculated as explained in Conservation Management in Section 3.7.11, above.

### 3.7.13 Published output

Publications are a fundamental unit of conservation “message” or innovation through which an institution contributes to its mandate. Published output (PO) take a variety of forms to ensure maximum impact. The output was expressed as a weighted ratio of publications per institution. The indicator gives an arbitrary weight in favour of published refereed papers compared to unrefereed materials. Although the magnitude of the weight is arbitrary, the indicator implies that refereed material has greater value. This is because dissemination of the published or refereed material is likely to be wider, quality controlled as well as reliable and credible, which is a key factor in a user’s decision to appreciate and adopt an innovation (Dickson, 2006). The indicator was expressed as:

$$PO_i = \sum_{2007}^{2011} \left( \frac{pY}{pN} \right) \times pN + \left( \frac{\sum pP - \sum pY}{pN} \right) \dots\dots\dots.10$$

Where:

- $pY$  = the total number of refereed journals/published book chapter/posters/newsletters;
- $pP$  = the total number of publications;
- $pN$  = total number of years;

### 3.7.14 Electronic media output

The output was expressed as a weighted ratio of electronic media output per institution as follows:



$$EC_i = \sum_{2007}^{2011} \left( \frac{eY}{eN} \right) \times eN + \left( \frac{\sum eP - \sum eY}{eN} \right) \dots\dots\dots 11$$

Where:

- $eY$ = the total number of audio visuals registered (video, tape, digital learning CDs);
- $eP$ = the total number of audio visuals;
- $eN$ = total number of years.

Electronic media output (EMO) takes a mean of the outputs over the preceding five years. This was expressed in proportion to the number of full time conservation staff equivalents. Qualitative information on the broader definition of conservation output was also collected.

### 3.7.15 Facilities

Conservation facilities (FA) are increasingly recognised as vital mechanisms of renewal of forest resources, institutional capacity development and partnerships. This indicator appraised the condition and availability of conservation resources across relevant institutions. The indicator was expressed as:

$$FA = \sum_{i=1}^{10} h \dots\dots\dots 12$$

Where:

- $i=i^{th}$  conservation-related institution;
- $h$ =measure of the condition of facilities in the  $i^{th}$  institution.

Results from the aforementioned tests was articulated and presented in form of values, tables and graphs to express the relative institutional capacities influencing adoption of forestry innovations through conservation interactions across relevant institutions in Kenya.

## 3.8 Data Collection

The researcher assisted by two assistants administered the structured questionnaire. Prior mail contacts and visits as well as discussions were made with the respective heads or senior officers of relevant institutions, to obtain quantitative both and qualitative information. The aim and background of the study was explained. Although attempts were made to obtain the full complement of data required (Neuman, 1997; Cheung, 2012) the study observed that poor record keeping, bureaucracy, and reluctance to provide particularly data on financial resources were evident.

## 3.9 Data Analysis

### 3.9.1 Statistical software and data analysis

A combination of statistical packages was used for data entry and analysis. EXCEL was used for data entry and as a model, while SPSS was used for comparative data analysis. Appendix 3.1 and 3.2 provides the data set from which statistical analysis was carried out. Data analysis comprised frequency distributions, and mean comparison tests were used to understand and show general trends in the variables under investigation. The model was also used to process data into values, tables and graphs to show the trends and normalised quartile values for each of the 14 indicators. Each indicator value was also plotted against the sample quartile values (Bengston *et al.* 1988; Spilsbury *et al.* 2003). Quartile statistics was used to determine what accounts for the differences in the boundary of capacity variation that is acceptable or expected variation region, also known as the **common cause** and the unexpected variation region or the **special cause**, which should be investigated and acted on to influence of institutional capacity on adoption of forestry innovations. Mean variation in data was tested using SPSS while the indicators were analysed to identify any associations (Moore and McCabe, 1999; Coe *et al.* 2002).

## **CHAPTER 4 RESULTS AND DISCUSSION**

### **4.1 Introduction**

This chapter is organised into six sections in relation to study objectives. Analysis of the diversity of responses has provided a framework of important areas for reflection to add value to conservation efforts across and within the sampled institutions. The questionnaire's qualitative and quantitative responses are key to responding to the highlighted research questions and output of the model based quartile graphs, highlighting the capacity indicator status across and within the surveyed institutions. The study notes that this model is sensitive to the requirement for comprehensive data and information needs for informed decision (Cheung. 2012).

### **4.2 Background Information of Sampled Institutions**

The components captured on background information of surveyed institutions included; name, address, location, legal status, year established, date of last major re-organisation, vision, mission, mandate, and governance of the institution. Responses were received from 51 out of 71 institutions in Appendix 1.2, representing six different functional categories (Appendix 2). The functional categories included; provision of service at 33.4%, training and research at 9.8%, higher and tertiary education at 17.6%, regional development at 11.8%, local authorities at 17.6%, and commercial at 9.8%. This implies that an overarching feature of the surveyed institutions was their complementary and mutually reinforcing mandates in relation to environmental conservation (Unasylva, 1998; Koech, 2006; FAO, 2006; UNEP, 2006).

Of the surveyed institutions, 62.7%, n=32 were public, 29.4%, n=15 NGOs and 7.8%, n=4 private, respectively. The distribution shows that public institutions are the major stakeholders involved in, or are supporting conservation activities in Kenya. The different institutions had different year of establishment with the oldest NMG having been established in 1910 and the youngest KFS in the year 2007. Although KFS was established in 2007, it was transformed from the former Forest Department, which was established in 1902 (Wandago, 2006). Thus, from a historical perspective, formal conservation activities in Kenya have been underway for over a century. Evidently, the process is still on-going and open to other new stakeholders.

Of the 51 sampled institutions 45 comprising 88.2%, indicated the presence of instruments of governance (Table 4.1). This translated to majority of the sampled institutions having set down rules that seek to define and inspire actions, grant power to invest, and verify performance (Johnson *et al.* 2011). In addition, good judgement and managerial acumen is imperative.

**Table 4.1: Instruments of governance present in institutions**

Instruments of Governance	Count (Present)
Vision	45
Mission	45
Mandate	45
Core values	45
Board of management/Directors	45

**4.3 Implication of Performance Based on Indicators**

A total of 14 indicator values described in Chapter 3 were used in this study. They are: human capital (HC); conservation interactions (CI); training interactions (TI); research interactions (RI); user interactions (UI); salary incentives (SI); non-salary incentives (NSI); internal interactions (II); technical support (TS); published output (PO); electronic media output (EMO); conservation management (CM); conservation investment (CIN); and facilities (FA). The mean of indicator values were compared from survey sample aggregated by institution as public, NGO and private sector as presented in Fig. 4.1.

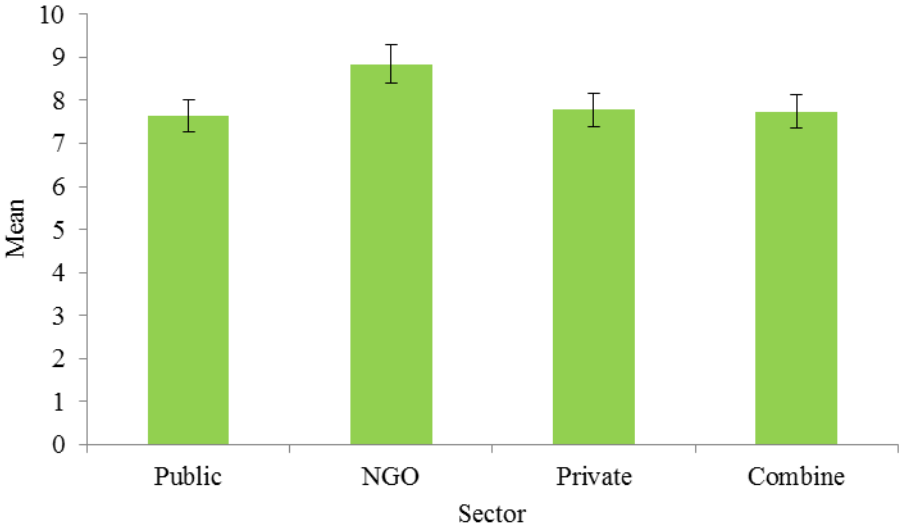


Fig 4.1: Distribution of indicator values among institutions

The results identify the potential of NGOs as best in performance across institutions with a mean score of 8.844082 while public ranked least with a mean score of 7.639330. The case of public institutions was equally lower when ranked against the combined mean score of 7.742857. This implies that public institutions were inadequately optimising their institutional capacity compared to the NGO and private sectors, respectively, to influence adoption of forestry innovations. The observation concurs with Konuche (2007) on AFORNET scientists disseminating research results for development. However, mean score may not be the best comparison for specific institutions since the highest and lowest were NGOs, which had a mean score of 12.17 and 2.44, respectively, compared to public, which had a mean score of 12.52 and 3.42, respectively.

A comparison of mean of indicator values by functional categories (Appendix 3.2), namely: provision of service (PS), n=17; Training and research (TR) n=5; Higher and tertiary education (HT) n=9; Regional development authorities (RDA) n=4; Local authorities (LA) n=9; and Commercial (C) n=5, was carried out to establish the specific category, which contributed to the low influence in adoption of forestry innovations.

The results shown in Fig. 4.2, tracks the characteristics of the mean of capacity indicator values graphically by functional categories. Based on the 14 indicator values, the institutions under higher and tertiary education (HT) functional category were best ranked with a mean score of 9.28, while local authorities (LA) were ranked least with a mean score of 5.29. In addition, LA displayed a relatively lower mean score than the combined mean score of 7.83. The low LA and combined means calls for a collective mechanism for identifying the capacity gaps as well as expanding the scope and size of implementation efforts to accommodate multi-sectoral interest in conservation initiatives (MENR 1994; FAO, 2003; 2006; WWF 2006; GoK 2010).

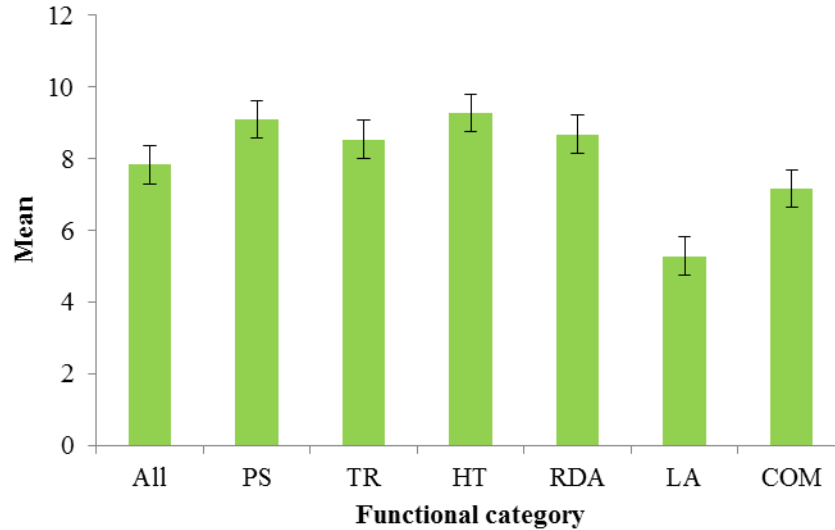


Fig. 4.2: Comparison of mean of indicator values between functional categories

#### 4.4 Distribution of Conservation Capacity in Institutions

Analysing variability using comparative quartile statistics and bar graphs plays an important role in benchmarking, determining and explaining institutional influence on adoption of forestry innovations across and within institutions in Kenya. Based on the study objectives, it was established that there exist significant capacity gaps across the institutions in the public, NGOs and private sectors. However, of all the sampled institutions, 11.8%, n=6 had no capacity gaps or limitations warranting investigation that inform action to be taken. The institutions ranged in numbers from 1 – 32 public, 33 – 47 NGOs and 48 - 51 private.

The results of the respective quartile analysis revealed the following:

- i. **Control limit:** Upper (1<sup>st</sup> quartile) or lower limit (3<sup>th</sup> quartile) boundary of variation that is acceptable.
- ii. **Expected highest (absolute) Level (value = 16.0)** region of sustained excellence.
- iii. **Expected variation region:** - The area between lower and upper limit. This is where institutions are expected to have all the capacities necessary for adoption of forestry innovations unless a change occurs. This region is also known as “**common cause** variation (2<sup>nd</sup> quartile).
- iv. **Unexpected variation region:** The area beyond the set control limits also known as “**special cause**” variation. This variability should be investigated and acted upon (4<sup>th</sup> Quartile).

The data for 51 surveyed institutions were collated by indicator and separated into quartiles graphs to allow comparison of means of capacity profiles across a set of 14 indicators for public, NGOs and private institutions. In addition, an indicator value at the top of the 1<sup>st</sup> quartile reflected the maximum value for that indicator in the survey sample; the value on the boundary of the 2<sup>nd</sup> and 3<sup>rd</sup> quartile corresponded to the median value, and at the bottom of the 4<sup>th</sup> quartile reflected the minimum indicator value. In this respect, the model attempts to provide evidence of capacity gaps, which must be identified and addressed to allow adoption of forestry innovations to thrive. It is observed that the outlined indicators do not necessarily imply a lower capacity or absence of an indicator, but also the reluctance and uncertainty among the respective institutions to provide data. This finding concurs with observation made by Spilsbury *et al.* (2003).

#### **4.4.1 Distribution of human capital among institutions**

Human capital (HC) is a key variable within the context of the study conceptual framework's intellectual capital or intangible resource. Personnel, is a fundamental component in enhancing adoption of forestry innovations. Effective personnel, embrace equal opportunities through the elements of quality, quantity and gender. Through complementary application of diverse skills and experiences they are able to exert influence to optimise efficiency, synergies and deploy resources effectively (Armstrong, 2005; Johnson *et. al.* 2011). The HC capacity grid in Fig. 4.3 indicates a clear trend that across institutions. Public institutions are best endowed in HC necessary to influence the level of, and effectiveness in adoption of forestry innovations compared to NGOs and private sector players, respectively. Similarly, NGOs are better endowed in HC compared to the private sector players. In addition, the HC grid also indicates an upper indicator value of 10 and lower indicator value of about 6, all of which are within the quartile of “**common cause**” or “**expected**” variation region. The variation region lies between the lower and upper quartile limits. Within this quartile region, institutions are expected to have all the capacities necessary for enhancing adoption of forestry innovations unless a change occurs. In this study, 6 specific institutions comprising 11.8% were observed to have underlying HC gaps or limitations, thus warranting investigation that inform actions to be taken. Of these, 66.7% of the institutions with HC capacity gap were public, while private sector players and NGOs in similar situation were about 16.3% each. The results also show that one institution, namely; number 1, had realised the highest level of performance excellence under this indicator. The specific gaps are as summarised in Table 4.2 and Appendix 4.1 on Conservation capacity profiles by institution.

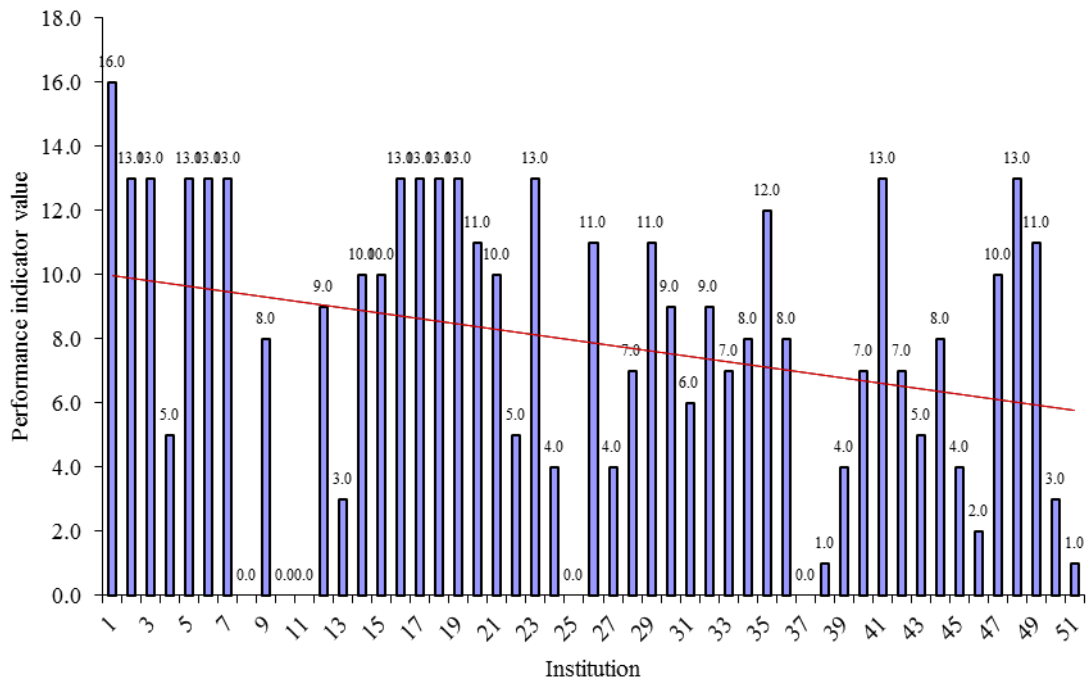


Fig. 4.3: Distribution of human capital in institutions

#### 4.4.2 Distribution of conservation interactions among institutions

Conservation interactions (CI) are described by seedling production, planting, conserving, planning, funding, publicity, extension or advisory services, and certification. The CI grid in Fig. 4.4 indicates a clear trend that across institutions, public institutions are least interactive in conservation interactions necessary for enhancing adoption of forestry innovations compared to private sector and NGO players, respectively. Nevertheless, the variation region lies between the quartile “common cause” or “expected” variation region. Within this quartile region, institutions are expected to have all the capacities necessary for enhancing adoption of forestry innovations unless a change occurs. However, 7 specific institutions comprising 13.7%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were observed to have conservation interaction gaps or limitations, thus warranting investigation that inform actions to be taken. Of the institutions that had gaps in conservation interactions, 71.4% were public while the remaining 28.6% were NGOs. The results show that two institutions, namely; numbers 7 and 33, had realised the highest level of performance excellence under this indicator.



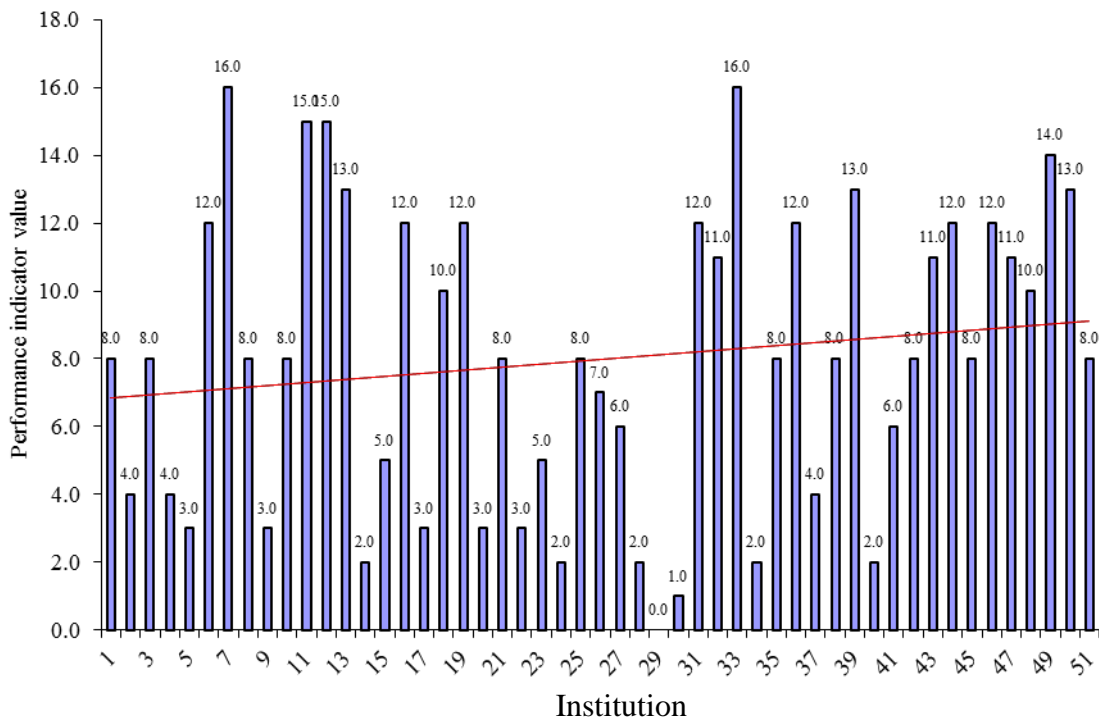


Fig. 4.4: Distribution of conservation interactions

#### 4.4.3 Distribution of training interactions among institution

The training interactions (TI) grid in Fig. 4.5 indicates a clear trend that across institutions, public institutions are best engaged in training interactions necessary to influence adoption of forestry innovations in Kenya compared to NGOs and private sector players. Similarly, NGOs are better engaged compared to the private sector players. In addition, the grid also indicates an upper value of 10 and lower value of about 6, all of which are within the quartile “**common cause**” or “**expected**” variation region. The variation region lies between the lower and upper quartile limits. Within this quartile region, institutions are expected to have all the capacities necessary for enhancing adoption of forestry innovations unless a change occurs. A total of 9 institutions comprising 17.7%, had capacity gaps in training interactions. Of the institutions with TI gaps, 66.7% were public, while the remaining 33.3% were NGOs as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1, thus, warranting investigation that inform actions to be taken. The results also show that four institutions, namely; numbers 5, 18, 33 and 35, had realised the highest level of performance excellence under this indicator.

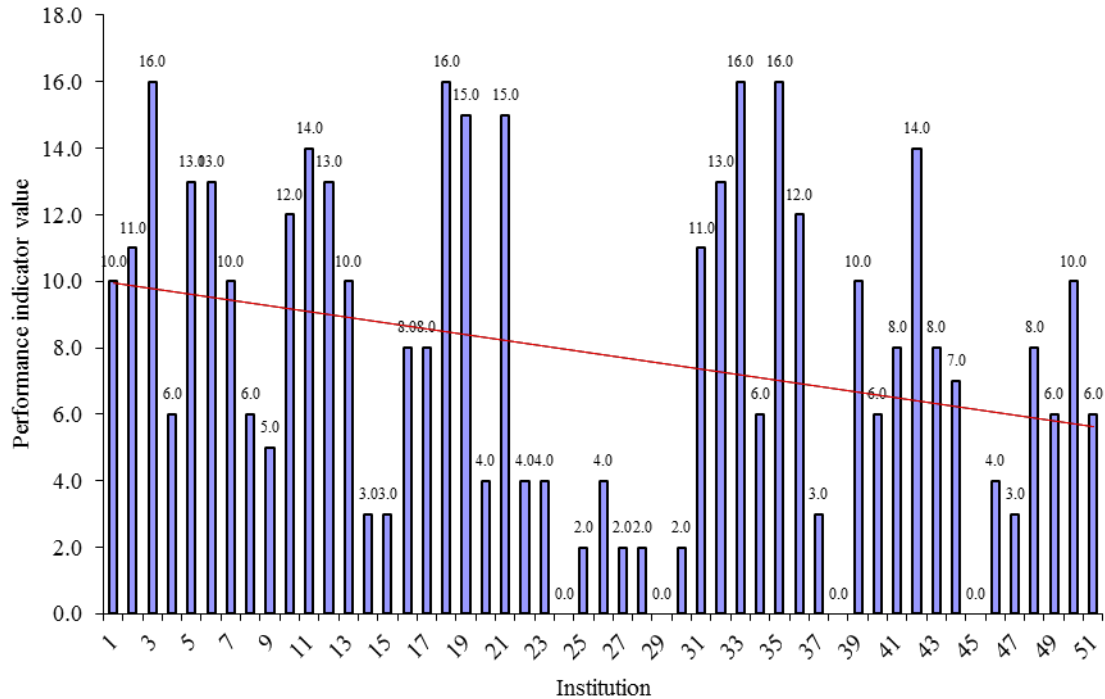


Fig. 4.5: Distribution of training interactions

#### 4.4.4 Distribution of research interactions among institutions

The research interactions (RI) grid in Fig. 4.6, indicates a clear trend that across institutions, public institutions are most engaged in conservation-related research interactions necessary for enhancing adoption of forestry innovations in Kenya compared to NGOs and private sector players. Similarly, NGOs are better engaged compared to the private sector players. In addition, the grid also indicates an upper value of about 11 and lower value of about 6, all of which are within the quartile “**common cause**” or “**expected**” variation region. The variation region lies between the lower and upper quartile limits. Within this quartile region, institutions are expected to have all the capacities necessary for enhancing adoption of forestry innovations unless a change occurs.

However, 9 specific institutions comprising 17.7%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were identified to have research interaction gaps or limitations, thus warranting investigation that inform actions to be taken. Of the institutions with gaps in research interactions, 44.4% were public; 44.4% NGOs and 11.2% private sector players, respectively.

The types of benefits from research interactions include staff secondment and training, certification, library resources, internet services, collaborative implementation of conservation activities, funding and publicity. The results show that four institutions, namely; numbers 3, 7, 11 and 42, had realised the highest level of performance excellence under this indicator. Nevertheless, Dickson (2006) reiterates that communication of accurate and reliable scientific and technical knowledge as well as embracing the same as a constituent element of the process of social development was imperative for better outcome.

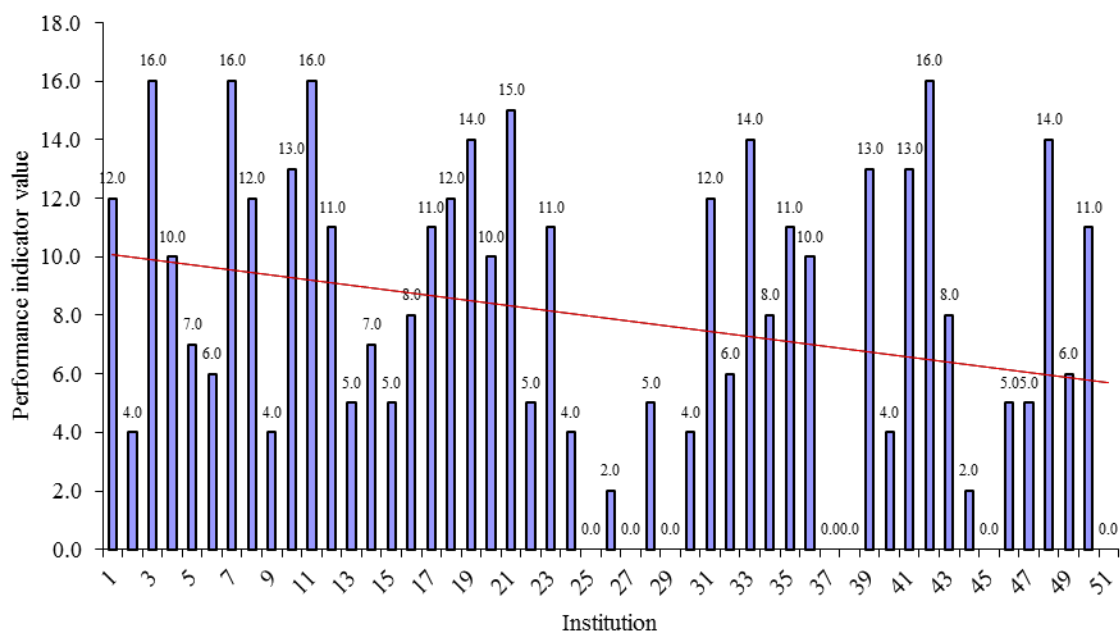


Fig. 4.6: Distribution of research interactions

#### 4.4.5 Distribution of user interactions among institutions

User interactions (UI) are a key process through which knowledge and value created integrates internally and externally through different measures. They are also important determinants of opportunities within and across institutions. The UI grid in Fig. 4.7 is described by the proportion of annual budget and staff time associated with dissemination of innovations to stakeholders. The grid shows a clear trend across institutions, that each is equally devoting staff time to engaging in both internal and external interactions to enhance adoption of forestry innovations.

The grid also shows that the variation region lies between the quartile of “**common cause**” or “**expected**” variation region (upper indicator value of about 8 and lower value of about 7.5, respectively). Within this quartile region, there is no user interaction gap or limitation to warrant investigation and that inform actions to be taken.

The study established that 12 specific institutions comprising 23.5%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 had UI gap or limitations, thus warranting investigation to inform actions to be taken. Of these, 58.3% institutions were public, 33.3% NGOs and 8.4% private sector, respectively. The results show that two institutions, namely; numbers 3 and 39, had realised the highest level of performance excellence under this indicator.

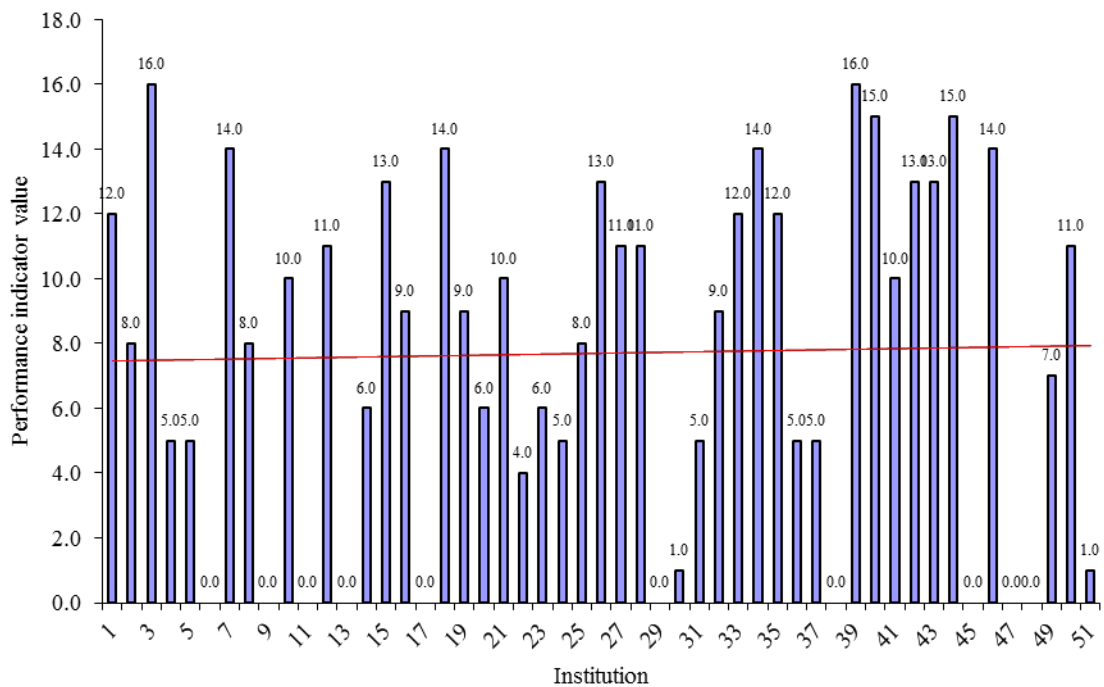


Fig. 4.7: Distribution of user interactions

#### 4.4.6 Distribution of salary incentives among institutions

Irrespective of the sector, attractive and competitive salary levels remain an incentive to retain and inspire personnel to influence conservation through adoption of forestry innovations. The salary incentives (SI) grid in Fig 4.8 shows a clear trend that across institutions, contrary to the old age perception that personnel in private institutions and NGOs are better remunerated, public institutions have at best overcome this perception.

The results confirm the Chairperson of Kenya Salaries and Remuneration Commission (SRC) Sarah Serem’s contention that the public sector is now the best employer but laments that levels of productivity are still very low (Kimutai, 2015). The gap is getting wider as shown by the grid. The variation region lies between the quartile of “**common cause**” or “**expected**” variation region (upper indicator value of about 7 and lower value of about 5, respectively). Within this quartile

region, there are no salary incentives gaps or limitations to warrant investigation and to inform actions to be taken.

However, 23 specific institutions comprising 45.1%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were identified to have serious underlying SI gap or limitation, thus warranting investigation that inform actions to be taken. Of the institutions with capacity gaps in SI, 60.9% were public, while 34.8% and 4.3% were NGOs and private sector players, respectively.

A weak SI is likely to undermine an institution’s ability to attract and retain human resources hence fail to effectively exercise, demonstrate, monitor and supervise adoption of forestry innovations (Cohen and Wheeler, 1997). In addition, the inter-dependent nature of the capacity indicators implies that a weak SI is likely to constrain other capacity indicators. If approached holistically among public institutions, SI would be a pillar of sustainability and action for effective conservation initiatives. The results show that one institution, namely; 1, had realised the highest level of performance excellence under this indicator.

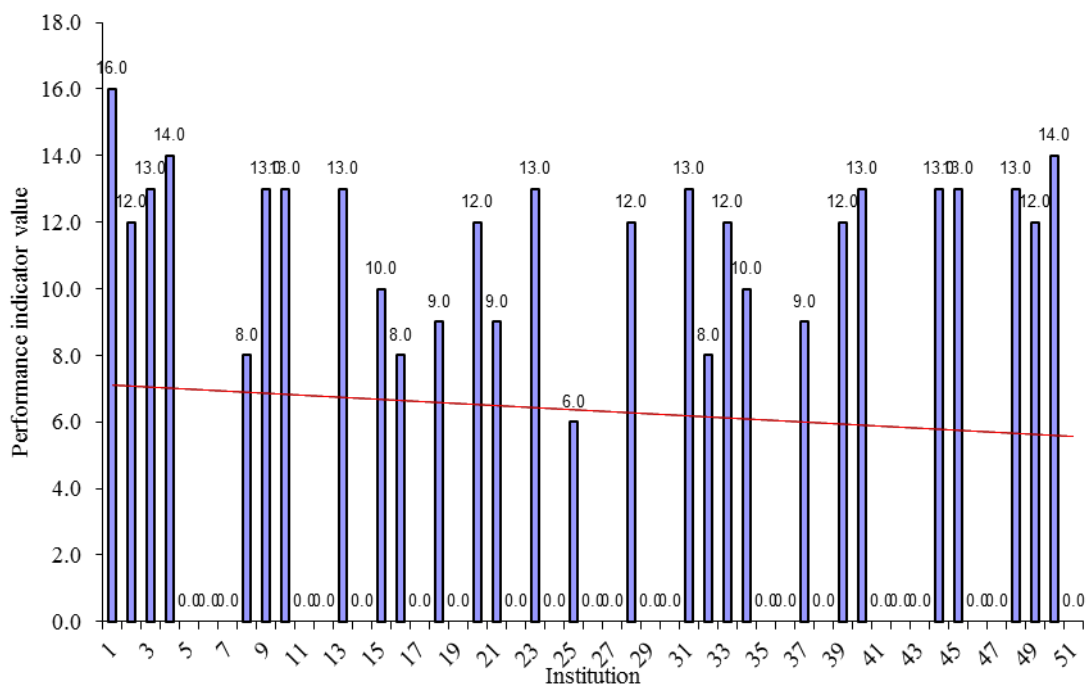


Fig 4.8: Distribution of salary incentives

#### 4.4.7 Distribution of non-salary incentives among institutions

Administration of non-salary incentives (NSI) and improving the quality of work life just like the salary incentives are an added value to an institution’s ability to attract and retain a competent and motivated human capital (Cohen and Wheeler, 1997). In making a comparison of NSI across

institutions, the NSI grid in Fig. 4.9 indicates better allowances among public institutions than by NGOs and private sector (Kimutai, 2015). The components of NSI included; transport/commuter allowance, medical allowance, housing allowance communication/ airtime allocation, leave allowance, prospects of promotion and opportunity for professional growth. The grid also shows that the variation region lies between the quartile of “**common cause**” or “**expected**” variation region (upper indicator value of about 10 and lower value of about 5, respectively). Within this quartile region, there are no salary incentives gaps or limitations to warrant investigation and to inform actions to be taken.

However, 8 specific institutions comprising 15.7%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were observed to have non-salary incentives gap or limitation, thus warranting investigation that inform actions to be taken. Of the institutions with NSI issues, 62.5% were public, while 25.0% and 12.5% were NGOs and private sector players, respectively. The results show that one institution, namely; number 17 had realised the highest level of performance excellence under this indicator.

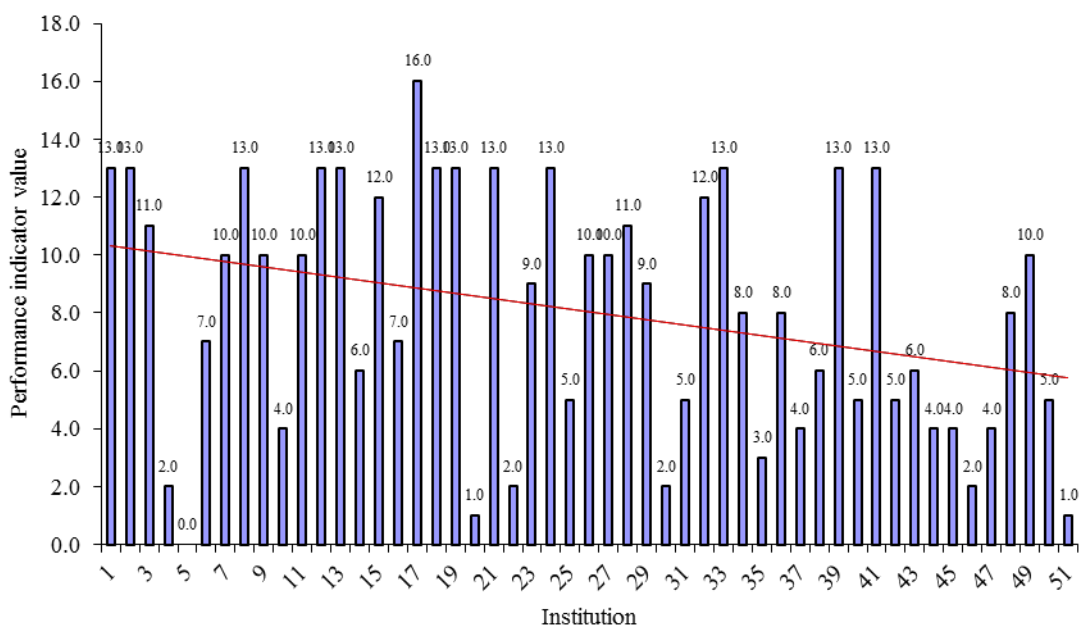


Fig. 4.9: Distribution of non-salary incentives

#### 4.4.8 Distribution of internal interactions among institutions

Internal interactions (II) are a key process through which conservation knowledge and value is shared internally through different measures. The grid of II in Fig. 4.10 through participation of relevant players indicates a clear trend that across institutions, that private sector institutions,

highly embrace II necessary for enhancing adoption of forestry innovations compared to NGOs and public institutions, respectively. Nevertheless, the variation region lies between the quartile “**common cause**” or “**expected**” variation region (upper value of about 9 and lower value of about 6, respectively). Within this quartile region, institutions are expected to have all the capacities necessary for enhancing adoption of forestry innovations unless a change occurs.

However, 12 specific institutions comprising 23.5%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were identified to have II gap or limitation, thus warranting investigation that inform actions to be taken. The study established that 83.3% of the institutions with II gaps were public, while private and NGOs in similar situation was 8.3% each. The results indicate that the need for public institutions to improve the internal skills and interactive capacity of the workforce was imperative. The results indicate that one institution, namely; number 41, had realised the highest level of performance excellence under this indicator.

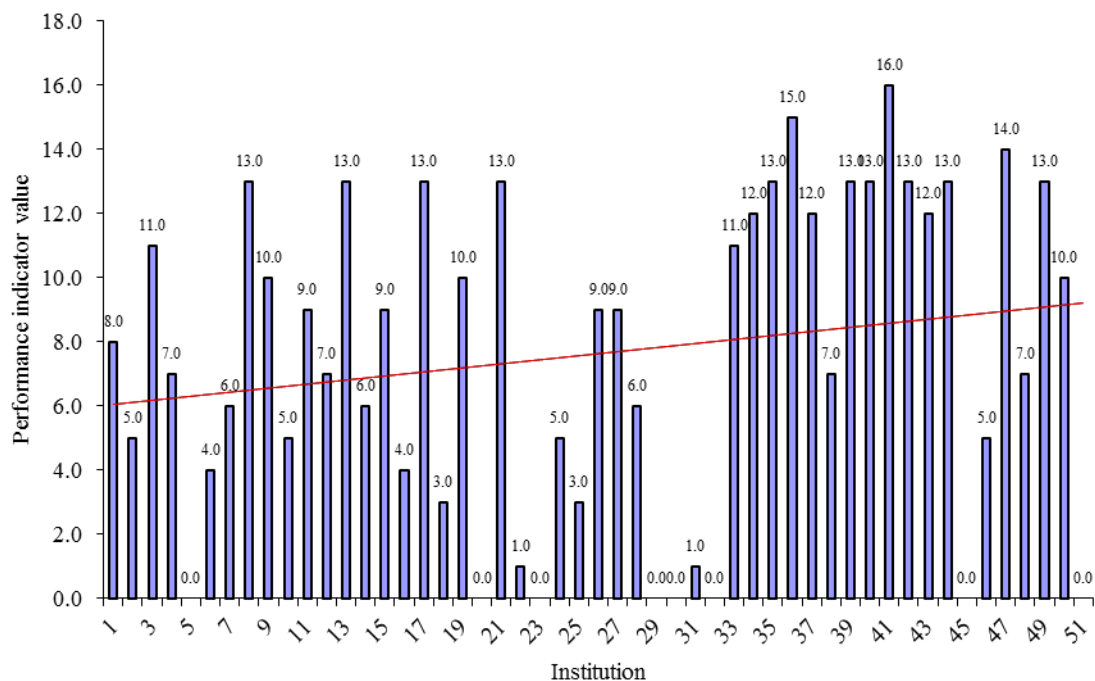


Fig. 4.10: Distribution of internal interactions

#### 4.4.9 Distribution of technical support among institutions

The technical support (TS) grid is described by the level and availability of technical and administrative staff. The grid in Fig. 4.11 indicate a clear trend that across institutions, there was relatively equal presence of capacity to support the human capital, hence adoption of forestry innovations. Public institutions had a relatively higher indicator value compared to private sector. The variation region lies between the quartile “**common cause**” or “**expected**” variation region.

Within this quartile region, institutions are expected to have all the technical support capacity necessary to influence adoption of forestry innovations unless a change occurs.

It was also noted that 12 specific institutions, comprising 23.5%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were identified to have TS gap or limitation, thus warranting investigation that informs actions to be taken. Although, there was equal presence in TS capacity across institutions (23.5%), the study established that of these, 58.4% of the gaps were attributed to public, 33.3% NGOs and 8.3% to private institutions, respectively. The results show that one institution, namely; number 42 realised the highest level of performance excellence under this indicator.

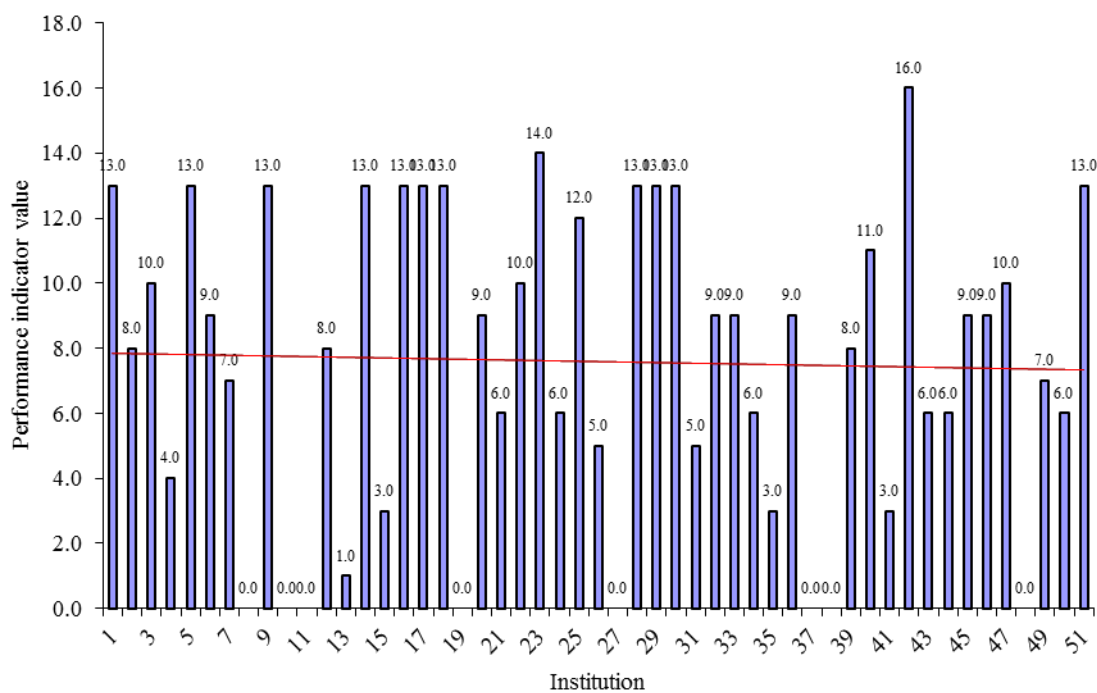


Fig. 4.11: Distribution of technical support

#### 4.4.10 Distribution of publications output among institutions

Information and knowledge are assets and key to competitiveness. Dickson (2006), asserts this value only has desired effects when they are reliable and accessible to stakeholders. By publishing, institutions are able to capture, apply and harness value from conservation personnel's and beneficiaries' experience. In making a comparison of the number of published output, the publication output (PO) grid in Fig. 4.12, shows a clear trend across institutions. Public institutions lead categories in publishing conservation materials necessary for influencing



adoption of forestry innovations. This is followed by NGOs and private sector players, respectively. In addition, the grid also highlights an upper indicator value of about 8.5 and lower indicator value of 6, all of which are within the quartile of “common cause” or “expected” variation region.

However, 14 specific institutions comprising 27.5% as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1, were identified to have PO gap or limitation, thus warranting investigation that inform actions to be taken. Of these, public institutions and NGOs accounted for 64.3% and 35.7%, respectively. The results show that one institution, namely; number 8, realised the highest level of performance excellence under this indicator.

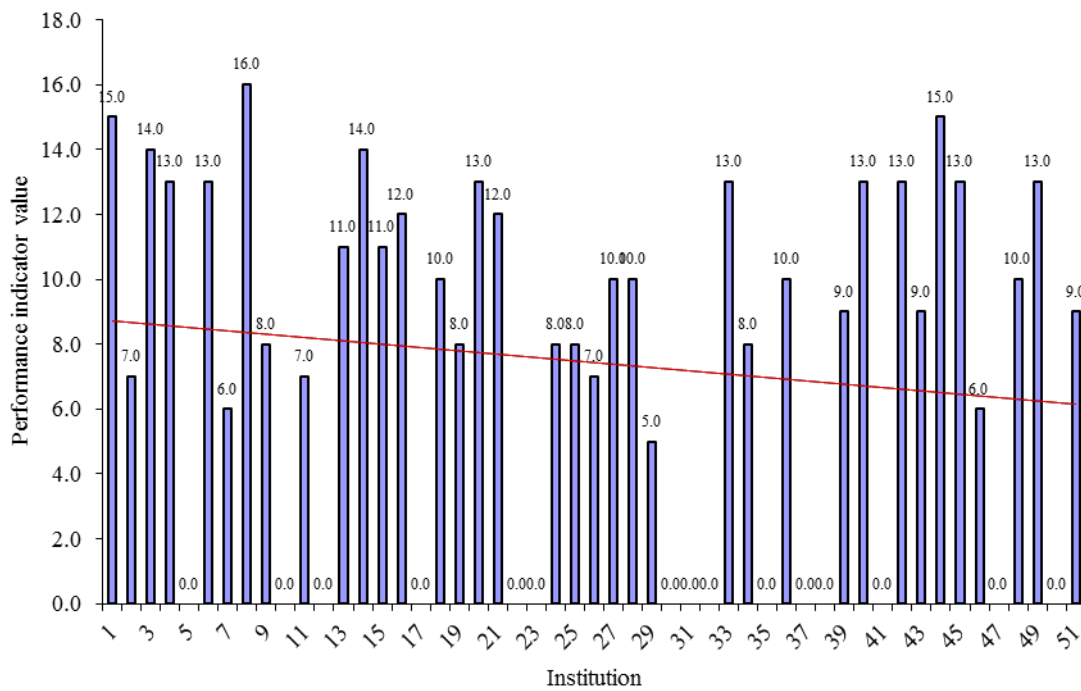


Fig. 4.12: Distribution of publication output

#### 4.4.11 Distribution of electronic media output among institutions

In making a comparison on the number of documented electronic media output, the electronic media output (EMO) grid in Fig. 4.13, shows a clear weak trend across institutions. Public institutions lead other categories in documenting digital format conservation materials necessary for enhancing adoption of forestry innovations. This was followed by NGOs and private sector players, respectively. In addition, the grid also highlights an upper indicator value of less than 6 and lower indicator value of less than 4. This implies that public and to an extent NGOs, lie

within the quartile of “**common cause**” or “**expected**” variation region, while the private institutions lie within the quartile of “**unexpected variation** or **special cause**” variation region. The “**special cause**” variation region is the area within which institutions have no capacities necessary for enhancing adoption of forestry innovations, (beyond the set control limits), implying that this variability should be investigated and acted upon.

A total of 30 specific institutions comprising 58.8%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1, were identified to have serious underlying EMO gap or limitation, thus warranting investigation that inform actions to be taken. Of these, public institutions, NGOs and private sector players accounted for 70%, 26.7% and 3.3%, respectively. The results show that one institution, namely; number 1, had realised the highest level of performance excellence under this indicator.

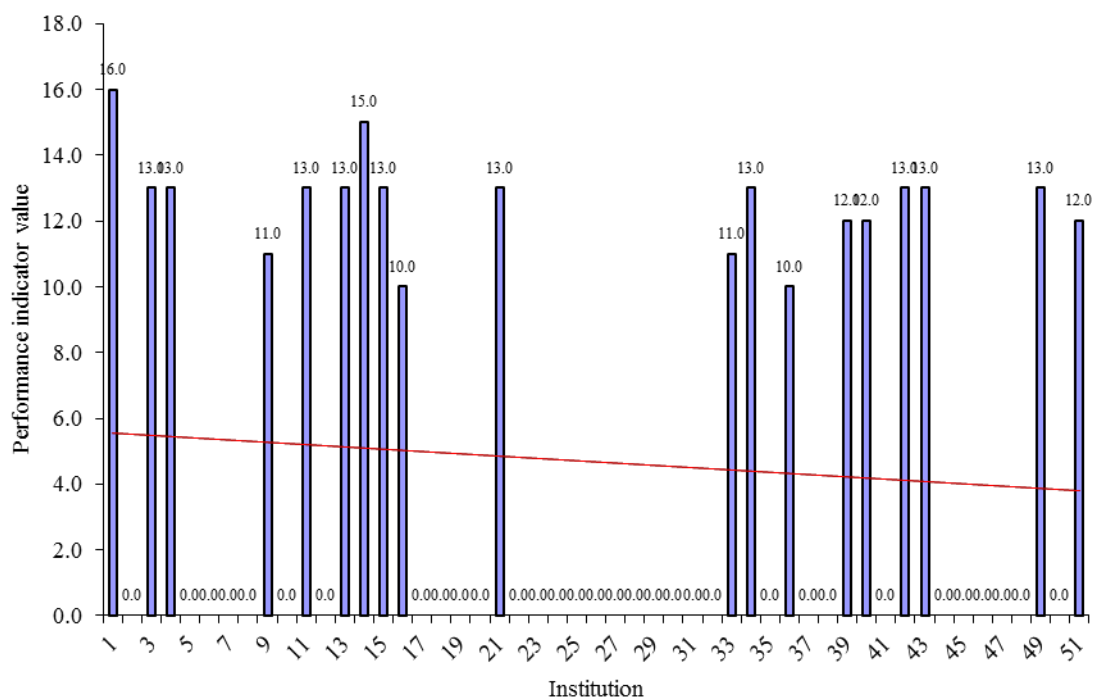


Fig. 4.13: Distribution of electronic media output

#### 4.4.12 Distribution of conservation management among institutions

Establishing meaningful and objective conservation management performance depends on whether institutional efforts are reflected as a profit margin or proxies that elicit information about adoption of forestry innovations. Spilsbury *et al.* (2003) laments the difficulties in realising the same for non-profit-oriented organisations, as it is the case in the study. The conservation

management (CM) grid in Fig. 4.14 presents the extent to which conservation management processes and resources are in place, and the extent to which they influence adoption of forestry innovations. It also reflects the degree to which management processes embrace recording of functions of: management, planning, implementing, monitoring, and controlling conservation efforts.

The study established that there was a clear trend across institutions, with public institutions increasingly embracing management of performance than NGOs and private sector players, respectively. In addition, the grid also highlights an upper indicator value of about 9 and lower indicator value of about 7.5, all of which are within the quartile of “**common cause**” or “**expected**” variation region. The variation region lie between the lower and upper quartile limits. Within this quartile region, institutions are expected to have all the capacities necessary for enhancing adoption of forestry innovations unless a change occurs.

Other than across institutions, 8 specific institutions, comprising 15.7%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were observed to have conservation management gaps or limitations, thus warranting investigation that inform actions to be taken. Of the specific institutions with conservation management gap, 75% were public, while NGOs and private accounted for 12.5% each.

Although most of the institutions had instruments of governance, work plans, embraced partnership and measures for improving performance, cases where conservation was a function of corporate social responsibility and competencies were also common. The value added by the observed results is linked to hypothesis 4 on the level of interactions discussed in Section 4.4. The results show that two institutions, namely; numbers 41 and 42, realised the highest level of performance excellence under this indicator.

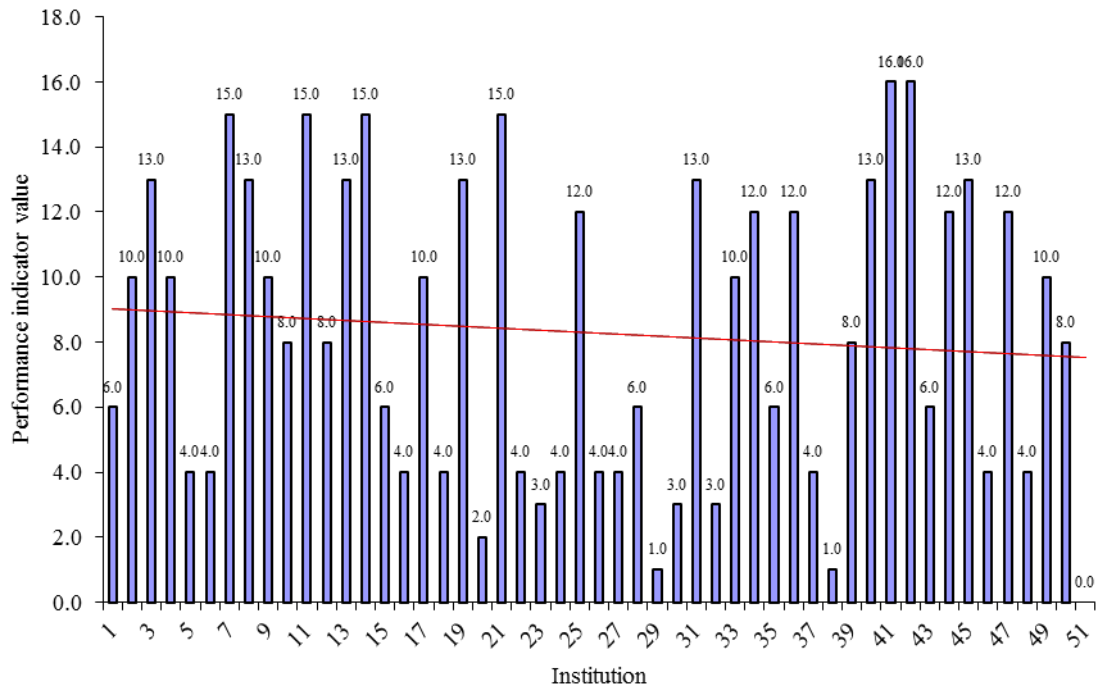


Fig. 4.14: Distribution of conservation management

#### 4.4.13 Distribution of conservation investment among institutions

Investment is a key concept in economics. It constitutes the set and value of items that are availed for production purpose. In making comparisons across institutions, the conservation investment (CIN) grid in Fig. 4.15, shows that public institutions are yet to consider the wider perspective of how to invest in, and to make best use of all its resources. Arguably, private sector institutions had higher levels of CIN than NGOs and public, respectively. The grid also shows highest indicator value of 10 for private sector and lowest of 6 for NGO and public sector, whose variation region lies between the quartile “**common cause**” or “**expected**” variation region. Within this quartile region, there was no facilities gap or limitation to warrant investigation and that inform actions to be taken.

However, 12 specific institutions comprising 23.5%, as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1 were observed to have CIN gaps or limitations, thus warranting investigation to inform actions to be taken. The study established that the public institutions accounted for 83.3% and NGOs 16.7% of the gaps, respectively. The private institutions had no gaps. The disparity reflects underinvestment in conservation to effectively enhance adoption of forestry innovations, particularly, in public institutions. The results also show

that two institutions, namely; numbers 41 and 47, had realised the highest level of performance excellence under this indicator.

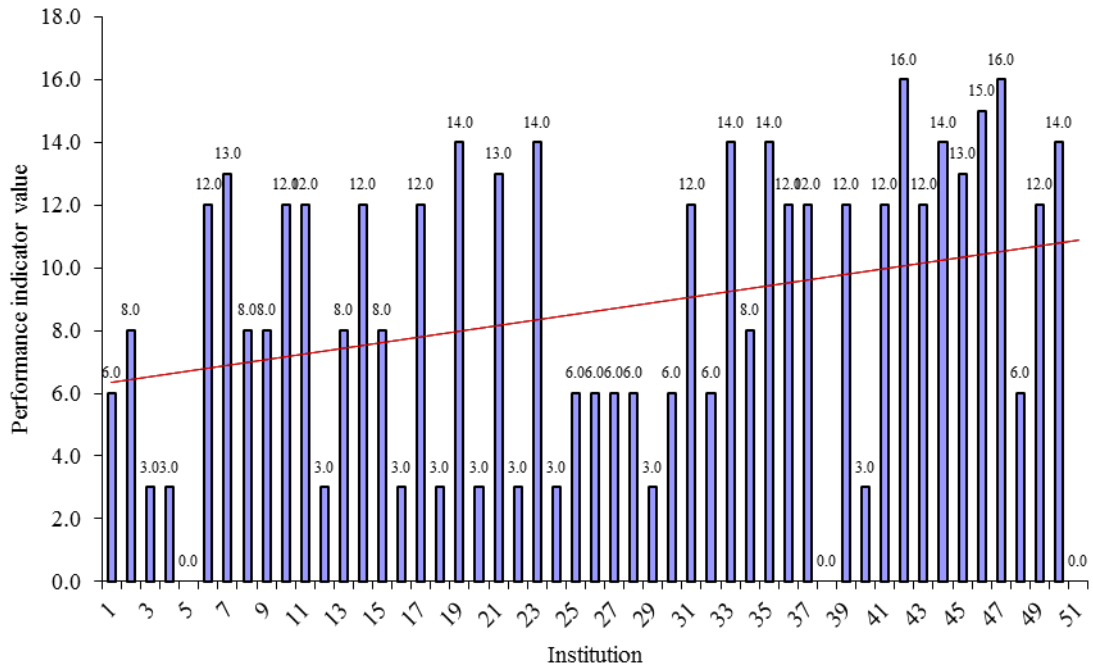


Fig. 4.15: Distribution of conservation investments

#### 4.4.14 Distribution of facilities among institutions

In making a comparison of facilities across institutions, the Facilities (FA) grid in Fig. 4.16 indicates the presence of equal strength and described as adequate to enhance adoption of forestry innovations. The upper and lower indicator value are about 10, respectively, whose variation region lies between the quartile “**common cause**” or “**expected**” variation region. Within this quartile region, there was no facilities gap or limitation to warrant investigation and that inform actions to be taken. The study established that none of the institutions as presented in Table 4.2 and Conservation capacity profiles by institution in Appendix 4.1, had any facilities gap or limitation that warrant investigation to inform actions to be taken. However, proficient communicative processes, is an important complement to favourable institutional facilities to influence adoption of appropriate innovations.

The facilities survey included Office buildings, on-station and on-farm conservation facilities; Library facilities such as publications, digital and audio-visuals materials; Internet/LAN computers and accessories, sharing resources; ASK showground stand; transport fleet; and communication (phone, fax, e-mail). The results show that one institution from the public sector,

namely; number 6, had realised the highest level of availability and adequacy or performance excellence under this indicator.

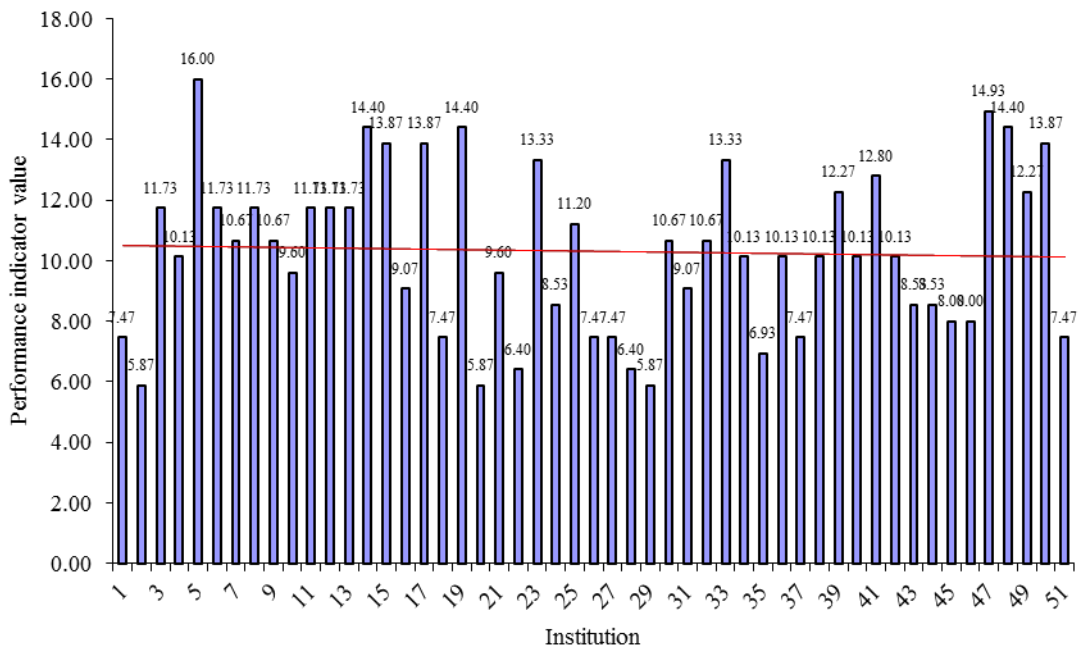


Fig. 4.16: Distribution of facilities

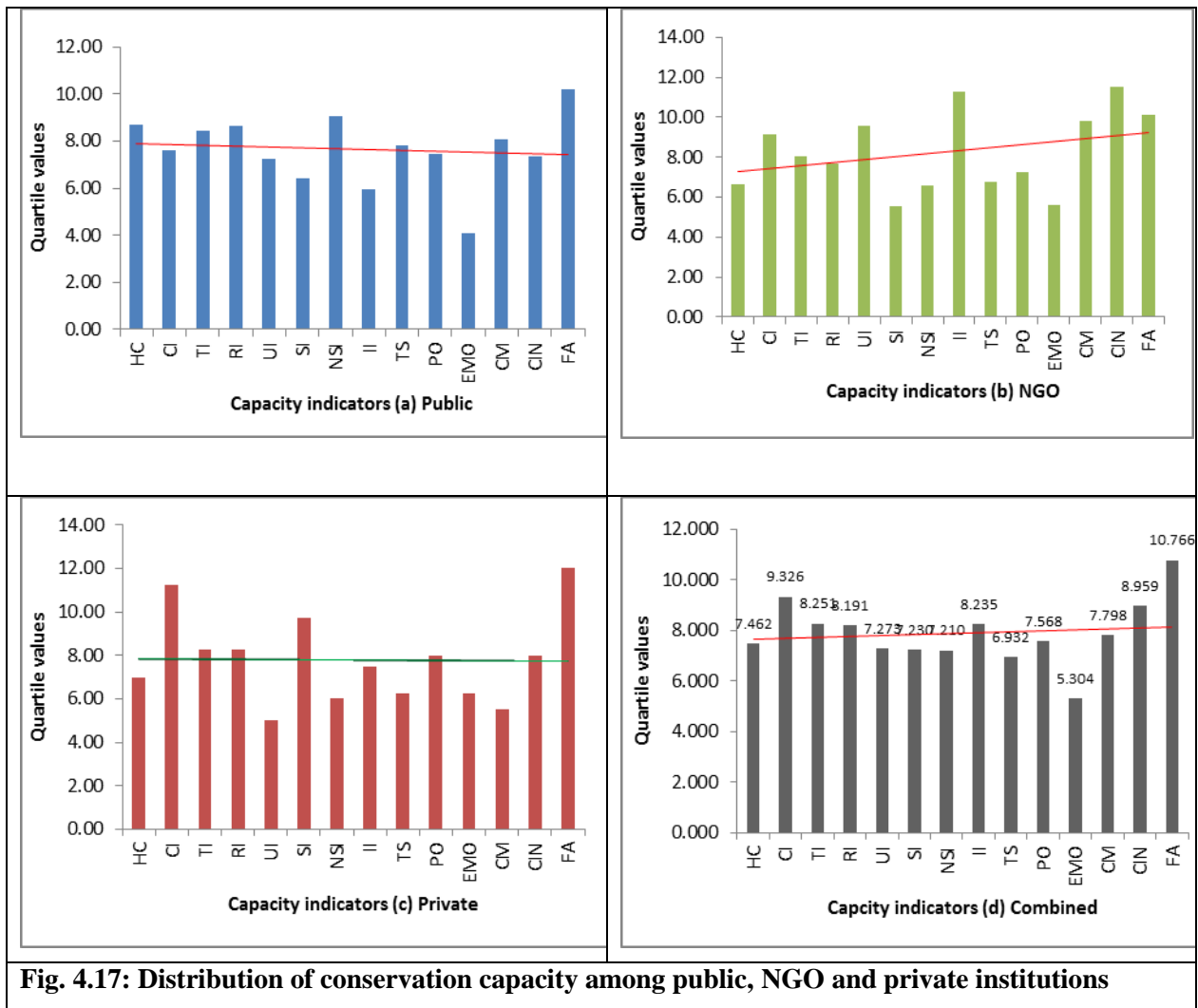
#### 4.5 Summary and Distribution of Institutional Capacity Among Public, NGOs and Private Institutions

This Section quantitatively describes, summarises and presents the distribution of specific institutions’ capacity gaps that enhance adoption of forestry innovations in Kenya as presented in Table 4.2 and figures 4.17. Therefore, the study model attempts to provide evidence of capacity gaps, which must be addressed to allow adoption of forestry innovations to thrive. However, some of the observed gaps do not necessarily imply a lower capacity or absence of an indicator, but may also be due to the reluctance and uncertainty among the respective institutions to provide data. The observed institutional specific gaps limiting and warranting investigation to inform decisions are as summarised in Appendix 4.2. A major finding is that institutional capacity across conservation related institutions was 77.81% or -2.19%, which is below the 80% improvement level suggested by USAID/CDIE (2000; 2011). Overcoming the gaps is not for the government alone, but will require concerted policy, institutional and individual effort to promote adoption of forestry innovation.

**Table 4.2: Summary of institutional capacity gaps among public, NGOs and private institutions**

	Capacity indicator	Institution number	Totals			Total (n)	% of N
			Public	NGO	Private		
1	HC	8, 10, 11, 25, 37, 51	4	1	1	6	11.76
2	CI	14, 24, 28, 29, 30, 34, 40	5	2	0	7	13.73
3	TI	24, 25, 27, 28, 29, 30, 38, 40, 45	6	3	0	9	17.65
4	RI	25, 26, 27, 29, 37, 38, 44, 45, 51	4	4	1	9	17.65
5	UI	6, 9, 11, 13, 17, 29, 30, 38, 45, 47, 48, 51	7	3	2	12	23.53
6	SI	5, 6, 7, 11, 12, 14, 17, 19, 22, 24, 26, 27, 29, 30, 35, 36, 38, 41, 42, 43, 46, 47, 51	14	8	1	23	45.10
7	NSI	4, 5, 20, 22, 30, 35, 46, 51	5	2	1	8	15.69
8	II	5, 18, 20, 22, 23, 25, 29, 30, 31, 32, 45	10	1	1	12	23.53
9	TS	8, 10, 11, 13, 15, 19, 27, 38, 41, 48	7	4	1	12	23.53
10	PO	5, 10, 12, 17, 22, 23, 30, 31, 32, 35, 37, 38, 41, 47	9	5	0	14	27.45
11	EMO	2, 5, 6, 7, 8, 10, 12, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 35, 37, 38, 41, 44, 45, 46, 47, 48	21	8	1	30	58.82
12	CM	12, 20, 23, 29, 30, 32, 38, 51	6	1	1	8	15.69
13	CIN	3,4, 5, 12, 16, 18, 20, 23, 24, 29, 38, 40	10	2	0	12	23.53
14	FA	None	0	0	0	0	0.00
<b>Average across institutions (%)</b>							<b>77.81</b>

Figure 4.17 illustrate a comparison of the mean of conservation profile based on the 14 capacity indicators across the three categories of the sample institutions, namely; public, NGOs and private. The results, clearly show the trendline across the three categories, hence indicating average performance is slightly below or slightly above the median level of 8.00. This falls within the expected or “common cause” variation region. Although this does not warrant an investigation that inform actions to be taken, a value equal to, or below the median level of 8.00, suggests a capacity inadequacy of 47.6% in overall performance across institutions to enhance adoption of forestry innovations. This finding concurs with USAID/CDIE (2000; 2011) that there is need to enhance capacity.



**Fig. 4.17: Distribution of conservation capacity among public, NGO and private institutions**

To be at par (Median of 8.00) with NGOs and private institutions despite its vast resources (HC, NSI, TS, FA) also suggest that public institutions could be under-performing, hence a need to enhance institutional capacity and quality across public institutions.

Furthermore, the specific institution category results show that in NGO and Private (50% each), none of the capacity indicator values fall on or within the unexpected variation or “special cause” variation region (4<sup>th</sup> quartile), instead they all fall within the expected or “common cause variation” region (2<sup>nd</sup> and 3<sup>rd</sup> quartiles). This implies that within this region, except for the public institutions, both NGO and private categories, collectively have adequate capacity necessary for enhancing adoption of forestry innovations, hence none of their capacity indicators warrant an investigation that inform actions to be taken.



In addition, the public institutions display a specific weakness in EMO capacity indicator value which falls on the boundary or within the 4<sup>th</sup> quartile (unexpected or “special cause” variation”) thus, implying a capacity limitation and a need warranting investigation to inform action to be taken. The results also show that across the three categories, all had adequate to optimum facilities necessary for influencing adoption of forestry innovations. Across the three categories, CI, UI, II, CM, and CIN are higher in the NGO and private compared to the public.

Table 4.3 presents a summary of the operational capacity and efficiency among the three categories, where the Public operational capacity and efficiency is 42.9%, while NGOs and Private are at 50% each. Of the established overall performance of 47.6%, the public category institutions’ contribution accounts for 30%, while NGO and private category contribute 35% each.

**Table 4.3: Capacity indicator values  $\geq 8.00$  (mid-value of highest and lowest quartile)**

	HC	CI	TI	RI	UI	SI	NSI	II	TS	PO	EMO	CM	CIN	FA	$\Sigma$	%
<b>PUB</b>	√		√	√			√					√		√	6	42.9
<b>NGO</b>		√	√		√			√				√	√	√	7	50.0
<b>PVT</b>		√	√	√		√				√			√	√	7	50.0
<b><math>\Sigma(\sqrt{)}</math></b>	1	2	3	2	1	1	1	1	0	1	0	2	2	3	20	47.6

#### **4.6 Institutional Capacity Strengths, Weaknesses, Opportunities and Threats (SWOT) in relation to PESTLEG Framework**

The study also summarised a strengths, weaknesses, opportunities and threats (SWOT) analysis across relevant institutions. From SWOT analysis, a political, economic, social, technological, legal, environment, and governance (PESTLEG) matrix was derived to be clear of what is most or less important, overcome the danger of over-generalising an underlying reason for that capability and understanding what can be done or not. In this way, the results show how key internal and external drivers of change could be identified, their relative importance and combined impact on adoption of forestry innovations, how they are unfolding and appropriate measures to enhance institutional capacity.

It is evident that the list is long, while their relative influence and drivers vary from institution to institution as well as acting and exerting their influence either singly or interdependently and in the same or different direction. As Johnson *et al.* (2011) contends it will be the combined or

simultaneous effect of some of these separate factors that will be of most importance rather than all the factors separately. Consequently, it is imperative that institutions should focus on factors with high potential for impact and a combined effect of what is desirable. The details of SWOT - PESTLEG data listings are summarised and presented in a complementary matrix as Appendices 4.3 and 4.4, thus capturing; public NGOs and private institutions. Attributes of strengths – opportunities analysis; weaknesses – opportunities analysis; strengths – threats analysis; and weaknesses – threats analysis are discussed in Sections 4.3.1 and 4.3.2.

**4.6.1 SWOT analysis**

The study undertook a SWOT analysis of the institutions sampled with regards to the following seven attributes: political, economic, social, technological, legislative, environmental, and governance (PESTLEG).

**4.6.1.1 Strengths**

The study established that there was significant political, governance and economic strength-related attributes to influence adoption of forestry innovations in the institutions sampled as shown in Fig. 4.18. These were rated at 22.6%, 19.8%, and 17.0%, respectively. The environmental and legislative strength-related attributes were rated lowest at 4.7% and 5.7%, respectively.

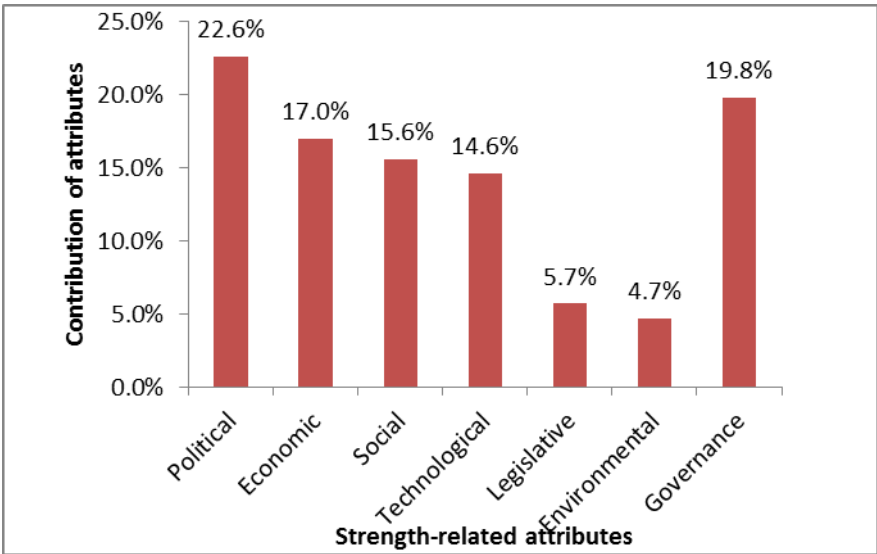


Fig. 4.18: Strength-related attributes

#### 4.6.1.2 Weaknesses

The study established that economic and governance weakness-related attributes in the sampled institutions contributed 39.4% and 23.0%, respectively, evidently constraining adoption of forestry innovations as shown in Fig. 4.19. The lowest rated weakness-related attributes were legislative and environmental contributing 1.9% and 2.3%, respectively. This suggests that adoption of forestry innovations may remain elusive if opportunities to invest in alleviating weaknesses continue to be inadequate.

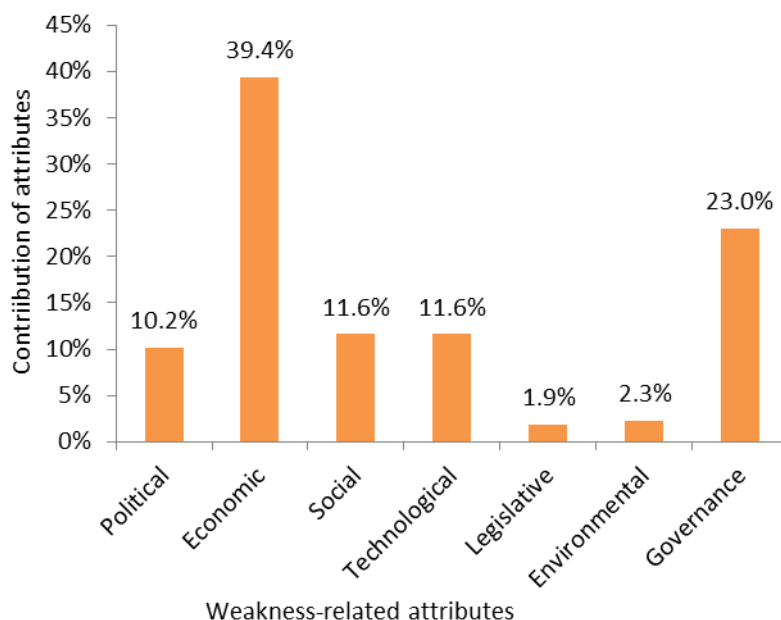


Fig. 4.19: Weakness-related attributes

#### 4.6.1.3 Opportunity

There is great opportunity in the sampled institutions to influence adoption forestry innovation, particularly in the political opportunity-related attributes which was rated at 37.0%. The economic and governance opportunity-related attributes accounted for 18.5% and 12.8%, respectively. The technological and legislative opportunity-related attributes were rated low at 7.6% and 6.6%, respectively, as shown in Fig. 4.20. This suggests a need to continue investing in these opportunities to enhance institutional capacity and influence adoption of forestry innovations.

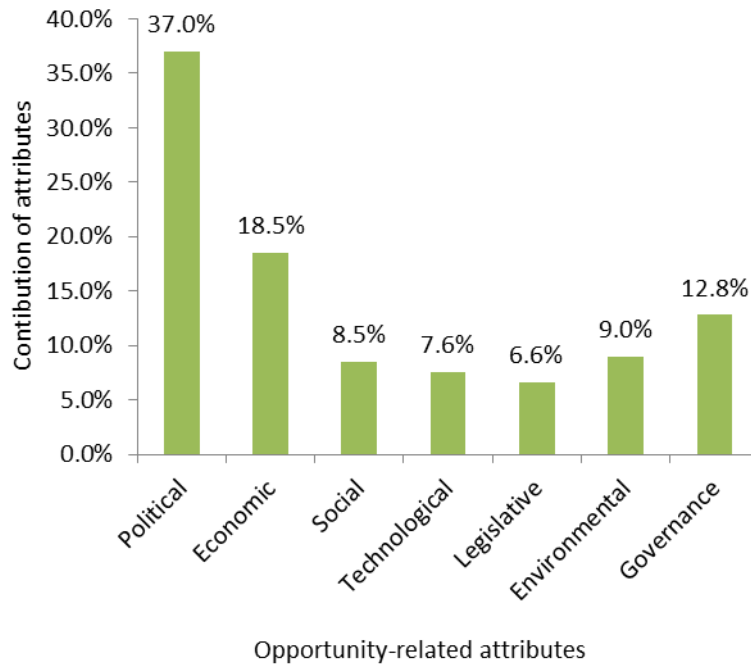


Fig. 4.20: Opportunity-related attributes

#### 4.6.1.4 Threats

The study established that in the institutions sampled, political, economic and social threat-related attributes, which were rated at 33.5%, 28.1% and 14.8%, respectively, accounted for a weak institutional capacity, hence low adoption of forestry innovations. Technological, governance and legislative threat-related attributes accounted for a low 2.5%, 3.9% and 4.4%, respectively. Figure 4.21 presents the respective attributes.

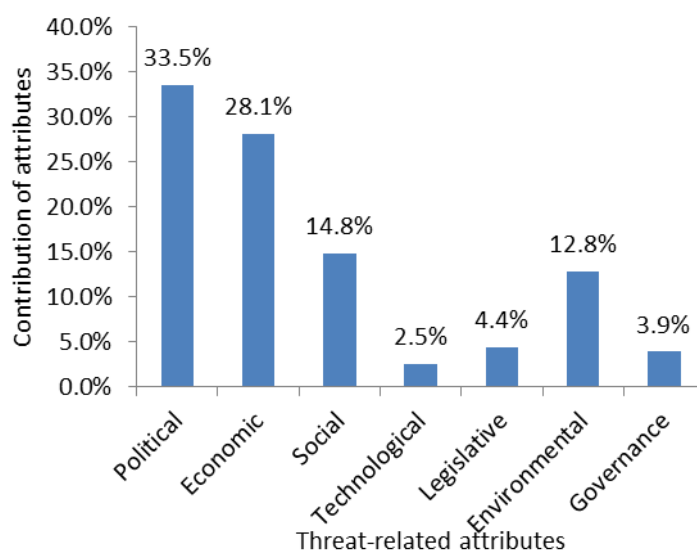


Fig. 4.21: Threat-related attributes

## **4.6.2 The SWOT matrix synthesis**

### **4.6.2.1 Strength - Opportunity (S – O) analysis**

The strength - opportunity (S – O) analysis indicates great potential for influencing adoption of forestry innovations among sampled institutions. This is emanating from the relatively complementary or simultaneous political, governance and economic strength-related attributes at 22.6%, 19.8%, and 17.0%, respectively and the political opportunity-related attributes at 37.0%. Great opportunity for institutional capacity improvement is also manifested in governance as a decision-support variable. This implies that strengths could be used to take advantage of capacity enhancement opportunities to impact on and drive adoption of forestry innovations.

### **4.6.2.2 Strength - Threat (S – T) analysis**

The strength – threat (S – T) analysis indicates political, governance and economic strength-related attributes at 22.6%, 19.8%, and 17.0%, respectively while political, economic and social threat-related attributes which were rated at 33.5%, 28.1% and 14.8%, respectively. Evidently, the complementary or simultaneous threat-related attributes appear to outweigh strength-related attributes thus, potentially standing to slow down the rate adoption of forestry innovations. If these threats are not addressed, the gains made by institutions will likely reduce.

### **4.6.2.3 Weakness – Opportunity (W – O) analysis**

The weakness – opportunity (W – O) analysis indicates that economic and governance weakness-related attributes in the sampled institutions contributed 39.4% and 23.0%, respectively, while the political and economic opportunity-related attributes contributed 37.0% and 18.5%, respectively. The relative complementary or simultaneous effects (W – O) of the attributes are likely to counter the weaknesses and propel adoption of forestry innovations to an extent.

### **4.6.2.4 Weakness – Threat (W – T) analysis**

The weakness – threat (W – T) analysis indicates that economic and governance weakness-related attributes in the sampled institutions contributed 39.4% and 23.0%, respectively while the political, economic and social threat-related attributes, were rated at 33.5%, 28.1% and 14.8%, respectively. Evidently, their relatively complementary or simultaneous effects pose considerable challenge to an effective and efficient institutional capacity hence adoption of forestry innovations.

From the findings, concerted investment in the combine strengths and opportunities observed in institutional capacities is essential to realise the stipulated 10% forest cover. The study also suggests that institutions should periodically undertake a SWOT - PESTLEG assessment to enhance their internal strengths, maximise on opportunities, manage the weaknesses and mitigate factors that pose a threat to elements of institutional capacity hence, enhancing adoption of forestry innovations.

## 4.7 Assessment of Institutional Capacity

### 4.7.1 Assessment of the quality of human resource needs for adoption of forestry innovations

Human quality and quantity are a fundamental requirement in conservation endeavour through their complementary application of different skills and experiences (Armstrong, 2005; Johnson *et al.* 2011).

In assessing the qualitative aspects of the human resource needs and adoption of innovations, conservation, training and research interactions in Kenya and various qualifications and experience among sampled institutions were used.

The standard deviations in Table 4.4 shows that the dispersion of mean score is relatively high, implying that most institutions responded within a relatively wide range of scores. This observation was consistent with results from the other interactions. Arguably, the value of the quality of human resource needs not only lies on the years of experience, but also in its ability to consistently engage, inspire, respond and enhance adoption of forestry innovations.

**Table 4.4: Distribution of quality of human resource needs and training interactions in Kenya**

Descriptive		N	Mean	SD	
Diploma	Never	4	9.00	10.52	
	Frequently	27	35.59	120.39	
PhD	Never	4	.00	.000	
	Frequently	27	7.15	26.50	
Number of years		N	Mean	df	s
0-3		8	1.54	289	0.75
4-10		8	1.58		0.82

#### 4.7.2 Assessment of quantity of human resource needs for adoption of forestry innovations

In assessing the quantitative aspect of human resource needs and adoption of forestry innovations, the variables used included; the number of institutions with between 0 -30 personnel or human capital, referred to as Group 1, and those with 31 and above as Group 2. Both groups hold various qualifications, and the cumulative number of human resource needs in the two groups.

Results in Table 4.5, shows the mean value of the quantity of professional personnel among the sampled institutions. The standard deviations show that the dispersion of mean score is relatively high so that most institutions responded within a relatively wide range of scores.

**Table 4.5: Distribution of the cumulative quantity of professional personnel**

	Rank	N	Mean	SD	df	SE
Cumulative	1	35	8.97	8.76	49	1.48
	2	16	237.69	305.66	-	76.41
Dip	1	35	4.29	5.23	49	0.88
	2	16	70.44	151.82	-	37.96
BSc	1	35	3.31	4.92	49	0.83
	2	16	55.00	78.84	-	19.71
MSc	1	35	1.03	1.67	49	0.28
	2	16	71.38	114.29	-	28.57
PhD	1	35	0.23	0.73	49	0.12
	2	16	40.88	99.25	-	24.81

Consequently, the results in Table 4.5 imply that across and within institutions in Kenya, an increase in the quantity of professional personnel, would enhance adoption of forestry innovations.

The distribution of gender within and across forest-related institutions, presents an average of 71.01% as males and 25.04% females as shown in Appendix 3.3. The difference indicates a compelling need for the stipulated equal opportunities of 70% male to 30% female in Vision 2030 (GoK, 2007). The variance should be realised through institutional compliance as provided in Vision 2030 when mainstreaming gender and affirmative action as a development challenge.

### 4.7.3 Assessment of available institutional information for adoption of forestry innovations

The study compared two samples representing institutions with none and unlimited budgets allocated for dissemination of information necessary for enhancing adoption of forestry innovations. There is no overlap between these two groups. The variable in this case was the total number of publications produced by the institutions. A distribution of the means for the two groups is as indicated in Table 4.6. The standard deviations shows that the dispersion of mean number of publications is relatively low, implying that most institutions, responded within a relatively small range of number of publications.

**Table 4.6: Distribution of Publications output**

<b>Indicators</b>	<b>Description</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>SE</b>
Institutional budget allocated to conservation /technology dissemination ( <i>Publications - budget</i> )	None	33	1.25	0.50	0.25
	Unlimited	1	1.03	0.17	0.30
Institutional strategic on conservation /technology dissemination) policy plan ( <i>Discussion</i> )	No benefit	4.0	1.25	0.5	0.25
	High benefit	36	1.03	0.17	0.03
Institutional budget allocated to conservation/extension/ technology dissemination ( <i>Library - types</i> )	None	6	0.67	0.51	0.21
	Good	10	0.90	0.57	0.18
Staff time associated with dissemination of innovations to stakeholder ( <i>Planning</i> )	Never	6	6.0	7.87	3.22
	Frequently	3	11.67	16.07	9.28

The results in Table 4.6 indicate that potential benefits across relevant institutions could be enhanced based on available forestry information. The results also show that the other opportunities and frequency of availing information through: discussion of conservation progress at project level: library facilities (availability of publications, electronic media output); planning of conservation at project level; and presence of an Institutional strategy on conservation/technology dissemination policy or plan are consistent with observations on potential benefits.

### 4.7.4 Assessment of levels of interactions for adoption of forestry innovations

The listed variables were used against staff time associated with dissemination of innovations to stakeholders within the context of the external and internal environment as well as the conceptual framework of the study to assess levels of interactions and adoption of forestry innovations. They included:



- Conservation interactions in Kenya
- Non-conservation interactions in Kenya
- Conservation interactions in Africa
- Non-conservation interactions outside Africa
- Training interactions in Kenya
- Training interactions in Africa
- Training interactions outside Africa
- Conservation-related research interactions in Kenya
- Conservation-related research interactions in Africa
- Conservation-related research interactions in outside Africa

Respondents were grouped based on whether their staff are frequently or never involved in conservation interactions in Kenya. It was observed that there was no overlap between these two groups. The two groups were also denoted by value zero meaning staff never engaged in conservation interactions in Kenya and two meaning staff frequently engaged in conservation interactions in Kenya. The test variables in this case were conservation, training, and research interactions in Kenya. Tables 4.7a and 4.7b illustrate the results of mean of the different categories of conservation and training interactions. Generally, the standard deviations show that the dispersion of mean score is relatively high so that most institutions responded within a relatively wide range of scores.

**Table 4.7a: Comparison of conservation interactions in Kenya**

<b>Conservation interactions in Kenya</b>		<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>SE</b>
Staff time associated with dissemination of innovations to stakeholders	Never	1	-		
	Frequently	36	27.81	29.58	4.93
<b>Non-conservation interactions in Kenya</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	4	21.00	32.92	16.46
	Frequently	22	32.77	30.45	6.49
<b>Conservation-related research interactions in Kenya</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	8	11.25	15.30	5.41
	Frequently	17	30.88	31.34	7.60
<b>Conservation interactions in Africa</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	15	25.73	28.59	7.38
	Frequently	8	18.13	27.51	9.73
<b>Conservation interactions outside Africa</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	24	22.29	28.43	5.80
	Frequently	12	34.67	35.23	10.17
<b>Conservation-related research interactions in Africa</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	27	23.33	30.97	5.96
	Frequently	7	39.29	33.96	12.84
<b>Conservation-related research interactions outside Africa</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	24	22.29	28.43	5.80
	Frequently	12	34.67	35.23	10.17

**Table 4.7b: Comparison of training interactions in Kenya, in and outside Africa**

<b>Training interactions in Kenya</b>		<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>SE</b>
Staff time associated with dissemination of innovations to stakeholders	Never	4	2.50	5.00	2.50
	Frequently	27	33.93	32.11	6.18
<b>Training interactions in Africa</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	24	26.29	31.60	6.45
	Frequently	8	48.75	30.09	10.64
<b>Training interactions outside Africa</b>					
Staff time associated with dissemination of innovations to stakeholders	Never	17	18.53	25.78	6.25
	Frequently	9	36.11	33.98	11.33

A cross-checking using research-related interactions in Kenya also presented similar results on adoption of forestry innovations.

A comparison of the mean based on the potential benefit derived from the level of interactions was also carried out. The first sample of the variable represents institutions, which perceive conservation interactions in Kenya as having no benefit to the institution. The second sample represents institutions, which perceive conservation interactions in Kenya as being very beneficial to the institution. It is noted that there is no overlap between these two groups (no benefit and very beneficial). This is because they were denoted by value one, meaning the institutions which perceive conservation and training interactions in Kenya as having no benefit, and value two, meaning the institutions which perceive conservation and training interactions in Kenya as being very beneficial to the institution in Kenya. Table 4.8 presents the distribution of the mean scores for the respective variables.

The respective standard deviations show that the dispersion of mean score is relatively high so that most institutions responded within a relatively wide range of scores.

**Tables 4.8: Comparison of mean of two variables for potential benefits among institutions for conservation related research and training interactions in Kenya**

<b>Conservation related research interactions</b>		<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>SE</b>
Staff time associated with dissemination of innovations to stakeholders	No benefit	24	22.29	28.43	5.80
	Very beneficial	12	34.67	35.23	10.17
<b>Training interactions</b>					
Staff time associated with dissemination of innovations to stakeholders	No benefit	1	-	-	-
	Very beneficial	32	30.19	31.17	5.51

Further, a comparison was also made for the perceived institutional benefit from training and conservation-related research interactions in Kenya and staff time associated with dissemination of innovations to stakeholders. Similarly, the results indicated that the institutional benefits derived from the level of conservation interactions could enhance adoption of forestry innovations.

In general, the results on the level of conservation, training, research and user interactions and adoption of forestry innovations display a consistent response based on frequency and potential benefits that allows us to present and integrate a focused perspective across conservation related institutions in Kenya.

#### **4.7.5 Assessment of available incentives and adoption of forestry innovations**

The influence of opportunity for professional training, transport or commuter allowance, medical allowance or cover, housing allowance, communication or airtime allowance, leave allowance, additional conservation funds, travel to other regions or countries, and prospects of promotion, were compared against the proportion of annual budget associated with dissemination of innovations to stakeholders. The distribution of the mean scores is indicated in Table 4.9.

**Table 4.9: Comparison of effectiveness of opportunity for professional training in motivating staff**

Indicators		N	Mean	SD	df
Proportion of annual budget associated with dissemination of innovations to stakeholders					
Opportunities for professional training	Ineffective	5	26.40	25.30	31
	Greatly	28	17.71	22.18	
Transport/commuter allowance	Ineffective	14	9.14	16.66	28
	Greatly	16	23.94	25.12	
Medical allowance/cover	Ineffective	9	10.44	19.12	32
	Greatly	25	18.57	21.15	
Housing allowance	Ineffective	10	14.10	20.43	31
	Greatly	23	20.13	25.04	
Communication/airtime allowance	Ineffective	5	4.60	8.65	30
	Greatly	27	20.19	23.72	
Leave allowance	Ineffective	11	12.55	20.04	31
	Greatly	22	19.14	23.77	
Additional conservation funds	Ineffective	11	21.00	27.91	15
	Greatly	19	14.84	18.21	
Travel to other regions or countries	Ineffective	12	13.00	18.04	30
	Greatly	20	12.70	21.37	
Prospects of promotion	Ineffective	5	6.40	8.65	29
	Greatly	26	18.12	24.02	

The results in Table 4.9, indicate that available incentives could enhance adoption of forestry innovation.

#### 4.7.6 Assessment of the adequacy of support facilities and adoption of forestry innovations

Table 4.10 presents the general perception of the respondent institutions of their support facilities on a score of 0 to 3 (M).

**Table 14.10: Perception of adequacy of support facilities**

Rating	Score (M)	F	Mf
None	0	54	0
Poor	1	77	77
Adequate	2	182	364
Good	3	147	441
<b>Total</b>		<b>460</b>	<b>882</b>

Now,  $\sum Mf / \sum f$  is  $882/460 = 1.917$ . Since the numbers are absolute values,  $1.917 < 2$ . Thus, the rating is relatively below adequacy, despite availability.

In testing the adequacy of support facilities in enhancing adoption of forestry innovations, two extreme variables none and good were used. None denotes a zero score, while good denotes three. Therefore, in this study, zero means there are no on-station conservation facilities to enhance adoption of forestry innovations while three means there are good facilities to enhance adoption forestry innovations. The results of the distribution of the mean score and comparison of the mean of the variables are as presented in Table 4.11.

**Table 4.11: Comparison of mean of two variables on available facilities as *none* or *good***

<b>Indicators</b>		<b>N</b>	<b>Mean</b>	<b>SD</b>
On-station conservation activities	None	5	1.00	0.71
	Good	17	0.76	0.44
On-farm conservation activities	None	27	0.80	0.43
	Good	27	0.93	0.48
ASK Show ground	None	32	0.88	0.49
	Good	32	0.88	0.34
Transport fleet	None	22	0.67	0.56
	Good	22	0.95	0.22

Table 4.12 presents the perception on conservation investment in relation to adequacy of support facilities based on a score (m) of 0 to 1.

**Table 4.12: Perception on conservation investment for support facilities**

<b>Rating</b>	<b>M</b>	<b>F</b>	<b>Mf</b>
No	0	296	0
Yes	1	141	141
<b>Total</b>		<b>437</b>	<b>141</b>

Now,  $\sum mf / \sum f = 141/437 = 0.323$ . Since the numbers are absolute values,  $0.323 < 1$ . Thus, the rating is relatively below adequacy, despite funding allocation. This implies that most of the institutions do not allocate adequate funds as conservation investments to ensure that adequacy of support facilities would contribute to enhanced adoption of forestry innovations across relevant institutions.

## **CHAPTER 5**

### **FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter is organised into four sections that summarises the key findings, conclusions and recommendations of the study based on the responses from 51 survey institutions in Kenya. The findings provides a way to focus on key institutional capacity indicators that are of considerable importance to enhanced adoption of forestry innovations and address challenges. The findings also add value to the type of innovative approaches, which are necessary to offer a sustainable forest conservation environment in Kenya. The study concludes that the outcome reflects the conceptual and institutional changes needed to increase and sustain tree cover in Kenya. The recommendations provides for operational settings, policy and research suggesting how institutions should position themselves with the coming of the counties, stipulated within Kenya's Constitution of 2010.

#### **5.2 Summary of Findings**

The following is a summary of the study findings:

1. Associated institutional capacity with the characteristics, which inform the process of enhancing adoption of forestry innovations across relevant institutions.
2. Established an objective and robust quantitative analytical capacity framework as a decision-support tool and an intervention across forestry conservation-related institutions.
3. Contributed knowledge to the development in forest science and technology, particularly, in conservation.
4. Identified capacities that institutions must have to enhance adoption of forestry innovations and robustness of forestry conservation practices across relevant institutions.
5. Enhanced ability to specifically engage institutional capacity elements that would translate into more conservation interactions and adoption of forestry innovations in Kenya.

#### **5.3 Conclusions**

##### **5.3.1 State of tree and forest cover**

Kenya is endowed with diverse eco-regions with forests and allied natural resources. It is recognised that the tree, forest and woodland resources present great potential in the realisation of Kenya's sustainable development initiatives. However, regardless of the source of statistics on the state of tree cover in Kenya, it is less than 10%, as recommended by international standards.

Hence, it is still dismal, dispersed and often degraded. If it Kenya's forestry conservation initiatives were to go by the number of institutions involved in, or supporting conservation or by the number and quality of available information, innovations, technologies or best practices, then, Kenya is not deficient in any, and would have been green all over. This implies that elements and inputs of institutional capacity for addressing conservation issues are yet to be robust and effective. A common perception was that low tree cover was attributed to institutional gaps or limitations to effectively plan, manage, inspire, and deliver. However, the results indicates that it is beyond institutional capacity. It also highlights that having knowledge about an effective technology or innovation is necessary, but also an equally insufficient perception or condition to enhance adoption of forestry innovation. This implies that adoption of innovations among communities is adversely influenced by other factors such as low level of formal education, inadequately translated and interpreted technical terms and number of personnel to respond to the innovation needs. Overall, the study reiterates that effective involvement of the public, NGO and private institutions is critical in successful implementation of conservation initiatives. Endeavours to drive the process are now clearly stipulated in the Constitution 2010 and Vision 2030.

### **5.3.2 The institutional capacity assessment model**

The term institutional capacity was used to highlight the interactive potential of our institutions with emphasis given to all elements of capacity to holistically approach and open new paradigms to effectively drive environmental conservation in Kenya. The institutional capacity elements were defined, described and assessed in terms of their availability, resourcefulness and constraints to enhance adoption of forestry innovations. Arguably, adoption of forestry innovations is dependent on many more factors than just the 14 capacity indicators in this study as well as those within the context of the study conceptual framework. This study has identified institutional capacity elements as core sets of drivers to leverage informed consensus and resilience on adoption of forestry innovations. In addition, it has established that adoption of forestry innovations also encapsulate attributes of attitudes and value management. Nevertheless, the challenge for most institutions and to a large extent their human capital is how to actualise adoption. With many institutions and innovations to choose from, the present state of tree cover tells it all, that very few institutions if any are able to actualise adoption. Thus, successful adoption of forestry innovations is everything not only to the institutions but also to the ultimate beneficiaries. This confirms as in the conceptual framework that the impact from adoption of forestry innovations results from effective and efficient organisations.



Although most of the institutions involved in, or supporting forestry conservation are different as described by their functional categories and mandates, their involvement is critical in enhancing adoption of forestry innovations. However, the quantitative analytical model used in this study provides a potentially integrated evaluation approach with attributes and a template that objectively fits all. Using the model, most institutions can periodically assess their institutional quality and capacity performance independently. There is a general acknowledgement that the model can periodically provide informed decisions by estimating and aggregating institutional capacity levels and information graphically. The model is available on a spreadsheet which can be manipulated by someone equipped with skills in Microsoft EXCEL.

The study results show that across the public, NGOs and private institutions, most recognise the importance of the capacity elements and have integrated them as an operational need and strategy to various degrees. This may be attributed to institutional mandate and strength.

### **5.3.3 Human capital**

Quantity and quality are two interdependent aspects of the human capital. The fact that the human capital as described by quality is of less importance compared to quantity in demand for forestry extension services, lends credence to the prevailing capacity gap (HC 11.76% and TS 23.53%). However, the opposite is true in demand for research services. This suggests that adoption of forestry innovations is likely to be dependent on the characteristics of the recipient. Other general aspects of the study, suggests the need for specific institutions, particularly the public to prioritise institutional needs, embrace knowledge management to effectively identify and respond to key knowledge gaps and opportunities, optimise effective deployment of human capital, increase funding and sustain continuous professional development. A Diploma or degree may not be all that is required to address attitudes and value to enhance adoption of forestry innovations, but equally important are the practice of participation, managing expectations, effective social and communication skills, good interpersonal relations, humility and passion for meaningful interaction and success. The management should have the wisdom to identify and engage from its human capital, individuals with such qualities. A complementary though significant observation is that better educated individuals or ultimate beneficiaries tend to adopt innovations much faster, which the human capital should be cognisant, for enhanced impact.

#### **5.3.4 Available information**

The study suggests the need for specific institutions, particularly the public to prioritise availability of institutional and stakeholder information needs, increase meaningful internal and external interactions, develop and demonstrate resourceful materials by ensuring clarity and building a knowledge management framework, enhance communicative process, efficient use of available information and innovation, increase investment funding and improve service delivery as in accuracy, timeliness and relevance. These aspects still remain weak among public institutions, yet the demand for information and knowledge has never been more important than it is today.

#### **5.3.5 Level of interactions**

The way in which an institution builds relationships and interacts with their internal and external environment has an important bearing on its capacity to handle and resolve issues as they arise. However, it would be important to know how they change and exhibit periodic patterns over time. Despite some of the sampled institutions' intentionally or not failure to provide data, all quartile graphs displayed active, interdependent and self-explanatory interactions, hence implying a versatile model. Other aspects of the study, suggests the need for specific institutions, particularly the public to recognise and strengthen sound management of the interrelations and institutional needs, consider what procedures and processes that can create meaningful knowledge needs and interactions, increase funding and improve service delivery to enhance adoption of forestry innovations.

#### **5.3.6 Available incentives**

The study established the importance of financial factors such as budgetary allocation, and expenditure trends, which most institutions declined to share the details, salary and non-salary incentives, as well as the need for conservation investment in creating and enabling the opportunities to enhance adoption of forestry innovations. It was noted that among institutions, recognition is an important incentive just as remuneration. It also emerged that inadequate funding potentially reduced activity levels and had become part of a culture that most institutions had to contend with. However, the study also noted that the perception that public institutions were poor employers than the NGOs and private sector in terms of remuneration and related incentives was gradually being demystified.

The study suggests the need for specific institutions, particularly the public to prioritise budgetary allocation, support for activities, increase funding and improve service delivery. It cannot be over-emphasised that it is not the amount of money that an institution sources and allocates that makes it realise an impact but how it is utilised and ensuring a high absorption rate.

### **5.3.7 Available facilities**

Systems that integrate different types of facilities, need to be developed and enhanced. It was evident that all institutions attribute adoption of innovations to availability and adequacy of available facilities. However, the study suggests the need for specific institutions, particularly the public to prioritise institutional facility needs, increase funding, continuously keep track of the relative and simultaneous influence of available facilities on enhancing adoption of forestry innovations and improve quality of service delivery. Across institutions, ICT presents conservation initiatives with opportunities for enhancing awareness on adoption of forestry innovation. However, the challenge across forestry-related institutions is how to ensure efficient use and management, optimally resource requirements and invest in ICT infrastructure.

### **5.3.8 Beneficiaries**

The main beneficiaries include Ministry of Environment and Natural Resources (MENR), County Governments, Kenya Forest Service (KFS), Kenya Forestry Research Institute (KEFRI) and relevant tertiary institutions. The study contributes directly to their vision, mission, objectives and activities as well as to those of the Kenya Forestry Master Plan (1995-2025), Kenya Vision 2030, Forestry Policy debates, National Forestry Programme, Forests Act No. 7 of 2005, and the Forest Conservation and Management Act No. 34 of 2016. Relevant institutions with complementary and mutually reinforcing mandates in the public, non-governmental organisations and private sectors would also benefit both directly and indirectly by bringing together their diverse talents, experiences in the perceived capacity building model, investments and improvements to ensure that they use their resources efficiently and operate effectively.

## 5.4 Recommendations

The study does not expect all institutions to develop at the same pace but those that have should serve as satellites. Therefore, the study recommends the following added value to the operational and policy settings to enhance adoption of forestry innovations:

### 1. **Integrate conservation knowledge and values**

Institutions should encourage and ensure that the socio-economic and environmental values are clearly understood and upheld through inter-institutional collaboration and partnerships as a source of positive influence on adoption of forestry innovations.

### 2. **Enhance capacity development in quality and quantity**

Each institution should expand their portfolio of training and capacity development activities to continually track, identify, understand and improve elements of institutional capacity to manage its underlying capacity constrain because of their uniqueness, hence reflecting on their environment.

### 3. **Maintain and comply with data requirements**

It is imperative that the respective institutions comply with the data requirements of the survey tool to adequately inform the institution on how to respond to the demands of its services. In addition, institutions should strive to integrate information technology applications that support adoption of forestry innovations.

### 4. **Enhance institutional effectiveness**

Institutions should build on their existing foundations to review their operations, articulate and strengthen their institutional agenda to a more effective conservation initiative for enhanced adoption of forestry innovations. Sound management of the interrelations is imperative.

### 5. **Address operational gaps**

Institutions should recognise and strengthen the observed institutional capacity gaps or limitations to generate new opportunities for adoption of forestry innovations, while noting that a prolonged inaction will generally constrain forest conservation aspirations and that adoption of innovations is a perpetual responsibility for all.

### 6. **Embrace financial measures** that not only ensures sound use and sustainability, but also, impacts to enhance adoption, which overcome continued weakening the quality of an institution, hence undermines adoption of forestry innovations and sustainable conservation efforts.

7. **Institutionalise incentives that will result into action**  
Ensure that institutional systems of incentives compares with the best elsewhere. Thus it is imperative to appreciate that recognition is as important as remuneration.
8. **Ensure the value of information, knowledge, technology or innovation is appreciated,** and can be **accessed** by those who are committed and need it, if it is to be widely adopted. In addition, establish if adoption of forestry innovations is a function of education among communities.
9. **Invest in publicity and publications**  
Institutions, particularly public should use their presence and experience to provide a framework for continuous engagement and institutional growth at the County level. People derive the best inspiration from direct interactions, which is the value of an effective human capital, a framework for institutional growth as a knowledge centre and knowledge management.
10. **Improve systems that integrate different types of facilities** e.g. internet and non-internet based infrastructure.

## 5.5 Areas for Further Research

Bearing in mind that a model is as good as data collected and analysed, the results suggests the following areas for research:

1. Undertake **periodic assessment** because institutional capacity interactions change or exhibit periodic patterns over time.
2. A **framework for measurement of adoption** of agricultural innovations based on specific packages was described by Ovwigho (2013). Such a framework and scale has yet to be comprehensively developed **in forestry** innovations, hence the back-loop relationship observed in the conceptual framework.
3. Undertake a **comprehensive documentation** of financial resources based on budgetary allocation and expenditure trends to enhance activity levels in adoption of forestry innovations and conservation to inform the **question of institutional quality,** accountability and transparency relative to its influence on adoption of forestry innovations and conservation activities.
4. Explore the role of **translation and interpretation skills** with technical terms in adoption of forestry innovations in a multilingual society to enhance characteristics of recipient/ adopter.

5. Understand the contribution of **attitudes and value management** in mutually engaging and enhancing synergies with the communities to enhance adoption of forestry innovations.
6. **Incremental improvement on the study conceptual framework** on assessment of institutional capacity and adoption of forestry innovations to effectively respond to conservation paradigm shift and inform policy.

## REFERENCES

- Acokoff, R. (1962). *Scientific Method*. New York: John Wiley and Sons.
- Act!. (2015). Environmental footprints: Towards sustainable management of natural resources in Kenya. Act!, Nairobi.
- Allanby, M. (1993). The Macmillan Dictionary of the Environment. In: C. Elliot. 1996. Paradigms of forest conservation. *Unasylya* 180(47): 3-9.
- Allen, R. E. (ed). (1991). *The Concise Oxford Dictionary of Current English*. 8<sup>th</sup> edn. Oxford: Clarendon Press.
- Anderson, J. & Farrington, J. (1996). Forestry extension: Facing the challenges of today and tomorrow. *Unasylya* 184(47) 3-12.
- Annan, K. (2002). Foreword. In: UNEP (2002). *Global Environment Outlook 3: Past, Present and Future Perspectives*. xiv-xv. United Nations Environment Programme (UNEP). London: Earthscan.
- Anyonge, C. H. (2002). Forest Extension: Equitable Partnerships for Sustainable Multi-functional Forestry. [http://www.infor.cl/webinfor/eventos/IUFRO\\_Valdivia\\_2002/textos](http://www.infor.cl/webinfor/eventos/IUFRO_Valdivia_2002/textos). (accessed on 11/8/2009).
- Anyonge, T. M. Holding, C., Kareko, K. K. & Kimani, J.W. (2001). Scaling up participatory agroforestry extension in Kenya: from pilot projects to extension policy. *Development in Practice*. 11(4) 449-459.
- Armstrong, M. (2005). *A Handbook of Human Resource Management Practice*. 9<sup>th</sup> edn. International Students Edition. London: Kogan Page.
- Arnold, J. E. M. (1992). *Community Forestry: Ten Years in Review*. Community Forestry Note 7. Rome: FAO.
- Ascough, J. (1994). What does appropriate technology mean to you? *African Technology Forum*. 7(2) 6-7.
- Awimbo, J., Barrow, E., & Karaba, M., (eds.). (2004). *Community Based Natural Resource Management in the IGAAD Region*. Nairobi: Scanhouse Press.
- Bengston, D. N., Gregersen, H. N., Lundgren, A. L. & Hamilton, L. S. (1988). *Forestry Research Capacity in the Asia-Pacific Region. Occasional Paper No. 6*. Honolulu: East-West Environment and Policy Institute.
- Bernacka, A. (2012). The importance of translation studies for development education. *Policy and Practice: A Development Education Review* e-journal

<http://www.developmenteducationreview.com/print/issue14-perspectives4> (accessed 20/5/2014).

- Boon, E. J. (1989). Philosophical Foundations of Extension. In: F. U. Ngesa, J. M. Ombati & M. Mutuku. *Extension Services and Enterprise Development: Study of Technology Extension Services to Small and Medium Size Manufacturing Firms in Nairobi, Kenya. ATPS. Working Paper Series. No. 36.*
- Casely, D. J. & Kumar, K. (1987). *Project Monitoring and Evaluation in Agriculture*. Baltimore and London: World Bank. The John Hopkins University Press.
- Central Bureau of Statistics. (2005). *Geographic Dimensions of Well-being in Kenya: Who and Where are the Poor? A constituency Level Profile Volume II*. Ministry of Planning and National Development. Nairobi: The Regal Press Kenya.
- Central Bureau of Statistics. (2006). *Kenya, Facts and Figures, 2006 Edn*. Ministry of Planning and National Development. Nairobi: The Regal Press Kenya Ltd.
- Centre Technique de Cooperation Agricole et Rurale*. (2004). *Annual Report 2003*. Wageningen: Technical Centre for Agricultural and Rural Cooperation.
- Chambers, R. (1997). *Whose Reality Counts: Putting the First Last*. London: ITDG.
- Cheboiwo, J. K. (1991). *Socio-economic Issues in Rural Afforestation in Kenya*. M.Sc. Dissertation. Australia: Australian National University.
- Cheung, P. (2012). Facing the Challenges of Measuring the Unmeasurable. *DESA News* 16:2.<http://www.un.org/en/development/desa/newsletter/desanews/feature/2012/02/index.html>.
- Cohen, J. M. & Wheeler, J. R. (1997). Building Sustainable Professional Capacity in African Public Sectors: Retention Constraints in Kenya. *Public administration and development*. 17:307-324.
- Coe, R., Stern, R. & Allan, E. (2002). *Data Analysis of Agroforestry Experiments: Lecture Notes 2*. Nairobi: ICRAF-The World Agroforestry Centre.
- Cooper, P. J. M. & Denning, G. L. (2000). *Scaling up the Impact of Agroforestry Research*. Report of the Agroforestry Dissemination Workshop. 14-15 September 1999, Nairobi: ICRAF.
- Desai, N. (2002). Partnerships: Turning Commitments into Results. *World Summit on Sustainable Development: Johannesburg Summit 2002 – Johannesburg, South Africa. 26<sup>th</sup> August - 4<sup>th</sup> September 2002*. United Nations.
- Dickson, D. (2006). The Importance of Scientific Communication. *Discovery and Innovation*, 18(1): 29-33.



- Dolan, T. (2006). Sustainable agriculture and rural development: A response to the realities of rural Africa. In: Garitty, D., Okono, A., Grayson, M., & Parrott, S. (eds). *World Agroforestry into the Future*. Nairobi. World Agroforestry Centre. pp 129-138.
- Eade, D. (2000). *Capacity Building: An Approach to People-Centred Development*. Oxford: Oxfam Publication.
- Elliot, C. (1996). Paradigms of Forest Conservation. *Unasyuva* 180(47): 3-9.
- Engel, P. G. H. (1994). Networking for Sustainability: Towards a New Paradigm for Extension. In: CTA (1994). *Agricultural Extension in Africa. Proceedings of an International Workshop, Younde, Cameroon, pp 133-150*. Wageningen: Technical Centre for Agricultural and Rural Cooperation.
- EuropeAid (2005). Institutional Assessment and Capacity Development Why, What and How?: Aid Delivery Methods Concept Paper - A Contribution to Development Thinking. European Commission. [http://www.ec.europa.eu/europeaid/multimedia/publications/document/tools/europeaid\\_adm\\_concept\\_paper\\_en.pdf](http://www.ec.europa.eu/europeaid/multimedia/publications/document/tools/europeaid_adm_concept_paper_en.pdf) (accessed on 21/5/2014).
- Evanson, R. (1998). The economic contributions of agricultural extension to agricultural and rural development. In: B. E. Swanson, R. P. Bentz & A. J. Sofranko. (1998). *Improving Agricultural Extension: A Reference Manual*. Rome: FAO. <http://www.fao.org/docrep/W5830E/w5830e06.htm> (accessed on 16/5/2010).
- Eveland, J. D. (1979). Issues in using the concept of “adoption of innovations”. *Journal of Technology Transfer*. 4(1): 1-13.
- Food and Agriculture Organisation. (1994). Technology Assessment and Technology Transfer for Sustainable Agriculture and Rural Development in the Asia-Pacific Region. In: *SDdimensions* (1996). <http://www.fao.org/sd/rtdirect/rtre0019.htm> (accessed on 4/11/2009).
- Food and Agriculture Organisation. (1996). Forestry extension. *Unasyuva* 18 (47).
- Food and Agriculture Organisation. (1997). *State of Food and Agriculture*. Rome: FAO.
- Food and Agriculture Organisation. (2003a). *Forests, Source of Life: Final Statement, XII World Forestry Congress*. <http://www.fao.org/forestry/site/18508/en> (accessed on 16/5/2010).
- Food and Agriculture Organisation. (2003b). *State of the World's Forests 2003*. Rome: FAO.
- Food and Agriculture Organisation. (2005). *Equitable Partnerships, Markets and Forest Extension*. <http://www.fao.org/forestry/foris/webview/forestry2> (accessed on 16/5/2010).
- Food and Agriculture Organisation. (2009). *State of the World's Forests 2009*. Rome: FAO.
- Food and Agriculture Organisation. (2010). Global Forest Resources Assessment 2010: *Main Report*, FAO Forestry Paper 163. Rome.

- Food and Agriculture Organisation. (2011). *Farmer Field School Implementation Guide: Farm Forestry and Livelihood Development*. Nairobi: FAO, JICA and KFS.
- Food and Agriculture Organisation. (2012). *State of the World's Forests 2012*. Rome: FAO.
- Food and Agriculture Organisation. (2013). *Climate Change Guidelines for Forest Managers*. Forestry Paper 172. Rome: FAO.
- Food and Agriculture Organisation. (2016). *State of the World's Forests 2016*. Rome: FAO.
- Frankfort-Nachmias, C. & Nachmias, D. (2004). *Research Methods in the Social Sciences*. 5<sup>th</sup> edn. London: Arnold.
- Franzel, S. & Scherr, S. J., (2002). (ed.). *Trees on Farm: Assessing the Adoption Potential of Agroforestry Practices in Africa*. London: CABI.
- Franzel, S., Cooper, P. & Denning, G. L. (2001). Scaling up the Benefits of Agroforestry Research: Lessons Learned and Research Challenges. *Development in practice*. 11(4): 524-534.
- Gallivan, M. J. (2004). Value in triangulation: A comparison of two approaches for combining qualitative and quantitative methods. <http://www.people.vcu/aslee/ifipwg82.pdf> (accessed on 15/2/2009).
- Garg, R. K., Das, J. K. & Gera, M. (2006). Developing and Testing Criteria and Indicators for an Effective Information System in the Forest Sector. *International Forestry Review*. 8(3): 307-328.
- Gatheru, W. & Shaw, R. (1998). (ed.). *Our Problems our Solutions: An Economic and Public Policy Agenda for Kenya*. Nairobi: The Institute of Economic Affairs.
- Gatundu, C. (2003). *Policy and Legislative Framework for Community-based Natural Resource Management in Kenya: A Review of Existing and Proposed Laws and Policies*. Nairobi: Forest Action Network, Newtec Concepts.
- Goldstein, I. L. & Ford, J. K. (2002). *Training in Organisations: Needs Assessment, Development and Evaluation*. 4<sup>th</sup> edn. Wadsworth, Lachina Publishing Services.
- Government of Kenya. (1999). *National Poverty Eradication Plan 1999-2015*. Nairobi: Government Press.
- Government of Kenya. (2003). *Economic Recovery Strategy for Wealth and Employment Creation 2003 – 2007*. Nairobi: Government Press.
- Government of Kenya. (2005a). The Forests Act No. 7 of 2005. Nairobi: Government Press.
- Government of Kenya. (2005b). *National Agricultural Sector Extension Policy (NASEP)*. Draft. Nairobi: Ministry of Agriculture; Ministry of Livestock and Fisheries Development and Ministry of Cooperative Development and Marketing.

- Government of Kenya. (2007). *Kenya Vision 2030*. Nairobi: Government Press.
- Government of Kenya. (2010a). *Agricultural Sector Development Strategy 2010-2020*. Nairobi: Government Press.
- Government of Kenya. (2010b). *The Constitution of Kenya 2010*. Nairobi. Government Press.
- Government of Kenya. (2010c). *National Climate Change Response Strategy*. Nairobi. Ministry of Environment and Mineral Resources.
- Government of Kenya. (2013a). *Second Medium Term Plan 2013-2017: Kenya Vision 2030 – Towards a Globally competitive and Prosperous Nation*. Nairobi. Ministry of Planning and Devolution.
- Government of Kenya. (2013b). *National Climate Change Action Plan 2013-2017: Vision 2030*. Nairobi.
- Government of Kenya. (2014). *Forest Policy, 2014*. Nairobi. Ministry of Environment, Water and Natural Resources.
- Honadle, G. (1999). *How Context Matters: Linking Environmental Policy to People and Place*. Connecticut: Kumarian Press.
- IUCN (The World Conservation Union). (2001). The Economic value of East Africa's forests. *Integrating economic instruments for the reduction of forest biodiversity loss into sectoral policies and strategies in East Africa - Project No. UNTS/RAF/008/GEF P.O. No: 93330*. Nairobi: IUCN, Eastern Africa Regional Office.
- Johnson, G., Scholes, K. & Whittington, R. (2011). *Exploring strategy: Text and Case Studies*. 7<sup>th</sup> edn. Pearson Education Limited. UK.
- Jones, G. E. & Garforth, C. (1998). The History, Development and Future of Agricultural Extension. In: B. E. Swanson, R. P. Bentz & A. J. Sofranko, [eds.] (1998). *Improving Agricultural Extension: A Reference Manual*. Rome: FAO. <http://www.fao.org/docrep/W5830E/w5830e03.htm> (accessed on 16/5/2010).
- Karlsson, A. (1998). Keynote Address. In: J. W. Wamuongo, J. K. S. Ogutu, J. O. Mugah, & J. A. Ayiemba, [eds.] (2001). From Research to Dissemination: Agroforestry into the Next Millennium. *Proceedings of the National Agroforestry Research Project (NARFP) Symposium. 8<sup>th</sup> to 11<sup>th</sup> December 1998, Izaak Walton Inn, Embu Kenya*. Nairobi: Kenya Agricultural Research Institute (KARI).
- Kaudia, A. A. (1996). *The Diffusion of Social Forestry in Semi-arid Areas: A Case Study in Kitui District, Kenya*. Ph.D. Thesis. UK: University of East Anglia.
- Kenya Agricultural Research Institute. (2000). *Agricultural Technology and Information Response Initiative (ATIRI) – Booklet*. Nairobi: KARI.

- Kenya Agricultural Research Institute. (2005). *Strategic Plan 2005 – 2015*. Nairobi: KARI.
- Kenya Forest Service. (2015). *Strategic Plan 2014-2017*. Nairobi: KFS.
- Kenya Forestry Research Institute. (1990). *Strategic Plan 1989-2000*. Nairobi: KEFRI.
- Kenya Forestry Research Institute. (1999). *Strategic Plan 1999-2004*. Nairobi: KEFRI.
- Kenya Forestry Research Institute. (2005). *Strategic Plan 2005-2010*. Nairobi: KEFRI.
- Kenya Forestry Research Institute. (2007). *Intellectual Property Rights Policy*. Nairobi: KEFRI.
- Kenya Forestry Research Institute. (2013). *Strategic Plan 2013-2018*. Nairobi: KEFRI.
- Kenya Institute of Public Policy Research and Analysis. (2005). *Research Methodology and Communication. Training Manual Series. Module 3, Vol. 1: Course Book TM/01-4/2005*. Nairobi: KIPPRA.
- Kenya National Bureau of Statistics. (2013). KNBS. Kenya Facts and Figures 2013. [http://www.knbs.or.ke/index.php?option=com\\_phocadownload&view=category&id=20&Itemid=1107](http://www.knbs.or.ke/index.php?option=com_phocadownload&view=category&id=20&Itemid=1107) (accessed on 20/5/2014).
- Kimutai, C. (2015). Sarah Serem: She is taking no prisoners. *Management Magazine: Cover Story*. Nairobi. March 2015, 18-21.
- Kiptot, E. (2007). *Seeing Beyond fertilizer Trees: A Case Study of a Community based Participatory Approach to Agroforestry Research and Development in Western Kenya*. Ph.D. Thesis. The Netherlands: Wageningen University.
- Kiptot, E., Franzel, S., Hebinck, P. & Richards, P. (2006). Sharing seed and knowledge: Farmer to farmer dissemination of agroforestry technologies in western Kenya. *Agroforest Systems*. 68:167-179.
- Kobia, M. & Mohammed, N. (2006). The Kenya Experience with Performance Contracting. 28<sup>th</sup> African Association for Public Administration and Management (AAPAM) Annual Roundtable Conference, Arusha, Tanzania. 4<sup>th</sup> to 8<sup>th</sup> December 2006. <http://unpan1.un.org/intradoc/groups/public/documents/AAPAM/UNPAN025987.pdf> (accessed on 14/10/2007).
- Koech, E. (2006). Forestry Extension and Education in Kenya: Historical Perspectives, Evolution, Challenges and Opportunities. pp 314-320. In: Muchiri, M. N., Kamondo, B., Ochieng, D., Tuwei, P. & Wanjiku, W. [eds]. *Proceedings of the 3<sup>rd</sup> KEFRI Scientific Conference. Muguga, Kenya. 6-9 November 2006*. Nairobi: KEFRI.
- Konuche, P. K. A. (2002). The Status of Forestry Research in Kenya. In: Chikamai, B. N., Mbiru, S. S., and Souvounnavong, O., (eds.). *Report of the Meeting of Heads of Forestry Research in Eastern Africa*. pp 45-50. Nairobi: Westlands Press.
- Korten, F. F., (1992). NGOs and the forestry sector: An Overview. *Unasylva* 171(43):3-10.

- Kowero, G., Kufakwandi, F. & Chipeta, M. (2006). Africa's capacity to manage its forests: An Overview. *International Forestry Review*. 8(1): 110-117.
- Kowero, G. S. & Spilsbury, M. J. (1997). *Capacity for Forestry Research in the Southern African Development Community*. Occasional Paper No. 11. Jakarta: CIFOR.
- Lake Victoria Basin Commission. (2013). *A Socio-economic Valuation of Losses from Non-Compliance with Forest Law Enforcement, Governance and Trade in East African Community Partner States*. Kisumu, Kenya, LVBC.
- Langat, D., Maranga, E. K., Cheboiwo, J., & Aboud, A. A. (2015). Forest use and dependency by forest adjacent households on East Mau forest ecosystems, Kenya. *Journal of Agricultural Economics, Extension and Rural Development*. 3(10): 326-337.
- Lelo, F. K., Ayieko, J. O., Muhia, R. N., Muthoka, S. K., Muiruri, H. K., Makenzi, P. M., Njeremani, D. M. & Omollo, J. W. (2000). *Egerton PRA Field Handbook*. PRA Programme. Njoro: Egerton University.
- Likert, R. (1932). A Technique for the management of attitudes. *Archives of Psychology* 22(1): 1-55.
- Longhorn Kenya. (2010). *Comprehensive Primary School Atlas*. Nairobi: Longhorn Publishers (K) Limited.
- Mathooko, J. M., Mathooko, F. M., & Mathooko, P. M. (2007). *Academic Proposal Writing: A guide to preparing proposals for academic research*. Nakuru: Amu Press.
- Maundu, P.M. & Tengnäs, B., (eds). (2005). *Useful Trees and Shrubs for Kenya. Technical Handbook No. 35*. Nairobi: World Agroforestry Centre.
- Ministry of Agriculture. (2005). *Strategic Plan 2005 - 2009*. Nairobi: MoA.
- Ministry of Environment and Natural Resources. (1994). *Kenya Forestry Master Plan*. Nairobi: Forest Department.
- Ministry of Environment and Natural Resources. (2006a). *Strategic Plan 2006 – 2010*. Nairobi: MENR.
- Ministry of Environment and Natural Resources. (2006b). *Sessional Paper No. 4 of 2006: Forest Policy*. Nairobi: Government Printers.
- Ministry of Forestry and Wildlife. (2012). Getting Kenya's Forest Cover Right. *Forestry and Wildlife News*. Vol. 6. January 2012 p.2.
- Ministry of Forestry and Wildlife. (2013a). Six Billion Lost in Deforestation. *Forestry and Wildlife News*. Vol. 7. January 2013 p.6.
- Ministry of Forestry and Wildlife. (2013b). Confirmed: Kenya's Forest Cover is 7%. *Forestry and Wildlife News*. Vol. 7. January 2013 p.7.

- Moore, D. S. & McCabe, G. P. (1999). *Introduction to the Practice of Statistics*. 3<sup>rd</sup> ed. New York: W. H. Freeman and Company.
- Mugabe J. & Clark, N. (eds) (1998). Technology Transfer and the Convention on Biological Diversity: Emerging policy and Institutional Issues. In: J. Mugabe & N. Clark (1998). *Managing Biodiversity: National Systems of Conservation and Innovation in Africa*. ACTS Environmental Policy Series No. 9. Nairobi: ACTS Press.
- Mugwe, J., Mugendi, D., Kungu, J. & Oeba, V. (2006). Adoption of organic and inorganic resources for soil fertility replenishment by smallholder farmers in central highlands of Kenya. pp 321-333. In: Muchiri, M. N., Kamondo, B., Ochieng, D., Tuwei, P. & Wanjiku, W. (eds). *Proceedings of the 3<sup>rd</sup> KEFRI Scientific Conference. Muguga, Kenya. 6-9 November 2006*. Nairobi: KEFRI.
- Mukolwe, M. O. (2006). Perspectives on adoption of social forestry. *Paper Presented at the Regional Training Course on Enhancing Adoption of Social Forestry in Africa: 9<sup>th</sup> January to 10<sup>th</sup> February 2006, held at KEFRI*. Muguga, Kenya.
- Mukolwe, M. O., Shimizu, K. & Nakamura, M. (2002). SOFEM Project is Evaluated. KEFRI/JICA/FD Miti ni Mali Newsletter Issue. 5:2-3.
- Mulwa, F. W. (2005). *Demystifying Participatory Development: In its Global Context Rooted in Participatory Strategic Planning*. Nairobi: Zapf Chancery Research Consultants and P. Oliver.
- Mulwa, F. W. & Nguluu, S. N. (2003). *Participatory Monitoring and Evaluation*. Nairobi: PREMESE-Olivex Publishers.
- Muturi, S. N. (1999). *Agroforestry Extension Manuals: A Survey of their use in Kenya*. Technical Report No. 21. Nairobi: The Regional Management Unit, RELMA/Sida. Colourprint Limited.
- Muyangu, M. & Jayne, T. S. (2006). *Agricultural Extension in Kenya. Draft for Review-Working Paper 2006*. Tegemeo Institute of Agricultural Policy and Development, Njoro: Egerton University.
- Nair, C.T.S. (2006). What is the future for African forests and forestry? *International Forestry Review*. 8 (1): 4-13.
- Ndah, H. T., Schuler, J., Uthes, P., & Zander, P. (2010). Adoption Decision Theories and Conceptual Models of Innovations Systems: Leibniz - Centre for Agricultural Landscape Research (ZALLF) e.V.: Session 3, Overview of Existing Modelling Approaches. *CA2Africa Inception Workshop, 2-4 March 2010*. Nairobi.

- Ndufa, J. K. & Poulton, C. (2006). Linking soil fertility and improved fallow technologies to development interventions in Western Kenya. In: *Proceedings of the Third KEFRI Scientific Conference, 6-9 November 2006*. Nairobi, Kenya.
- National Environment Management Authority. (2011). *Kenya State of the Environment and Outlook 2010: Supporting the Delivery of Vision 2030*. NEMA, Nairobi.
- Neuman, W. L. (1997). *Social Research Methods: Qualitative and Quantitative Approaches*. 3<sup>rd</sup> edn. Boston, U.S.A: Allyn and Bacon.
- Ngesa, F. U., Ombati, J. M. & Mutuku, M. (2003). Extension Services and Enterprise Development: Study of Technology Extension Services to Small and Medium Size Manufacturing Firms in Nairobi, Kenya. African Technology Policy Studies. *ATPS Working Paper Series No. 36*.
- Nightingale, D. L. M. (2003). (ed). *Forests and Development: Investing in Policy Analysis, Advocacy and Monitoring to Resolve Forest Conservation Conflicts in Kenya*. Environmental Legislation and Policy Working Group, Forest Conservation Papers. Nairobi: Nature Kenya.
- Nilsson, S. (2004). Scenarios and Forest Policy Responses. In: Buck, A., B. Burger & G. Wolfrum G., (eds.). *Forest Research: Challenges and Concepts in a Changing World*. IUFRO Occasional Paper No. 16. pp 51-73. Vienna: IUFRO.
- Njuki, J., Temu, A. & Awimbo, J. (2006). Building Capacity for Research in Agroforestry. In: Garrity, D., A. Okono, M. Grayson and S. Parrott [eds]. *World Agroforestry into the Future*. pp 147-154. Nairobi: World Agroforestry Centre.
- Noordin, Q., Niang, A., Jama, B. & Nyasimi, M. (2001). Scaling up adoption and impact of agroforestry technologies from western Kenya. *Development in Practice*. 11(4): 509-523.
- Nyangena, W., (2008). Economic Issues for Environmental and Resource Management in Kenya. In: C. O. Okidi, P. Kameri-Mbote & M. Akech [eds]. *Environmental Governance in Kenya: Implementing the Framework Law*. pp 235-259. Nairobi: East African Educational Publishers Ltd.
- Ochieng', B. O. (2008). Institutional Arrangements for Environmental Management in Kenya. In: C. O. Okidi, P. Kameri-Mbote & M. Akech [eds]. *Environmental Governance in Kenya: Implementing the Framework Law*. pp 183-207. Nairobi: East African Educational Publishers Ltd.
- Odendo, M, Obare, G., & Salasya, B. (2011). Factors Influencing Adoption Speed of soil Fertility Management Technologies: Evidence from Western Kenya. *Journal of Development and Agricultural Economics*. 3(13): 627 - 637.

- Odera, J. A. (2006). The Kenya Forestry Society: A Leading Partner in Forest Development in Kenya: Keynote Paper Presented at the Kenya Forestry Society Scientific Conference. *In: the Proceedings of the First Kenya Forestry Society Scientific Conference held on 10<sup>th</sup> – 11<sup>th</sup> August 2006 at Waterbuck Hotel, Nakuru.* pp 6-13. Nairobi: Kenya Forestry Society.
- Oeba, V. O., Otor, S. C., Kungu, J. B., & Muchiri, M. N. (2012). Modelling Determinants of Tree Planting and Retention on Farm for Improvement of Forest Cover in Central Kenya. *International Scholarly research Network ISRN Forestry* Vol. 2012 Article ID 867249.
- Ombati, J. M., Ngesa, F. U. & Githeko, J. M., (2007). Factors Influencing Farmers' Adoption of Information and Communication Technologies in Accessing Agricultural Information: The Case study of Nakuru District, Kenya. *Egerton Journal*, Special Issue (2007) 7(s): 27-42.
- Ongugo, P. O. & Njuguna, J. W. (2004). Effects of Decentralisation Policies on Forest Management: Experience from Seven Forests in Kenya. *Paper Presented to the 10<sup>th</sup> Biennial Conference of the International Association for the Study of Common Property (IASCP) 9<sup>th</sup> to 13<sup>th</sup> August 2004 Oaxaca, Mexico.*
- Organisation for Economic Cooperation and Development. (2006). *The Challenge of Capacity Development: Working Towards Good Practice.*
- Osgood, C. E, May, W.H. & Miron, M. S. (1975). *Cross-cultural Universals of Affective Meaning.* Urbana, IL: University of Illinois Press.
- Osgood, C. E, Suci, G. J. & Tannenbaum, P. H. (1957). *The Measurement of Meaning.* Urbana, IL: University of Illinois Press.
- Ovwith, B. O. (2013). A Framework for Meaning Adopting of Innovations: Improved Cassava Varieties in Delta State Nigeria. *Extension Farming Systems Journal.* 9(1): 171-177. <http://www.aspen.org.au/extension-farming-systems-journal> (accessed on 13/6/2015).
- Owino, F. (2007). Kenya 'fumbles' on... *Swara, East African Wildlife Society.* 30(2): 5.
- Pannell, D. J., Marshall, G. R., Barr, N., Curtis, A., Vanclay F., & Wilkinson, R. (2013). Understanding and Promoting Adopting of Conservation Practices by Rural Landholders. <http://dpannell.fnas.uwa.edu.au/dp0502.htm> (accessed on 4/11/2015).
- Park, C. (2008). *Oxford Dictionary of Environment and Conservation.* Oxford University Press. Great Britain.
- Parwada, C., Gadzirayi, C. T., Muriritiwa, W. T., & Mwenye, D. (2010). Adoption of Agroforestry Technologies among Small-holder Farmers: Case of Zimbabwe. *Journal of Development and Agricultural Economics.* 2(10): 351 - 358.



- Phelan, C. & Wren, J. (2007). Exploring Reliability in Academic Assessment. [https://www.uni.edu/chfasoa/reliabilityand validity.htm](https://www.uni.edu/chfasoa/reliabilityand%20validity.htm)
- Pretty, J. N. (1995). Participatory learning for sustainable agriculture. *World Development* 23: 1247-1263.
- Ragasa, C., Babu, S., Abdullahi, A. S., and Abubakar, B. Y. (2010). Strengthening Innovation Capacity of Nigerian Agricultural Research Organisations. *IFPRI Discussion Paper 01050*. International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/7799> (accessed 13/6/2015).
- Republic of Kenya. (2001). *Poverty Reduction Strategy Paper for the Period 2001-2004*. Nairobi: Ministry of Finance and Planning.
- Republic of Kenya. (2005). *Forests Act 2005*. Special Issue Kenya Gazette Supplement No. 88 (Acts No. 7). Government Printer, Nairobi. pp 229 - 305.
- Republic of Kenya. (2015). *Kenya Agricultural and Livestock Research Act No. 17 of 2013*. Revised edition. [www.kenyalaw.org](http://www.kenyalaw.org) (accessed 6/10/2016).
- Republic of Kenya. (2016). *The Forest Conservation and Management Act, 2016*. Special Issue Kenya Gazette Supplement No. 155 (Acts No. 34). Government Printer, Nairobi. pp 677-736.
- Rogers, E. M., (2003). *Diffusion of Innovations*. 5<sup>th</sup> edn. New York: Free Press.
- Rogers, E. M. (1995). *Diffusion of Innovations*. 4<sup>th</sup> edn. New York: The Free Press.
- Rollinson, D. & Broadfield, A. (2002). *Organisational Behaviour and Analysis: An Integrated Approach*. 2<sup>nd</sup> edn. Gasport: Ashford Colour Press.
- Rural Development Forestry Network/Overseas Development Institute. (1998). Criteria and indicators for sustainable forest management. *Newsletter issue* 23: 1-2. London: RDFN/ODI.
- Singh, A. K. (2006) *Agricultural Extension: Impact and Assessment*. Agrobios, India.
- Simiyu, S. (2012). Biodiversity and Ecosystem Services: The Research Agenda in the 21<sup>st</sup> Century. Keynote paper. In: Wasonga, V., Lusweti, A., Lange, C., Handa, C, & Wabuye, E. [eds.]. *Heritage Management for Sustainable Development*. Proceedings of the 3<sup>rd</sup> National Museums of Kenya Biennial Scientific Conference. 7-9 November 2011. NMK, Nairobi, Kenya.
- Situma, F. D. P. (2008). Forestry Law and the Environment in Kenya. In: C. O. Okidi, P. Kameri-Mbote & M. Akech [eds]. *Environmental Governance in Kenya: Implementing the Framework Law*. pp 235-259. Nairobi: East African Educational Publishers Ltd.

- Soubbotina, T. P. (2004). *Beyond Economic Growth: An Introduction to Sustainable Development*. 2<sup>nd</sup> edn. Washington D.C: The International Bank for Reconstruction and Development/World Bank.
- Spilisbury, M. J., Kowero, G. S., Mukolwe, M. O., Netzehti, A., Legesse, W. W., Nsengiyumva, O., Kiwuso, P. & Sabas, E. (2003). *Forest-related Research Capacity in Eastern Africa*. Rome: FAO.
- Spilisbury, M. J., Tchala-Abina, F. & Kowero, G. S. (1999). *Capacity for Forest Research in Selected Countries of West and Central Africa*. Occasional Paper No. 24. Jakarta: CIFOR.
- Synnerton, J. M. (1954). *A Plan to Intensify the Development of African Agriculture in Kenya*. Nairobi: Government Printer.
- Temu, A. B. (2006). Challenges of funding renewable natural resources research and education in Sub-Saharan Africa. *International Forestry Review*. 8(4): 454-461.
- Tengnäs, B. (1993). *Guidelines on Agroforestry Extension Planning in Kenya*. Technical Handbook No. 3. Nairobi: Regional Soil Conservation Unit (RSCU)/SIDA.
- The World Conservation Union. (2001). The Economic value of East Africa's forests. *Integrating economic instruments for the reduction of forest biodiversity loss into sectoral policies and strategies in East Africa - Project No. UNTS/RAF/008/GEF P.O. No: 93330*. Nairobi: IUCN, Eastern Africa Regional Office.
- Thornton, P. K., Randolph, T. F., Kristjanson, P. M., Omamo, W. S., Odera, A. N. & Ryan, J. G. (2000). *Assessment of Priorities to 2010 for the Poor and Environment*. ILRI Impact Assessment Series No. 6. Nairobi: International Livestock Research Institute (ILRI).
- Thornton, P. K. & Odera, A. N. [eds]. (1998). *Compendium of ILRI Impact and Adoption, 1975-98*. ILRI Impact Assessment Series No. 1. Nairobi: International Livestock Research Institute (ILRI).
- Unasylva. (1998). Accommodating multiple interests in forestry. *Unasylva* 194(49):2.
- Underwood, R. (2007). The turn of the forestry wheel. *Australian Forestry Journal*. 70 (1): 1-2.
- United Nations Environment Programme. (2001). *An Assessment of the Status of the Worlds Remaining Closed Forests*. UNEP/DEWA/TR 01-2.
- United Nations Environment Programme. (2002). *Global Environment Outlook 3: Past, Present and Future Perspectives*. London: Earthscan.
- United Nations Environment Programme. (2006). *Africa Environmental Outlook 2: Our Environment, Our Wealth*. Malta: Progress Printing Press.

- United Nations Environment Programme. (2009). *Kenya: The Atlas of Our Changing Environment*. Malta: Progress Printing Press.
- United Nations Environment Programme. (2012). *The Role and Contribution of Montane Forests and Related Ecosystem Services to the Kenyan Economy*. In: Benefits of Forest Ecosystem\_18-09-15.pdf
- United States of America Agency for International Development-Centre for Development Information and Evaluation. (2000). Recent Practices in Monitoring and Evaluation: Measuring Institutional Capacity. TIPS No. 15. [http://www.classtoolkit.org/sites/default/files/documents/Recent\\_Practices\\_in\\_Monitoring\\_\\_Evaluation.pdf](http://www.classtoolkit.org/sites/default/files/documents/Recent_Practices_in_Monitoring__Evaluation.pdf) (accessed on 25/10/2016).
- United States of America Agency for International Development-Centre for Development Information and Evaluation. (2011). Recent Practices in Monitoring and Evaluation: Measuring Institutional Capacity. TIPS No. 15. (accessed on 11/3/2015).
- Van den, A. W. and Hawkins, H. S. (1996). *Agricultural Extension*. London Blackwell Science.
- Walker, P. M. B., (1988). *Chambers Science and Technology Dictionary*. Edinburgh: Chambers Cambridge University Press.
- Wamuongo, J. W., Ogutu, J. K. S., Mugah, J. O. & Ayiemba, J. A. (2001). *From Research to Dissemination: Agroforestry into the Next Millennium*. Proceedings of the National Agroforestry Research Project (NARFP) Symposium. 8<sup>th</sup> to 11<sup>th</sup> December 1998, Izaak Walton Inn, Embu Kenya. Nairobi: Kenya Agricultural Research Institute.
- Wandago, B. (2006). Kenya Forest: How Different is From Forest Department? In: *the Proceedings of the First Kenya Forestry Society Scientific Conference. 10<sup>th</sup> – 11<sup>th</sup> August 2006, Waterbuck Hotel, Nakuru*. pp 6-13. Nairobi: Kenya Forestry Society.
- Wanjiku, J., Mukolwe, M. O., Mwaura, J. & Anapapa, A. [eds]. (2013). Technology Needs Assessment Survey. *Proceedings of the Technology Needs Assessment Seminar, 18<sup>th</sup> June 2013*. KEFRI Hqs. Nairobi.
- Wanyiri, J. M., & Bundotich, J. K. (2006). Environmental and Natural Resources Management Policy Framework in Kenya. In: Udoto, M. O., Mungai, N. W., Ngoda, B. J. M., & Ondiek, J. O. [eds] pp 39-42. *Proceedings of a Policy Framework Forum on Agroforestry and Natural Resources Management: Current Changes in Primary, Secondary and Tertiary Institutions*. 24<sup>th</sup> – 26<sup>th</sup> November 2005 at Stem Hotel, Nakuru, Kenya. Njoro: Egerton University Press.
- Wass, P. (ed.). (1995). *Kenya's Indigenous Forests: Status, Management and Conservation*. Gland, and Cambridge: IUCN.

- World Bank. (2005). *Capacity Building in Africa: An OED Evaluation of World Bank Support*. Washington D.C: The World Bank Operations Evaluation Department.
- World Bank. (1978). *Forestry: Sector Policy Paper*. Washington, DC: World Bank.
- World Wide Fund for Nature. (2006). *WWF Eastern Africa Conservation Action Plan 2005-2006*. Nairobi: WWF-EARPO.

## APPENDICES

### Appendix 1.1: Authority to Undertake Study and Research

## KENYA FORESTRY RESEARCH INSTITUTE

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+254 722 157 414  
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00200, Nairobi  
KENYA

Ref: KEFRI/62/06 Vol. II (15)  
.....

Date: 18<sup>th</sup> October 2016  
.....

The Director  
Graduate School  
Egerton University  
P.O. Box 536 - 20115  
EGERTON

### AUTHORITY TO UNDERTAKE PhD STUDY AND RESEARCH

Kenya Forestry Research Institute (KEFRI) is registered as a Research Institute with the National Commission for Science, Technology and Innovations, (Registration No., NACOSTI/2016/05/002), upon satisfying the requirements of the Science, Technology and Innovation Act, 2013.

Mr. Michael O. Mukolwe is a Principal Research Scientist in KEFRI (KEFRI/5566). Within this context, Mr. Mukolwe was authorised to register and undertake the study for award of the Degree of Doctor of Philosophy in Natural Resources Management at Egerton University, (Reg. No.: ND - 11/0165/05).

Kindly, assist him as appropriate to accomplish his study programme.

Thank you.



**Bernard N. Kigomo (PhD)**  
**SENIOR DEPUTY DIRECTOR (R&D)**

/zc

*All communications should be addressed to the Director*

## Appendix 1.2: List of Institutions by Sector and Functional Categories

Institution/Organisation	Sector	Function
<b>Public Sector</b>		
1. Embu Municipal Council	Public	Service
2. Garissa Municipal Council	Public	Service
3. Kakamega Municipal Council	Public	Service
4. Kenya Forest Service	Public	Service
5. Kenya Wildlife Service	Public	Service
6. Kisumu City Council	Public	Service
7. Ministry of Agriculture	Public	Service
8. Ministry of Energy	Public	Service
9. Mombasa City Council	Public	Service
10. Nairobi City Council	Public	Service
11. Nakuru Municipal Council	Public	Service
12. Nyeri Municipal Council	Public	Service
13. Machakos Municipal Council	Public	Service
14. County Council of Wareng	Public	Service *
15. Coffee Research Foundation	Public	Training & Research
16. Kenya Agricultural Research Institute	Public	Training & Research
17. Kenya Forestry Research Institute	Public	Training & Research
18. Kenya Marine and Fisheries Research Institute	Public	Training & Research
19. Kenya Medical Research Institute	Public	Training & Research
20. National Museums of Kenya	Public	Training & Research
21. Tea Research Foundation of Kenya	Public	Training & Research
22. Kenya Electricity Generating Company	Public	Commercial
23. Nyayo Tea Zone Development Corporation	Public	Commercial
24. Safaricom	Public	Commercial*
25. Egerton University	Public	Higher education
26. Jomo Kenyatta University of Agriculture and Technology	Public	Higher education
27. Kenyatta University	Public	Higher education
28. Maseno University	Public	Higher education
29. Moi University	Public	Higher education
30. University of Nairobi	Public	Higher education
31. Masinde Muliro University of Science and Technology	Public	Higher education
32. Bukura Institute of Agriculture	Public	Tertiary education
33. Embu Agricultural Staff College	Public	Tertiary education
34. Kenya Forestry College	Public	Tertiary education
35. Rift Valley Institute of Science & Technology	Public	Tertiary education*
36. Kenya Wildlife Training Institute	Public	Tertiary education*
37. Wambugu Agricultural Training Centre	Public	Tertiary education
38. Development Bank of Kenya	Public	Financial
39. Kenya Commercial Bank	Public	Financial*
40. National Bank of Kenya	Public	Financial
41. Coast Development Authority	Public	Regional Development
42. Ewaso Nyiro North Development Authority	Public	Regional Development
43. Ewaso Nyiro South Development Authority	Public	Regional Development
44. Lake Basin Development Authority	Public	Regional Development
45. Kerio Valley Development Authority	Public	Regional Development
46. Tana and Athi River Development Authority	Public	Regional Development
47. Kenya Plant Health and Protection	Public	Regulatory

48. National Environmental Management Authority	Public	Regulatory
49. Water Resources Management Authority	Public	Regulatory*
<b>Non-governmental Organisations</b>		
50. Green Belt Movement	NGO	Service
51. Kakamega Environmental Education Programme	NGO	Service
52. Kamurugu Agricultural Development Initiatives	NGO	Service
53. Ugunja Community Resource Centre	NGO	Service
54. Farming Systems Kenya	NGO	Service
55. Community Mobilisation Against Desertification	NGO	Service
56. Forest Action Network	NGO	Service*
57. Kijabe Environmental Volunteers	NGO	Service
58. Bungoma Organisation for Empowering Women	NGO	Service
59. Wildlife Clubs of Kenya	NGO	Service*
60. Council for Human Ecology in Kenya	NGO	Service
61. Green Africa Foundation	NGO	Service
62. Catholic Diocese of Garissa	NGO	Service
63. Rural Energy and Food Security Organisation	NGO	Service
64. Elangata Wuas Ecosystem Management Programme	NGO	Service
65. Kenya Institute of Organic Farming	NGO	Tertiary education
66. Kenya Forestry Working Group	NGO	Regulatory*
67. Kenya Forestry Society	NGO	Regulatory*
<b>Private Sector</b>		
68. Baraka Agricultural College	Private	Tertiary education
69. Manor House Agricultural Centre	NGO	Tertiary education
70. Chandaria Foundation	Private	Service*
71. Nation Media Group	Private	Commercial
72. The Standard Group	Private	Commercial
73. Eco-Total Kenya	Private	Commercial*
74. Homa Lime Company Ltd	Private	Commercial*
75. Lafarge Ecosystems (Haller Park)	Private	Commercial
76. Ngomongo Villages	Private	Commercial
77. Timsales Ltd	Private	Commercial
78. Rai Plywoods	Private	Commercial
79. Mastermind Tobacco Company Limited	Private	Commercial
80. British American Tobacco Company Limited	Private	Commercial
81. East African Breweries Limited – Green Team (E-Green Team)	Private	Commercial
82. Baraton University	Private	Higher education
83. Barclays Bank	Private	Financial
84. Standard Chartered Bank	Private	Financial

NB: \* Pre-tested institutions

## Appendix 2.1: Capacity Assessment Survey Questionnaire

### 1.0. Institutional Information

Please provide as complete responses as possible to 1.1.

<b>1.1. Name of institution</b>			<b>Code:</b>
Address:			
Location:			
Telephone:		Mobile:	
Fax:			
E-mail:			
Website: http://			
Legal status (tick)	Public [ ]	Private [ ]	NGO [ ]
Year established:			
Date of last major re-organisation:	Year:	Please state the reason(s):	

### 1.2. Vision, mission, mandate and governance

Please indicate the absence or presence of these instruments.

(rank those that apply as 0=absence; 1=presence)							
Vision		Mission		Mandate		Core values	Board of Management/ Directors
Please state your institution's vision:							

### 1.3. Functional categories

Please tick as appropriate your institutional functional category.

Service		Training & research		Higher education		Commercial		Financial		Others (please specify)	
State your institution's focus or major conservation issues/questions											



## 2.0. Human Resources

### 2.1. Professional staff

Please enter the specific number of staff in each category and year (2002-2011).

Qualification/ Year	2002	2003	2004	2005	2006	Optimal No.
Diploma						
B.Sc.						
M.Sc.						
Ph. D						
Expatriates						
<b>Total</b>						

Qualification/ Year	2007	2008	2009	2010	2011	Optimal No
Diploma						
B.Sc.						
M.Sc.						
Ph. D						
Expatriates						
<b>Total</b>						

### 2.2 Staff situation 2011

Please enter the specific number of staff by category and years of experience.

Professional staff							Total
Years of experience	0-3 years		4-10 years		>10 years		Total
Highest qualification (q)	Male	Female	Male	Female	Male	Female	
Diploma							
B.Sc.							
M.Sc.							
Ph. D							
Expatriates							
<b>Total</b>							

### 2.3. Technical support staff (certificate and below) 2011

Please enter the specific number of staff by category and gender.

Technical support staff	Male	Female	Total
Field technicians			
Other support staff			
Administrative/secretarial/ maintenance/others			
<b>Total</b>			

### 2.4. Estimate overall proportion of staff time dedicated to conservation

Please tick as appropriate.

0-19%		60-79%	
20-39%		80-100%	
40-59%		Actual share if available	

### 3.0. Financial Resources

#### 3.1. Sources of conservation funding

Please fill in an estimated amount of funding for conservation by your organisation from the respective sources and years in the spaces provided in thousands of Ksh ('000s).

Source/Year	2002	2003	2004	2005	2006
Government/Public					
Bilateral donors					
Multilateral donors					
Development banks					
Private enterprises					
NGOs					
Own income					
Others					
<b>Total (Ksh)</b>					

Source/Year	2007	2008	2009	2010	2011
Government/Public					
Bilateral donors					
Multilateral donors					
Development banks					
Private enterprises					
NGOs					
Own income					
Others					
<b>Total (Ksh)</b>					

#### 3.2. Donor Agencies

Provide names of donor agencies, which your institution has benefited from in terms of funding.

Agency	Name of Agency	Sector
(1) Bilateral donor agencies		
(2) Multi-lateral donors agencies		
(3) Development banks		
(4) Private enterprises		
(5) Others		

### 3.3. Conservation expenditure

Please provide a consolidated estimate of expenditure for conservation by your organisation in thousands of Ksh ('000s) for the respective years.

Year	2002	2003	2004	2005	2006
<b>Total Expenditure</b>					

Year	2007	2008	2009	2010	2011
<b>Total Expenditure</b>					

### 3.4. Allocation of conservation effort

List conservation projects, their duration, number of staff deployed and the allocated budget estimate.

Title/Topic of Conservation Project	Project duration (Years)	Full time staff equivalents per year	Total budget (& donor's, if applicable)
1.			
2.			
3.			
4.			
5.			
6.			
7.			

## 4.0. Interactions within External and Internal Environment

### 4.1. External Environment

#### 4.1.1. Conservation interactions

Please use the numerical codes to provide response to conservation interactions in Kenya (F) interactions.

Type	Frequency of interaction	Benefits to institution	Name of link institutions
	0=never	1=no benefit	
	1=occasionally	2=moderate benefit	
	2=frequently	3=very beneficial	
Conservation interactions in Kenya (F)			
Non-conservation interactions in Kenya (N)			
Conservation interactions in Africa (R)			
Non-conservation interactions outside Africa (O)			
Types of benefits from conservation interactions e.g. staff secondment, training, library resources, internet services, certification, collaborative dissemination of outputs, seeds, seedlings, planting, funding, publicity etc.			

#### 4.1.2. Training interactions

Please use the numerical codes to provide response to training interactions.

Type	Frequency of interaction	Benefits to institution	Name of link institutions
	0=never	1=no benefit	
	1=occasionally	2=moderate benefit	
	2=Frequently	3=very beneficial	
Training institutions in Kenya (E)			
Training institutions in Africa (Q)			
Training institutions outside Africa (S)			
Types of benefits from training interactions e.g. staff secondment, training or workshops, seminars, internships, library resources, internet services, certification, production of publications and other outputs, internship, etc.			

#### 4.1.3 Research interactions

Please use the numerical codes to provide response to research interactions.

Type	Frequency of interaction	Benefits to institution	Name of link institutions
	0=never	1=no benefit	
	1=occasionally	2=moderate benefit	
	2=frequently	3=very beneficial	
Conservation-related research interactions in Kenya (E)			
Conservation-related research interactions in Africa (Q)			
Conservation-related research interactions outside Africa (S)			
Types of benefits from research interactions e.g. staff secondment and training, library resources, internet services, certification, collaborative implementation of conservation activities, joint research, evaluation, funding, publicity etc.			

#### 4.1.4 User interactions

Please fill in the specific values as a proportion of operating costs and time.

Subject	%	Institutions involved in dissemination /use of conservation innovations
Proportion of annual budget associated with dissemination of innovations to stakeholders (B)		
Staff time associated with dissemination of innovations to stakeholders (T)		

## 4.2 Internal Environment

#### 4.2.1. Financial incentives (in '000s Ksh)

Please fill in an estimated value or ratio in thousands of Ksh (in '000s).

	Private sector	Public sector	NGO
Income of comparable conservation staff in other institutions			

#### 4.2.2. Average annual salary

Please fill in an estimated value in thousands of Ksh (in '000s).

	Average annual salary	Average annual fringe benefits
Technical conservationist (Diploma + 5 yrs)		
Professional conservationist (M.Sc. + 5 yrs)		
Support staff		
Secretary		
Casual		

#### 4.2.3. Non-salary incentives

Please provide your response by inserting the numerical codes as appropriate.

Type	Frequency of use	Effectiveness in motivating productivity	Importance of benefit to employee
	0=not used	0=ineffective	0=none
	1=selected staff	1=slightly	1=low
	2=All staff	2=moderately	2=medium
		3=greatly	3=high
Transport/Commuter allowance			
Medical allowance/Cover			
Housing allowance			
Communication/airtime allowance			
Leave allowance			
Additional conservation funds			
Travel to other regions or countries			
Prospects for promotion			
Opportunities for professional training			
Others			

#### 4.2.4. Internal conservation interactions

Please provide your response by inserting the numerical codes as appropriate.

Type of formal meeting	Frequency of interaction (K)	Benefit to institution (U)	Who attends? (a)
	0=never	0=no benefit	1=admin/support staff
	1=once a year	1=low level	2=management
	2=every 6 months	2=medium benefit	3=conservationists/library
	3=every month	3=high benefit	4=conservation user group If '4' give name of group
4=every week			
Selection of projects at institutional level			
Planning of conservation at project level			
Discussion of conservation progress at institutional level			
Discussion of conservation progress at Project level			
Seminars, staff and visiting conservationists			

**NB:** If in any formal meeting there is more than one category of participants, add the designated values. For example, if in Selection of projects at institutional level both administration and management staff participate, add values "1" for administration to "2" for management to get "3".

## 5.0. Conservation Outputs

### 5.1. Publications

Please insert the specific numerical values for the respective year.

Category/Year	2006	2007	2008	2009	2010	2011
Technical/conservation/extension notes						
Conservation/extension pamphlets/posters						
Proceedings						
Annual reports						
Management guidelines/manuals						
Decision support systems						
Others						
Total number of publications						
Total number in refereed journals/published book chapters						
	<b>Yes</b>	<b>No</b>	<b>List Institutional publication series</b>			
Is there an institutional journal or magazine?						
Is there any other relevant journal publish institutional work in Kenya						

### 5.2. Audio visuals

Please insert the specific numerical values for the respective year.

Category/Year	2006	2007	2008	2009	2010	2011
Technical/conservation/extension notes						
Conservation/extension drama						
Proceedings						
Management guidelines/manuals						
Decision support systems						
Others						
Total number. of audio visuals						
Total number registered						
	<b>Yes</b>	<b>No</b>	<b>List Institutional audio visual production series</b>			
Is there an institutional audio visuals documentary series?						

## 6.0. Conservation Management

Please provide information on conservation management by scoring as appropriate.

Score (0=no; 1=yes)	Yes	No	Remarks
1. Is there an institutional strategic (on conservation/technology dissemination) policy plan?			
2. Do all staff have access to a copy of strategic plan?			
3. Is the strategic plan more than 5 years?			
4. Is there an annual operation plan (AOP)?			
5. Does the preparation of AOP and allocation of resources involve all conservation staff?			
6. Is there a list of proposed conservation activities that were rejected?			
7. Is the institution involved in collaborative conservation/extension/technology dissemination?			
8. Do you have any memorandum of understanding (MoU) with partners?			
9. Do you have more than 4 MoUs?			
10. Are conservation progress reports prepared?			
11. Is the frequency of reporting on conservation progress more than 5 per year?			
12. In the implementation of conservation activities, is there an approach that is most preferred?			
13. Do you conduct conservation surveys on adoption rate of innovations?			
14. Is your conservation output packaged as a publication?			
15. Is your conservation output packaged as audio-visual/digital format?			
16. Do you maintain a record of conservation accomplishment?			
17. If 'Yes' to Q 16, is your record to-date and more than 5 years?			
18. Is your organisation connected to the internet services?			
19. If 'Yes' to Q 18, do you have a website?			
20. Is the percentage of computer literate conservation staff greater than 50%			
<b>Total scores</b>			

## 7.0 Conservation Investments

Please provide information on conservation investment by scoring as appropriate.

Score (0=no; 1=yes)	Yes	No.	Remarks
1. Is there an institutional budget allocated to conservation/extension/ technology dissemination?			(Please specify in Ksh)
2. Is the annual budget allocated to conservation operations and facilitation > 15% of total budget?			
3. Is the percentage allocated to ICT facilities for conservation > 5% of total budget?			
4. Is the percentage allocated to audio visual facilities and publicity > 10% of total budget?			
5. Is the percentage allocated to publications > 10% of total budget?			
6. Is the percentage allocated to capacity building support > 20% of total budget?			
7. Is the percentage allocated to on-farm demonstrations > 10% of total budget?			
8. Is the percentage allocated to on-station demonstrations > 5% of total budget?			
9. Is the percentage allocated to open and field days, ASK shows and publicity activities > 10% of total budget?			
10. Is the percentage allocated to improvement, monitoring and evaluation of conservation innovations > 15% of the total budget?			
<b>Total scores</b>			

## 8.0. Facilities

Please provide information on facilities by scoring as appropriate.

Status score (0=none, 1=poor, 2=adequate, 3=good)		
Facility/Status	Value	Remarks (quantify)
General condition of building		
On-station conservation activities		
On-farm conservation activities		
Library facilities (publications, digital materials, audio-visuals, etc.)		
Internet/LAN		
Computers and accessories		
Sharing resources		
ASK Showground stand		
Transport fleet (vehicles, etc.)		
Communication (phone, fax, email)		
<b>Total scores</b>		



## 9.0 SWOT Analysis

Using the matrix provided, list in the respective fields all strengths and weaknesses as well as opportunities and threats relating to capacity for enhancing adoption of forest innovations in your institution.

	<p><b>Strengths</b> (positive characteristics and advantages of issue, situation or innovation)</p>	<p><b>Weaknesses</b> (negative characteristics and advantages of issue, situation or innovation)</p>
<p><b>Opportunities</b> (factors, situations, that can benefit, enhance or improve the issue, situation or innovation)</p>	<p><b>Strength-Opportunity (S-O Analysis)</b> (how can strengths be used to take advantage of development opportunities?)</p>	<p><b>Weaknesses-Opportunity (W-O Analysis)</b> (how can weaknesses be overcome to take advantage of development opportunities?)</p>
<p><b>Threats</b> (factors, situations that can hinder the issue, situation or innovation)</p>	<p><b>Strengths-Threats (S-T Analysis)</b> (how can strengths be used to mitigate threats that tend to hinder achievement of objectives and pursuit of opportunities?)</p>	<p><b>Weaknesses-Threats (W-T Analysis)</b> (how can weaknesses be overcome to mitigate threats that tend to hinder achievement of objectives and pursuit of opportunities?)</p>

Adopted: KIPPRA (2005)

Signature:

Date:

## Appendix 2.2: Profile of Sampled Institutions

Name of the institution/Contact	Legal status	Year established	Conservation focus
Kenya Forest Service (KFS) <a href="http://www.kenyaforestservice.org">www.kenyaforestservice.org</a>	Public	(1902) 2007	Conserve, develop and sustainably manage forests and allied resources for environmental stability and the social-economic development of the people of Kenya
Kenya Forestry College (KFC) <a href="http://www.kenyaforestservice.org">www.kenyaforestservice.org</a>	Public	1957	Imparting knowledge and skills on technical personnel
Kenya Forestry Research Institute (KEFRI) <a href="http://www.kefri.org">www.kefri.org</a>	Public	1986	Undertake research in forestry and allied natural resources for socio-economic development
Kenya Marine and Fisheries Research Institute (KMFRI) <a href="http://www.kmfri.co.ke">www.kmfri.co.ke</a>	Public	1979	Mangrove forest ecosystem functions and services
Kenya Plant Health Inspectorate Service (KEPHIS) <a href="http://www.kephis.org">www.kephis.org</a>	Public	1998	A lead regulatory agency in agriculture
Tea Research Foundation of Kenya (TREK) <a href="http://www.tearesearch.or.ke">www.tearesearch.or.ke</a>	Public	(1950) 1998	Research on tea
National Environmental Authority (NEMA) <a href="http://www.nema.go.ke">www.nema.go.ke</a>	Public	2002	Regulatory; restoration, protection, research and enforcement
Kenya Agricultural Research Institute (KARI) <a href="http://www.kari.org">www.kari.org</a>	Public	1979	A centre of excellence in agricultural research and technology transfer
Nyayo Tea Zones Development Corporation (NTZDC) <a href="http://www.teazones.co.ke">www.teazones.co.ke</a>	Public	1986	A leader in conservation of forests and protection of the environment
National Museums of Kenya (NMK) <a href="http://www.museums.or.ke">www.museums.or.ke</a>	Public	1910	Develop and implement research projects that are focused on a sustainable use, conservation and preservation of Kenya's heritage
Kenya Wildlife Service (KWS) <a href="http://www.kws.org">www.kws.org</a>	Public	1990	Sustainably conserve and manage Kenya's wildlife and their habitats in collaboration with other stakeholders for posterity
Coast Development Authority (CDA) <a href="http://www.cda.go.ke">www.cda.go.ke</a>	Public	1993	Contribute to creation of wealth and employment and improvement of socio-economic well-being of the communities
Ewaso Nyiro South Development Authority (ENSDA) <a href="http://www.ensda.go.ke">www.ensda.go.ke</a>	Public	1989	The institution's focus or major conservation issues is the Promotion of environmental and catchments conservation as well as promote sustainable utilization of natural resources and exploitation of resource based investment for the benefit of the local community
Ewaso Nyiro North Development Authority (ENNDA) <a href="http://www.ennda.go.ke">www.ennda.go.ke</a>	Public	1989	Co-ordinate and collaborate with actors in environment conservation
Kerio Valley Development Authority (KVDA) <a href="http://www.kvda.go.ke">www.kvda.go.ke</a>	Public	1997	Support to government afforestation programme and promotion of farm forestry and environmental conservation
Lake Victoria Basin Development Authority (LBDA) <a href="http://www.lbda.co.ke">www.lbda.co.ke</a>	Public	1997	Catchment conservation and rehabilitation through agroforestry, seedling production and extension
Tana and Athi River Development Authority (TARDA) <a href="http://www.tarda.co.ke">www.tarda.co.ke</a>	Public	1974	Optimal management of the Tana and Athi Rivers basins resources for social and economic development

Egerton University (EU) www.egerton.ac.ke	Public	1987	Natural Resource Management –NRM (Mau, RCE, Tourism, Agriculture, Water Resource Management)
Maseno University (MASU) www.maseno.ac.ke	Public	1990	Environmental consciousness and sustainability
Moi University www.mu.ac.ke	Public	1984	The university of choice in nurturing innovation and talent in science, technology and development
Masinde Muliro University of Science and Technology (MMUST) www.mmust.ac.ke	Public	2006	Establish and promote links with other research institutions and individuals to design and lead in providing appropriate management responses to emerging ecological management issues and threats
Municipal Council of Mombasa (MCM)	Public	1928	A leading holiday destination and commercial hub of Africa
Municipal Council of Nakuru (MCN)	Public	1952	Plant trees and flowers in designated areas
Municipal Council of Machakos (MCKOS) www.mcmachakos@localgovernment.go.ke	Public		Clean, secure and sustainable environment by supporting tree planting efforts
Municipal Council of Kisumu (MCK-CCK) www.kisumu.go.ke	Public	(1940) 1960	Improve Environmental Management (An environmentally conscious and productive community deriving optimal benefits from a healthy and well-managed environment within a fast growing economy)
Municipal Council of Nyeri (MCNy) www.nyerimunicipal.go.ke	Public	1911	To provide services to communities in the urban (garbage collection) and sustainable environment as a public good
Municipal Council of Kakamega (MCKak) mckakamega@localgovernment.go.ke	Public	1971	The general appearance of the municipal council is one of a town with gardens, recreation parks and well decorated buildings
Municipal Council of Embu (MCE)	Public	1971	Clean and healthy environment through good governance
Nairobi City Council (NCC) www.nairobi.go.ke	Public	(1899) 1963	Conservation and maintenance of public parks
County Council of Warend (CCW)	Public	1994	Promote afforestation of the whole of Uasin Gishu County
Wambugu Agricultural Training Centre (WAM)	Public	(1958) 2006	Training and research where farmers and other stakeholders are involved
Kenya Electricity Generating Company Limited (KenGen) www.kengen.co.ke	Public	(1954) 1998	Tree nursery establishment and management, provision of seedlings to communities in vicinity of major KenGen power installations, collaborative afforestation initiatives with other bodies for watershed management
Manor House Agricultural Centre (MHAC) www.mhacbiointensive.org	NGO	1984	Agroforestry as in nursery establishment and management
Kenya Institute of Organic Farming (KIOF) www.kiof.org	NGO	1986	Training farmers and pastoralists on agroforestry as major farming activities
Elangata Wuas Ecosystem Management Programme (EWEMP)	NGO	1993	Sustainable natural resource management for community benefit
Kamurugu Agricultural Development Initiative (KADI)	NGO	1991	Training/ encouraging people to plant/ conserve trees and management of tree/ fruit nursery for over 13years
Bungoma Organisation for Empowerment of Women (BOEW)	NGO	1998	Tree planting through community seedlings production and promotion of energy saving Jikos to conserve the environment

Catholic Diocese of Garissa (CDG)	NGO	1984	Work for the needs and rights of all
Farming Systems Kenya (FSK) www.farmingsystemskenya.org	NGO	1981	Transform smallholder farmers from subsistence to commercial to farming through research appropriate technology, service provision from a sustainable perspective
Community Mobilisation Against Desertification (C-MAD) www.cmadkenya.org	NGO	1987	Conservation of plant biodiversity-farm forestry
Green Belt Movement (GBM) www.greenbeltmovement.org	NGO	1977	Better environmental management, community empowerment, and livelihood improvement using tree planting as an entry point: (tree planting, advocacy and climate change, and community empowerment and education).
Kakamega Environment Education Programme (KEEP) www.KEEPKakamega.org	NGO	1995	Conserve the Kakamega Forest through environmental education, eco-tourism and initiation of nature based enterprises e.g. wildlife conservancy, butterfly farming, tree nursery, processing of herbal medicine, beekeeping.
Ugunja Community Resource Centre (UCRC) www.ucrc.org	NGO	1992	Promoting sustainable utilization of natural resources such as land, water and trees.
Kijabe Environment Volunteers (KENVO) www.kenvo.org	NGO	1996	Community empowerment, forest rehabilitation, biodiversity conservation and protection and livelihood improvement through nature based entrepreneur
Rural Energy and Food Security Organisation (REFSO) www.refso.org	NGO	1996	Integrated natural resource management
Council for Human Ecology in Kenya (CHEK)	NGO	1977	Indigenous knowledge and environmental conservation
Green Africa Foundation (GAF) www.greenafricafoundation.org	NGO	2000	The institution's major focus is in three green folds: The <b>First Green</b> to treat people kindly through upholding ethics and training on life skills. The <b>Second Green</b> is to promote good health, peace within communities and to create sustainable livelihood. The <b>Third Green</b> is the actual environmental conservation.
Timsales Limited (TSL) www.timsales.com	Private		Afforestation and re-afforestation in government and private farms
Baraka agricultural College (BAC) www.sustainable.org	Private	1974	Sustainable agriculture and rural development in which the various alternatives like agroforestry and natural resources management is emphasized.
Lafarge Ecosystems (LES) www.lafargeecosystems.com	Private	1954	Rehabilitation of quarries and tree planting
Ngomongo Villages (NV) www.ngomongo.com	Private	1991	We just plant tree when we think to! And what we think will work, so far so good. Others include rehabilitation of a once degraded coral rock quarrying and Municipal of Mombasa garbage dumping site to an eco-cultural and ecotourism attraction as well as a hospitality college

**Appendix 3.1: Quartile Indicator Values for Conservation Capacity Across Surveyed Institutions (1 – 22)**

	KFS	KFC	KEFRI	KMFRI	KEPHIS	TRFK	NEMA	KARI
HC	16.00	13.00	13.00	5.00	13.00	13.00	13.00	0.00
CI	8.00	5.00	8.00	5.00	4.00	12.00	16.00	8.00
TI	10.00	11.00	16.00	7.00	13.00	13.00	10.00	7.00
RI	12.00	4.00	16.00	11.00	8.00	7.00	16.00	12.00
UI	12.00	8.00	16.00	6.00	5.00	0.00	14.00	8.00
SI	16.00	13.00	13.00	14.00	0.00	0.00	0.00	9.00
NSI	13.00	13.00	11.00	2.00	0.00	7.00	10.00	13.00
II	8.00	5.00	11.00	7.00	0.00	4.00	6.00	13.00
TS	13.00	7.00	9.00	4.00	13.00	9.00	6.00	0.00
PO	15.00	7.00	14.00	13.00	0.00	13.00	6.00	16.00
EMO	16.00	0.00	13.00	13.00	0.00	0.00	0.00	0.00
CM	6.00	10.00	14.00	10.00	4.00	4.00	15.00	14.00
CIN	6.00	8.00	3.00	3.00	0.00	12.00	13.00	8.00
FA	7.47	5.87	11.73	10.13	16.00	11.73	10.67	11.73

	NTZDC	NMK	KWS	CDA	ENSDA	ENNDA	KVDA	LBDA
HC	8.00	0.00	0.00	9.00	4.00	10.00	10.00	13.00
CI	4.00	8.00	15.00	15.00	13.00	2.00	6.00	12.00
TI	6.00	12.00	14.00	13.00	10.00	4.00	4.00	9.00
RI	4.00	13.00	16.00	12.00	6.00	8.00	6.00	9.00
UI	0.00	10.00	0.00	11.00	0.00	6.00	13.00	9.00
SI	13.00	13.00	0.00	0.00	13.00	0.00	10.00	9.00
NSI	10.00	4.00	10.00	13.00	13.00	6.00	12.00	7.00
II	10.00	5.00	9.00	7.00	13.00	6.00	9.00	4.00
TS	13.00	0.00	0.00	8.00	1.00	12.00	3.00	13.00
PO	8.00	0.00	7.00	0.00	11.00	14.00	11.00	12.00
EMO	11.00	0.00	13.00	0.00	13.00	15.00	13.00	10.00
CM	10.00	8.00	15.00	8.00	14.00	15.00	6.00	4.00
CIN	8.00	12.00	12.00	3.00	8.00	12.00	8.00	3.00
FA	10.67	9.60	11.73	11.73	11.73	14.40	13.87	9.07

	TARDA	EU	MASU	MU	MMUST	MCM
HC	13.00	13.00	13.00	11.00	10.00	5.00
CI	4.00	10.00	12.00	4.00	8.00	4.00
TI	9.00	16.00	15.00	5.00	15.00	5.00
RI	12.00	12.00	14.00	11.00	15.00	6.00
UI	0.00	14.00	9.00	6.00	10.00	5.00
SI	0.00	9.00	0.00	12.00	9.00	0.00
NSI	16.00	13.00	13.00	1.00	13.00	2.00
II	13.00	3.00	10.00	0.00	13.00	1.00
TS	13.00	13.00	0.00	9.00	5.00	10.00
PO	0.00	10.00	8.00	13.00	12.00	0.00
EMO	0.00	0.00	0.00	0.00	13.00	0.00
CM	10.00	4.00	14.00	2.00	15.00	4.00
CIN	12.00	3.00	14.00	3.00	13.00	3.00
FA	13.87	7.47	14.40	5.87	9.60	6.40

### Quartile Indicator Values for Conservation Capacity Across Surveyed Institutions (23 – 44)

	MCN	MCKOS	MCK-CCK	MCNY	MCE	NCC	MCKak	CCW
HC	13.00	4.00	0.00	11.00	4.00	7.00	11.00	9.00
CI	6.00	3.00	8.00	8.00	7.00	3.00	0.00	2.00
TI	5.00	0.00	3.00	5.00	3.00	3.00	0.00	3.00
RI	12.00	4.00	0.00	2.00	0.00	6.00	0.00	4.00
UI	6.00	5.00	8.00	13.00	11.00	11.00	0.00	1.00
SI	13.00	0.00	6.00	0.00	0.00	12.00	0.00	0.00
NSI	9.00	13.00	6.00	10.00	10.00	11.00	9.00	2.00
II	0.00	5.00	3.00	9.00	9.00	6.00	0.00	0.00
TS	14.00	5.00	12.00	5.00	0.00	13.00	13.00	13.00
PO	0.00	8.00	8.00	7.00	10.00	10.00	5.00	0.00
EMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CM	3.00	4.00	12.00	4.00	4.00	6.00	1.00	3.00
CIN	14.00	3.00	6.00	6.00	6.00	6.00	3.00	6.00
FA	13.33	8.53	11.20	7.47	7.47	6.40	5.87	10.67

	WAM	KENGEN	MHAC	KIOF	EWEMP	KADI	BOEW	CDG
HC	6.00	9.00	7.00	8.00	12.00	8.00	0.00	2.00
CI	12.00	11.00	16.00	3.00	8.00	12.00	5.00	8.00
TI	11.00	13.00	16.00	7.00	16.00	12.00	4.00	0.00
RI	12.00	7.00	14.00	9.00	12.00	11.00	0.00	0.00
UI	5.00	9.00	12.00	14.00	12.00	5.00	5.00	0.00
SI	13.00	8.00	12.00	11.00	0.00	0.00	9.00	0.00
NSI	5.00	12.00	13.00	8.00	3.00	8.00	4.00	6.00
II	1.00	0.00	11.00	12.00	13.00	15.00	12.00	7.00
TS	5.00	9.00	8.00	6.00	3.00	9.00	0.00	0.00
PO	0.00	0.00	13.00	8.00	0.00	10.00	0.00	0.00
EMO	0.00	0.00	11.00	13.00	0.00	10.00	0.00	0.00
CM	13.00	3.00	10.00	12.00	6.00	12.00	4.00	1.00
CIN	12.00	6.00	14.00	8.00	14.00	12.00	12.00	0.00
FA	9.07	10.67	13.33	10.13	6.93	10.13	7.47	10.13

	FSK	CMAD	GBM	KEEP	UCRC	KENVO
HC	5.00	7.00	13.00	7.00	5.00	8.00
CI	13.00	3.00	7.00	8.00	11.00	12.00
TI	10.00	7.00	9.00	14.00	9.00	8.00
RI	13.00	4.00	13.00	16.00	9.00	2.00
UI	16.00	15.00	10.00	13.00	13.00	15.00
SI	12.00	13.00	0.00	0.00	0.00	13.00
NSI	13.00	5.00	13.00	5.00	6.00	4.00
II	13.00	13.00	16.00	13.00	12.00	13.00
TS	7.00	11.00	3.00	16.00	5.00	6.00
PO	9.00	13.00	0.00	13.00	9.00	15.00
EMO	12.00	12.00	0.00	13.00	13.00	0.00
CM	8.00	14.00	16.00	16.00	6.00	12.00
CIN	12.00	3.00	12.00	16.00	12.00	14.00
FA	12.27	10.13	12.80	10.13	8.53	8.53

### Quartile Indicator Values for Conservation Capacity Across Surveyed Institutions (45 – 51)

	REFSO	CHEK	GAF	TSL	BAC	LE	NV
HC	5.00	3.00	10.00	13.00	11.00	3.00	1.00
CI	8.00	12.00	11.00	10.00	14.00	13.00	8.00
TI	0.00	5.00	4.00	9.00	7.00	10.00	7.00
RI	0.00	6.00	6.00	14.00	7.00	12.00	0.00
UI	0.00	14.00	0.00	0.00	7.00	11.00	2.00
SI	13.00	0.00	0.00	13.00	12.00	14.00	0.00
NSI	5.00	2.00	4.00	8.00	10.00	5.00	1.00
II	0.00	5.00	14.00	7.00	13.00	10.00	0.00
TS	9.00	9.00	9.00	0.00	7.00	5.00	13.00
PO	13.00	6.00	0.00	10.00	13.00	0.00	9.00
EMO	0.00	0.00	0.00	0.00	13.00	0.00	12.00
CM	14.00	4.00	12.00	4.00	10.00	8.00	0.00
CIN	13.00	15.00	16.00	6.00	12.00	14.00	0.00
FA	8.00	8.00	14.93	14.40	12.27	13.87	7.47

### Abbreviations

HC	Human capital
CI	Conservation interactions
TI	Training interactions
RI	Research interactions
UI	User interactions
SI	Salary incentives
NSI	Non-salary incentives
II	Internal interactions
TS	Technical support
PO	Published outputs
EMO	Electronic media outputs
CM	Conservation management
CIN	Conservation investment
FA	Facilities

## Appendix 3.2: Indicator Values by Functional Categories

### 1. Provision of Service (n = 17)

	KFS	KWS	KEPHIS	NEMA	EWEMP	KADI	BOEW	CDG	FSK
HC	16.0	0.0	13.0	13.0	12.0	8.0	0.0	2.0	5.0
CI	8.0	15.0	4.0	16.0	8.0	12.0	5.0	8.0	13.0
TI	10.0	14.0	13.0	10.0	16.0	12.0	4.0	0.0	10.0
RI	12.0	16.0	8.0	16.0	12.0	11.0	0.0	0.0	13.0
UI	12.0	0.0	5.0	14.0	12.0	5.0	5.0	0.0	16.0
SI	16.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	12.0
NSI	13.0	10.0	0.0	10.0	3.0	8.0	4.0	6.0	13.0
II	8.0	9.0	0.0	6.0	13.0	15.0	12.0	7.0	13.0
TS	13.0	0.0	13.0	6.0	3.0	9.0	0.0	0.0	7.0
PO	15.0	7.0	0.0	6.0	0.0	10.0	0.0	0.0	9.0
EMO	16.0	13.0	0.0	0.0	0.0	10.0	0.0	0.0	12.0
CM	6.0	15.0	4.0	15.0	6.0	12.0	4.0	1.0	8.0
CIN	6.0	12.0	0.0	13.0	14.0	12.0	12.0	0.0	12.0
FA	7.47	11.73	16.00	10.67	6.93	10.13	7.47	10.13	12.27

	CMAD	GBM	KEEP	UCRC	KENVO	REFSO	CHEK	GAF
HC	7.0	13.0	7.0	5.0	8.0	5.0	3.0	10.0
CI	3.0	7.0	8.0	11.0	12.0	8.0	12.0	11.0
TI	7.0	9.0	14.0	9.0	8.0	0.0	5.0	4.0
RI	4.0	13.0	16.0	9.0	2.0	0.0	6.0	6.0
UI	15.0	10.0	13.0	13.0	15.0	0.0	14.0	0.0
SI	13.0	0.0	0.0	0.0	13.0	13.0	0.0	0.0
NSI	5.0	13.0	5.0	6.0	4.0	5.0	2.0	4.0
II	13.0	16.0	13.0	12.0	13.0	0.0	5.0	14.0
TS	11.0	3.0	16.0	5.0	6.0	9.0	9.0	9.0
PO	13.0	0.0	13.0	9.0	15.0	13.0	6.0	0.0
EMO	12.0	0.0	13.0	13.0	0.0	0.0	0.0	0.0
CM	14.0	16.0	16.0	6.0	12.0	14.0	4.0	12.0
CIN	3.0	12.0	16.0	12.0	14.0	13.0	15.0	16.0
FA	10.13	12.80	10.13	8.53	8.53	8.00	8.00	14.93



## 2. Training and Research (n = 5)

	KEFRI	KMFRI	TRFK	KARI	NMK
HC	13.0	5.0	13.0	0.0	0.0
CI	8.0	5.0	12.0	8.0	8.0
TI	16.0	7.0	13.0	7.0	12.0
RI	16.0	11.0	7.0	12.0	13.0
UI	16.0	6.0	0.0	8.0	10.0
SI	13.0	14.0	0.0	9.0	13.0
NSI	11.0	2.0	7.0	13.0	4.0
II	11.0	7.0	4.0	13.0	5.0
TS	9.0	4.0	9.0	0.0	0.0
PO	14.0	13.0	13.0	16.0	0.0
EMO	13.0	13.0	0.0	0.0	0.0
CM	14.0	10.0	4.0	14.0	8.0
CIN	3.0	3.0	12.0	8.0	12.0
FA	11.73	10.13	11.73	11.73	9.60

## 3. Higher and Tertiary Education (n = 9)

	KFC	EU	MASU	MU	MMUST	WAM	MHAC	KIOF	BAC
HC	13.0	13.0	13.0	11.0	10.0	6.00	7.0	8.0	11.0
CI	5.0	10.0	12.0	4.0	8.0	12.00	16.0	3.0	14.0
TI	11.0	16.0	15.0	5.0	15.0	11.00	16.0	7.0	7.0
RI	4.0	12.0	14.0	11.0	15.0	12.00	14.0	9.0	7.0
UI	8.0	14.0	9.0	6.0	10.0	5.00	12.0	14.0	7.0
SI	13.0	9.0	0.0	12.0	9.0	13.00	12.0	11.0	12.0
NSI	13.0	13.0	13.0	1.0	13.0	5.00	13.0	8.0	10.0
II	5.0	3.0	10.0	0.0	13.0	1.00	11.0	12.0	13.0
TS	7.0	13.0	0.0	9.0	5.0	5.00	8.0	6.0	7.0
PO	7.0	10.0	8.0	13.0	12.0	0.00	13.0	8.0	13.0
EMO	0.0	0.0	0.0	0.0	13.0	0.00	11.0	13.0	13.0
CM	10.0	4.0	14.0	2.0	15.0	13.00	10.0	12.0	10.0
CIN	8.0	3.0	14.0	3.0	13.0	12.00	14.0	8.0	12.0
FA	5.87	7.47	14.40	5.87	9.60	9.07	13.33	10.13	12.27

## 4. Regional Development Authorities (n = 6)

	CDA	ENSDA	ENNDA	KVDA	LBDA	TARDA
HC	9.0	4.0	10.0	10.0	13.0	13.0
CI	15.0	13.0	2.0	6.0	12.0	4.0
TI	13.0	10.0	4.0	4.0	9.0	9.0
RI	12.0	6.0	8.0	6.0	9.0	12.0
UI	11.0	0.0	6.0	13.0	9.0	0.0
SI	0.0	13.0	0.0	10.0	9.0	0.0
NSI	13.0	13.0	6.0	12.0	7.0	16.0
II	7.0	13.0	6.0	9.0	4.0	13.0
TS	8.0	1.0	12.0	3.0	13.0	13.0
PO	0.0	11.0	14.0	11.0	12.0	0.0
EMO	0.0	13.0	15.0	13.0	10.0	0.0
CM	8.0	14.0	15.0	6.0	4.0	10.0
CIN	3.0	8.0	12.0	8.0	3.0	12.0
FA	11.73	11.73	14.40	13.87	9.07	13.87

## 5. Local Authorities (n = 9)

	MCM	MCN	MCKOS	MCK-CCK	MCNY	MCE	NCC	MCKak	CCW
HC	5.0	13.0	4.0	0.0	11.0	4.0	7.0	11.0	9.0
CI	4.0	6.0	3.0	8.0	8.0	7.0	3.0	0.0	2.0
TI	5.0	5.0	0.0	3.0	5.0	3.0	3.0	0.0	3.0
RI	6.0	12.0	4.0	0.0	2.0	0.0	6.0	0.0	4.0
UI	5.0	6.0	5.0	8.0	13.0	11.0	11.0	0.0	1.0
SI	0.0	13.0	0.0	6.0	0.0	0.0	12.0	0.0	0.0
NSI	2.0	9.0	13.0	6.0	10.0	10.0	11.0	9.0	2.0
II	1.0	0.0	5.0	3.0	9.0	9.0	6.0	0.0	0.0
TS	10.0	14.0	5.0	12.0	5.0	0.0	13.0	13.0	13.0
PO	0.0	0.0	8.0	8.0	7.0	10.0	10.0	5.0	0.0
EMO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CM	4.0	3.0	4.0	12.0	4.0	4.0	6.0	1.0	3.0
CIN	3.0	14.0	3.0	6.0	6.0	6.0	6.0	3.0	6.0
FA	6.40	13.33	8.53	11.20	7.47	7.47	6.40	5.87	10.67

## 6. Commercial (n = 5)

	NTZDC	KENGEN	TSL	LE	NV
HC	8.0	9.0	13	3	1
CI	4.0	11.0	10	13	8
TI	6.0	13.0	9.00	10.00	7.00
RI	4.0	7.0	14.00	12.00	0.00
UI	0.0	9.0	0.00	11.00	2.00
SI	13.0	8.0	13.00	14.00	0.00
NSI	10.0	12.0	8.00	5.00	1.00
II	10.0	0.0	7.00	10.00	0.00
TS	13.0	9.0	0.00	5.00	13.00
PO	8.0	0.0	10.00	0.00	9.00
EMO	11.0	0.0	0.00	0.00	12.00
CM	10.0	3.0	4.00	8.00	0.00
CIN	8.0	6.0	6.00	14.00	0.00
FA	10.67	10.67	14.40	13.87	7.47

## Abbreviations

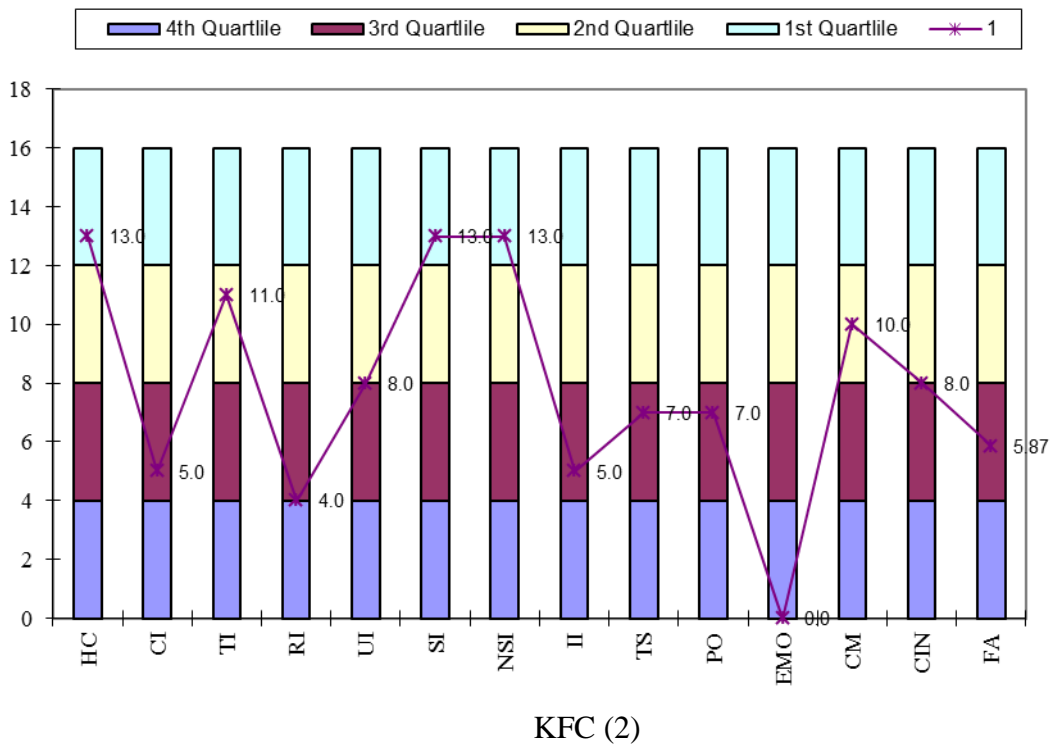
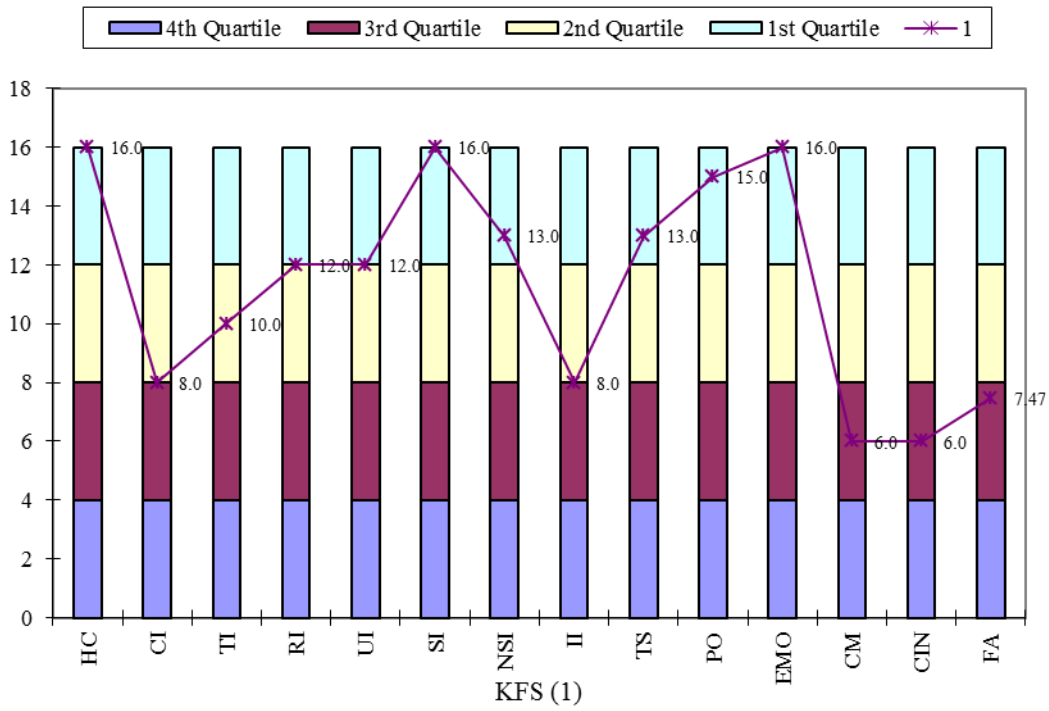
HC	Human capital
CI	Conservation interactions
TI	Training interactions
RI	Research interactions
UI	User interactions
SI	Salary incentives
NSI	Non-salary incentives
II	Internal interactions
TS	Technical support
PO	Published outputs
EMO	Electronic media outputs
CM	Conservation management
CIN	Conservation investment
FA	Facilities

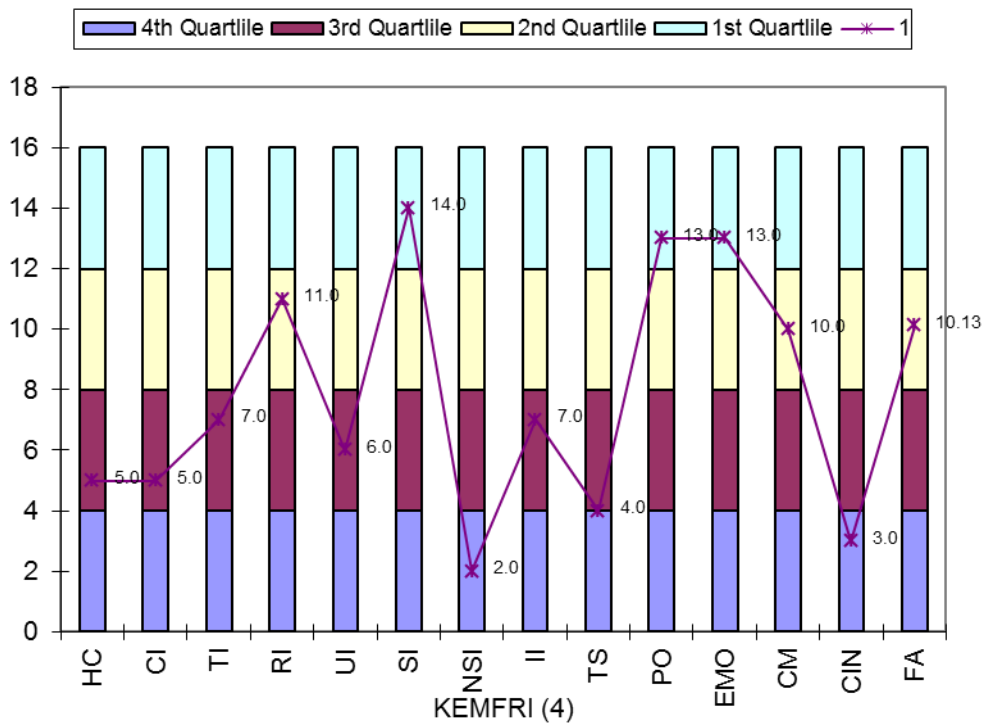
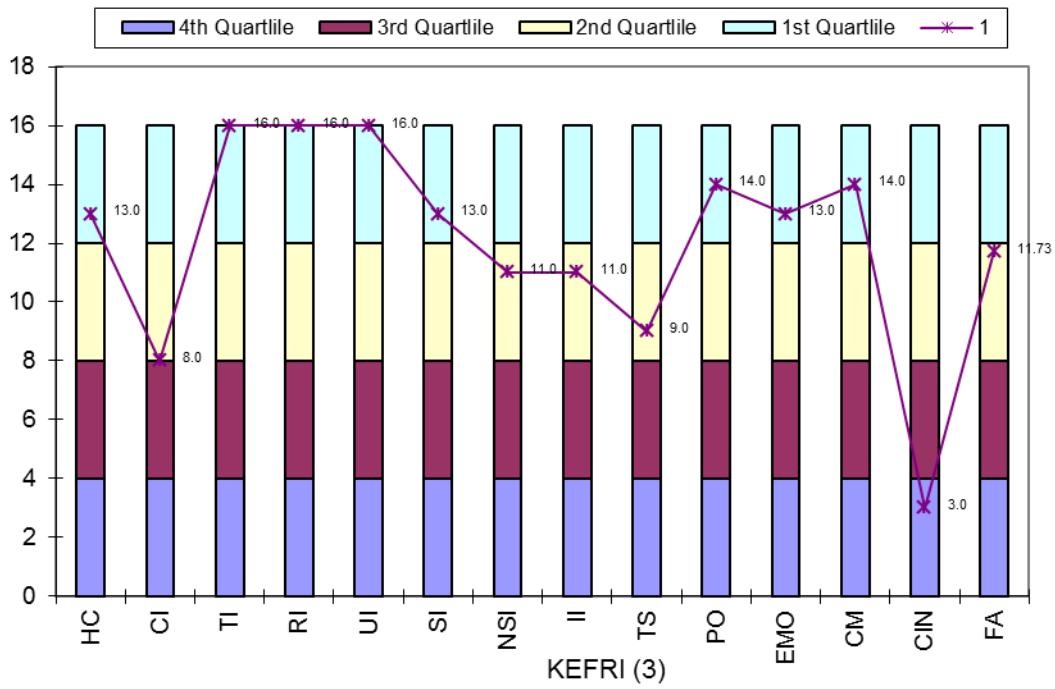
### Appendix 3.3: Human Capital and Qualification in Sampled Institutions

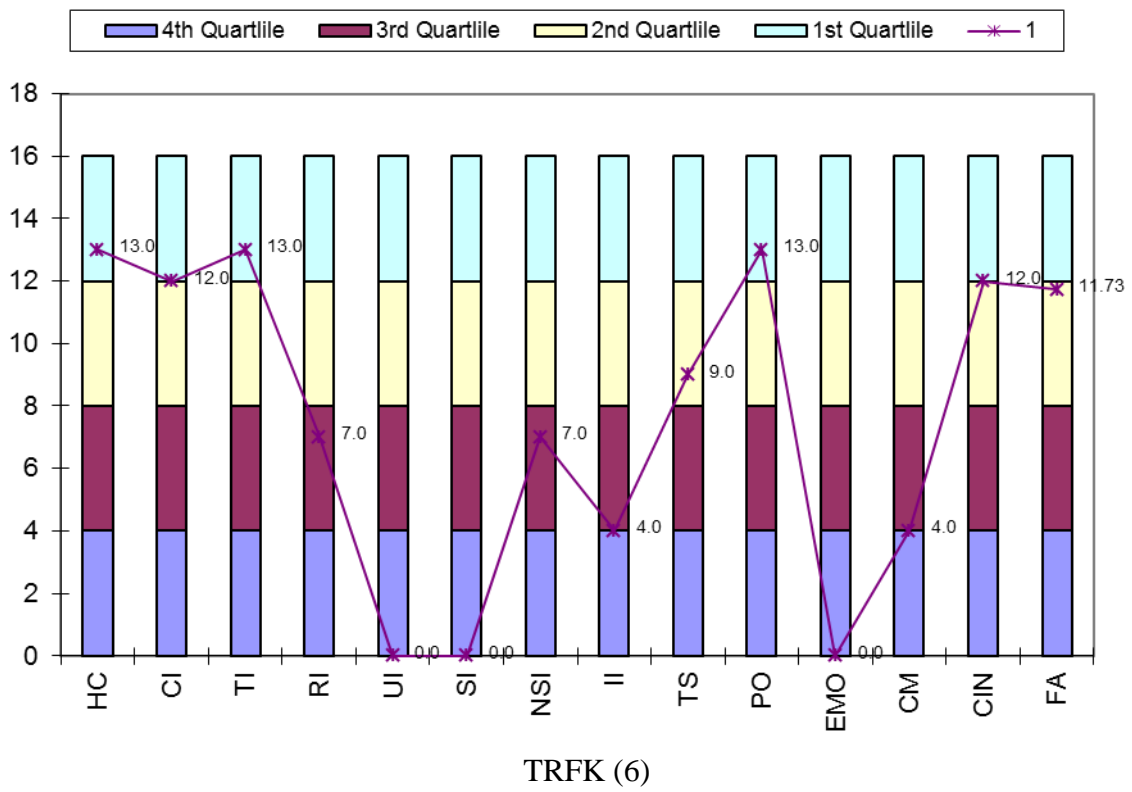
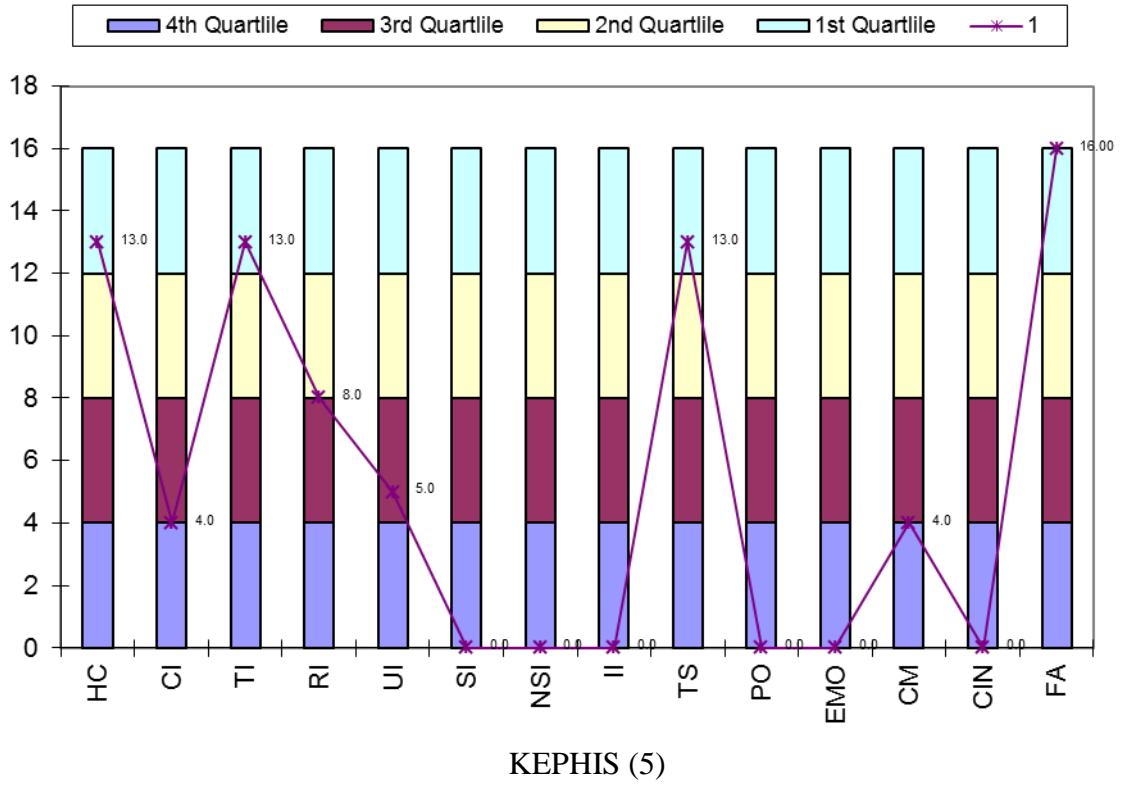
	Institution	Diploma	B.Sc.	M.Sc.	Ph.D.	Total	% of sample total	Rank	% of females	% of males
1	KFS	630	314	161	2	1107	26.91	2	19.87	80.13
2	KFC	11	13	0	0	24	0.58	1	20	80
3	KEFRI	56	84	73	19	232	5.64	2	17.24	82.76
4	KMFRI	3	3	6	4	16	0.39	1	37.5	62.5
5	KEPHIS	70	77	42	6	195	4.74	2	35.9	64.1
6	TFRK	31	3	7	5	46	1.12	2	23.91	76.09
7	NEMA	14	57	47	6	124	3.01	2	27.42	72.58
8	KARI	0	112	320	110	542	13.18	2	0	0
9	NTZDC	0	19	1	1	21	0.51	1	14.29	85.71
10	NMK	0	0	0	0	0	0.00	1	0	0
11	KWS	0	0	0	0	0	0.00	1	0	0
12	CDA	11	7	3	0	21	0.51	1	85.71	14.29
13	ENSDA	1	0	2	0	3	0.07	1	0	100
14	ENNDA	8	18	1	0	27	0.66	1	7.41	92.59
15	KVDA	3	6	0	0	9	0.22	1	0	100
16	LBDA	32	95	16	0	143	3.48	2	31.47	68.04
17	TARDA	32	10	4	0	46	1.12	2	36.96	63.04
18	EU	24	8	59	78	169	4.11	2	15.47	83.53
19	MASU	0	0	368	394	762	18.53	2	35.43	64.57
20	MU	5	2	21	22	50	1.22	2	13.73	86.27
21	MMUS	14	7	6	11	38	0.92	2	34.21	65.79
22	MCM	2	1	0	0	3	0.07	1	0	100
23	MCN	103	41	6	0	150	3.65	2	44	56
24	MCKOS	1	1	0	0	2	0.05	1	0	100
25	MCKCCK	0	0	0	0	0	0.00	1	0	100
26	MCNY	15	4	0	0	19	0.46	1	57.89	42.11
27	MCE	0	0	0	0	0	0.00	1	0	100
28	NCC	6	5	2	1	14	0.34	1	7.14	92.86
29	MCKak	24	0	0	0	24	0.58	1	41.67	58.33
30	CCW	6	9	6	0	21	0.51	1	28.57	71.43
31	WATC	4	1	1	0	6	0.15	1	16.67	83.33
32	KenGen	9	7	5	0	21	0.51	1	61.9	38.1
33	MHAC	6	3	1	1	11	0.27	1	27.27	72.73
34	KIOF	7	4	1	1	13	0.32	1	23.08	76.92
35	EWEMP	0	0	0	0	0	0.00	1	0	100
36	KADI	0	0	0	0	0	0.00	1	0	100
37	BOEW	0	0	0	0	0	0.00	1	0	100
38	CDG	0	0	0	0	0	0.00	1	0	100

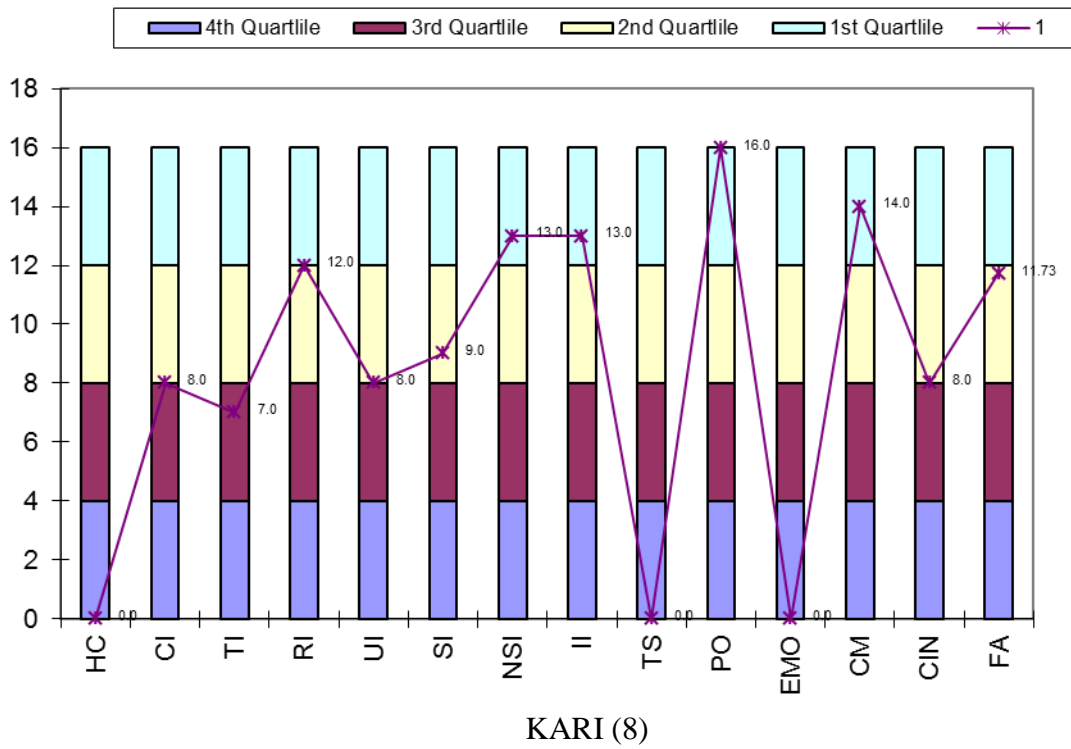
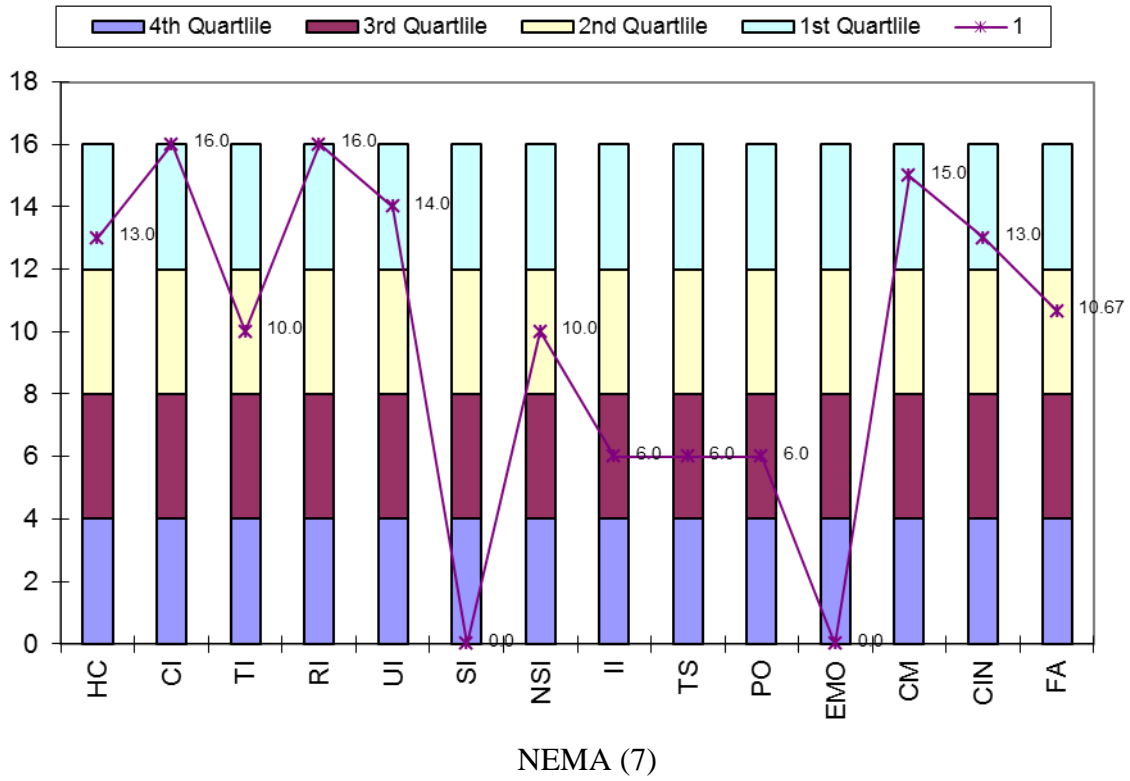
<b>39</b>	<b>FSK</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>7</b>	<b>0.17</b>	<b>1</b>	<b>28.57</b>	<b>71.43</b>
<b>40</b>	CMAD	9	6	1	0	16	0.39	1	17.65	82.35
<b>41</b>	GBM	64	57	4	1	126	3.06	2	44.88	55.12
<b>42</b>	KEEP	3	0	0	0	3	0.07	1	0	100
<b>43</b>	UCRC	7	0	0	0	7	0.17	1	57.14	42.86
<b>44</b>	KENVO	5	3	2	0	10	0.24	1	18.18	81.82
<b>45</b>	REFSO	5	2	0	0	7	0.17	1	42.86	57.14
<b>46</b>	CHEK	2	0	0	0	2	0.05	1	100	100
<b>47</b>	GAF	0	0	0	0	0	0.00	1	0	100
<b>48</b>	TSL	34	6	1	0	41	1.00	2	26.83	73.17
<b>49</b>	BAC	18	7	7	0	32	0.78	2	34.37	65.63
<b>50</b>	LE	1	1	2	0	4	0.10	1	75	25
<b>51</b>	NV	2	1	0	0	3	0.07	1	66.67	33.33
	<b>Total</b>	<b>1280</b>	<b>997</b>	<b>1178</b>	<b>662</b>	<b>4117</b>	<b>100.00</b>			
	<b>Average</b>								<b>25.04</b>	<b>71.01</b>
	<b>Category</b>	<b>No.</b>								
<b>1</b>	Dip	1280								
<b>2</b>	BSc	997								
<b>3</b>	MSc	1178								
<b>4</b>	PhD	662								
	<b>Total</b>	<b>4117</b>								

### Appendix 4.1: Conservation Capacity Profiles by Institution

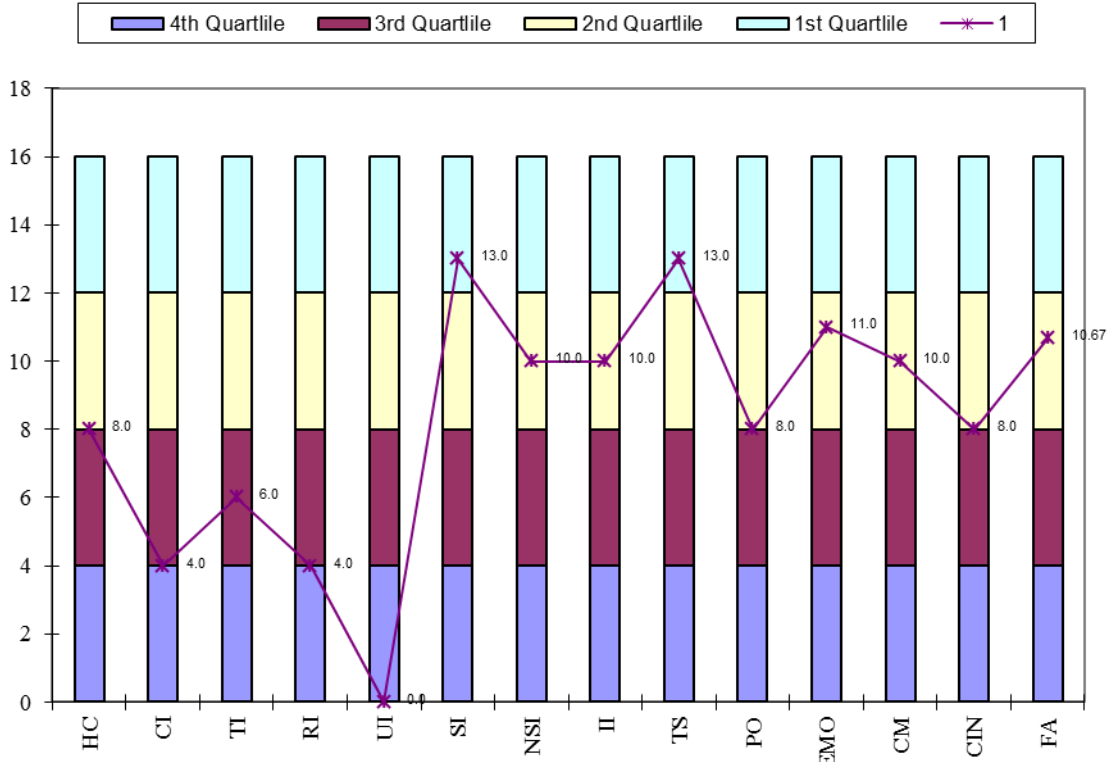




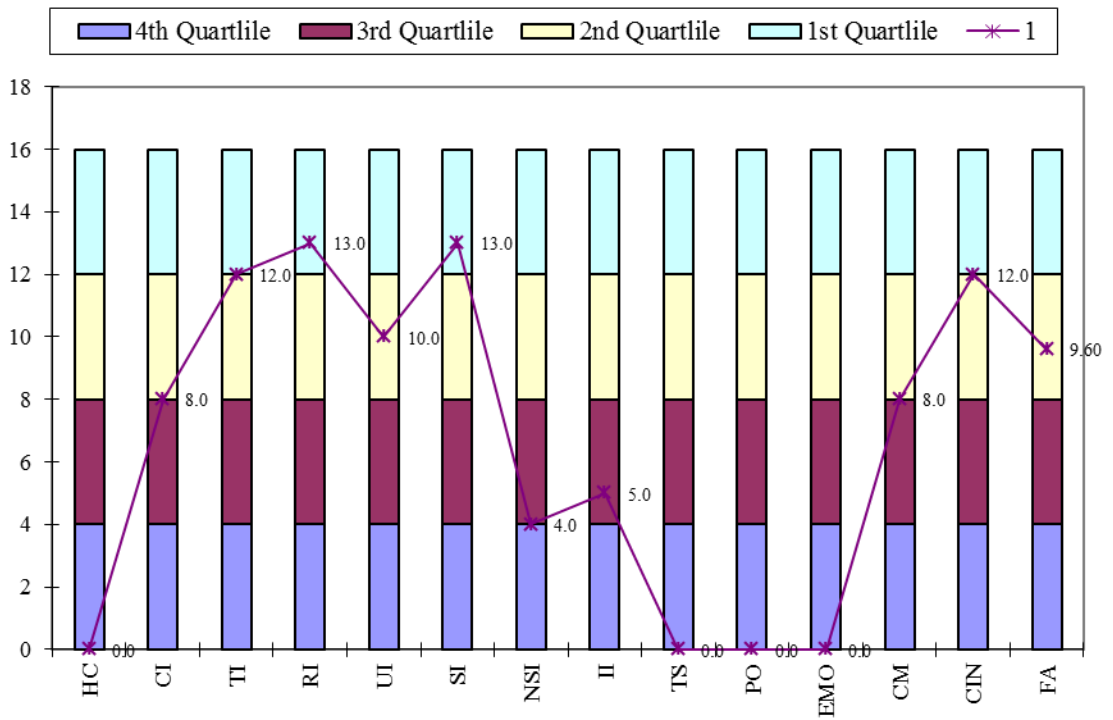




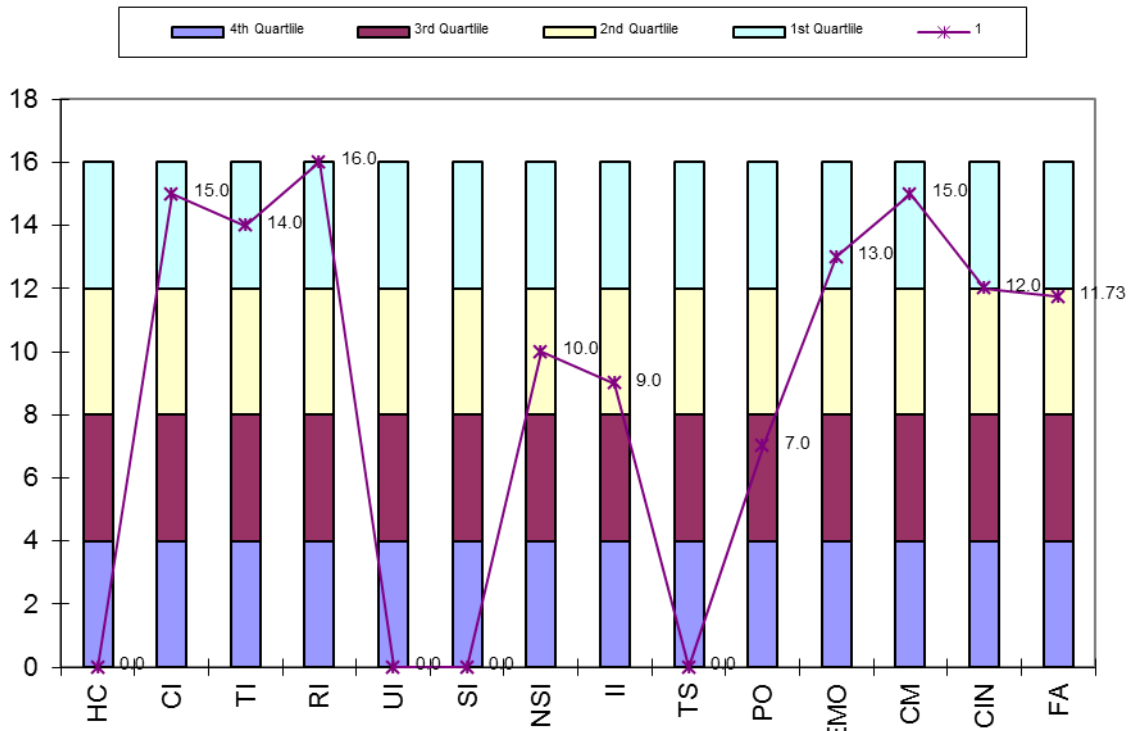




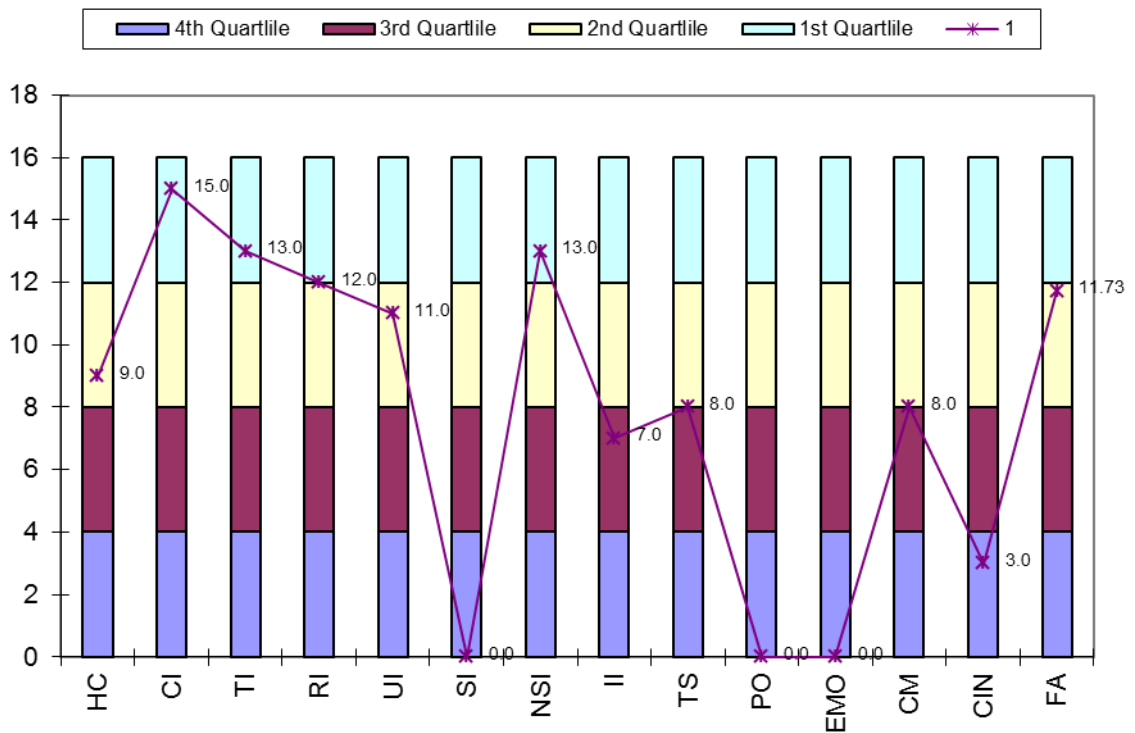
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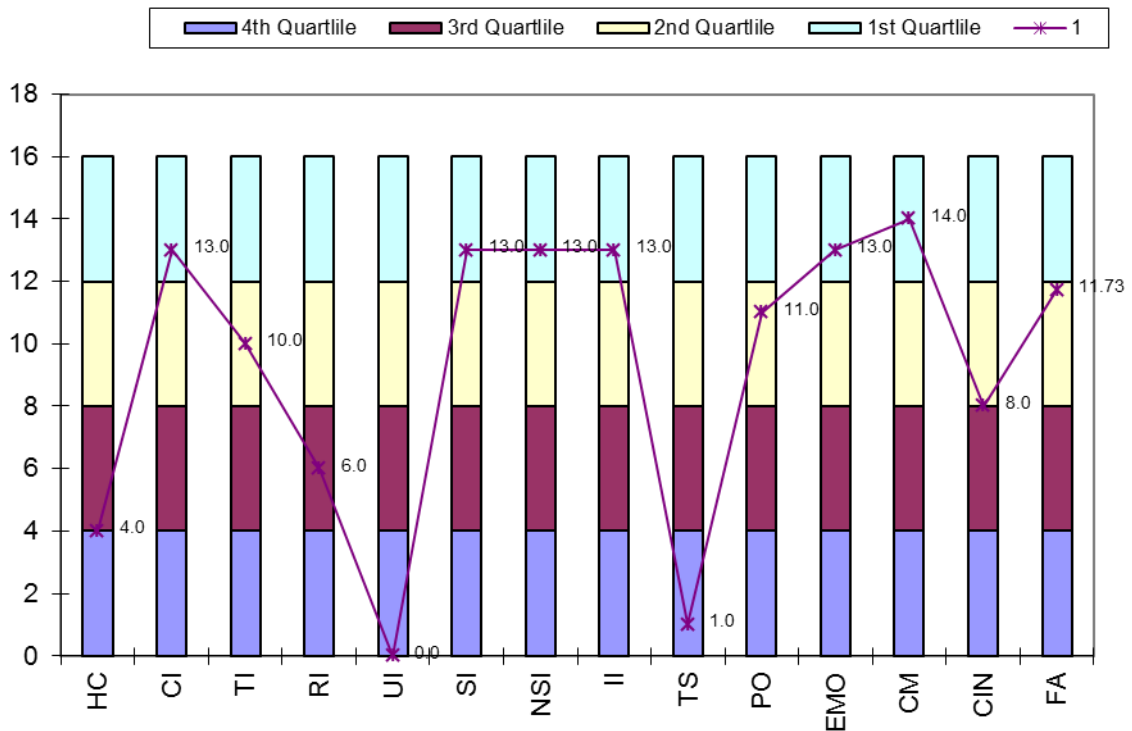
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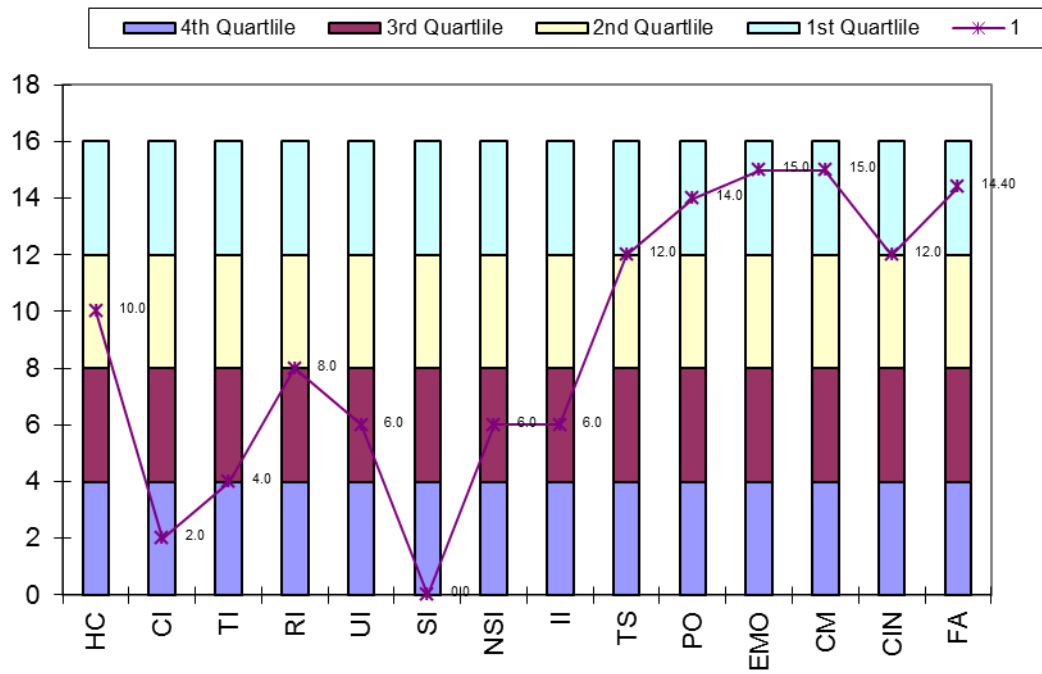
KWS (11)



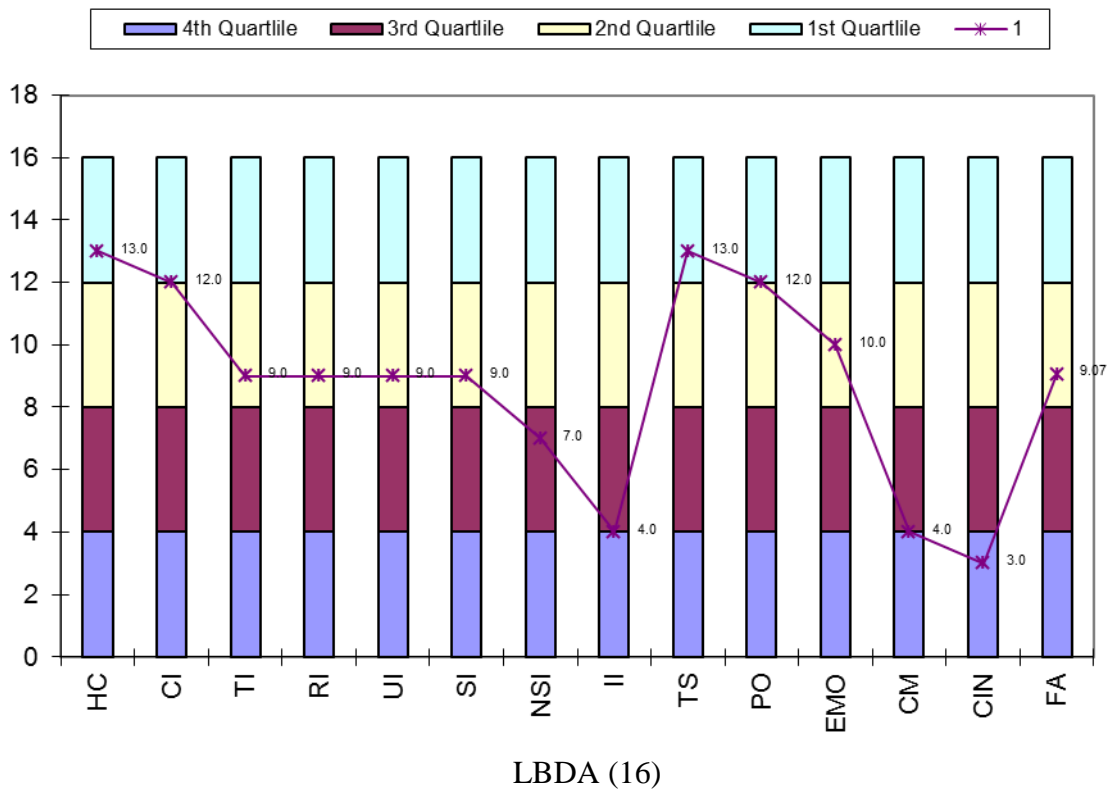
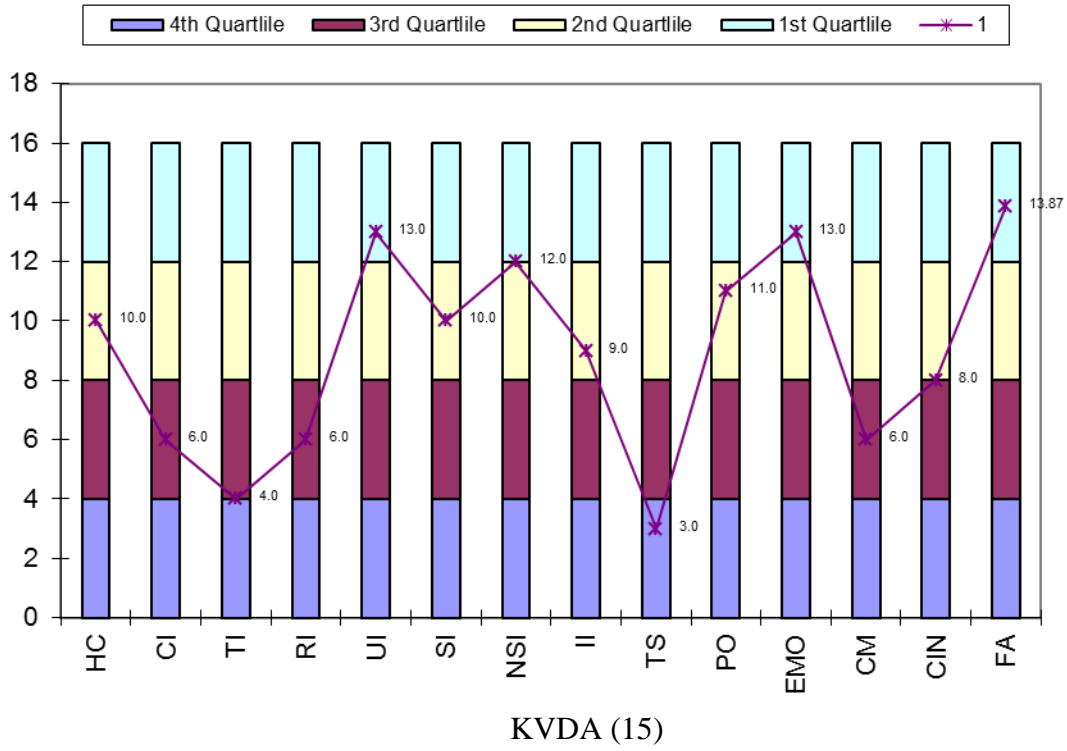
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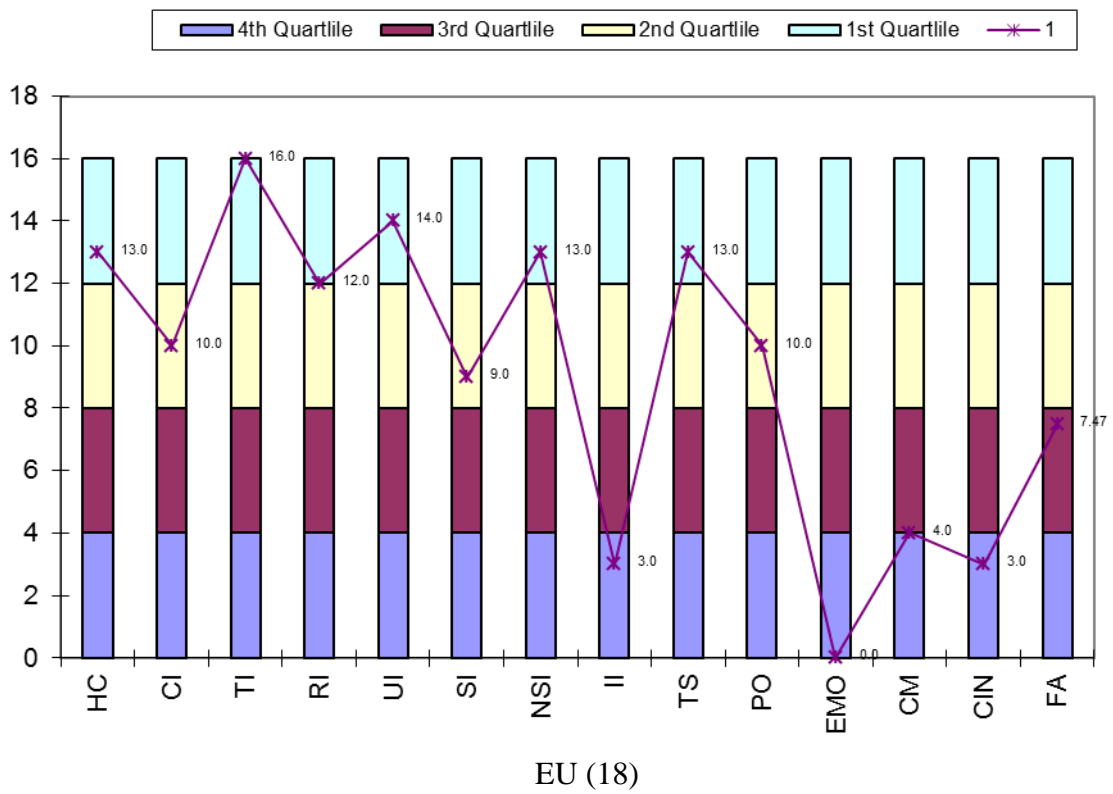
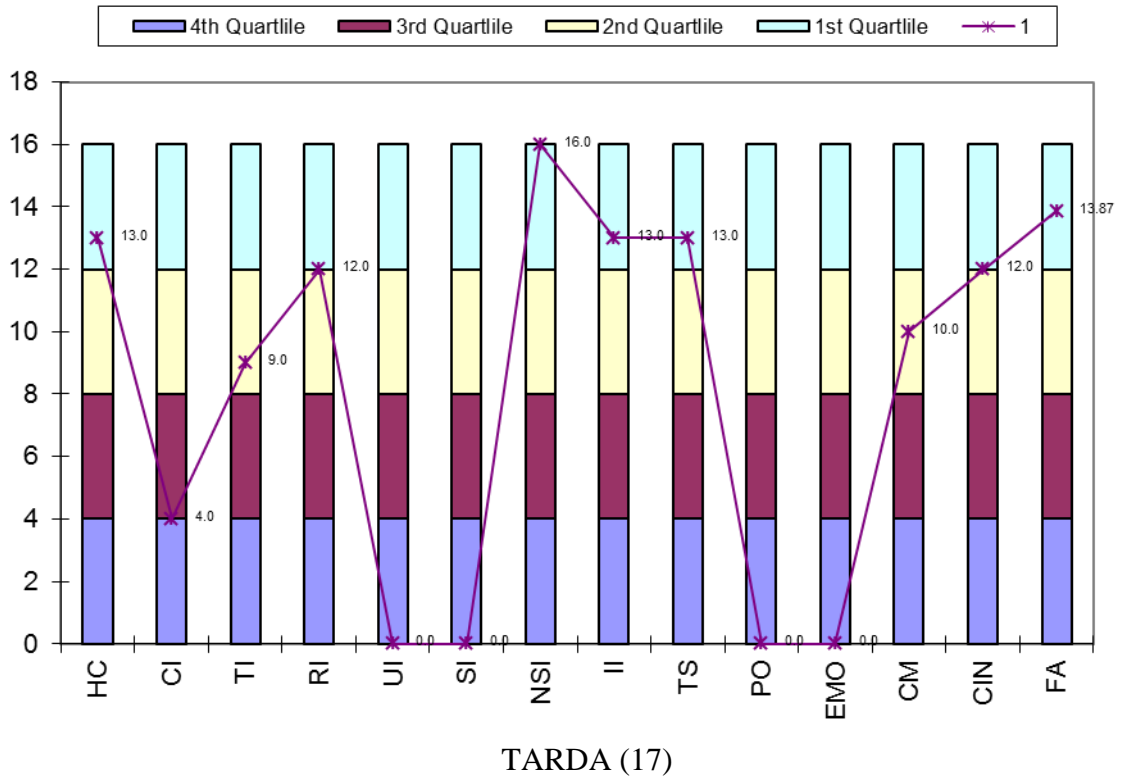


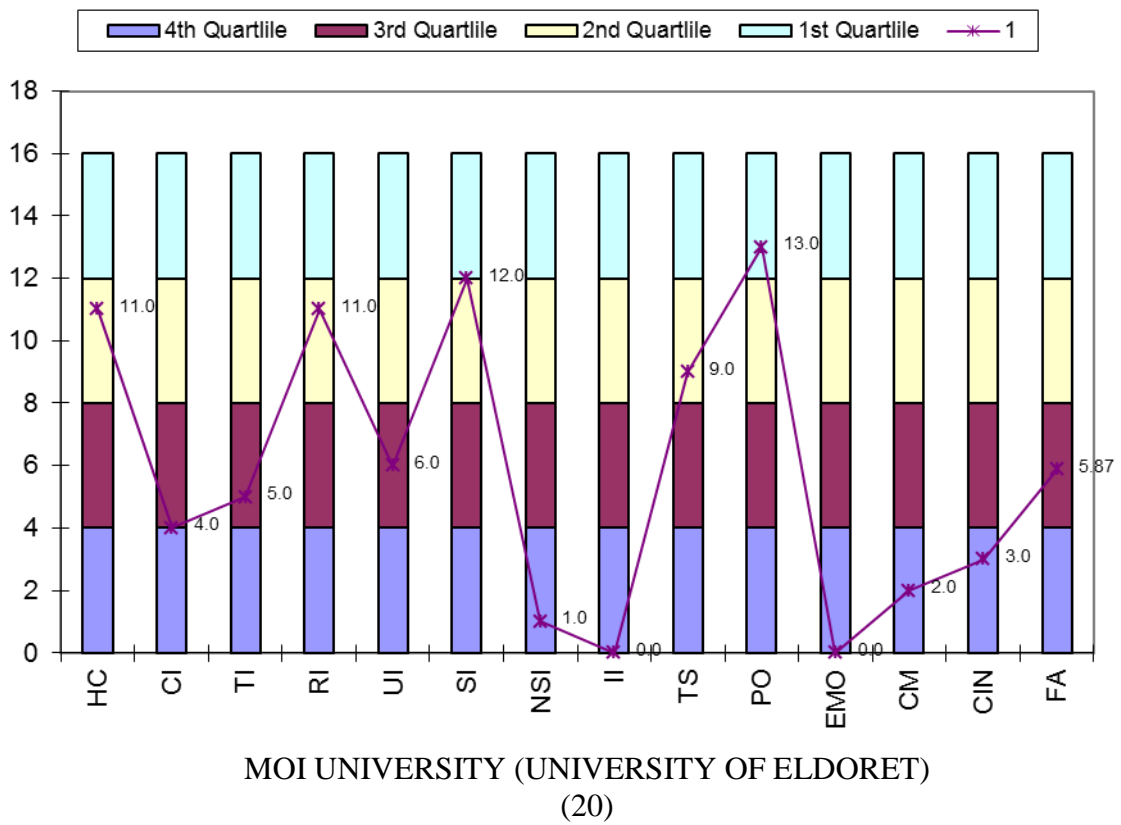
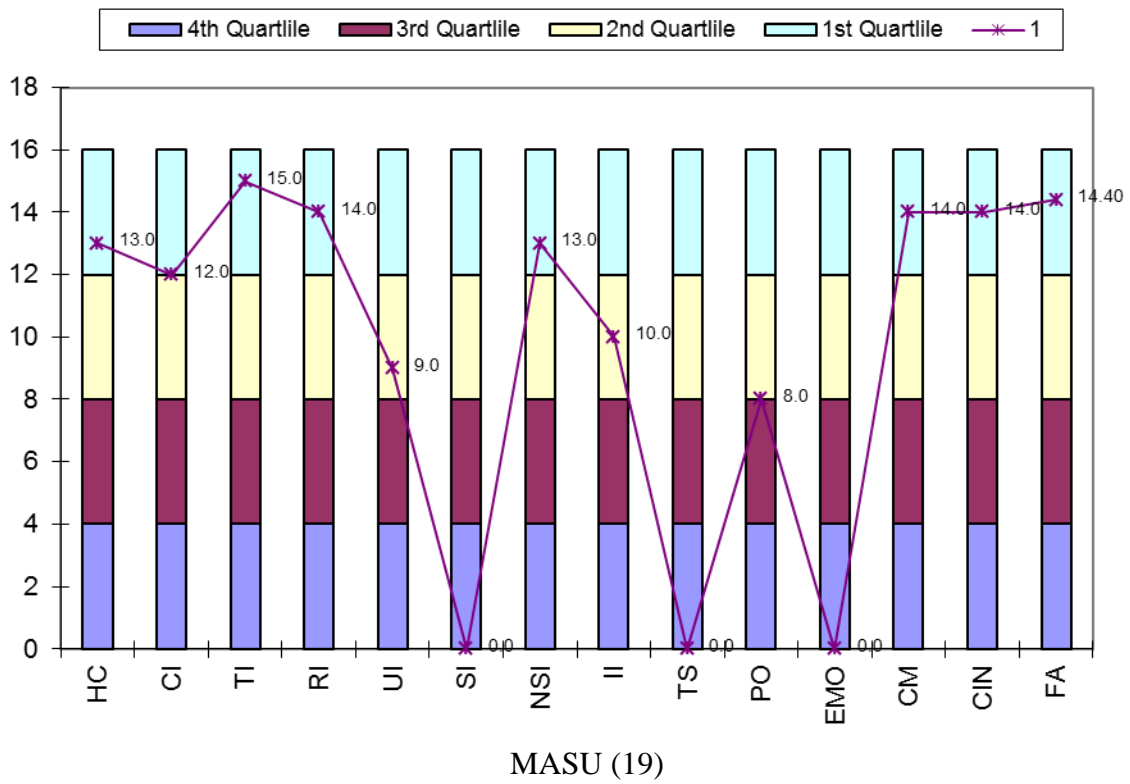
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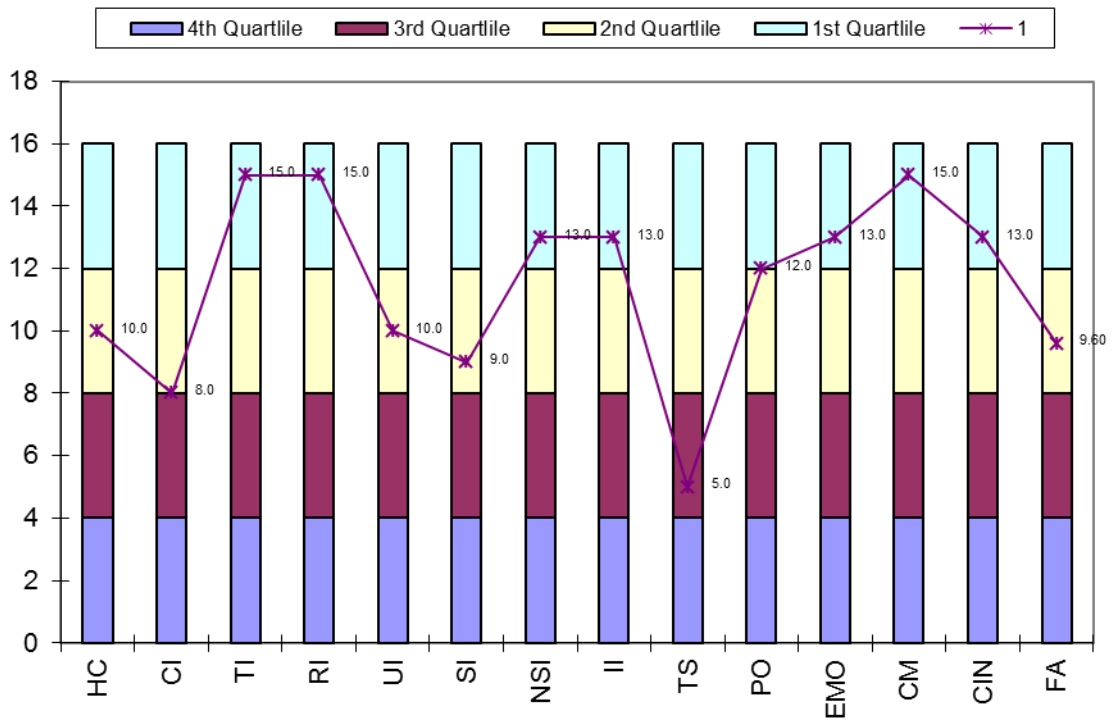


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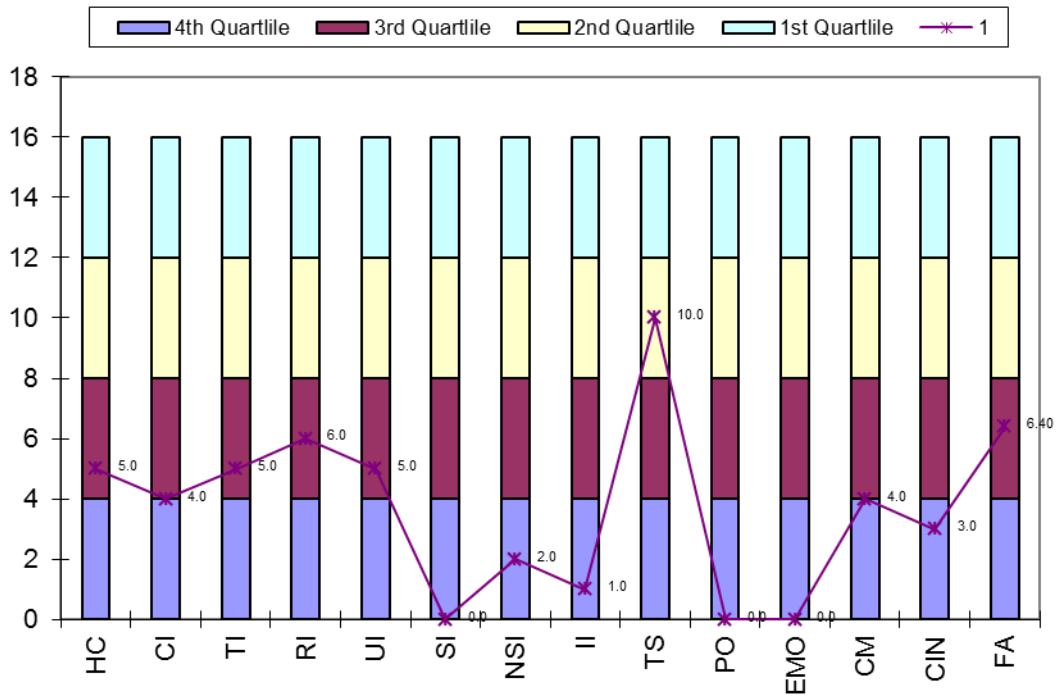




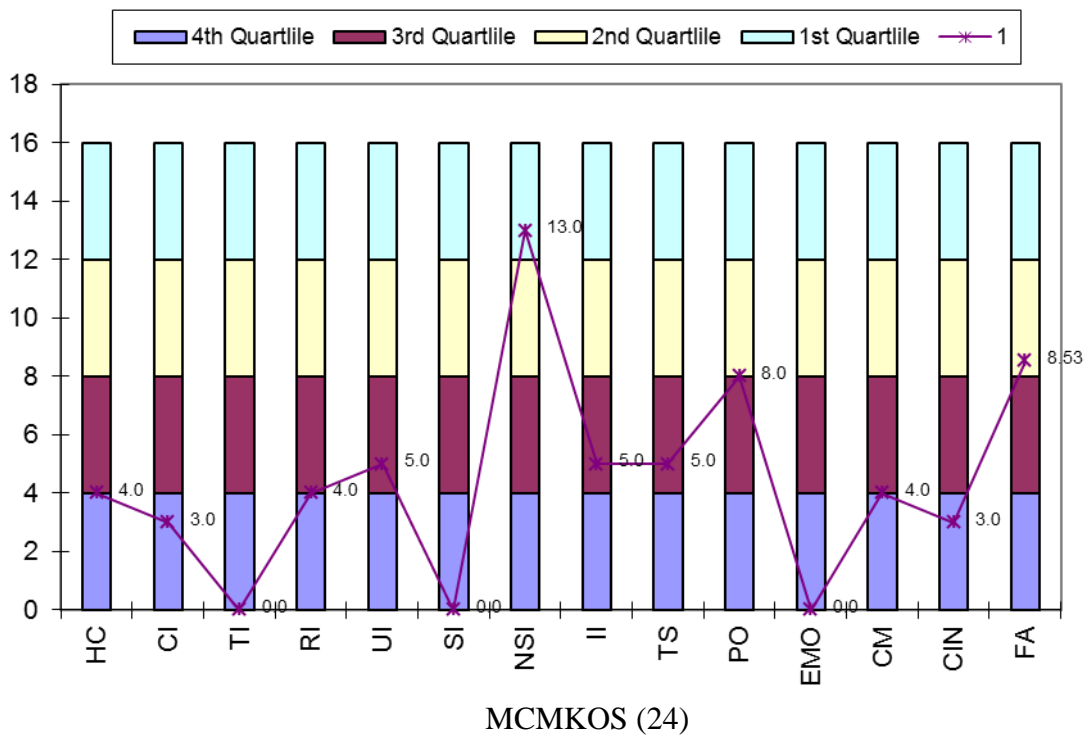
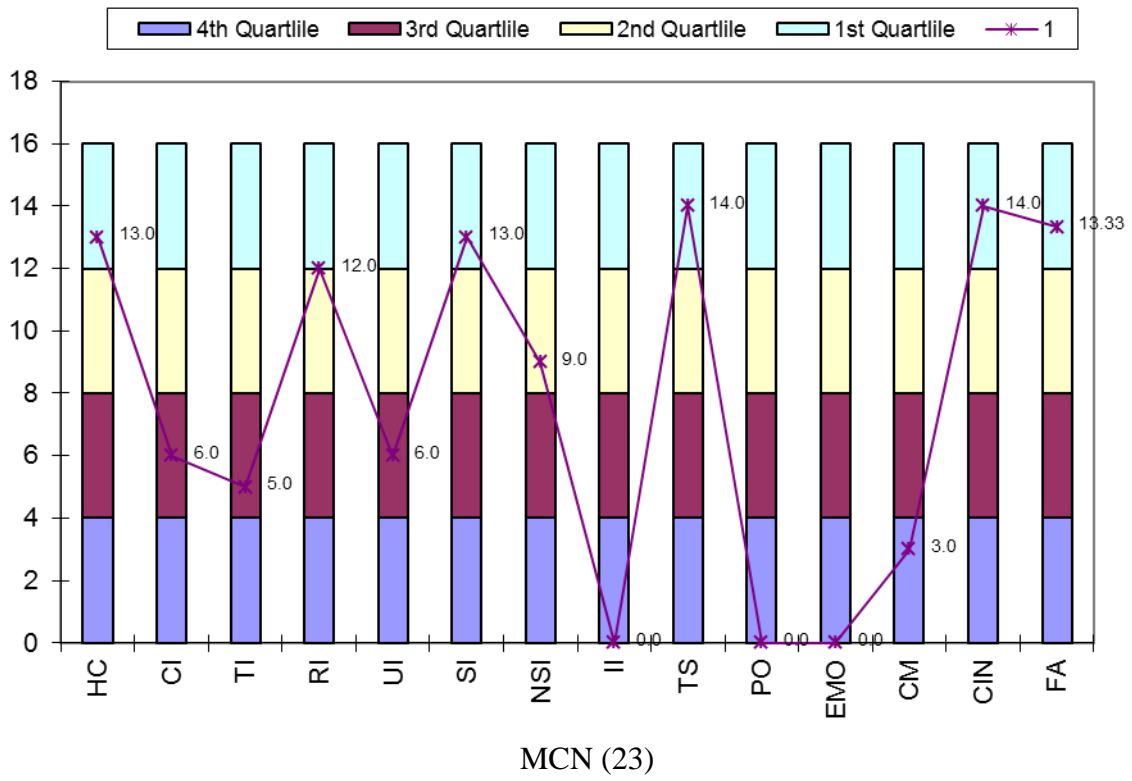




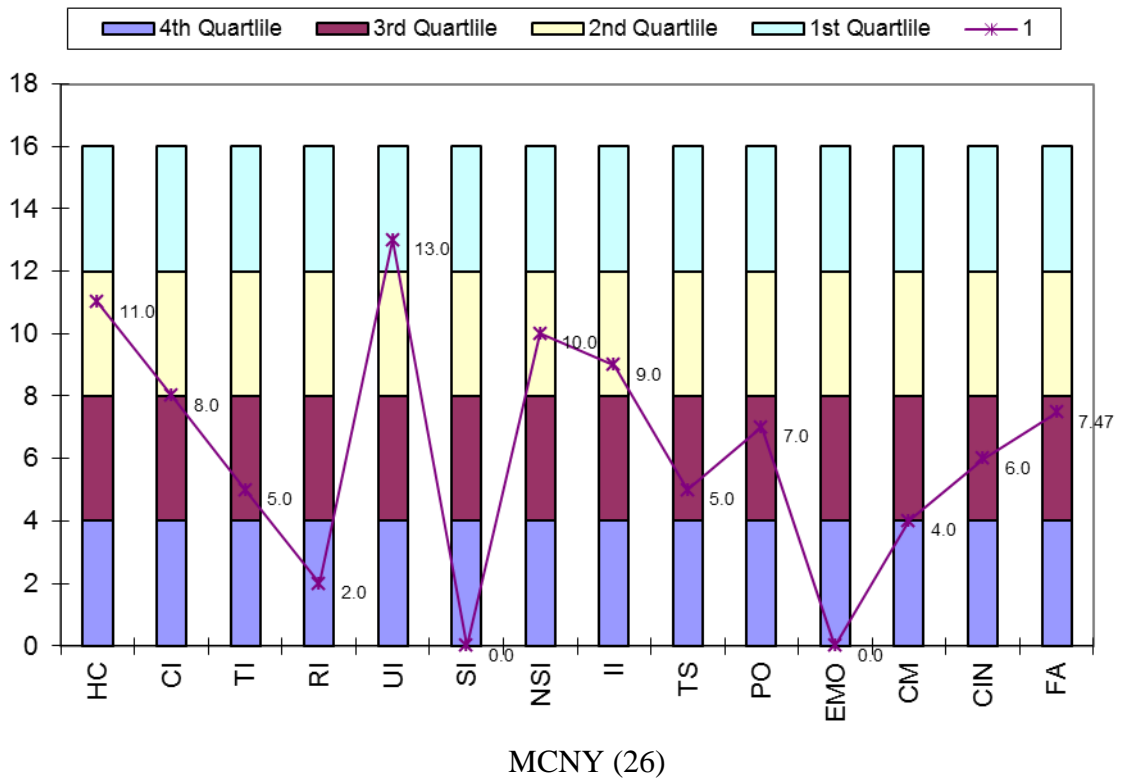
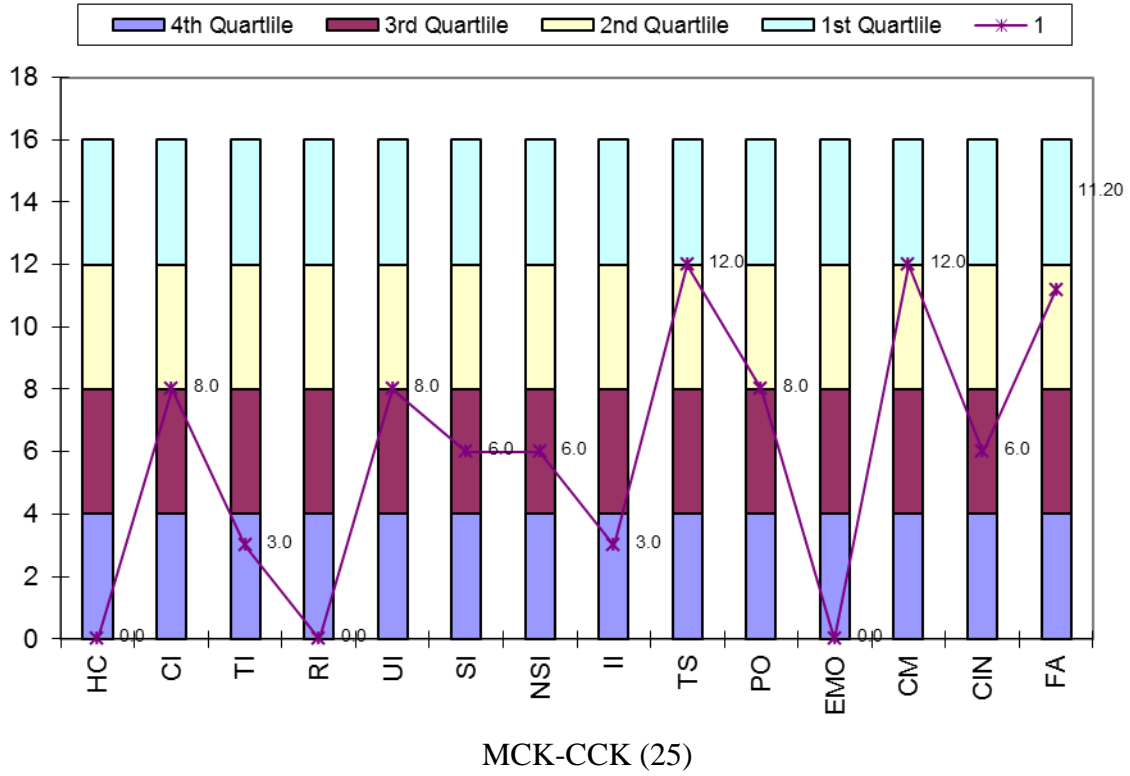
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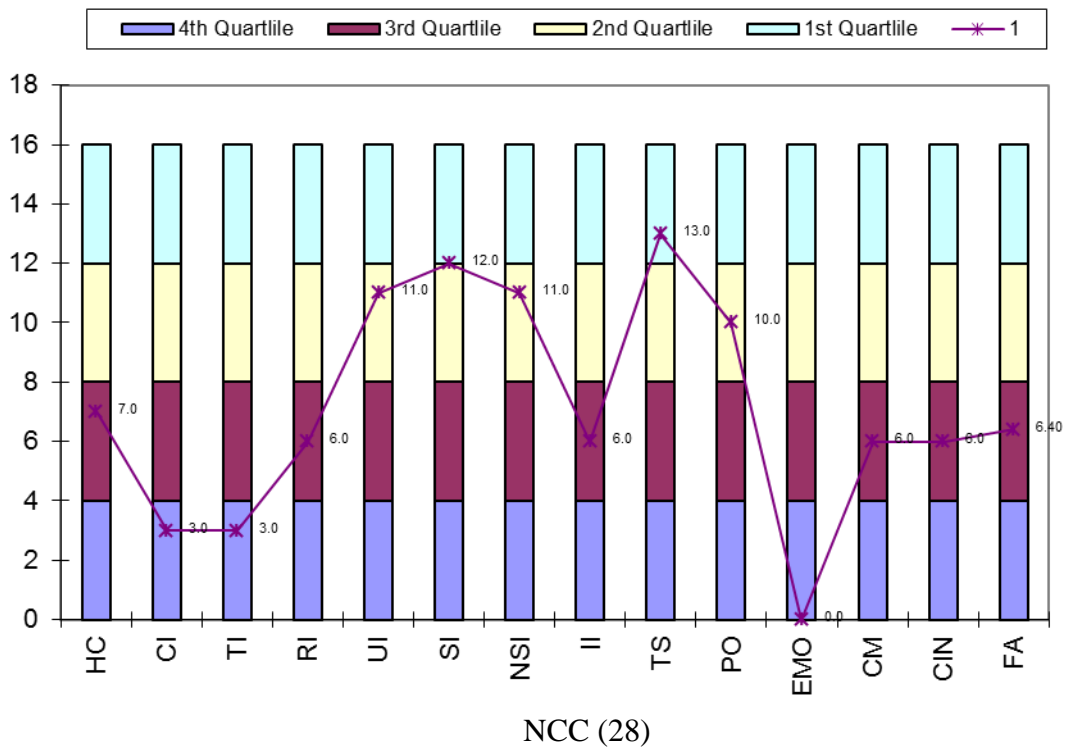
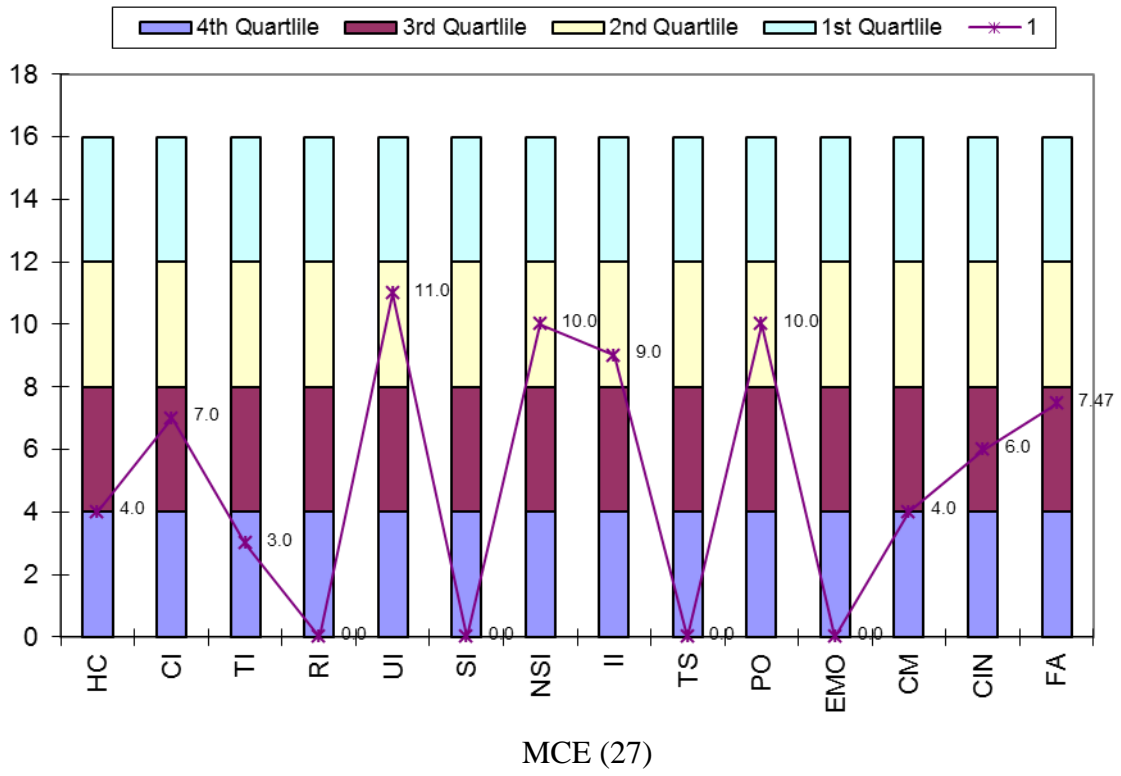


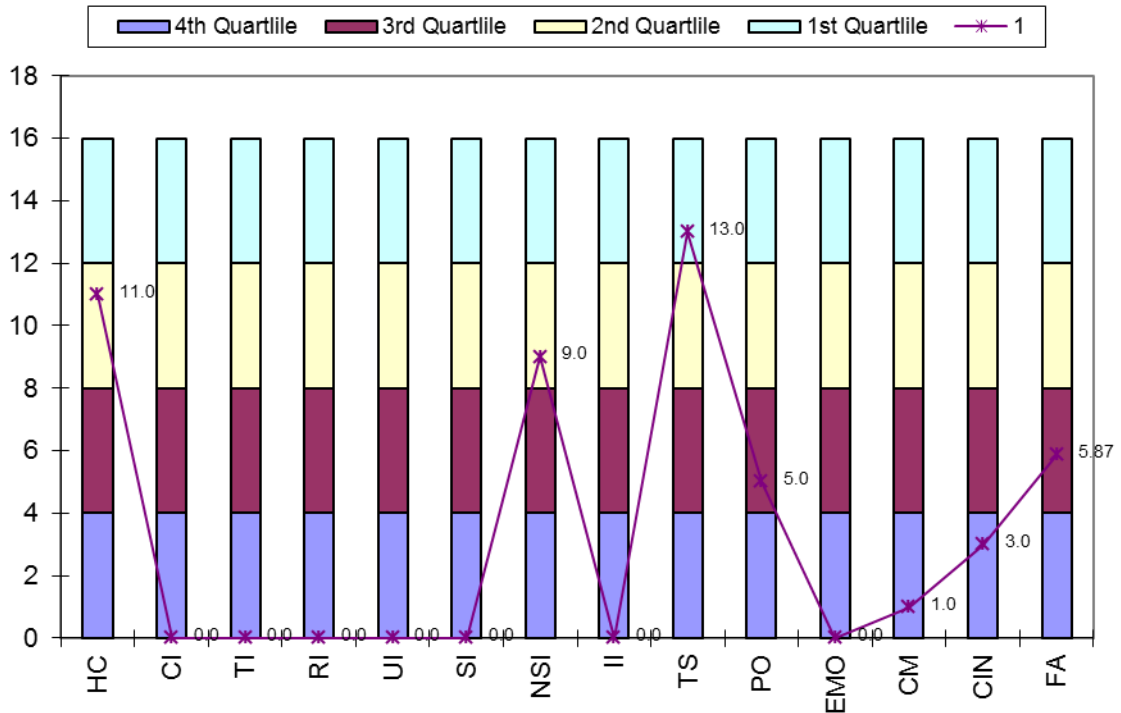
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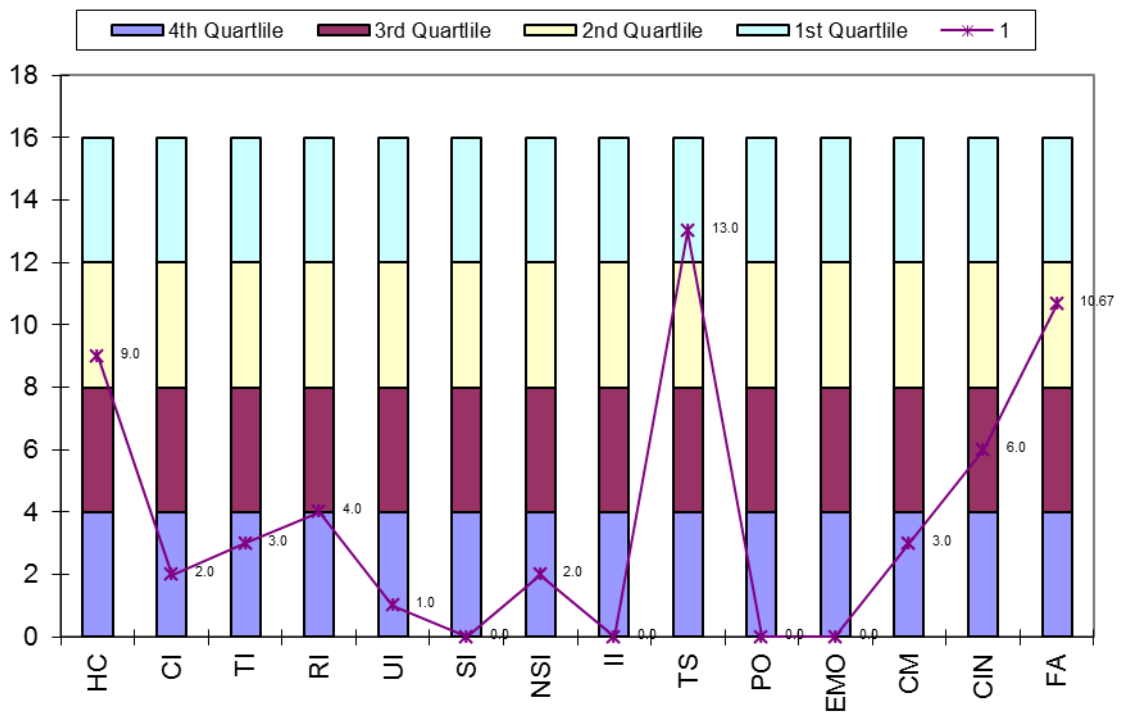




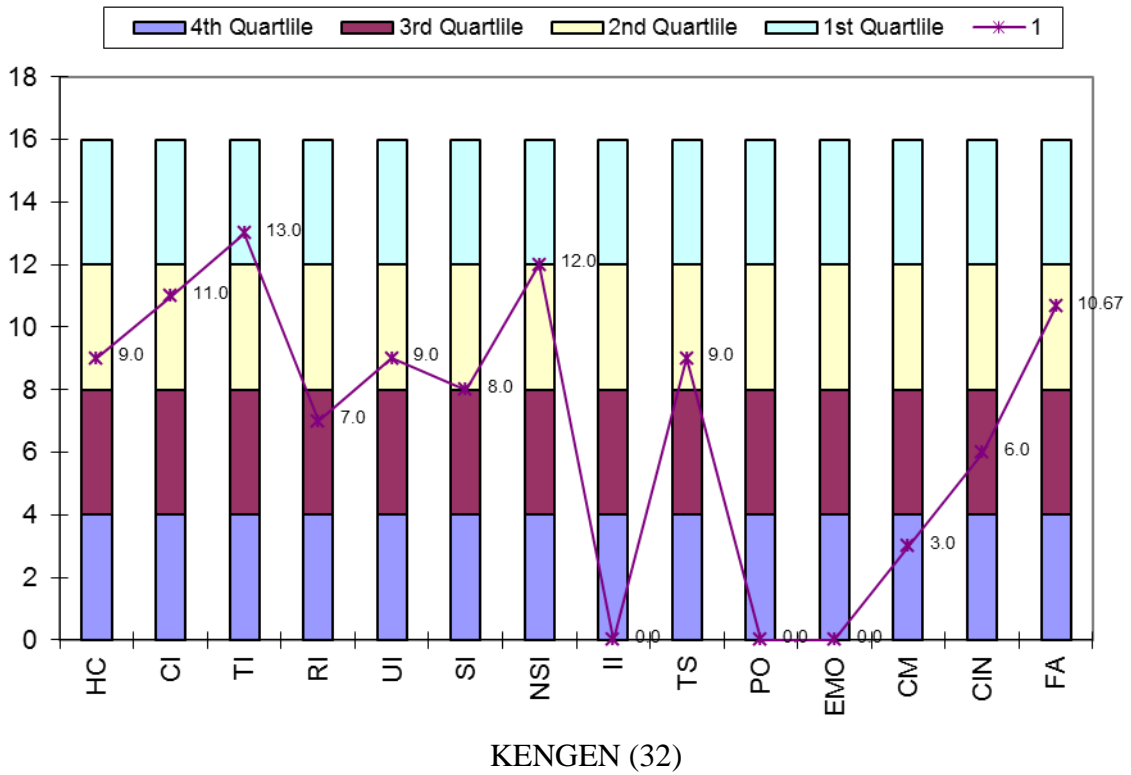
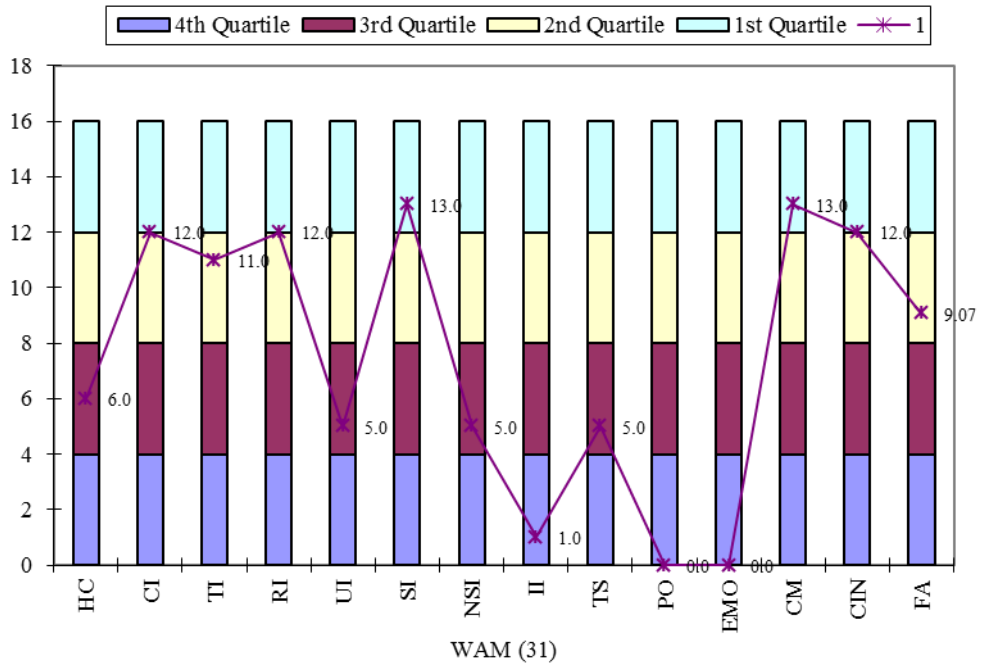


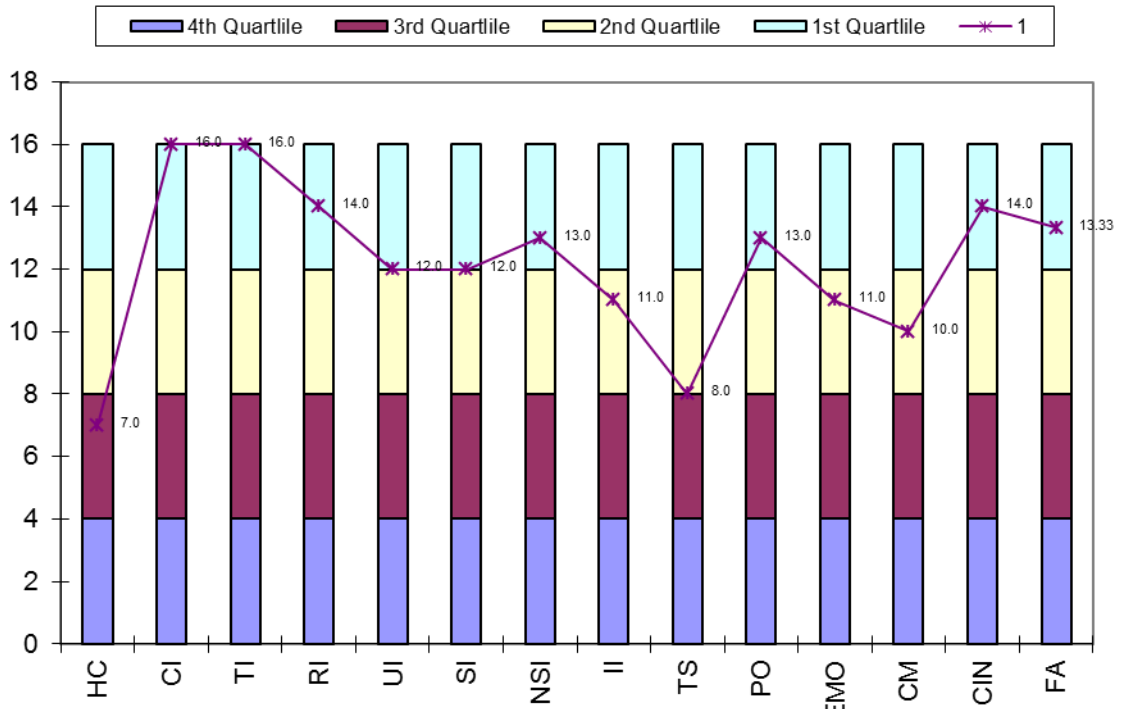


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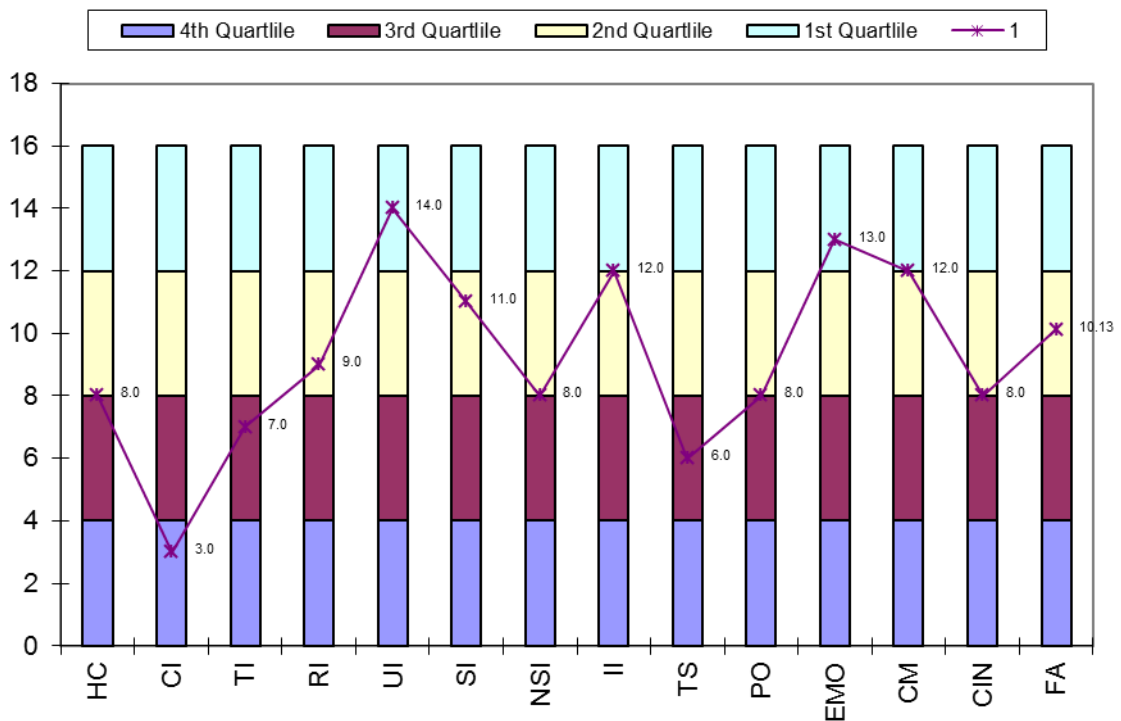


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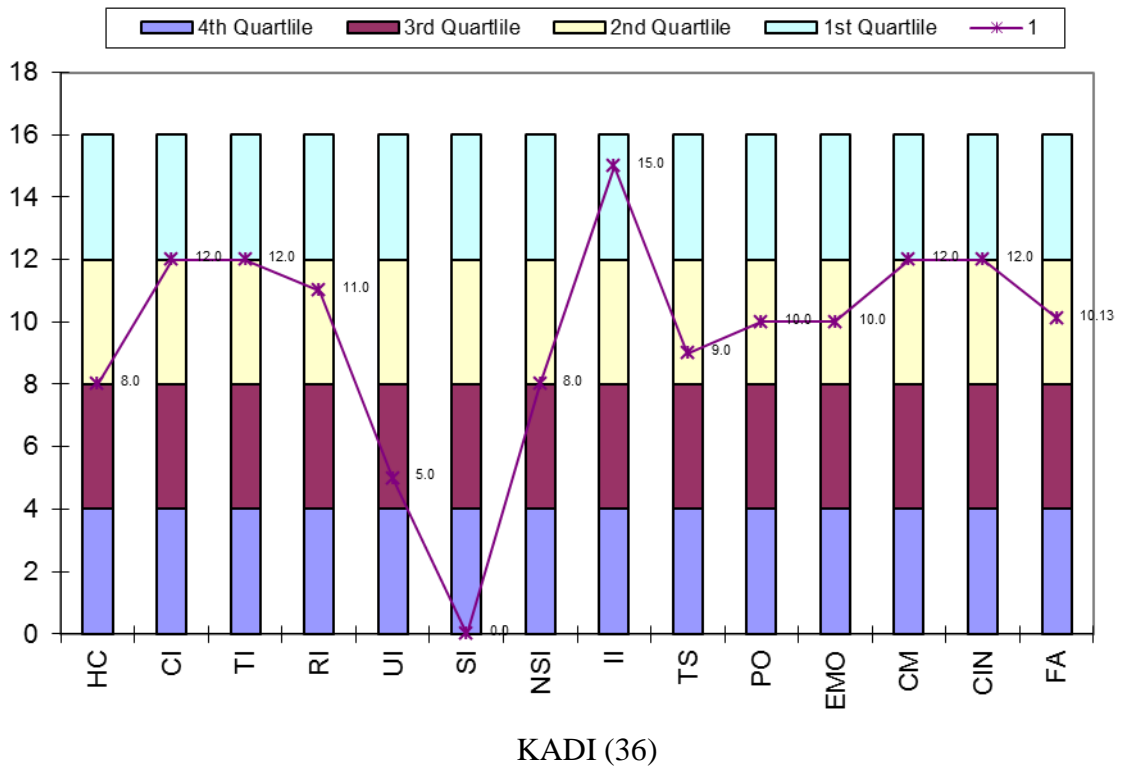
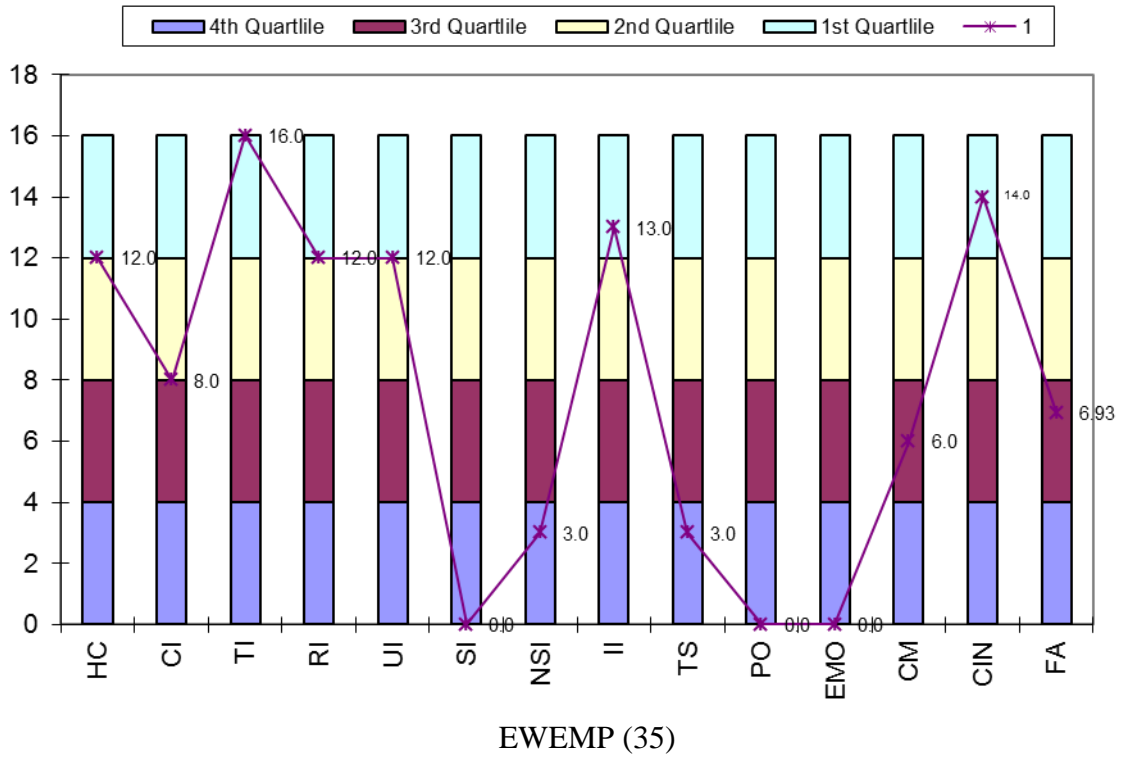


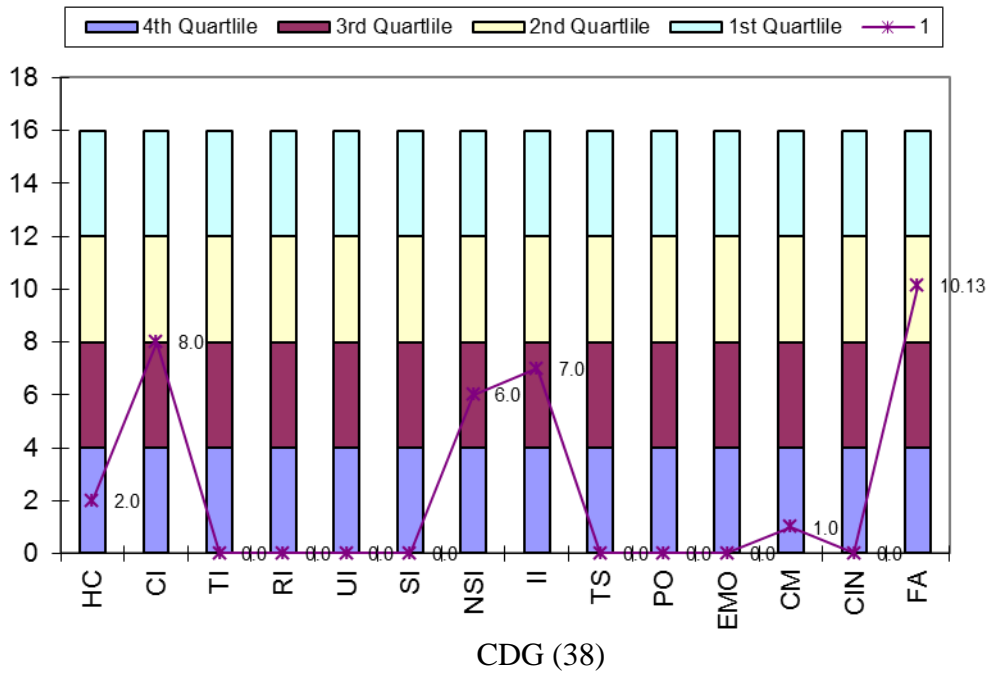
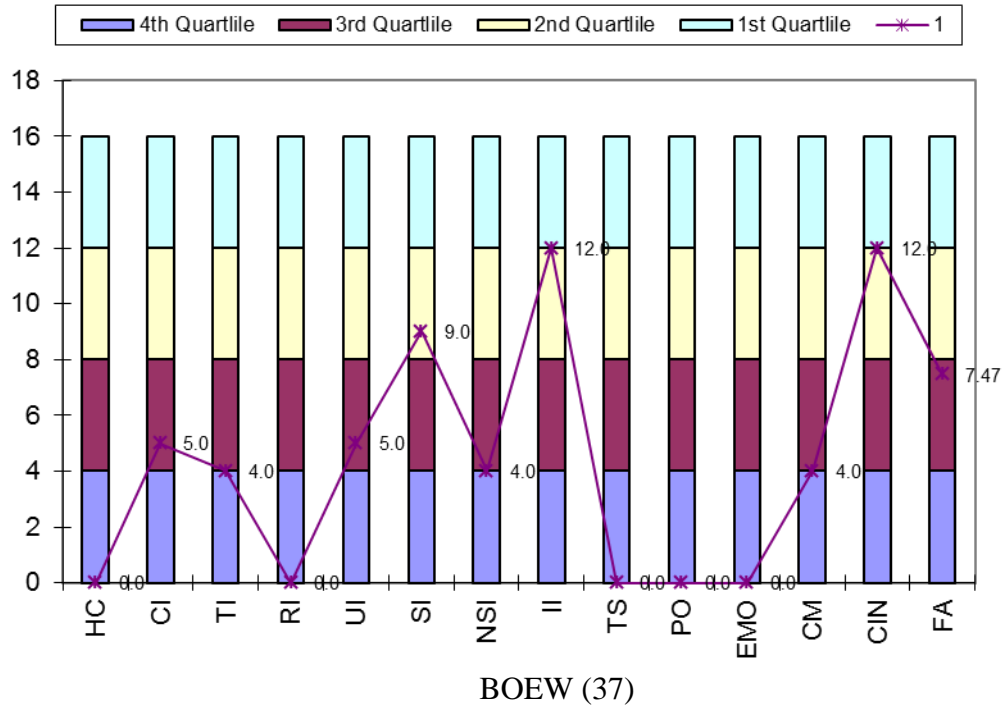


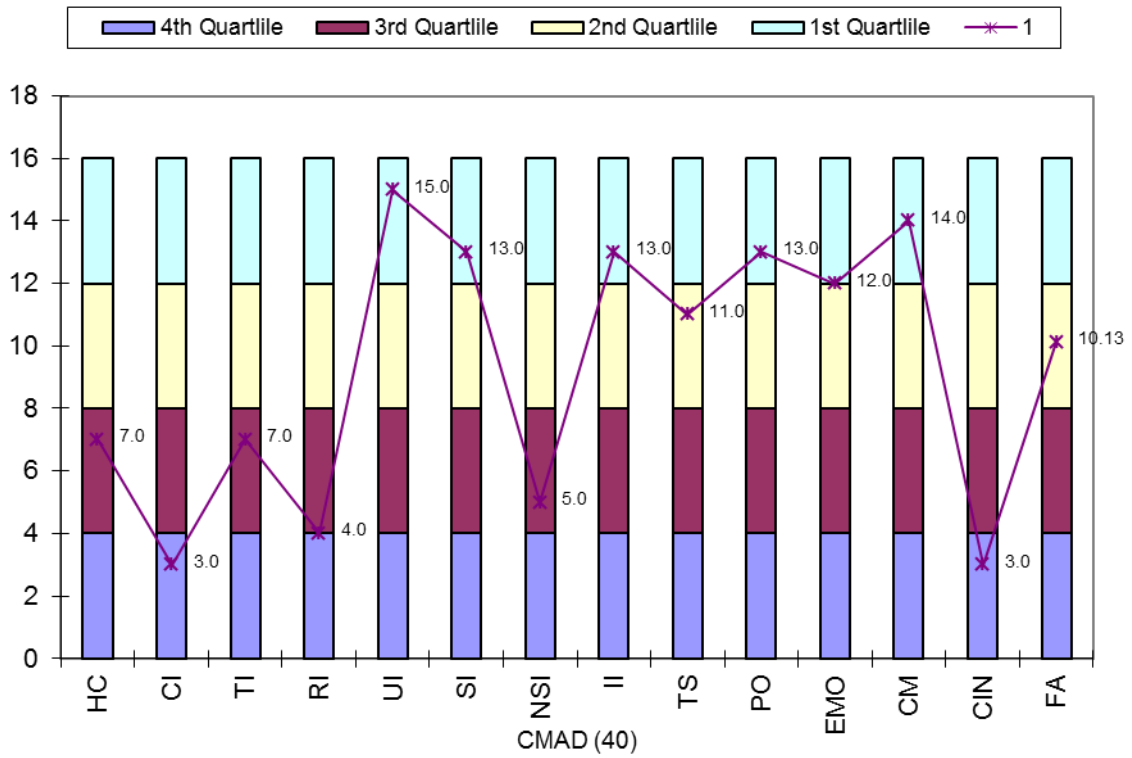
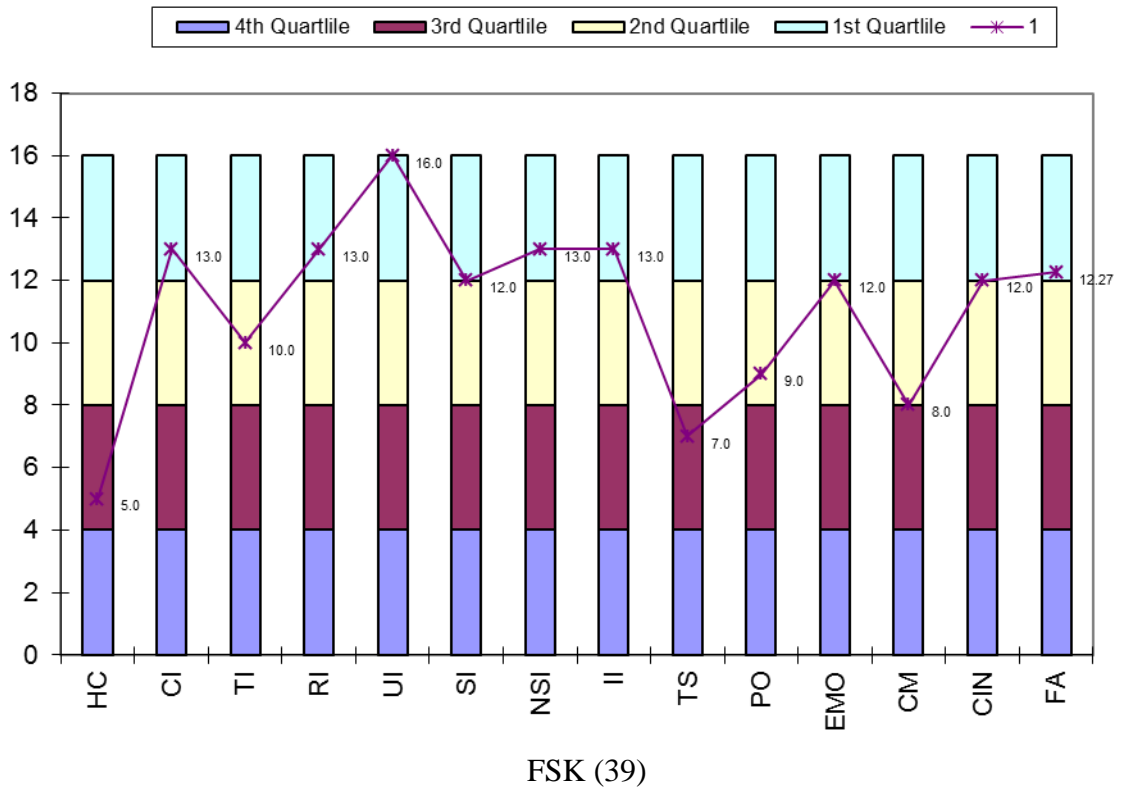
MHAC (33)



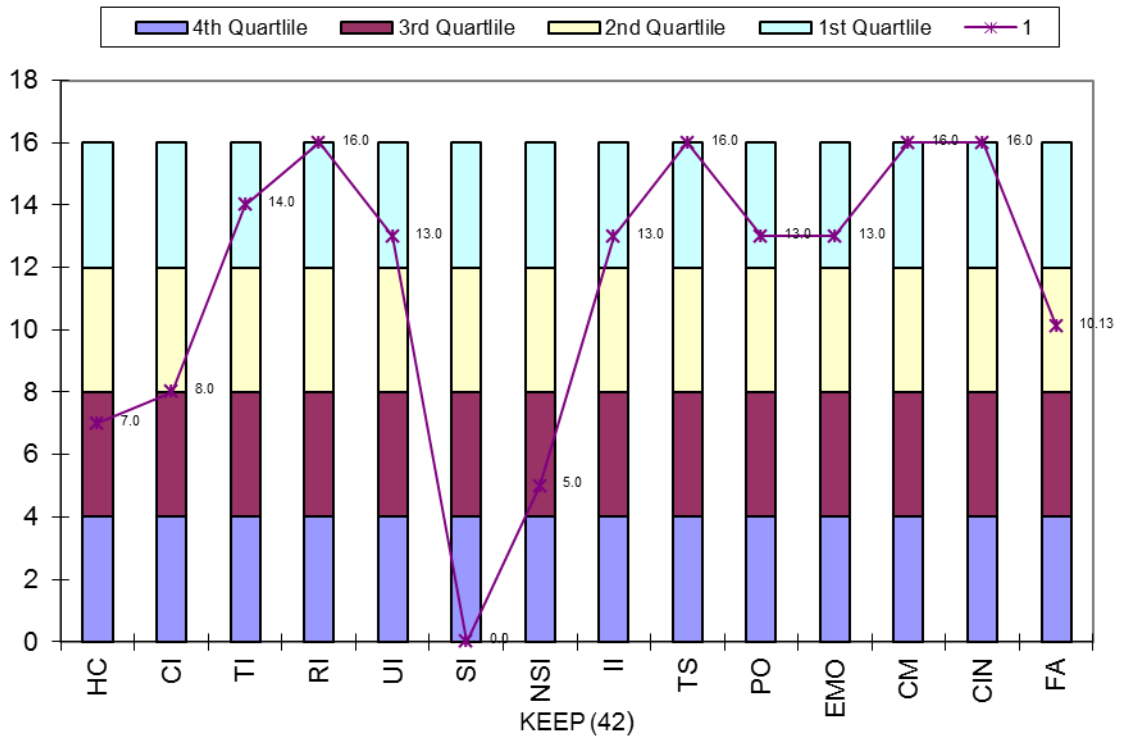
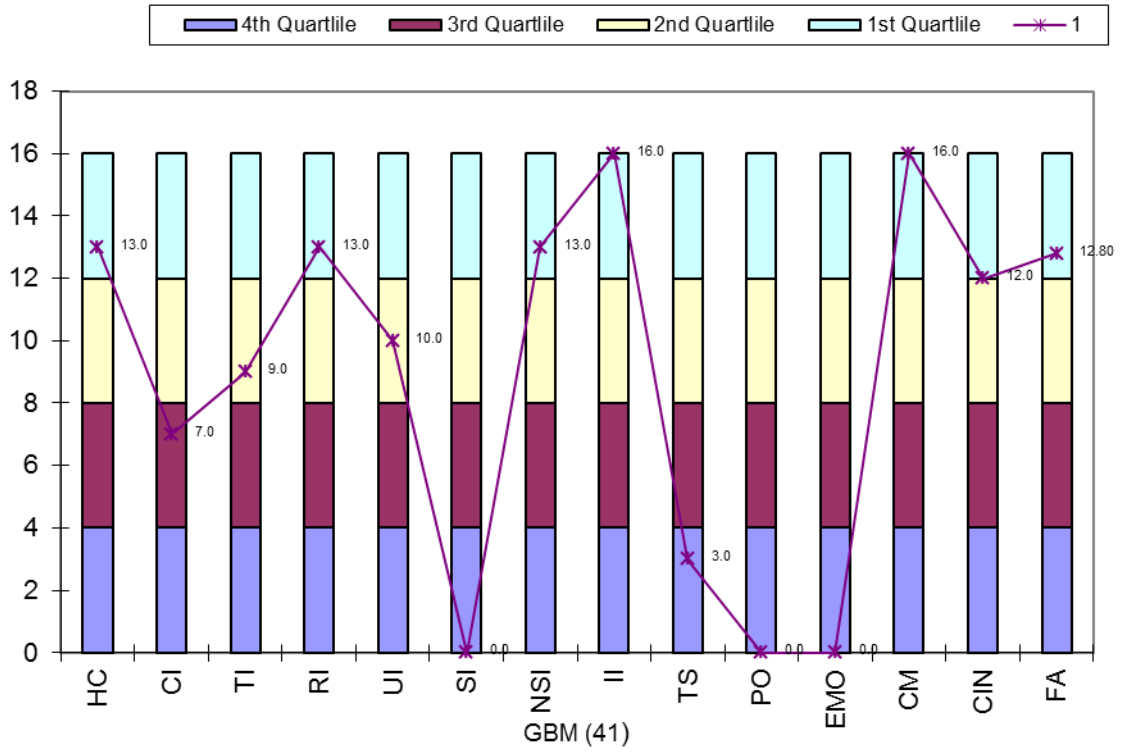
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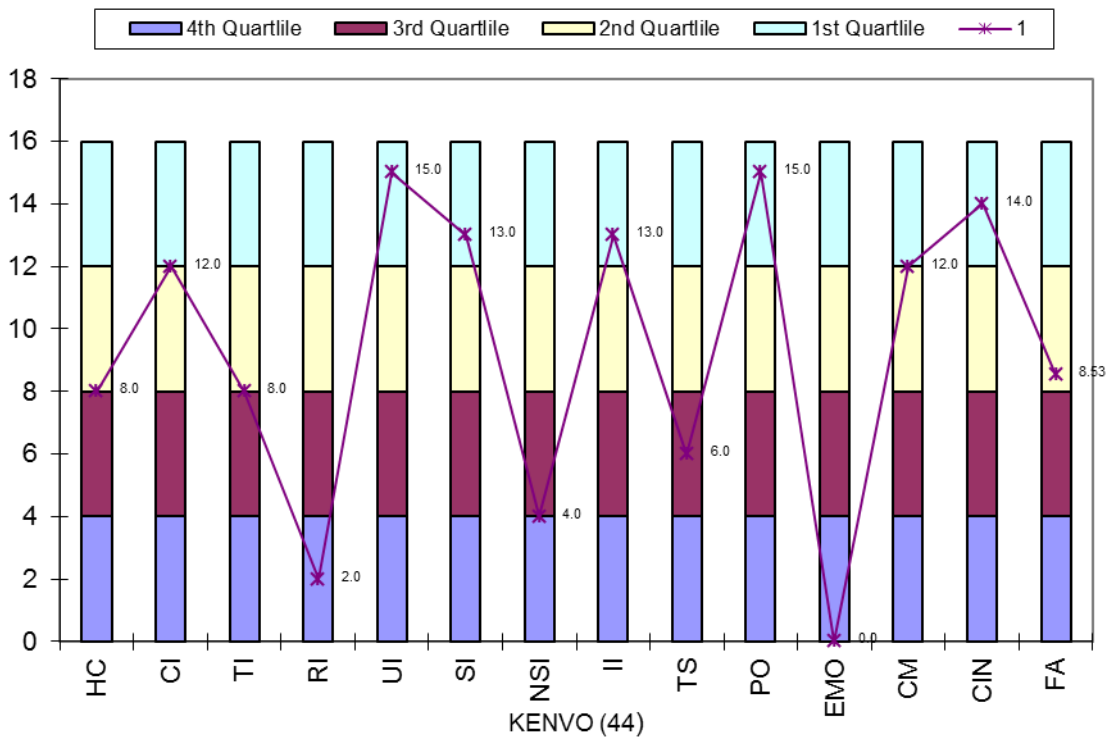
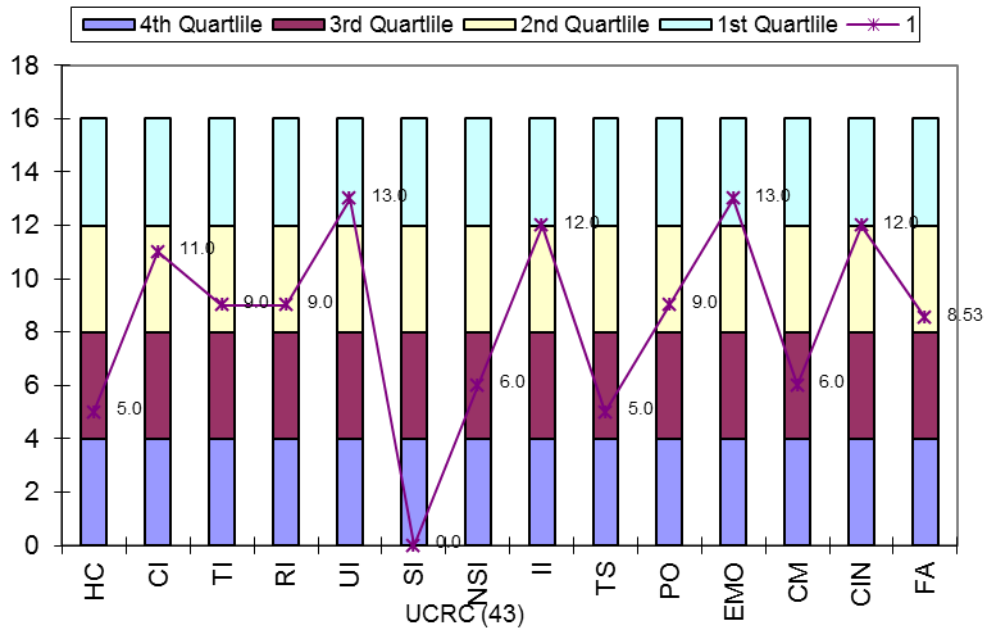


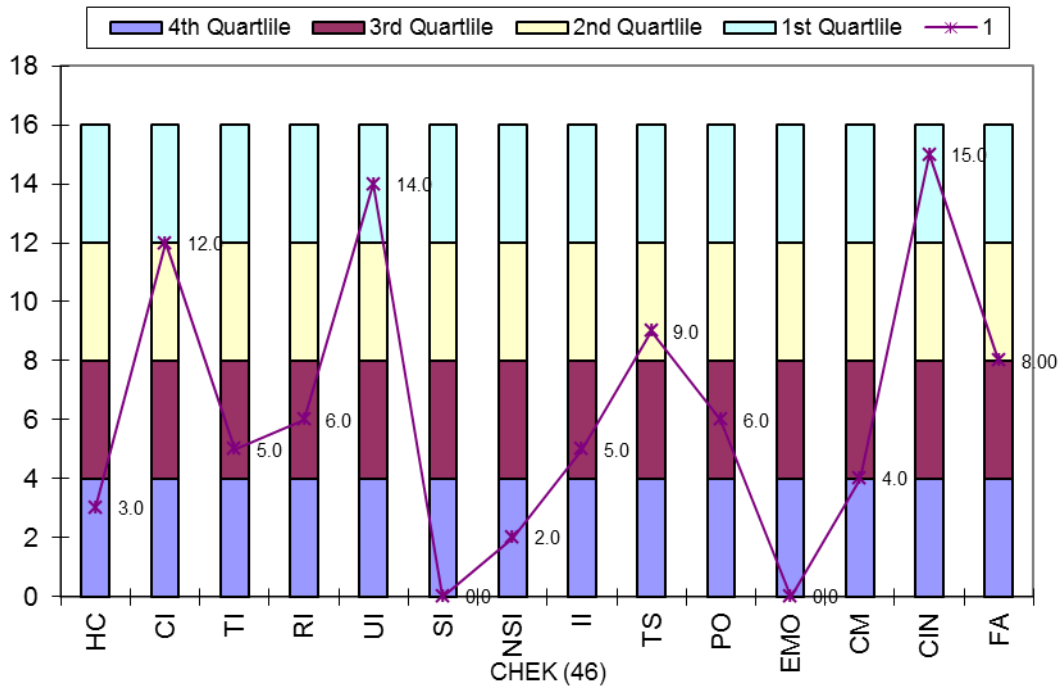
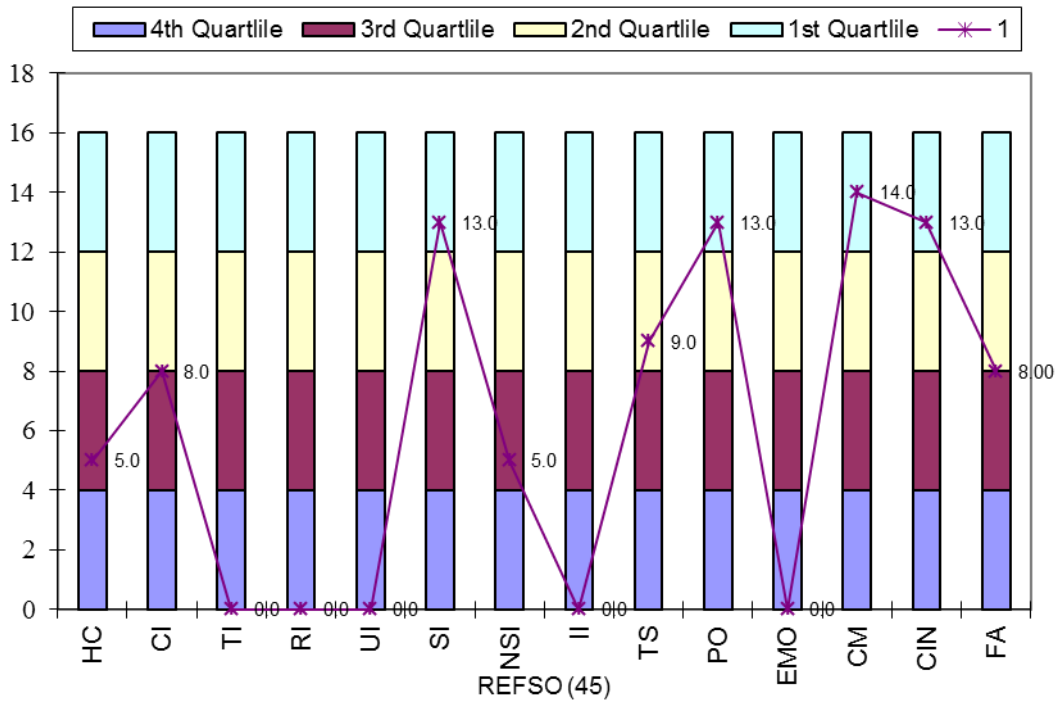


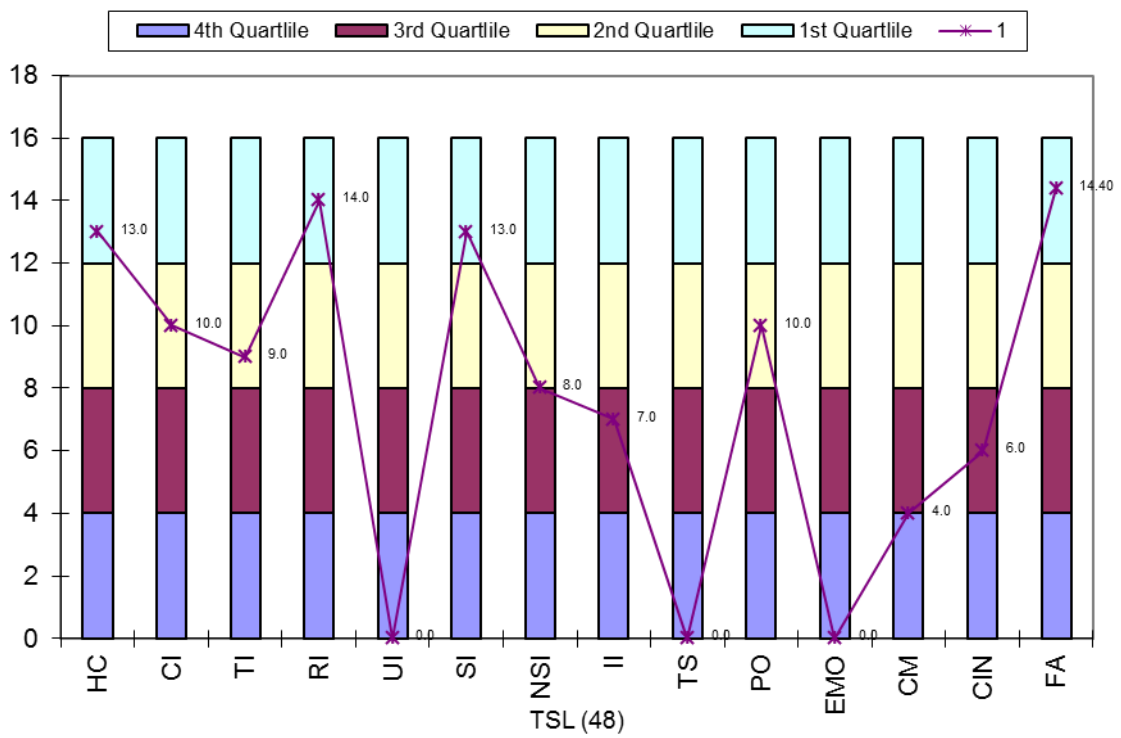
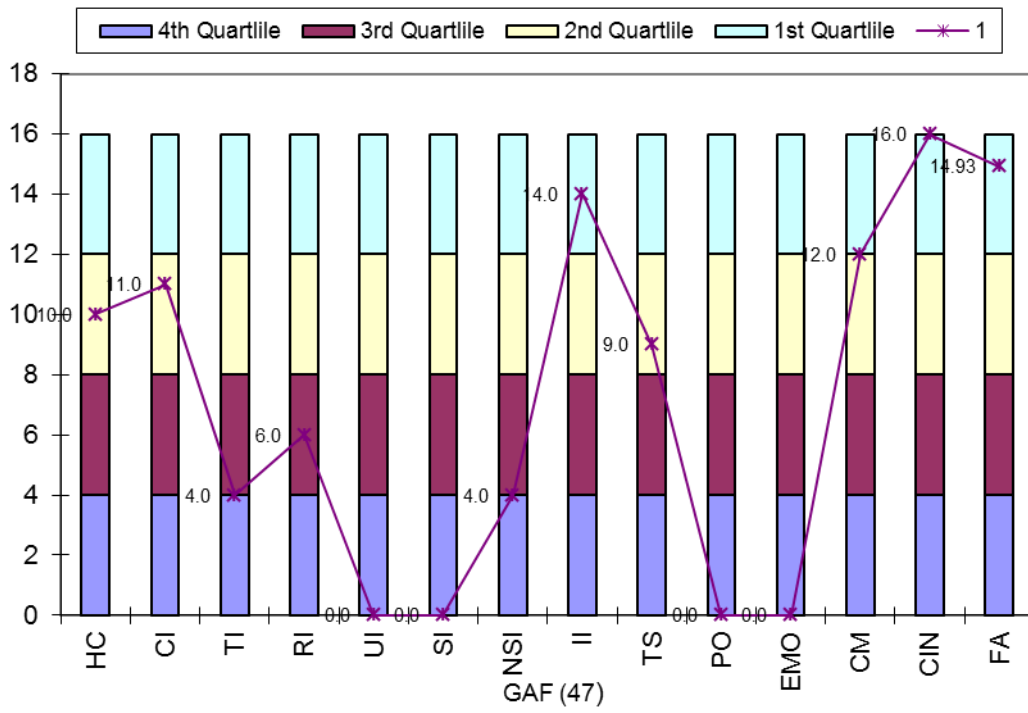


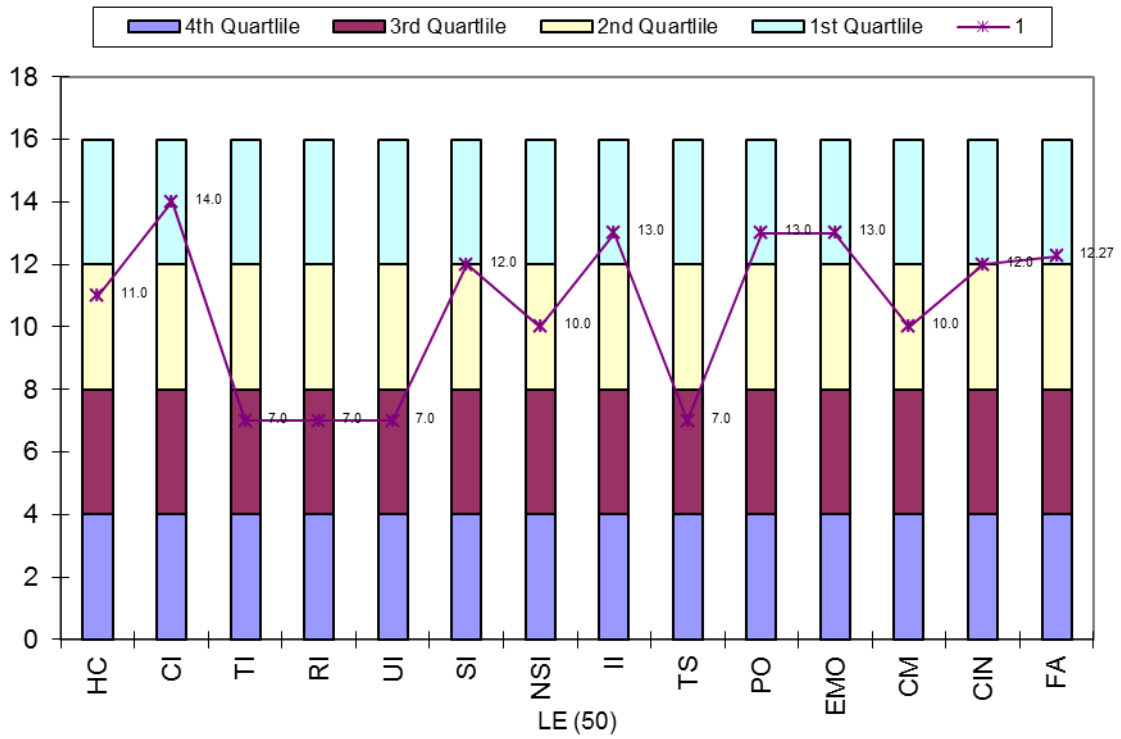
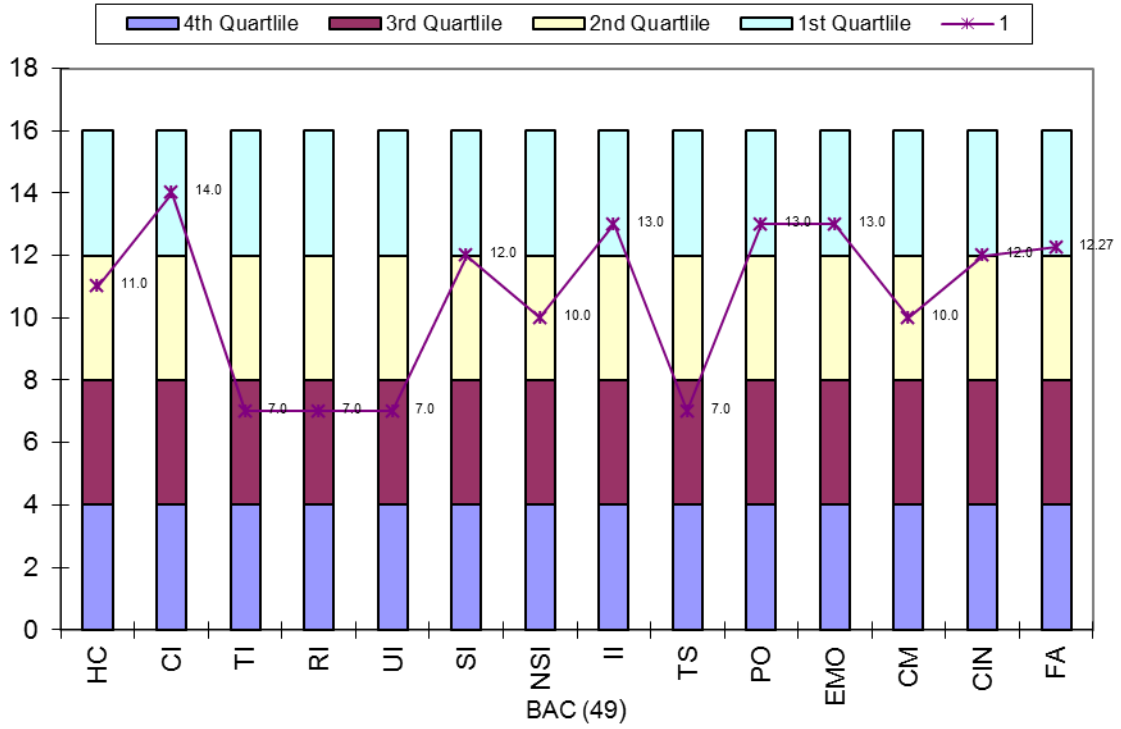


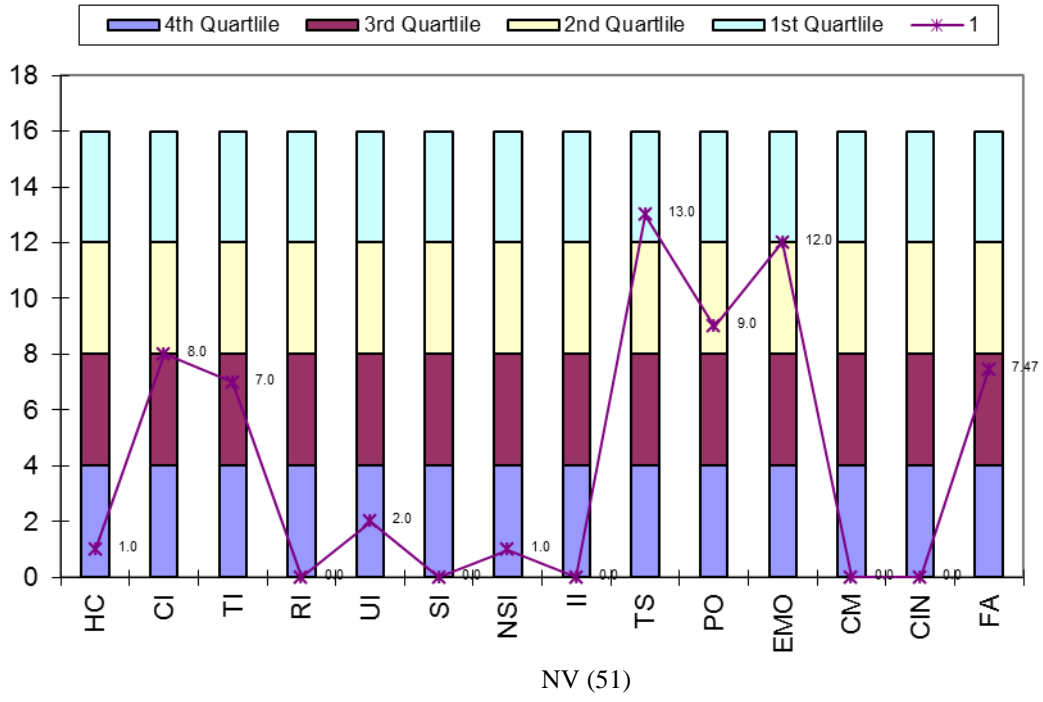












#### Appendix 4.2: Details of institutional capacity gaps in adoption of forest innovations

Institution	Capacity Gap	Remark
1-KFS	<ul style="list-style-type: none"> <li>• None</li> </ul>	Had no capacity gap
2-KFC	<ul style="list-style-type: none"> <li>• Electronic media outputs</li> </ul>	Investigate the cause and act to improve the highlighted capacity
3-KEFRI	<ul style="list-style-type: none"> <li>• Conservation investment</li> </ul>	Investigate the cause and act to strengthen the highlighted capacity
4-KMFRI	<ul style="list-style-type: none"> <li>• Non-salary incentives</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to improve the highlighted capacities
5-KEPHIS	<ul style="list-style-type: none"> <li>• Salary incentives</li> <li>• Non salary incentives</li> <li>• Internal interactions</li> <li>• Published outputs</li> <li>• Electronic media output</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to improve the highlighted capacities
6-TRFK	<ul style="list-style-type: none"> <li>• User interactions</li> <li>• Salary incentives</li> <li>• Electronic media outputs</li> </ul>	Investigate the causes and act to improve the highlighted capacities
7-NEMA	<ul style="list-style-type: none"> <li>• Salary incentives</li> <li>• Electronic media outputs</li> </ul>	Investigate the causes and act to improve the highlighted capacities
8-KARI	<ul style="list-style-type: none"> <li>• Human capital</li> <li>• Technical support</li> <li>• Electronic media outputs</li> </ul>	Investigate the cause and act to improve the highlighted capacities
9-NTZDC	<ul style="list-style-type: none"> <li>• User interactions</li> </ul>	Investigate the cause and act to strengthen the highlighted capacity
10-NMK	<ul style="list-style-type: none"> <li>• Human capital</li> <li>• Technical support</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> </ul>	Investigate the causes and act to strengthen the highlighted capacity
11-KWS	<ul style="list-style-type: none"> <li>• Human capital</li> <li>• User interactions</li> <li>• Salary incentives</li> <li>• Technical support</li> </ul>	Investigate the causes and act to strengthen the highlighted capacity
12-CDA	<ul style="list-style-type: none"> <li>• Salary incentives</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to strengthen the highlighted capacities
13-ENSDA	<ul style="list-style-type: none"> <li>• User interaction</li> <li>• Technical support</li> </ul>	Investigate the causes and act to strengthen the highlighted capacities
14-ENNDA	<ul style="list-style-type: none"> <li>• Salary incentives</li> <li>• Conservation interaction</li> </ul>	Investigate the causes and act to strengthen the highlighted capacities
15-KVDA	<ul style="list-style-type: none"> <li>• Technical support</li> </ul>	Investigate the cause and act to improve the highlighted capacity
16-LBDA	<ul style="list-style-type: none"> <li>• Conservation investment</li> </ul>	Investigate the cause and act to improve the highlighted capacity
17-TARDA	<ul style="list-style-type: none"> <li>• User interaction</li> <li>• Salary incentives</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> </ul>	Investigate the causes and act to improve the highlighted capacities
18-EU	<ul style="list-style-type: none"> <li>• Internal interactions</li> <li>• Electronic media outputs</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to improve the highlighted capacities
19-MASU	<ul style="list-style-type: none"> <li>• Salary incentives</li> <li>• Technical support</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities

20-MU	<ul style="list-style-type: none"> <li>• Non salary incentives</li> <li>• Internal interactions</li> <li>• Electronic media outputs</li> <li>• Conservation management</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to improve the highlighted capacities
21-MMUST	<ul style="list-style-type: none"> <li>• None</li> </ul>	Had no capacity gap
22-MCM	<ul style="list-style-type: none"> <li>• Salary incentives</li> <li>• Non salary incentives</li> <li>• Internal interactions</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to improve the highlighted capacities
23-MCN	<ul style="list-style-type: none"> <li>• Internal interactions</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> <li>• Conservation management</li> </ul>	Investigate the causes and act to improve the highlighted capacities
24-MCMKOS	<ul style="list-style-type: none"> <li>• Conservation interactions</li> <li>• Training interactions</li> <li>• Salary incentives</li> <li>• Electronic media output</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to improve the highlighted capacities
25-MCK CCK	<ul style="list-style-type: none"> <li>• Human capital</li> <li>• Training interactions</li> <li>• Research interactions</li> <li>• Internal interactions</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
26-MCNY	<ul style="list-style-type: none"> <li>• Research interaction</li> <li>• Salary incentives</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
27-MCE	<ul style="list-style-type: none"> <li>• Training interactions</li> <li>• Research interactions</li> <li>• Salary incentives</li> <li>• Technical support</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
28-NCC	<ul style="list-style-type: none"> <li>• Conservation interactions</li> <li>• Training interaction</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
29-MCkak	<ul style="list-style-type: none"> <li>• Conservation interactions</li> <li>• Training interactions</li> <li>• Research interactions</li> <li>• User interactions</li> <li>• Salary incentives</li> <li>• Internal interactions</li> <li>• Electronic media output</li> <li>• Conservation management</li> <li>• Conservation investment</li> </ul>	Investigate the cause and act to improve the highlighted capacities
30-CCW	<ul style="list-style-type: none"> <li>• Conservation interactions</li> <li>• Training interactions</li> <li>• User interactions</li> <li>• Salary incentives</li> <li>• Non salary incentives</li> <li>• Internal interactions</li> <li>• Published outputs</li> <li>• Electronic media output</li> <li>• Conservation management</li> </ul>	Investigate the cause and act to improve the highlighted capacities



31-WATC	<ul style="list-style-type: none"> <li>• Internal interactions</li> <li>• Published output</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
32-KENGEN	<ul style="list-style-type: none"> <li>• Internal interactions</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> <li>• Conservation management</li> </ul>	Investigate the causes and act to improve the highlighted capacities
33-MHAC	<ul style="list-style-type: none"> <li>• None</li> </ul>	Had no capacity gap
34-KIOF	<ul style="list-style-type: none"> <li>• Conservation investment</li> </ul>	Investigate the cause and act to improve the highlighted capacity
35-EWEMP	<ul style="list-style-type: none"> <li>• Salary incentive</li> <li>• Non-salary incentives</li> <li>• Technical support</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> </ul>	Investigate the causes and act to improve the highlighted capacities
36-KADI	<ul style="list-style-type: none"> <li>• Salary incentives</li> </ul>	Investigate the cause and act to improve the highlighted capacity
37-BOEW	<ul style="list-style-type: none"> <li>• Human capital</li> <li>• Research interactions</li> <li>• Technical support</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> <li>• Conservation investments</li> </ul>	Investigate the causes and act to improve the highlighted capacity
38-CDG	<ul style="list-style-type: none"> <li>• Training interactions</li> <li>• Research interactions</li> <li>• User interactions</li> <li>• Salary incentives</li> <li>• Technical support</li> <li>• Published outputs</li> <li>• Electronic media outputs</li> </ul>	Investigate the causes and act to improve the highlighted capacity
39-FSK	<ul style="list-style-type: none"> <li>• None</li> </ul>	Had no capacity gap
40-CMAD	<ul style="list-style-type: none"> <li>• Conservation interactions</li> <li>• Conservation investment</li> </ul>	Investigate the cause and act to improve the highlighted capacity
41-GBM	<ul style="list-style-type: none"> <li>• Salary incentives</li> <li>• Technical support</li> <li>• Published output</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
42-KEEP	<ul style="list-style-type: none"> <li>• Salary incentive</li> </ul>	Had no capacity gap
43-UCRC	<ul style="list-style-type: none"> <li>• Salary incentives</li> </ul>	Investigate the causes and act to improve the highlighted capacities
44-KENVO	<ul style="list-style-type: none"> <li>• Research interactions</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
45-REFSO	<ul style="list-style-type: none"> <li>• Training interactions</li> <li>• Research interactions</li> <li>• User interactions</li> <li>• Internal interactions</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
46-CHEK	<ul style="list-style-type: none"> <li>• Human capital</li> <li>• Salary incentives</li> <li>• Non-salary incentives</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
47-GAF	<ul style="list-style-type: none"> <li>• User interactions</li> <li>• Salary incentives</li> <li>• Published outputs</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities

48-TSL	<ul style="list-style-type: none"> <li>• User interactions</li> <li>• Technical support</li> <li>• Electronic media output</li> </ul>	Investigate the causes and act to improve the highlighted capacities
49-BAC	<ul style="list-style-type: none"> <li>• None</li> </ul>	Had no capacity gap
50-LE	<ul style="list-style-type: none"> <li>• None</li> </ul>	Had no capacity gap
51-NV	<ul style="list-style-type: none"> <li>• Human capital</li> <li>• Research interactions</li> <li>• User interactions</li> <li>• Salary incentives</li> <li>• None salary incentives</li> <li>• Internal interactions</li> <li>• Conservation management</li> <li>• Conservation investment</li> </ul>	Investigate the causes and act to improve the highlighted capacities

## Appendix 4.3: Details of SWOT – PESTLEG Listings from Sampled Institutions

### Appendix 4.3.1: SWOT – PESTLEG matrix: public institutions

	Strengths	Weaknesses	Opportunities	Threats
<b>Political</b>	<ul style="list-style-type: none"> <li>-Good corporate culture-integrity and industry</li> <li>-A leading forest research institution in eastern and central Africa</li> <li>-International recognition through membership of OECD, UPOV and ISTA</li> <li>-Enhanced collaboration with all stakeholders</li> <li>-Realigned strategic plan in line with EMCA 1999 and Vision 2030</li> <li>-Extensive collaboration and partnerships-CSO, Private sector, Public sector, bilateral and multilateral</li> <li>-Client orientation: a good base of enhanced focus on client needs</li> <li>-Proactive and excellent local, regional and international reputation</li> <li>-Public and political goodwill</li> <li>-Well established and beneficial partnerships and collaboration with other institutions</li> <li>-Existence of strong community support</li> <li>-Public relations department</li> <li>-Willing stakeholders</li> <li>-Good climate</li> <li>-Good working relationship with stakeholders especially the communities with whom we work with in the forests.</li> <li>-High awareness level of the communities on forestry issues</li> <li>-Existence of other institutions for collaboration and linkages</li> <li>-Old linkages</li> <li>-Strong collaborative linkages</li> <li>-Enhanced security</li> <li>-Location of the university</li> <li>-Government committed in funding the university by providing recurrent and development requirements</li> <li>-Good will from political establishment locally and internationally</li> <li>-Supportive and competent staff to ensure due services</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of international accreditation, especially the Labs and internal processes to enhance international recognition of products and services</li> <li>-Illiterate communities</li> <li>-Land tenure systems (trust land)</li> <li>-Inadequate extension services</li> <li>-Resistance to change and reforms</li> <li>-Internal politics</li> <li>-Unrealistic demands from both staff and Councillors</li> <li>-Corruption within the council</li> <li>-Poor public relations causing harassment of the customers by council employees</li> <li>-Nepotism in employment</li> <li>-High handedness in employees impacting on customers</li> <li>-Failure to complete LASDAP Projects</li> <li>-The culture of business as usual among Councillors and staff.</li> <li>-Selective support from stakeholders</li> <li>-Low number of officers due to a ban on recruitment</li> <li>-Low priority given to promotion of tree cover when budgeting</li> <li>-Poor perception of City Council of Nairobi undertakings by the public, thus image problem</li> <li>-A legacy of unplanned developments which</li> </ul>	<ul style="list-style-type: none"> <li>-Political goodwill</li> <li>-Public has adopted tree planting</li> <li>-Large catchment for farmers</li> <li>-Only technical forestry institution in Kenya</li> <li>-Reforms in forest sector being undertaken</li> <li>-Environment and forestry issues becoming increasingly important</li> <li>-Private sector becoming an important player in forestry development</li> <li>-Wood continues to be a dominant source of energy, poles and timber in Kenya</li> <li>-Forestry research within the region improving</li> <li>-GoK focal point on marine research</li> <li>-Global interests on conservation, poverty, eradication, MDG, Climate change</li> <li>-Research</li> <li>-Institutional strategic direction</li> <li>-There are many collaborating partners</li> <li>-Focus on maintenance of integrity of forest boundaries</li> <li>-Potential for enhancing partnerships</li> <li>-Government and community support</li> <li>-Existence of willing collaborators</li> <li>-Existence of MoU with collaborators</li> <li>-Enabling political environment</li> <li>-Financial donors</li> <li>-Good public image</li> <li>-Enhanced collaboration of different agencies</li> </ul>	<ul style="list-style-type: none"> <li>-Government bureaucracy</li> <li>-Competition from other institutions</li> <li>--Reforms in forest sector may take long</li> <li>-Competition for research funds with private and NGO sectors</li> <li>-Devolution</li> <li>-Control by Government to allocate more funds</li> <li>-Inadequate political goodwill</li> <li>-Over dependence on donor funding</li> <li>-Overlapping mandates and functions between directorate and departments</li> <li>-Lack of international accreditation, especially the Labs and internal processes to enhance international recognition of products and services</li> <li>-General insecurity in some parts of the country resulting largely from the influx of illegal weapons</li> <li>-Poaching and human / wildlife conflicts, as well as illegal trade in wildlife products</li> <li>-Environmental degradation and encroachment in protected areas as a result of poverty and other socio-economic inequities pose a problem</li> <li>-Terrorist threats</li> <li>-Negative advisories and unfavourable resolutions reached at international conservation fora</li> <li>-Diminishing conservation areas</li> </ul>

	<ul style="list-style-type: none"> <li>- Favourable/conducive location for its academic programmes, research and consultancy services</li> <li>-Opportunity to network with other institutions and organisations locally and internationally</li> <li>-Enjoys historical linkages with donors who established physical facilities for WECO</li> <li>- Co-operation between political wing and the staff</li> <li>- General goodwill from members of the public.</li> <li>- Previous performance on partnerships e.g.: E.U, Metropolitan projects</li> <li>-Harmony between the council and local administration</li> <li>-Increased support from central Government</li> <li>-Corporate social responsibility through P.P.P</li> <li>-Both the civic and the executive leaders have a desire to improve the performance of the council.</li> <li>-Community</li> <li>-National and international campaigns, communications and advocacy</li> </ul>	<ul style="list-style-type: none"> <li>have led to the establishment of a culture of plans prior to their being undertaken.</li> <li>-Non co-operation by stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>with a common goal.</li> <li>-Willingness by the communities to implement</li> <li>-Collaboration with other stakeholders</li> <li>-Existence of good political will</li> <li>-Solicit funds for conservation from GoK, World Bank, EU and NGOs</li> <li>-Proximity to partners</li> <li>-Vast and growing demand for university education</li> <li>-Political stability in the country and within East Africa region</li> <li>-Creation of counties</li> <li>-Increased funding for research</li> <li>-Geographical location of Maseno University</li> <li>-Political developments in the neighbouring countries</li> <li>-Policy on special needs education</li> <li>-Borderless East Africa region</li> <li>-International partnership and collaborative opportunities</li> <li>-Training, research and consultancy within EAC and COMESA</li> <li>-Linkages with reputable private and public sector organisations</li> <li>-Raising demand for university education to offer relevant programmes</li> <li>-On-going public sector reforms provide opportunities for university training, research and consultancy services</li> <li>-Emphasis on science and technology in emerging areas of material science</li> <li>-Vast conservation information from internet</li> <li>-Funds from donors</li> <li>-Goodwill from the public</li> <li>-Strategic location -</li> </ul>	<ul style="list-style-type: none"> <li>-High community support expectations</li> <li>-Regional and local political instability</li> <li>-Politics</li> <li>-Conflict of interest</li> <li>-Formation of anonymous youth groups with vigor objectives</li> <li>-Changes in government policies</li> <li>-Shortage of funding extension</li> <li>-Changes in government policies</li> <li>-Large area to cover, 39,0000 km<sup>2</sup></li> <li>-Lack of funding from the Ex-Chequer</li> <li>-Competition from other bodies carrying out conservation in Tana and Athi Basin.</li> <li>-Upcoming counties taking on our core mandate of conservation</li> <li>-Upcoming colleges</li> <li>-Liberation of higher Education</li> <li>-Increasing poverty levels</li> <li>-Reduced capital from GoK</li> <li>-Reduced GoK funding due to austerity measures</li> <li>-Perceptions about joblessness and education</li> <li>-Heavy disease burden in the region</li> <li>-Corruption</li> <li>-Dependence on government and donors for funding university programmes</li> <li>-Increased competition from international universities with satellite campuses</li> <li>-Conflicting policies</li> <li>-Implementation of the Nairobi Metropolitan development plans</li> <li>-Implementation of the new labour laws</li> <li>-Review of Council boundaries</li> <li>-Inadequate funds from Central</li> </ul>
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			<p>Machakos is strategically located 16 km along Nairobi Mombasa highway and is part of Nairobi Metropolis</p> <ul style="list-style-type: none"> <li>-Increased L ATF, HPA, KRBF and CDF allocations</li> <li>-Improvement of governance by creating institutions that bring checks and balances</li> <li>-Support from NGO and other donors such as EU.</li> <li>-Existence of management policy documents.</li> <li>-Donors support</li> <li>-Good will</li> <li>-Collaboration</li> <li>-Possibility of more funds being allocated to forest innovations in future</li> <li>-Climate change and global warming as a problem to be addressed by authority and community members</li> <li>-Development of curricular for higher learning on organic agriculture</li> <li>-Collaboration with governments and institutes in other countries</li> <li>-Goodwill</li> <li>-Centre is accessible</li> <li>-Collaboration</li> <li>-Donor funding of partnership</li> <li>-Demand for services that address poverty issues</li> <li>-Enhance rapport with donors</li> <li>-Funds available for empowerment from major donors and the Government of Kenya</li> <li>-Collaboration and networking with other stakeholders</li> <li>-County government</li> <li>-New Constitution</li> <li>-Donor support getting broader in scope and coverage</li> <li>-The existing partnerships with</li> </ul>	<p>Government</p> <ul style="list-style-type: none"> <li>-High poverty levels</li> <li>-Corruption</li> <li>-Accountability</li> <li>-Inadequate funding</li> <li>-Greater threat of legal action and penalties from enlightened citizens, creditors and supervisory authorities such as NEMA, KACA</li> <li>-Lack of sustainability</li> <li>-Lack of constant funding</li> <li>-Negative policies</li> <li>-Political instability</li> <li>-Donor influence</li> <li>-Political interference</li> <li>-Bad local politics</li> <li>-Policy change</li> <li>-Political influence</li> <li>-Slow implementation of the Constitution</li> <li>-Conflicts between County/Devolved and Central government</li> <li>-Insufficient funding from donors</li> </ul>
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			other conservation organisations and also with the community members -Stability in country Education centre	
<b>Economic</b>	<ul style="list-style-type: none"> <li>-Revenue generated</li> <li>-Improved infrastructure</li> <li>-Availability of practical training block</li> <li>-Good infrastructure</li> <li>-Infrastructure</li> <li>-Ability to generate revenue through licensing, penalties, grants, gifts and some others</li> <li>-Local resources: expertise within the Institute for resource mobilisation from different sources.</li> <li>-Well established organisational infrastructure</li> <li>-Good infrastructure in protected areas</li> <li>-A diversified product base ensures its stability and ability to effectively discharge its mandate</li> <li>-Available transportation means</li> <li>-Reliable funding from government</li> <li>-Revenue base from assets</li> <li>-Provision of consultancy services</li> <li>-Adequate space for programmes</li> <li>-Mechanisation of the farms</li> <li>-Affordable cost of programmes</li> <li>-Means of transport</li> <li>-Land at Mazeras for nursery operations</li> <li>-Provided tools and equipment</li> <li>-Good office location</li> <li>-Adequate working space for the staff</li> <li>-Sound capital base and staff motivation through increased salaries</li> <li>- Ability to pay salaries on time</li> <li>- Serviceable vehicles for service delivery</li> <li>- Support from private nurseries and enterprises</li> <li>-Plenty of land/space for tree planting</li> <li>-The climate in the region is conducive to all the year round agricultural production. This in turn translates to a high and stable revenue source by</li> </ul>	<ul style="list-style-type: none"> <li>-Inadequate budget</li> <li>-Inadequate infrastructure and equipment</li> <li>-Low budgeting provision</li> <li>-Low funding in forest sector</li> <li>-Inadequate capacity in revenue generation activities</li> <li>-Poor remuneration</li> <li>-Poor incentives</li> <li>-Poor funding</li> <li>-Inadequate resources</li> <li>-Inadequate human resource, capital, capacity</li> <li>-Brain drain: Unattractive terms and conditions of service, remuneration and incentive schemes to reward satisfactory and outstanding performance has led to high staff turn-over.</li> <li>-Poor resource flow: Untimely availability and inadequacy of research operating funds, field and laboratory equipment constrain implementation of research activities.</li> <li>-Over-reliance on donor funding: A big proportion of research operational funds come from external donors. This has often resulted in research planning and management cycles that are responsive to donor agenda rather than national priorities</li> <li>-Dependence on formal donor funding</li> <li>-Inadequate and unpredictable</li> </ul>	<ul style="list-style-type: none"> <li>-Vibrant market for forest products</li> <li>-Subsistence dependence on mangrove resources</li> <li>-Improvement of infrastructure</li> <li>-Development, promotion and marketing products and services targeting the public</li> <li>-Commercialisation of activities</li> <li>-Investment opportunities in wildlife tour products and services abound including unexploited parks and reserves</li> <li>-Excellent training, research and education facilities</li> <li>-There also exists a potential for increased revenue generation, promotion of domestic tourism, utilisation of idle assets, diversification of products and commercialisation of some business units like the Airwing and KWSTI</li> <li>- Pooling of resources together</li> <li>-Infrastructural capacity</li> <li>-Marketing opportunities for rolling out Maseno university programmes in neighbouring countries</li> <li>-Increasing liberalization of the economy opens opportunities for innovations</li> <li>-Technical institutes in the region with infrastructure to offer academic programmes collaboratively</li> <li>-Request for training by relevant institutions such as</li> </ul>	<ul style="list-style-type: none"> <li>-Competing land users</li> <li>-Poor infrastructure</li> <li>- Low enrollment</li> <li>-Reduced funding</li> <li>-Reliance on woodfuel in tea factories</li> <li>-Economic liberalization: The global trend of market liberalisation has both positive and negative effects on the agricultural sector. The negative effects include dumping of cheap crop and livestock commodities and products from other countries which could suppress local production.</li> <li>-Brain drain due to competition: Some other institutions are able to provide better incentives which could lead to scientists leaving.</li> <li>-Unattractive terms and conditions of service for staff</li> <li>-Inadequate marketing of products and services</li> <li>-Poor road infrastructure</li> <li>-Decreased funding from Treasury</li> <li>-Escalating food prices have presented unprecedented threats to tourism and by extension to KWS</li> <li>-Diminishing financial resources from GoK</li> <li>-High rate of technician staff turnover</li> <li>-Poverty in CDA's area of jurisdiction</li> <li>-Lack of funds</li> <li>-Staff leaving for other employment in other institutions</li> </ul>

	<p>way of market fees.</p>	<p>financial resources causing over-dependence on donor funding</p> <ul style="list-style-type: none"> <li>-Limited space for conservation and collections</li> <li>-Unattractive terms and conditions of service for staff</li> <li>-Inadequate marketing of products and services</li> <li>-Unexploited revenue base / potential revenue streams</li> <li>-Incomplete review and documentation of operational processes</li> <li>-Inadequate financial resources</li> <li>-Inadequate marketing and research</li> <li>-Over-reliance on external tourism which is not helped by seasonality</li> <li>-Low pricing</li> <li>-Inadequate transport</li> <li>-Inadequate working tools</li> <li>- Limited funds</li> <li>- Inadequate resources mainly financial resources</li> <li>-No sponsorships for long-term courses</li> <li>-Weak financial base and financial resources</li> <li>-Inadequate facilities</li> <li>-Poor remuneration</li> <li>-Limited resources in terms of funds</li> <li>-Not recruiting staff</li> <li>-Low returning and collaboration ventures</li> <li>-Lack of book security</li> <li>-Inadequate teaching and learning facilities</li> <li>-Weak marketing strategies for units and products</li> <li>-Inability to attract and retain best staff</li> <li>-Inadequate</li> </ul>	<p>Kenya Forestry</p> <ul style="list-style-type: none"> <li>-Commercialisation of services e.g.: garbage collection.</li> <li>-Public Private Partnerships</li> <li>-Potential revenue base e.g.; Konza mining</li> <li>-Development of techno city may enhance investment</li> <li>-Privatization is emerging as one means through which council can reduce the burden it takes in serving increased numbers of people in extended areas.</li> <li>-Employment of more qualified staff who can be trained further</li> <li>-Marketing</li> <li>-Increased demand for university products and services</li> <li>-Start income-generating activities to enhance sustainability</li> <li>-Expand micro-credit programme</li> <li>-Recruit key staff</li> <li>-Initiation of income generating activities e.g. KEEP wildlife conservation</li> <li>-Engagement of staff in different projects which broaden their remuneration capacity</li> <li>-Availability of private land for afforestation</li> <li>-Land is available</li> <li>-Tourism catchment</li> <li>-Good tourism</li> </ul>	<ul style="list-style-type: none"> <li>-Growing competition for students by private and public university in Kenya and the region leading top potential loss of the university market share</li> <li>-General low income in society thus difficult to levy cost-effective fees</li> <li>-Economic recession experienced in the country</li> <li>-Globalisation leading to brain drain thus difficult to attract and retain well-trained staff - global market</li> <li>-High and increasing demand of space for physical development</li> <li>-Greater pressure for service delivery</li> <li>-Loss of trained staff to well-paying organisation</li> <li>-Inflation</li> <li>-Short-term donor funding</li> <li>-No extension staff</li> <li>-Limited funding</li> <li>-Subdivision of land into uneconomical sizes</li> <li>-Escalation of input prices</li> <li>-Rural-urban migration</li> <li>-Competition from other NGOs offering same services and going for same resources</li> <li>-Low pay compared to other NGOs</li> <li>-Unhealthy competition</li> <li>-Communication and transportation e.g. roads, infrastructure</li> <li>-Movement of staff</li> <li>-Staff turnover</li> </ul>
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		<p>budgetary provisions,          -Dilapidated infrastructure          -Inadequate facility and equipment          - Level of remuneration and terms of service are not competitive          -Inadequately staffed in many key areas          -Inadequate physical facilities and infrastructure for teaching, research and extension          -Inadequate ICT facilities and infrastructure          - Inadequate government and internally generated funding          -Lack of training facilities within the community          -Low remuneration of conservation staff          -Lack of funds          -Inadequate service delivery facilities          -Unexploited revenue          -Mismanagement of council resources          -Inadequate ICT infrastructure and services          -Transportation          -Old/shortage of working tools and equipment          -Understaffing in some Sections          -Inadequate transport fleet          -Weak ICT          -No Website          -Lack of adequate staff at the technical level coupled with lack of adequate development of those in such cadres.          -Narrow financial base coupled with poor mobilisation thus leading to a weak financial position.          -High past long outstanding debts which are yet to be</p>		
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		cleared. -Few personnel -Allocation of funds is limited		
<b>Social</b>	<ul style="list-style-type: none"> <li>-Well trained, qualified and experienced staff</li> <li>-Highly motivated staff</li> <li>-Qualified technical staff</li> <li>-Well trained scientists</li> <li>-Availability of modern facilities in some KEFRI Regional Research Centres</li> <li>-Decentralised services</li> <li>-Human capacity: a critical mass of skilled and experienced scientists and support staff</li> <li>-Critical mass of well trained and skilled scientific and support staff</li> <li>-Committed and competent workforce</li> <li>-A dedicated, committed and competent staff (receive the coveted COYA awards in 2008)</li> <li>-Competent staff to carryout conservation</li> <li>-Accessibility</li> <li>-Available technical staff and support staff</li> <li>-Adequate personnel</li> <li>- Well trained and experienced management staff</li> <li>-Effective relationships with stakeholders</li> <li>- Competent officers</li> <li>-Most of the employees, civic leaders as well as the residents come from the same community with one common language. Hence it can be easy to create understanding and better rapport as everyone can readily understand and identify with one another.</li> <li>-The number of people residing within the town is small compared to the total population as many reside in their rural homes. Hence the current burden facing the council can be regarded as light.</li> <li>-Area is surrounded by hinterlands endowed with rich agricultural resources and attractive tourist sites. Hence, it has a high economic potential</li> <li>-Financial ability</li> <li>-Training provides more knowledge for those with a certain level of education</li> <li>-At least there is always</li> </ul>	<ul style="list-style-type: none"> <li>-Weakness in partnership with stakeholders</li> <li>-Poor dissemination</li> <li>-Weak links between NMK and stakeholders</li> <li>-Lack of incentive schemes to recognise exceptional performance</li> <li>- Low tree growing culture amongst local communities</li> <li>-High illiteracy among the target groups</li> <li>-Weak external linkages</li> <li>-Weak alumni</li> <li>-Lack of a reward and sanction system for best and worst performing staff</li> <li>-Human destruction</li> <li>-Lack of incentives to staff</li> <li>-Inadequate mechanisms for measuring customer satisfaction</li> <li>-Lack of technical staff</li> <li>-Low self-esteemed staff</li> <li>-Substance abuse among staff</li> <li>-Rigidity and negative attitude at work by the employees</li> <li>-There is a prevalent negative work attitude and culture among the council stakeholders which results in low productivity within the council</li> <li>-Reluctance by employees to move to other areas to work or to work in other stations. This results in stagnation, limited exposure to other view points and styles of working, inability to bring in new employees, from other areas and the</li> </ul>	<ul style="list-style-type: none"> <li>-Ability to attract volunteer staff</li> <li>-Competent staff</li> <li>- Capacity building and human resources development.</li> <li>-Training of staff</li> <li>-Competing staff</li> <li>-Corporate social responsibility through P-P-P</li> <li>-Community conscious on need to clean environment</li> <li>- Has room to improve its self-worthy</li> <li>-Expansion in educational opportunities available within Kakamega has enabled the council to have a pool of qualified candidates who are set to offer themselves for election to local authorities. This is expected to improve the performance of civic leaders in the discharge of their responsibilities within the council.</li> <li>-Due to the effects of a number of civic education and human rights advocacy and lobby groups, the residents of local authorities are being empowered to know and defend their rights. Hence the residents are expected to play their roles more effectively in supporting the council in the discharge of its activities.</li> <li>-Rich Maasai culture</li> <li>-Interactions with the farming communities</li> </ul>	<ul style="list-style-type: none"> <li>-Death</li> <li>-Low adoption of modern technologies despite availability</li> <li>-Unfulfilled expectations from local residents</li> <li>-High HIV prevalence</li> <li>-Low levels of environmental education</li> <li>-Customization of curricula</li> <li>-Competition from other universities</li> <li>-Decline of moral values and ethics at the university</li> <li>-Impact of HIV/AIDS pandemic and other diseases</li> <li>-Loitering stray animals</li> <li>-Lack of access to current innovational skills</li> <li>-Ignorance of public on the importance of forests</li> <li>-Negative attitude from customers</li> <li>-Lack of awareness</li> <li>-Rapid urban growth (population)</li> <li>-Malicious damage of trees</li> <li>-Increased urban population</li> <li>-The neighbour of the institution boundaries destroy the established seedlings</li> <li>-Human-forest conflict for survival</li> <li>-Cultural erosion</li> <li>-Destructive human activities</li> <li>-Strong cultural leaning among clientele</li> <li>-Neighbouring community</li> </ul>

	<p>funds allocated to forest activities, sometimes it increases.</p>	<p>deepening of any negative practices among the employees. It also interferes with the development of staff through job rotation. The development is equally hampered.</p> <ul style="list-style-type: none"> <li>-The institution does not have a specialist in conservation</li> <li>-Some staff's level of education does not permit certain training which is a hindrance to acquiring knowledge.</li> </ul>		
<b>Technological</b>	<ul style="list-style-type: none"> <li>-Basic computer facilities</li> <li>-Larger forest training block</li> <li>-Decentralised research and development activities</li> <li>-Good links with Kenya Forest Service and main stakeholders</li> <li>-Good networking</li> <li>-Skilled staff</li> <li>-Internationally accredited laboratories and inspection service</li> <li>-Research capacity</li> <li>-Laboratories</li> <li>-Institutional capacity: well-placed research institution with the minimum physical and human capacity for undertaking quality research.</li> <li>-Technical capacity: is the accumulated knowledge, information and technologies it has developed over many years of research that can be modified and adopted to respond to different client-demands.</li> <li>-Large and unique collection of natural and cultural materials in the world</li> <li>-Experience in ASAL</li> <li>-Long history of extension</li> <li>-Long history of training in Forestry</li> <li>-Digitalised and integrated student register</li> <li>-ICT complaint</li> <li>-Automated library system</li> <li>- Advantage of learning from the experiences of the other universities</li> </ul>	<ul style="list-style-type: none"> <li>-Outdated curricula</li> <li>-Inadequate capacity to meet increasing demand for tree seed</li> <li>-Weak in product development and deployment</li> <li>-Need to be informed by science</li> <li>-Inadequate market and policy expertise: Available manpower is heavily biased towards biological specialisations, hence, a limited capacity to deal with non-production aspects of the product value chain or social and policy research.</li> <li>-Inappropriate research outputs and lack of market focus: Many research outputs are either not available in a form that is usable and accessible to clients, or do not adequately address the changed circumstances under a liberalised economy leading to low adoption and use of the available technologies.</li> <li>-Low post-college training on conservation among staff</li> <li>-Low adoption of</li> </ul>	<ul style="list-style-type: none"> <li>-New/emerging technologies</li> <li>-Demo sites exists</li> <li>-Institutional results level</li> <li>-Thematic area of research</li> <li>-Agribusiness product value chain approach</li> <li>-Conducting research in response to product value chains</li> <li>-Advancement in ICT</li> <li>-Increasing domestic tourism</li> <li>-New innovations</li> <li>-Availability of appropriate technology and innovations</li> <li>-Research into tree species suitable for Kenya</li> <li>-Participatory forest management (PFM)</li> </ul>	<ul style="list-style-type: none"> <li>-Regional integration: The current move towards regional economic integration could undermine the gains made in local entrepreneurship leading to low demand of agricultural technologies.</li> <li>-Over-reliance on rain-fed agriculture hence: productivity will continue being vulnerable to moisture deficiencies and resultant poor performance thus discouraging investment in or uptake of new agricultural technologies.</li> <li>-Inadequate and unpredictable financial resources causing over-dependence on donor funding</li> <li>-Industrial environmental concerns</li> </ul>

	<ul style="list-style-type: none"> <li>- Developed new and unique academic programmes tailored for the industry</li> <li>- LAIFOM system</li> <li>-Extensive tree nurseries</li> <li>-Has capacity to generate seedlings at minimal cost</li> </ul>	<ul style="list-style-type: none"> <li>modern technologies despite availability</li> <li>-Inadequate use and application of ICT</li> <li>-Incomplete biodiversity inventory which may lead to illegal transfer of our flora and fauna for research elsewhere in the world</li> <li>-Undocumented success stories</li> <li>- Inadequate technical capacity due to very few personnel with technical expertise.</li> <li>-Insufficient skills and personnel</li> <li>-Lack of management information systems champion</li> <li>-Inadequate structures for quality assurance</li> </ul>		
<b>Legislative</b>	<ul style="list-style-type: none"> <li>-An enabling policy and new Forests Act</li> <li>-Established by an Act of Parliament</li> <li>-Decentralised autonomy</li> <li>-Existence of Act and mandate</li> <li>-Mandate to carryout conservation activities within Tana and Athi River Basins</li> <li>-Ability to review and enact new By-laws</li> <li>-Enforceable By-laws</li> <li>- Legal entity</li> <li>- Enforceable By-laws and Legal Notices</li> <li>-The authority has the power to make and enforce regulations and to levy and collect understand revenue with the full backing of the law and the power of the central power.</li> <li>-Supported By-law</li> <li>-Statutory mandate to promote tree cover</li> </ul>	<ul style="list-style-type: none"> <li>-Stringent GoK procurement system</li> <li>-Weak policy framework</li> <li>-Inadequate By-laws</li> <li>-Selective enforcement of Council By-laws</li> </ul>	<ul style="list-style-type: none"> <li>-Change from FD to KFS</li> <li>-Supportive government legislation and policies</li> <li>-Expected review of policy and legislation will create a platform for greater and clearer collaboration with various players in wildlife management including those involved in bio-prospecting</li> <li>-Expecting to benefit from the revised legislation on compensation for losses and injuries by wildlife and for protection of ecosystems (water towers)</li> <li>-Forests Act 2005</li> <li>-EMCA 1999</li> <li>-Water Act 2002</li> <li>-New policy for regional development</li> <li>-Proposed university Bill</li> <li>-Successful implementation of the Kenya Vision 2030</li> <li>-Legal framework e.g. the new constitution</li> </ul>	<ul style="list-style-type: none"> <li>-Weak policy coordination among different agricultural sector ministries can undermine research efforts and adoption of technologies.</li> <li>-Legal and policy environment leading to institutional conflicts</li> <li>-Lack of institutional Intellectual Property Rights Policy (IPR)</li> <li>-Conflicts/overlap of Act. NEMA, WRMA, etc.</li> <li>-Competing land use and enabling land use policies</li> <li>-Review of the Local Government Act and the new Constitution</li> <li>-Tussles amongst relevant statutory organs e.g. CCN, Kenya Urban-Roads Authority (KURA), KENHA, KWS, KFS</li> <li>-Forestry policies that are not conducive</li> </ul>

			-Legal framework -Vision 2030	
<b>Environmental</b>	-Acquired ISO 9001: 2008 for quality management systems -A recognised scientific authority for key international and regional Conventions and Protocols -Unique wildlife resources and landscapes -Act of Parliament - CDA -ISO 9001: 2008 -Commissioned hotspots	-Weather challenges	-Geographic location buffer is appropriate for innovations -Environment and climate change offers opportunity to engage in mitigation measures -River Ewaso Nyiro -Good environment with rainfall that supports tree growing -Degraded catchments that need rehabilitation -Proximity to forest areas -Existence of natural resources -Can establish a tree nursery as land is available -Great natural resources wealth -Appealing landscape -Very low tree cover in our farms -Forest indigenous knowledge -Climate change -Species diversity	-Pests and diseases -Climate change impacts -Soil degradation -Global climate changes -Climate characteristics especially drought -Outbreaks of forest fires (during dry spell) and diseases affecting trees in the forest -Recurrent drought -Flush floods -High rates of catchment degradation -Climate change -Global warming -Emerging diseases -Climate change and reduced rainfall patterns -Persistent or prolonged drought -Climatic changes threaten rain-fed agriculture -New biophysical constraints will emerge as a consequence of changes in the global climate, thus posing new challenges such as intensified droughts and floods, and new crop and livestock pests and diseases. -Unreliable weather pattern
<b>Governance</b>	-Competent management -Good corporate image -Confidence from partners: developed a culture of accountability, transparency and impact orientation leading to building of confidence and credibility as a trusted public institution. -Management willingness and goodwill -Institutional policy and mandate -Established, relevant and functional research and public programmes -Donor support and confidence -Established operational, institutional and	-Lack of information for decision making -Low corporate profile -Weak management information system -Weak capacity to publish and disseminate research findings -Weak management capacity in regional centres -Weak national coordination: of the different research centres, programmes and projects is seriously affecting efficiency	-Establishment of college KFS Board -Supportive MOUs with other institutions -Operationalisation of endowment fund should provide adequate window through which funds may be channeled -Our broad mandate -Exchange programmes -Staff exchange programmes locally and internationally -Introduction of the performance management strategy in local authorities. -Corporate social	-Strengthening forestry extension service may take long -Weak links between NMK and stakeholders -Lack of an internal ITC Policy -Limited space for conservation and collections -Greater demand for effective performance by the ministry and other government supervisory bodies -Lack of innovative board members -Changing trends in

	<p>management structures</p> <ul style="list-style-type: none"> <li>-Well established and defined wildlife protection units and community programmes</li> <li>-Clear national mandate with the Wildlife Act</li> <li>-Strong leadership and governance systems</li> <li>-Has specialised and strategic national programmes for conservation</li> <li>-A national presence and excellent corporate governance image</li> <li>-Local and international goodwill enhances its potential and ability to attract financial support and other resources from development partners</li> <li>-Introduction of performance management tool - the balance scorecard will further enhance the capacity and performance of KWS</li> <li>-Good team work</li> <li>-Well defined objectives</li> <li>-Existence of implementation structures from national level to grassroots</li> <li>-Normalisation of academic year</li> <li>-Financial support from GoK and development partners</li> <li>-Quality assurance champion</li> <li>-Increased number of programmes</li> <li>- Teamwork among management staff</li> <li>-Timely submission of returns or reports</li> <li>-Committed staff in implementation of council policies</li> <li>-The institution liaise with forestry section</li> <li>-Periodic participatory programme review</li> <li>-Those in environment and afforestation sections are dedicated to the work</li> <li>-Effective execution of watershed-based tree planting and forest restoration and conservation</li> <li>-Robust internal systems and structures to ensure programme integrity</li> </ul>	<p>and productivity of the system.</p> <ul style="list-style-type: none"> <li>-Weak research planning, implementation and management:</li> <li>Overall research planning and management has been, and remains weak, leading to erratic research direction, hence, the quality and focus of the research programmes and projects have suffered leading to a widespread “non-implementation syndrome” and lack of impact.</li> <li>-Inadequate attention to modern technologies: The need to take full advantage of modern technologies such as tissue-culture, biotechnology, participatory plant breeding, and modern communication and information technologies.</li> <li>-Overlapping mandates and functions between directorate and departments</li> <li>-Lack of an internal ITC Policy</li> <li>-Lack of institutional Intellectual Property Rights Policy (IPR)</li> <li>-Lack of clear staff deployment policy</li> <li>-Incomplete synergy between departments,</li> <li>-Low collaboration with private sector</li> <li>-Lack of scheme of service for professional staff</li> <li>- Limited staff in Environment Department</li> <li>-Shortage of extension staff</li> <li>-Inadequate professional and technical staff</li> <li>-Lopsided research</li> </ul>	<p>responsibility through P.P.P</p> <ul style="list-style-type: none"> <li>-Performance contracting</li> <li>-Available Service Charter</li> <li>-Performance Contact compliance</li> <li>-Good governance framework</li> <li>-Potential to liaise with diverse stakeholders including individual property owners, industries</li> <li>-Can strengthen legal framework within which tree cover promotion can be done</li> <li>-Presence of committee</li> <li>-Potential for expansion of operation areas</li> <li>-Room to break into new grounds and regions</li> <li>-Restructure to increase competitiveness</li> <li>-Environment among MDGs</li> <li>-Curriculum reviews and development</li> <li>-Networking arrangements</li> </ul>	<p>funding regime</p>
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		<ul style="list-style-type: none"> <li>-Lack of MSE Unit</li> <li>-Rigid and bureaucratic administrative procedures and processes</li> <li>- Does not have adequate policies in critical areas</li> <li>-Establishing a good maintenance culture has become elusive</li> <li>-Lack of professional staff</li> <li>-Lack of literature material on forestry and conservation</li> <li>-Poor record keeping</li> <li>-Inadequate staffing / rationalisation</li> <li>-Lack of scheduled council committee meetings</li> <li>-Lack of intra and inter departmental meetings</li> <li>-Weak communication mechanism.</li> <li>-Staff appraisal systems not embraced.</li> <li>-No clear schedule of duties and responsibilities</li> <li>-Misplaced labour</li> <li>-Poor debt collection leading to huge debtor's folio.</li> <li>-Poor time management</li> <li>-Poor accountability of resources</li> <li>-Lack of proper planning</li> <li>-Poor infrastructural management</li> <li>-Poor and inadequate service delivery</li> <li>-Lack of clear accountability towards key stakeholders</li> <li>-Failure to comply with organisation's strategic plan</li> <li>-Poor maintenance of public utilities</li> <li>-Poor management of garbage collection</li> <li>-Delay in completion of projects</li> <li>-Lack of</li> </ul>		
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		Performance Appraisal -Lack of institutional arrangement -Lack environmental policy -Inadequate environmental policy framework -Dual and unharmonised management system.		
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### Appendix 4.3.2: SWOT – PESTLEG matrix: NGOs

	<b>Strengths</b>	<b>Weaknesses</b>	<b>Opportunities</b>	<b>Threats</b>
<b>Political</b>	<ul style="list-style-type: none"> <li>-Facilities based in the community site</li> <li>-Community good will</li> <li>-Favour with clientele</li> <li>-National and international campaigns, communications and advocacy</li> <li>-Good will of government and community</li> <li>-Available donor support</li> <li>-Donor support getting broader in scope and coverage</li> <li>-Good working relation with government</li> <li>-Among trust NGOs to be registered</li> <li>-Has on going partnerships with various community groups e.g. CFAs that would facilitate adoption of forest innovations</li> </ul>	<ul style="list-style-type: none"> <li>-Geographic confinement</li> <li>-Low priorities in social forestry</li> <li>-Changing dynamism from central to devolved government</li> </ul>	<ul style="list-style-type: none"> <li>-Goodwill</li> <li>-Donor funding of partnership</li> <li>-Potential for expansion of operation areas</li> <li>-Room to break into new grounds and regions</li> <li>-Funds available for empowerment from major donors major donors and the Government of Kenya</li> <li>-County government</li> <li>-New Constitution</li> </ul>	<ul style="list-style-type: none"> <li>-Donor influence</li> <li>-Political instability</li> <li>-Human-forest conflict for survival</li> <li>-Political interference</li> <li>-Bad local politics</li> <li>-Political influence</li> <li>-Slow implementation of the Constitution</li> <li>-Conflicts between County/Devolved and Central government</li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li>-Provides food, fruit and fodder</li> <li>-Existing infrastructure at Kudu Base Camp</li> <li>-Has an office in place</li> <li>-About 50% self-sustaining</li> <li>-Foundation for growth existence</li> <li>-Ability to design and market proposals</li> <li>Owned plot</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of enough material and market</li> <li>-Unable to meet clients' demands</li> <li>-Some tree species take too long to mature</li> <li>-Influence of urbanisation</li> <li>-Inadequate finances</li> <li>-Weak ICT</li> <li>-Lack of sufficient funds</li> <li>-Inadequate staff</li> <li>-Old vehicles /machinery</li> <li>-Poor marketing of FSK</li> <li>-Over-reliance on donors</li> <li>-Forestry related</li> </ul>	<ul style="list-style-type: none"> <li>-Marketing</li> <li>-Great natural resources wealth</li> <li>-Centre is accessible</li> <li>-Demand for services that address poverty issues</li> <li>-Start income-generating activities to enhance sustainability</li> <li>-Expand micro-credit programme</li> <li>-Initiation of income generating activities e.g. wildlife conservation</li> </ul>	<ul style="list-style-type: none"> <li>-Loss of trained staff to well-paying organisation</li> <li>-Destructive human activities</li> <li>-Inflation</li> <li>-Short-term donor funding</li> <li>-No extension staff</li> <li>-Limited funding</li> <li>-Competition from other NGOs offering same services and going for same resources</li> <li>-Subdivision of land into uneconomical sizes</li> <li>-Escalation of input prices</li> </ul>

		<ul style="list-style-type: none"> <li>budgets too little</li> <li>-Inadequate finances to motivate members e.g. salaries</li> <li>-Inadequate funds</li> <li>-Movement of staff</li> <li>-Limited resources</li> <li>-Non-flexible funding conditions</li> <li>-Inadequate remuneration by institutions</li> <li>-Donors do not support resource acquisition</li> <li>-Depending on donor funding</li> <li>-Inadequate membership contribution</li> </ul>		<ul style="list-style-type: none"> <li>-Rural-urban migration</li> <li>-Low pay compared to other NGOs</li> <li>-Unhealthy competition</li> <li>-Communication and transportation, e.g. roads, infrastructure</li> <li>-Movement of staff</li> <li>-Changing trends in funding regime</li> <li>-Staff turnover</li> <li>-Insufficient funding from donors</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>-Activities rooted with Kenyan communities</li> <li>-Community involvement</li> <li>-Formed and empowered community groups</li> <li>-Historical impact</li> <li>-Exposure</li> <li>-Membership</li> <li>-Gender issues</li> <li>-Local volunteers</li> </ul>	<ul style="list-style-type: none"> <li>-Volunteer staff - no salary</li> <li>-Illiteracy</li> <li>-Most board members are old</li> <li>-Partners e.g. herbalist are old</li> </ul>	<ul style="list-style-type: none"> <li>-Rich Maasai culture</li> <li>-Very low tree cover in our farms</li> </ul>	<ul style="list-style-type: none"> <li>-Cultural erosion</li> <li>-Strong cultural leaning among clientele</li> </ul>
<b>Technological</b>	<ul style="list-style-type: none"> <li>-Training Agroforestry in curriculum</li> <li>-Conservation agriculture is an environment friendly technique</li> <li>-Qualified staff / multi-disciplinary team</li> <li>-Innovativeness</li> <li>-Adaptability</li> <li>-Trained technical staff in nursery management</li> </ul>	<ul style="list-style-type: none"> <li>-No qualified staff</li> <li>-Lack of technical professionalism</li> <li>-Limited skills</li> <li>-There is minimal capacity and expertise on forest innovations hence necessitates outsourcing of the same in adopting the innovations</li> <li>-There is lack of funds to adopt innovations</li> </ul>	<ul style="list-style-type: none"> <li>-Research into tree species suitable for Kenya</li> <li>-Development of curricular for higher learning on organic agriculture</li> <li>-Participatory forest management (PFM)</li> <li>-Forest indigenous knowledge</li> </ul>	<ul style="list-style-type: none"> <li>-Emerging technologies</li> </ul>
<b>Legislative</b>			<ul style="list-style-type: none"> <li>-Vision 2030</li> </ul>	
<b>Environmental</b>	<ul style="list-style-type: none"> <li>-Provides soil-cover and windbreak shade</li> <li>-Creates micro-climate in the garden</li> <li>-Provides soil organic matter and firewood</li> <li>-Provides natural habitats for birds and other life</li> </ul>	<ul style="list-style-type: none"> <li>-Unreliable source of water ( only depends on rains)</li> <li>-Competes with food crop production for space</li> <li>-Some tree species may take too much water from the land e.g. eucalyptus</li> </ul>	<ul style="list-style-type: none"> <li>-Climate change and global warming as a problem to be addressed by authority and community members</li> <li>-Appealing landscape</li> <li>-Environment among MDGs</li> <li>-Climate change</li> </ul>	<ul style="list-style-type: none"> <li>-Emerging diseases</li> <li>-Climate change</li> <li>-Global warming, - climate change and reduced rainfall patterns</li> <li>-Persistent or prolonged drought</li> <li>-Climatic changes threaten rain-fed agriculture</li> <li>-Location near Kakamega Forest which most eco-tourists prefer to institution's site</li> </ul>
<b>Governance</b>	<ul style="list-style-type: none"> <li>-Institutional capacity and experience</li> <li>-Strong networking partnership</li> <li>-Have a project in place</li> <li>-Rapport with collaborators</li> <li>-Wide linkages and</li> </ul>	<ul style="list-style-type: none"> <li>-Documentation</li> <li>-Collaboration</li> <li>-Capacity building on staff inadequate</li> <li>-Lack of innovative board members</li> </ul>	<ul style="list-style-type: none"> <li>-Collaboration with governments and institutes in other countries</li> <li>-Enhance rapport with donors</li> <li>-Restructure to increase</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>



	<p>networks</p> <ul style="list-style-type: none"> <li>-Staff trained in agriculture and NRM</li> <li>-Effective execution of watershed-based tree planting and forest restoration and conservation</li> <li>-Robust internal systems and structures to ensure programme integrity</li> <li>-Effective outreach programme</li> <li>-Available trained manpower</li> <li>-Efficient use of resources</li> </ul>		<p>competitiveness</p> <ul style="list-style-type: none"> <li>-Collaboration and networking with other stakeholders</li> <li>-Engagement of staff in different projects which broaden their remuneration capacity</li> <li>-The existing partnerships with other conservation organisations and also with the community members</li> </ul>	
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### Appendix 4.3.3: SWOT – PESTLEG matrix: Private institutions

	Strengths	Weaknesses	Opportunities	Threats
<b>Political</b>	-Security	-	-Stability in country	-
<b>Economic</b>	<ul style="list-style-type: none"> <li>-Available resources-finances and manpower</li> <li>-Networks with other business units and institutions</li> </ul>	-Poor cash flow	<ul style="list-style-type: none"> <li>-Good tourism</li> <li>-Availability of private land for afforestation</li> </ul>	<ul style="list-style-type: none"> <li>-Land availability</li> <li>-Poor tourism</li> <li>-Poor economy</li> <li>-Bank insolvency</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>-Good learning facilities</li> <li>-A well-organised outreach community extension programme</li> <li>-Available technical staff</li> </ul>	-Poor sanitation	<ul style="list-style-type: none"> <li>-Education centre</li> <li>-Networking arrangements</li> <li>-Interactions with the farming communities</li> </ul>	<ul style="list-style-type: none"> <li>-Land tenure system</li> <li>-Neighbouring community</li> <li>-Proximity to hotels</li> <li>-Other colleges</li> <li>-Fires incidences</li> </ul>
<b>Technological</b>	<ul style="list-style-type: none"> <li>-Well developed curriculum for agroforestry and environmental studies</li> <li>-Enclosed underground water</li> </ul>	<ul style="list-style-type: none"> <li>-Few facilitators and qualified staff in the specific sector</li> <li>-Poor documentation of lessons or experiences</li> <li>-Industrial processes</li> <li>-Environmental challenge</li> <li>-No lead experts</li> </ul>	-Curriculum reviews and development	-
<b>Legislative</b>	-	-	-	-Forestry policies that are not conducive
<b>Environmental</b>	-	-Environmental challenge	<ul style="list-style-type: none"> <li>-Tourism catchment</li> <li>-Species diversity</li> </ul>	<ul style="list-style-type: none"> <li>-Unreliable weather pattern</li> <li>-El-Nino</li> <li>-Industrial environmental concerns</li> </ul>
<b>Governance</b>	-No fully pledged department	-	-	-

#### Appendix 4.4: SWOT – PESTLEG matrix numerical data listing summaries

Table 4.13a: SWOT – PESTLEG matrix data for public institutions listings

	S	W	O	T	Total	% of Total
Political	37	19	70	60	186	
Economic	28	63	30	37	158	
Social	22	20	13	23	78	
Technological	23	15	11	4	53	
Legislative	12	4	13	8	37	
Environmental	6	1	13	17	37	
Governance	30	46	21	7	104	
<b>Total</b>	<b>158</b>	<b>168</b>	<b>171</b>	<b>156</b>	<b>653</b>	77.6

Table 4.13b: SWOT – PESTLEG matrix data for NGOs listings

	S	W	O	T	Total	% of Total
Political	10	3	7	8	28	
Economic	6	21	7	16	50	
Social	8	4	2	2	16	
Technological	6	5	4	1	16	
Legislative	0	0	1	0	1	
Environmental	4	3	4	6	17	
Governance	11	4	6	1	22	
<b>Total</b>	<b>45</b>	<b>40</b>	<b>31</b>	<b>34</b>	<b>150</b>	17.8

Table 4.13c: SWOT – PESTLEG matrix data for private institutions listings

	S	W	O	T	Total	% of Total
Political	1	0	1	0	2	
Economic	2	1	2	4	9	
Social	3	1	3	5	12	
Technological	2	5	1	0	8	
Legislative	0	0	0	1	1	
Environmental	0	1	2	3	6	
Governance	1	0	0	0	1	
<b>Total</b>	<b>9</b>	<b>8</b>	<b>9</b>	<b>13</b>	<b>39</b>	4.6

Table 4.13d: SWOT – PESTLEG matrix data for combined institutions listings

	S	W	O	T	Total	% of Total
Political	48	22	78	68	216	25.7
Economic	36	85	39	57	217	25.8
Social	33	25	18	30	106	12.6
Technological	31	25	16	5	77	9.1
Legislative	12	4	14	9	39	4.6
Environmental	10	5	19	26	60	7.1
Governance	42	50	27	8	127	15.1
<b>Total</b>	<b>212</b>	<b>216</b>	<b>211</b>	<b>203</b>	<b>842</b>	100.0