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GPR 699: PROJECT PAPER

BENEFITS OF MAIZE VARIETY PROTECTION IN KENYA

A Project Report Submitted in Partial Fulfillment of the Requirements for the Master of Laws Degree, (LL.M)

University of Nairobi

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BY

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A Project Report Submitted in Partial Fulfillment of the Requirements for the Award of Master of Laws Degree, (LL.M), of the University of Nairobi.

DECEMBER, 2015.

DECLARATION

This Project Report is my original piece of work and it has never been submitted to any other learning institution for the award of any Diploma or Degree Certificate, by either me or any other person, whatsoever.

Signature:…….....…….this…….....day of……, 2015.

APRINAH MAGARINAH SHIKOLI

(G62/68127/2013)

This Project Report is being submitted to the University of Nairobi, Kenya, for examination with my approval as the Student Supervisor:

Signature:……..……...…….this……..….day of…….……, 2015.

PROF. PATRICIA KAMERI-MBOTE

DEDICATION

You know how it is; you pick up a book, flip to the dedication and find that, once again, the author has dedicated the book to someone else and not you.

Not this time, this one is for you and you probably know why.

My son Jack-Daryl

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ABSTRACT

Several African countries and regional organizations are investing in the establishment of a plant variety protection system modeled on the UPOV 1991 Convention, which currently provides the strongest, international standard for plant variety protection. Whereas proponents argue that strong protection of breeder's rights will incentivize breeding and the introduction of new varieties for farmers, opponents fear that the proposed legal framework is unsuitable for African countries as it may hamper traditional farming practices of using and exchanging farm-saved seed. The challenge for African countries is to strike a balance between protecting the interests of breeders through the incentive function of plant breeder's rights for the commercial market, and the leeway that needs to be provided to smallholder farmers that depend on informal sources for their seed security and survival. The intellectual property system for the protection of plant varieties designed by developing and least developed countries (LDCs) should strike the necessary balance between the interests of plant breeders and society so that the right to food can be better realized. One of the major international instruments whose implementation can have implications on the realization of the right to food in these countries is the Agreement on Trade Related Intellectual Property Rights (the TRIPS Agreement). Kenya has enacted the Plant Breeders' Rights for the protection of plant varieties. Accordingly, the purpose of this paper is to examine and explore varies ways in which maize variety in Kenya can be protected to enhance food security and economic advancement.

University of Nairobi

School of Law; June, 2015.

Aprinah Magarinah Shikoli

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ACRONYMS

ASAL	Arid and Semi-Arid areas
CBD	Convention on Biological Diversity
CBOs	Community Based Organizations
CRF	Coffee Research Foundation
CWR	Crop Wild Relatives
DH01	Dry land Hybrid 1
DLC1	Dry land Composite 1
FAO	United Nations Food and Agriculture Organization
IP	Intellectual Property
IPRs	Intellectual Property Rights
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUPGR	International Undertaking on Plant Genetic Resources
KARI	Kenyan Agricultural Research Institute
KCB	Katumani Composite Breed
KEFRI	Kenya Forestry Research Institute
KEPHIS	Kenya Plant Health Inspectorate Services
KESREF	Kenya Sugar Research Foundation
KSC	Kenya Seed Company
NGOs	Non-Governmental Organizations
NPT	National Performance Testing
OAPI,	African Intellectual Property Organization
OPV	Open-Pollinated Variety

PBK	Pyrethrum Board of Kenya
PGRFA	Plant Genetic Resources for Food and Agriculture
PGRFA	Plant Genetic Resources for Food and Agriculture
PVP	Protection of new Varieties of Plants
TRFK	Tea Research Foundation of Kenya
TRIPS	Trade Related Aspects of Intellectual Property
UN	United Nations
UNCBD	United Nations Convention on Biological Diversity
UNCED	United Nations Conference on Environment and Development
UPOV	International Convention for the Protection of New Varieties of Plants
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

CHAPTER ONE

INTRODUCTION

1.0 INTRODUCTION

Intellectual property rights (IPRs) are legal devices that protect creations of the mind which have commercial value, such as inventions. They grant exclusive rights to the creators (rights-holders) to protect access to and use of their property from unauthorized use by third parties. The term 'intellectual property' (IP) has no universally agreed definition. Rather than define IP as a concept, the various treaties and conventions on IP refer to various categories of IP. For instance, the 1967 Convention Establishing the World Intellectual Property Organization (WIPO Convention) does not offer a formal definition of IP rather 'defining' IP broadly as including rights relating to:

> "Literary artistic and scientific works; performances of performing artists, phonograms, and broadcasts; inventions in all fields of human endeavor; scientific discoveries; industrial designs; trademarks, service marks, and commercial names and designations; protection against unfair competition; and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields."

Subsequent to the 1967 WIPO Convention, the concept of IP has been stretched to include not only patents, copyright, industrial designs and trademarks but also trade secrets, plant breeder's

rights, geographical indications and rights to layout designs of integrated circuits.[1] This study focuses on plant breeder's rights as aspects of intellectual property.

Plant Breeders Rights are rights, granted by the state (the sovereign) to persons, who have developed new varieties of plants, for a limited period of time. These rights allow the owner to have exclusive rights to exploit the variety, and entitle the breeder to prevent unauthorized use of their variety. A protected variety, therefore, is a plant variety for which exclusive plant breeder's rights have been granted to the owner. The grant of these rights is subject to the variety meeting the internationally recognized standards of distinctness, uniformity, stability and novelty. In addition, the plant variety should also be designated by prescribed variety denominations. The protection is marked by a grant of special title of protection.[2]

The basis of this study stems from the evolution of protection of plant biotechnology culminating in the extension of intellectual property rights to plant biotechnology. The Trade Related Aspects of Intellectual Property (TRIPS) Agreement has a purposeful provision on the protection of plant biotechnology. This has brought about a major shift towards imposition of plant variety protection in a lot of countries. Article 27 of TRIPS provides for agro patents by stipulating that

> "…patent protection is available for all inventions in all fields including agriculture and related science."

[1] World Intellectual Property Organization (WIPO) <http://www.wipo.int/wipolex/en/index.jsp>accessed 18 February, 2015.

[2] Wekesa, M. (2009), 'An Overview of Intellectual Property Rights (IPRs) in Kenya' in Moni Wekesa and Ben Sihanya (eds) *Intellectual Property Rights in Kenya (*Konrad Adenauer Stiftung and Sports Link Nairobi, Kenya)pp. 51-6.

In addition, Article 27 (3) (b) provides that:

> "Members may exclude from patentability plants and animals other than micro-organisms, and essentially biological processes for the production of plant or animals other than non-biological and microbiological processes. However members shall provide for the protection of plant varieties either by patents or by effective *sui generis* systems or by a combination of both."

This article leaves a wide choice to national systems. However, it essentially introduces the central aspect of this study: Plant variety protection (effective *sui generis system*)

Another important international instrument that has established IPR in plant biotechnology is the International Convention for the Protection of New Varieties of Plants (UPOV). New Plant Varieties are eligible for the intellectual property protection under the plant breeders rights provided in the UPOV Convention. Other Agreements include WIPO, OAPI, BANGUI Agreement and ARIPO (Harare Protocol) among others.

In spite of provisions in international instruments as discussed above, protection of plant biotechnology through intellectual property has however, been riddled with controversy centered on the threat to food security. The discussion on this is outside the scope of this study. This study's the basic objective to establish the status of legal protection of plant biotechnology through intellectual property.[3]

[3] Matthew Rimmer, 'Franklin Barley Patent Law and Plant Breeders' Rights' (December 2003) 10 (4) Murdoch University Electronic Journal of Law <http://www.murdoch.edu.au/elaw/issues/v10n4/rimmer104.html> accessed 23 October, 2014.

1.1 BACKGROUND OF THE STUDY

Plant genetic resources for food and agriculture provide the biological basis for agricultural production and world food security. These resources serve as the most important raw material for farmers, who are their custodians, and for plant breeders. The genetic diversity in these resources allows crops and varieties to adapt to ever-changing conditions and to overcome the constraints caused by pests, diseases and abiotic stresses. Plant genetic resources are essential for sustainable agricultural production. There is no inherent incompatibility between the conservation, Protection through PVP or Licensing and the use of these resources. In fact, it will be critically important to ensure that these activities are fully complementary.[4]

Agriculture in the twenty-first century will face many new challenges. Food production will have to increase dramatically to meet the needs of a growing and modernizing population with a proportionally smaller rural labor force. Changes in diets and food habits will drive changes in crop and livestock production systems. Faced with the world's food security, energy and sustainable development needs, countries will have to address the challenges and opportunities posed by the production and use of bio-fuels.

In many parts of the world, the effects of climate change are likely to require changes in the adaptability of many crops and forages, increasing the interdependence of countries on Plant Genetic Resources for Food and Agriculture (PGRFA). Climate change will also lead to changes in production areas and practices as well as in the occurrence of pests and diseases of crops and livestock. Agriculture will need to continue to reduce its negative impact on the environment and

[4] Jose Graziano da Silva, 'Second Global Plan of Action for Plant Genetic Resources' (FAO, Rome, Italy 29 November 2011) <http://www.fao.org/fileadmin/templates/agphome/documents/PGR/GPA/GPA2/GPA2_en.pdf> accessed 24 February, 2015

biodiversity and to adopt more efficient and sustainable production practices. Changes in land use will limit the area available for agriculture and increase the pressure on populations of crop wild relatives (CWR) and wild food plants. PGRFA underpin the ability of agriculture to cope with changes, whether environmental or socio-economic. They will therefore have to play an increasingly important role in securing continued improvements in agricultural production and productivity, not only by providing new genes for improved crop varieties but also by contributing to effective agro-ecosystem function and bio-product development. This can only be achieved if we have a strong plant variety Protection system to motivate the breeder to breed even more varieties that will help to sustain the growing population.[5]

Moreover Agriculture in the twenty-first century has faced numerous new challenges. The demand for food in Kenya is on the sharp rise especially with the country's growing population. Despite efforts to diversity to other foods, maize consumption in the country continues to grow. Maize, however, faces an alarming decline in production brought about by climate change, pests, diseases and abiotic stresses. The constant rise in demand has led to an increase in public expenditure on maize imports which is still incapable of offsetting the deficit.

The status of production of maize in the country remains low and this has significantly caused the uneven distribution of available maize in the country. A daily challenge that is all too familiar to farmers and breeders. It is no surprise that the exorbitant price of maize products in the market are beyond the reach of many Kenyans thus exacerbating poverty in the country. Ordinary farmers and breeders, (most of whom form part of the rural poor) encounter a myriad

[5] ibid p. 2

of problems emanating from limited access to land and security of tenure where majority make up a huge population of squatters all attributed to weak policies having a detrimental impact on food security in the country.

Concerns over food security, energy and sustainable development needs for the country need to be addressed while opportunities for increased production of maize such as the use of bio fuels should be explored. It is against this backdrop of the challenges facing farmers and breeders that plant variety protection comes out as instrumental in encouraging the development of new maize varieties for the benefit of society. In comparison to animal breeding which is lengthy and expensive, plant variety is easy and quick to reproduce. It increases the number of new varieties in the market with the potential of development of new industry competitiveness on foreign varieties.

1.2 STATEMENT OF THE PROBLEM

There have been concerns about food security in Kenya. This study opines that these concerns can best be addressed by focusing on maize variety protection. This is because of two reasons. First, maize being a plant, its breeding takes a shorter time in comparison to animal breeding. Second, maize is the central staple food in the country.

Over the years, the breeding of maize has been through traditional methods. Traditional method of propagating maize in mainly through seed rotation which basically involves saving of a seed of a previous harvest to use in future planting. This involves no research to improve the maize variety in question. In addition, it has the potential of lowering crop resistance to pests and

diseases since same gene traits are propagated year-in-year-out. The result of this traditional maize protection system has seen dwindling yields per acre year in year out. This has continued to expose the country to serious maize shortage. However, with the developments in bio-technology, researchers have been able to come up with better breeds of seeds with high yields. Such varieties contain only the good-yield genes to ensure better harvests.

Traditional methods of protecting plant varieties are either lacking or are not effective, where they exist. As such, the traditional plant varieties do not provide an incentive to farmers to engage in food production because of dwindling yields per acre. Protection of high yield maize variety is central to ensuring food security in the country. In this regard, intellectual property stands to play a central role in securing the protection. This will not only ensure guarded use of the said variety to the advantage of only the breeders but also increase in the number of new varieties in the market with the potential of food explosion in the country.

This study highlights the importance of intellectual property protection of maize varieties that have been scientifically developed to suit varies climatic zones in Kenya. It is the central argument in this study that enhanced protection of maize variety breeds has the potential of significantly improving maize harvests in Kenya; and hence will address the question of food security.

1.3 HYPOTHESIS

This study hypothesizes that protection of scientifically developed maize varieties has the potential of addressing the food security concerns in Kenya. Protection of maize varieties will

assure breeders recoup their labour and resources in the research. This will encourage breeders to engage in further research as pest and disease resistance of the present varieties reduces with time.

The protected varieties will enhance a controlled use of the same so as to lay a basis of comparison with the ordinary varieties. Hybrid maize varieties have the potential of high yields per acre. This translates to production of enough food for the country using few seeds. It is in no question therefore that improvement and protection of maize varieties is the route to food security in the country, and both patenting and using an effective *sui generis* means in protecting of the new varieties is the surest way to propel further research hence leading to food security.

1.4 OBJECTIVE OF THE STUDY

1.4.1 GENERAL OBJECTIVE

The main objective of this study was to assess the economic importance of maize variety protection in Kenya.

1.4.2 SPECIFIC OBJECTIVES

The specific objectives of this study were:

1. To assess the effect of *sui generis* protection of maize varieties on investment in maize breeding in Kenya;
2. To assess the connection between maize variety protection through *sui generis* and maize farmers' income;

3. To assess the effectiveness of maize variety protection on rural economic development; and
4. To establish how international market of maize crop responds to protecting of maize varieties.

1.5 RESEARCH QUESTIONS

This study was to examine the status and the trend of plant variety protection, especially maize protection through *sui generis* in the Kenyan context. The study undertook to re-examine in detail the implication of maize variety protection in Kenya. To undertake this study, the following research questions acted as a guide.

1. What is the effect of *sui generis* protection of maize variety on investment in maize breeding Kenya?
2. What is the connection between maize varieties protection through *sui generis* and maize farmers' income?
3. To what extent does protecting of maize varieties contribute to rural economic development? and
4. How does international market of maize crop respond to protecting of maize variety?

1.6 THEORETICAL FRAMEWORK

1.6.1 INTRODUCTION

Over the years, the development of intellectual property world over has ushered in a new era of property ownership. The main focus is the value from intellectual capital and knowledge-based assets as opposed to the traditional property theory whereby assets were seen in terms of raw

materials such as land and chattels. As a result, intellectual property rights regimes have also emerged to confer upon the creator an exclusive right for the use of his creation for a certain period of time. To ensure order and justice in the protection, management and administration of intellectual property rights, government-run institutions have been established.

As private property ownership regime, the focus on intellectual property rights is buoyed by the belief that increased privatization and recognition of a person's intellectual capital and knowledge-based assets will enable him to better capture the value from his productive knowledge assets. To this end, and in relation to this study, the United Nations is convinced, through the International Convention for the Protection of New Plant Varieties of Plants (UPOV)[6] that this is the way to go.

The basis for the protection of intellectual property rights is founded on various property theories. This study was premised on two property theories namely: the private or personality rights theory and the natural rights theory.

1.6.2 THE PRIVATE/PERSONALITY PROPERTY RIGHTS THEORY

The main jurisprudential basis in this study is the private or personality right property theory. The private property rights theory is derived from Hegel's[7] philosophy of right. According to this theory, private property rights are crucial to the satisfaction of some fundamental human needs. The theory further postulates that property is not merely material acquisition but is central to an

[6] UPOV came into force on December 2, 1961. It was revised on November 10, 1972, on October 23, 1978 and on March 19, 1991

[7] Georg Wilhelm Friedrich Hegel (August 27, 1770 – November 14, 1831) was a German Philosopher, who authored *The Elements of Philosophy of Rights* in 1820. A major figure in German Idealism, he combined history and idealism to account for reality. [Information accessed on 29th March, 2014].

individual's assertion of identity and personality. Thus, property is an expression of self and the locus of an individual's claim to rights, since it is through property that one can say 'this is mine,' a claim that others respect. Hegel asserted that property is the 'embodiment of personality.'

Hegel's private property theory propounds two crucial aspects attachable to the system of private property: individuality and personality which can be enhanced through contract and exchange. In this regard, governments should strive to create and allocate entitlements to resources in the manner that best enables people to fulfill those needs. On this basis, intellectual property rights are justifiable either on the ground that they protect infringement of proprietary rights; or on the ground that they create social and economic conditions conducive to creative intellectual activity, which in turn is important to human flourishing.[8]

Thus, private property theory alludes to two important guidelines concerning the proper shape of an intellectual property system. First governments, being in a social contract with its citizens, has the obligation to accord legal protection to the fruits of highly individualistic expressive intellectual activities, such as the development of new maize varieties aimed at addressing food security in a world faced with an ever changing climatic conditions. Second, a maize variety breeder's intellectual property is his '*persona.*' Intellectual property right in the breeding of new maize variety is therefore an important receptacle for personality of the breeder deserving of generous legal protection.[9]

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[8] Margaret Jane Radin, *Reinterpreting Property* (University of Chicago Press 1993); Jeremy Waldron, *The Right to Private Property* (Oxford, Clarendon 1988)

[9] Justin Hughes, 'Philosophy of Intellectual Property' (1998) 77 Georgetown Law Journal 287, 330-350

In regard to this study, the primary economic benefits of intellectual property rights protection for new maize varieties are two-fold. First, it will be useful to consumers since it will reduce their 'search costs' for quality maize. The consumer will easily pick the new maize variety at the exclusion of other maize varieties on the basis of reliance of the intellectual property protection. Secondly, the intellectual property protection of the new maize variety will create an incentive for businesses to the variety breeder to engage in further research for the improvement of the variety as climatic conditions keep changing.[10]

1.7 LITERATURE REVIEW

1.7.1 INTRODUCTION

This sub-chapter looks at the various publications that have been released and which are related to this study. The purpose is to distinguish this study from previous studies and also to fill the gaps that have been left by people who have researched in this area of interest.

The protection of plants and plant genes has not been a subject of discussion in various publications and researches. This is in spite of rich literature in bio-piracy and patenting of biological materials and traditional knowledge from gene-rich developing countries for profit without fair and equitable sharing of benefits or the appropriate transfer of new technologies in line with the provisions of the Convention on Biological Diversity.

[10] William Landes and Richard Posner, 'Trademark Law: An Economic Perspective' (1987) 30 Journal of Law and Economics 265; Nicholas Economides, 'The Economics of Trademarks, (1988) 78 Trademark Reporter 523-39 and Daniel McClure, 'Trademarks and Competition: The Recent History' (1996) 59 Law and Contemporary Problems 13-43

The protection of plants, genes and biotechnology thereof as well as the plant breeders is a matter of international concern that brings together both the exploiters in the North and the exploited in the South. As such, international instruments of protections [11] have become appropriate mechanisms for achieving a global goal.[12] In addition, national laws also play a significant role since the property which requires protection is national.

Whereas Sikinyi E.[13] makes a huge attempt at dealing with the laws governing plant breeders' rights in Kenya, the impact of these laws in Kenya is not highlighted. This leaves an important aspect of knowledge gap which this study intends to fill up. In this respect, this study will focus on the maize variety in Kenya with a view to making recommendations on how protected maize varieties may be utilized to increase yield the crop's yield to ensure food security in the country.

The field of economic importance of protecting maize variety especially in Kenya remains fallow. This study recognizes that maize is a crop that is largely consumed by many Kenyans, and having a variety that is resistant to many unfavorable conditions will be a break through as regards to food scarcity in Kenya. To have high yield varieties is not enough, to protect the maize varieties and the breeders' rights are the ultimate panacea to food security in Kenya.

In the book of Jayashree Watal[14], plants, genes and biotechnology have been dealt with in brief but how to protect this technology has not been written or researched on. This book has talked

[11] TRIPS, UPOV, UNCBD, WTO among others

[12] Srividhya Ragavan, "Of Plant variety Protection, Agricultural Subsidies and the WTO" in Peter K, YU (eds), *Intellectual Property and Information Wealth , Issues and Practices in the Digital Age*, (Praeger Publisher 2007) p. 327

[13] B. Sihanya, 'Plant Variety Protection (Plant Breeder's Rights) in Kenya' Moni Wekesa and Ben Sihanya (eds) *Intellectual property rights in Kenya* (Konrad Adenauer Stiftung, Sports Link Limited and Authors, 2009)

[14]Jayashree Watal (2nd edn), 'Intellectual Property Rights in the WTO and Developing Countries' (2001) Kluwer Law International 128

about pirating and patenting biological material and traditional knowledge from the gene-rich developing world for profit, without fair and equitable sharing of benefits or the appropriate transfer of the new technologies as called for by the Convention on Biological diversity (CBD) without giving / suggesting ways of protecting this technology and of course protecting the breeders in this field.

The author in this book[15] has also not mentioned some of the instruments and International Agreements that protect plant varieties and plant breeders in General, thus no specific mention of maize variety in Kenya and the economic importance it brings about.

In a book edited by Moni Wekesa and Ben Sihanya, E. Sikinyi[16] covers Plant Variety Protection in Kenya, he writes about the laws governing Plant breeders rights in Kenya at length and also cover international conventions on Plant variety protection. However he does not talk about the impact of having these laws in Kenya. Its Economic implications, He does not write about how it is done in Kenya and its advantages. Moreover this book does not look at a particular crop that needs to be protected especially in Kenya so as to increase the yields given the relief food we ask for every year and also given that maize is the staple food for Kenya and protection and increase in variety is paramount to help in hunger reduction.

In this book plant breeder's rights has not been listed as one of Intellectual property rights, This book recognizes only copyrights, patents and trademarks, industrial designs and confidential information to be the only intellectual properties.[17] In Merett, Compulsory licenses and licenses

[15] Supra note 4
[16] B. Sihanya, 'Plant variety protection (Plant Breeder's Rights) in Kenya' Moni Wekesa and Ben Sihanya (eds) *Intellectual Property Rights in Kenya* (Konrad Adenauer Stiftung, Sports Link Limited and Authors 2009)
[17] Paul Merett (2nd edn), *Intellectual Property Law* (Sweet& Maxwell Limited 1996) p. 2

of rights is mentioned in brief, it provides that licenses to use a patented invention may be granted in certain circumstances, notably when the right holder is not fully exploiting the patent, the public knowledge that a new invention be fully utilized has always been considered. From this paragraph it is clear that Merett does not write about PVP IP and it dwells on patents and other rights. This is a gap that this study fills.

In his book[18] Carlos looks at various topics of interest, he write widely about plant genetic resources under patent law, plant biotechnology under patents, patents on biological materials, patents and genes patents on plant varieties and access under plant breeders rights. It is clear that Carlos is more concerned about patenting of plant varieties without talking about protecting plant varieties under sui generis and off course not writing about the economic importance of protecting different plant varieties.

The international Union for the protection of new varieties of plants is closely associated with WIPO. The two organizations share both a building and the chief executive. UPOV administers the international convention for the protection of new varieties of plants, which sets out the Intellectual property rights of breeders in the new varieties of plants they breed. UPOV's importance resides primarily in its relationship to the TRIPS agreement which requires UPOV-based intellectual property protection standards for plant varieties.[19] This is a good analysis of a few International agreements that protects the plant breeders. Mine will be to expound on it.[20]

[18] Correa C. M. (3rd edn), *Intellectual Property Rights the WTO and Developing Countries: The TRIPS Agreements and Policy options* (Zed Books Ltd 2000) p. 167

[19] "UPOV Convention" means the 1991 Act of the International Convention for the Protection of New Varieties of Plants.

[20] Renee' Marlin Bennett (2nd edn), *Intellectual Property Information and Privacy* (Viva Books Private Ltd. 2006) p. 59

And to narrow down to the benefits of protecting plant varieties and most importantly maize variety in Kenya.

In this paper the author has dealt with many important issues surround plant variety protection, for example the author talks about Plant variety in general though briefly, he gives history of plant variety protection, he also writes about his concerns in developing countries. The author goes ahead to talk about international obligations for plant variety protection under this sub-topic he talks about TRIPS, UPOV, WTO among others. Apart from patenting the writers explained another way of protecting varieties i.e. sui generis system. The writer also examines plant breeder's rights in the context of agricultural subsidies. This is a good read though my work will be to look at Kenyan perspective[21] and most importantly the economic benefits of maize protection in Kenya.

In this book, conceptual perspective on Biodiversity has been dealt with, plant breeder's rights and licensing of agricultural IP has not been talked about. This book[22] has many gaps to be filled. I shall also fill the gap by writing about the general economic benefits of maize protection.

William provides patenting for plant varieties, He also writes about licensing of patents and allied rights. William goes ahead to talk about Licensing, under this he talks about types of licenses, particular terms of licenses, protection for the licensor and the licensee. He summarizes

[21]Srividhya Ragavan, 'Of Plant Variety Protection, Agricultural Subsidies and the WTO' in Peter K, YU (eds), *Intellectual property and Information Wealth ,Issues and Practices in the Digital Age* (Praeger Publisher 2007) p. 327

[22]Chidi Oguamanam, *Intellectual property, Plant Biodiversity, and Traditional Knowledge* (University of Toronto Press Incorporation 2006) p. 163

by giving circumstances under which a license can be forcefully be given out to the public without owners consent.[23] To fill this gap I will dwell on PVP and its economic importance in Kenya.

In a nutshell I have realized that not many people have written on the economic importance of plant variety protection, leave alone protecting maize variety especially in Kenya, this is an area I would like to dwell on since maize is a crop that is consumed by many Kenyans, and having a variety that is resistant to many unfavorable conditions will be a break through as regards to food scarcity in Kenya. We shall not have people dying in most areas of Kenya due to hunger. This can only be achieved if we have a strong law that protects maize and when people realize the importance of this protection. This is a huge gap that this study fills.

1.8 RESEARCH METHODOLOGY

1.8.1 INTRODUCTION

The research majorly relied on both primary and secondary data sources for example library materials and internet based research. It further involved the study of publications on this subject. It also involved books written by experts in this field of Plant variety protection. I also reviewed journals written on the subject. Online resources came in handy as a way of getting a clear understanding of the recent developments and contemporary issues on Plant variety protection.

1.8.2 DATA NEEDS AND DATA SOURCES

The data was generated during the study was majorly dictated by the research problem. Thus data that provided answers to the research questions. These included data on the status of plant

[23] Wiliam Corlnish (6th edn), *Intellectual Property* (Sweet and Maxwell Limited 1981) p. 13-15

variety protection in Kenya; materials on the social economic implications of having maize variety protected will be paramount; and data on whether maize variety protection will encourage technology transfer and development of international markets.[24]

The main sources of this data were books, journals and the internet. Reports of various Organizations that deal with plant breeder's rights also formed part of the data source.

1.8.3 DATA PRESENTATION AND ANALYSIS

The data has been presented both in prose. It has been analyzed strictly qualitatively based on the secondary data from various literature considered in the study.

1.8.4 LIMITATIONS

This study was restricted to the issues concerning maize plant variety protection and its economic importance in Kenya. being limited data gathered from books, journals, pronouncements made by renowned international and local law scholars, conventions and protocols, the study did not involve international travels to centers that transfer plant technologies for example MONSANTO, Bayer, SYNGETA. Other limitations also arose from inadequate resources, e.g. text books, journals and articles from the University library also compounded the limitations of the study.

1.9 CHAPTER BREAKDOWN

This section gives brief outline of the intended Chapters to be covered in the study. A total of five Chapters are intended to be covered as outlined below.

[24] Korathi C. R. (2nd revised edn), *Research Methodology: Methods and Techniques,* (New Age International Limited Publisher, New Delhi, India, 2004) p. 95

1.9.1 CHAPTER ONE: INTRODUCTION

This Chapter covers the research proposal. It introduces the topic of study, gives a basic background of the research question, the statement of the problem, objectives, hypothesis, research question and justification of the study it also provides the literature review and the research methodology applicable to the study.

1.9.2 CHAPTER TWO: LEGAL FRAME WORK FOR PLANT VARIETY PROTECTION

This Chapter examines the legal and institutional framework for the protection of plant varieties. A discussion is mounted at the global level, regional and national levels.

1.9.3 CHAPTER THREE: THE TRENDS OF PLANT VARIETY PROTECTION

At this point I have endeavored to look at the Plant variety protection in Kenya. A detailed research on the relevant laws in this field has been the basis of ascertaining whether there is a conducive environment for the protection of plant varieties in Kenya.

1.9.4 CHAPTER FOUR: THE ECONOMIC IMPLICATION OF PVP: THE CASE OF MAIZE IN KENYA

This Chapter widely deals with the economic implications of plant variety protection in Kenya; especially the advantages and disadvantages of the applicable laws and practices in plant variety protection.

1.9.5 CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

This Chapter provides the conclusion and recommendations of the study based on the lessons to be learned in practices of developed countries that have the technical knowhow in areas of plant breeding and in the protection of the breeders' rights.

CHAPTER TWO

LEGAL FRAMEWORK FOR PLANT VARIETY PROTECTION

2.0 INTRODUCTION

Many countries, including developing countries and countries in transition to a market economy, are considering the introduction of a system for the protection of new varieties of plants (PVP system). Most of the countries which have already introduced a PVP system have chosen to base their system on the International Union for the Protection of New Varieties of Plants (UPOV Convention) in order to provide an effective, internationally recognized system which concerns itself with the protection of plant varieties that are new, distinct, stable and uniform.

2.1 GLOBAL INSTRUMENTS FOR PLANT VARIETY PROTECTION

A number of international instruments govern plant variety protection globally, the main international instrument being the International Union for the Protection of New Varieties of Plants (UPOV). However, five other instruments are also of importance in this regard. These are the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement; the United Nations Convention for Biological Diversity (UNCBD); The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. Food and Agriculture's International Undertaking on Plant Genetic Resources (IUPGR) 1983; and the International Treaty on Plant Genetic Resources for Food and Agriculture 2001. We undertake to give an insight into each of these instruments on standalone basis and also in comparison to each other, as far as is appropriate.

2.1.2 INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS (UPOV)

The protection of plant varieties is by and large governed globally by the International Union for the Protection of New Varieties of Plants (UPOV Convention). For the plant varieties to be protected under UPOV, they must be new, distinct, stable and uniform. Owing to increasingly changing trends in the technology of plant variety protection, UPOV which first came into force in 1961[25] has seen substantial amendment,[26] the most recent being the 1991 Act.[27] In spite of these amendments, countries are free to choose which Act should apply in their case.

Two later revisions, the 1978 Act and the 1991 Act of UPOV, introduced the basis for determining an 'effective sui generis right' under Article 27(3) (b) of the TRIPS Agreement.[28] This has been useful to developing economies which have hence modeled their domestic legislations to conform to the UPOV Act. However, subtle differences exist between the 1978 and the 1991 Acts of UPOV.

The 1978 Act of UPOV, while specific only to plant varieties of nationally defined species or genera,[29] introduced an angle to the production of new plant varieties for the purposes of commercial marketing, offering for sale and marketing of propagating material for a protected

[25] The International Convention for the Protection of New Varieties of Plants of December 2, 1961
[26] The Act of 10, November 1972; the Act of October 23, 1978; and the Act of March 19, 1991
[27] The International Convention for the Protection of New Varieties of Plants of March 19, 1991
[28] 'Members may also exclude from patentability plants and animals other than micro-organisms, and essentially biological processes for the product of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties by patents or by an effective *sui generis* system or any other combination thereof. The provisions of this sub-paragraph shall be reviewed four years after the date of entry into force of the WTO Agreement'
[29] International Union for the Protection of New Varieties of Plant, 1978 Act, Article 2 (2)

variety. It also covers only plant varieties of nationally defined species or genera.[30] The 1978 Act sets the minimum period for protection at 15 years during which time breeders may use a protected variety to develop a new variety unless it requires repeated use of that variety;[31] and farmers may use their harvested material from a protected variety for any purpose.[32]

The1991 Act, on the other hand, was enacted to respond to changes and developments in intellectual property rights of breeders with a view to enhancing the breeders' intellectual property rights. This Act addressed itself to, *inter alia*, exportation, importation and stocking of the protected material.[33] While aligning itself to protection period of patents under TRIPS Agreement of 20 years,[34] the 1991 Act expanded its cover to plant varieties of all genera and species.[35]

The 1991 Act proscribes not only the production of plant varieties which are essentially derived from a protected variety or which are not distinguishable from such a variety, but also the selling or exchanging harvested material for replanting. However, it leaves it to the discretion of national governments to decide whether farmers shall be allowed within reasonable limits, while safeguarding the legitimate interests of the rights holder, to reuse the harvest of protected varieties on their own land-holdings without the authorization of the rights holder. Thus, in choosing whether the 1978 Act or the 1991 Act is the more effective sui generis model under article 27(3) b of the TRIPs Agreement, countries ought to be aware of these differences.

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[30] ibid, Article 5
[31] ibid, Article 8
[32] ibid, Article 5(3)
[33] International Union for the Protection of New Varieties of Plant, 1991 Act, Article 14
[34] Agreement on Trade-Related Aspects of Intellectual Property Rights, 15th April 1994, Article 33; and ibid (n 43), Article 19 (2)
[35] ibid, 43, Article 3 (1) (ii)

2.1.3 AGREEMENT ON TRADE-RELATED INTELLECTUAL PROPERTY RIGHTS (TRIPS) AGREEMENT

The one but all important Article of the World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) for the protection of plant varieties is Article 27.3(b). Pursuant to this Article, all WTO Member States have a duty to provide for intellectual property protection for plant varieties '… either by patents or by an effective *sui generis* system or by any combination thereof.' The point here being that owing to the fact that *sui generis* itself can take many forms, the range of flexibility is wide for a WTO member to develop its own mechanism to protect plant varieties.

A country's chosen protection system, if a complete *sui generis*, is typically comprehensive; covering many aspects. Whereas some of these aspects are addressed in the TRIPS Agreement and the Convention on Biological Diversity (CBD), others are dictated by such country-specificities as the level of economic development, resources, agricultural and industrial policies, the state of the public and private research capability, and special needs of small farmers and indigenous communities. However, this study takes a close look at two key building blocks of a *sui generis* system, namely farmer's rights and breeder's rights. As all *sui generis* systems must include both these rights, the main question is striking an appropriate balance between the two.

The general rule for patentability is that patents shall be available for inventions, whether products or processes, in all fields of technology, provided that they are new, involve an

inventive step and are capable of industrial application. However, as one of the three cases of exceptions from the general rule is the provision of the protection of plant varieties.[36]

The exception provides for patent protection for non-biological and microbiological processes such as biotechnological gene manipulation and gene transfer. Thus, microorganisms, such as bacteria, viruses, fungi, algae, protozoa and non-biological and microbiological processes for the production of plants and animals are accordingly eligible for patent protection. To this extent, countries that exclude plant varieties from patent protection are required to provide an 'effective *sui generis* system' of protection.

The gist of this exception to the general rule lies in the legal interpretation enunciated from a Food and Agriculture resource manual TRIPS Agreement (FAO 2000). According to FAO, 'plant' includes whole plant and parts of the plant as well (genetic material, tissues, leaves, etc). However, Article 27.3 (b) has kept open the number of botanical genera and species that can be included for protection. In principle, therefore, all genera and species of plants can be included in the list of protected varieties. Similarly, nothing in the Article precludes WTO Members from granting protection under *sui generis* system to subject matter that goes beyond plant varieties only. Therefore, even traditional or indigenous knowledge and farmers' rights may be subject to protection under a sui generis system.

[36] TRIPS Agreement: the three exceptions to the general rule of patentability: Article 27 (2): inventions contrary to order public (public order), or where inventions are dangerous to human, animal or plant life or health or to the integrity of the environment; Article 27 (3) (a): diagnostic, therapeutic and surgical methods for the treatment of humans or animals; and Article 27 (3) (b): plants and animals other than microorganisms and essentially biological processes for the production of plants or animals (natural breeding methods)

FAO excludes from the animal and plant kingdoms, microorganisms being microscopic organism including bacteria, viruses, unicellular algae and protozoan, and microscopic fungi, and are considered to be a category different from the kingdoms of plant and animals. This conforms to the provision of Article 27 (3) (b) requiring patenting for microorganisms.

FAO borrows from natural science to define 'biological process' as any biological activity carried out by any living organism at molecular, cellular or organism level. Extending this concept, 'essentially biological process' may be understood as a process which is performed without the application of any external technical skill by humans. This interpretation, though, is debatable and therefore leaves room for interpretation by members themselves.

FAO defines 'microbiological process' as a process that applies microbiological techniques using plant cells or microorganism. This may or may not result into production of an entire plant, hence Article 27 (3) (b) is a controversial provision. However, for non-biological process, FAO has enabled its interpretation as a process, which will result in a product that cannot be created naturally. Thus, any method of genetic engineering may be regarded as being non-biological method.

2.1.4 CONVENTION ON BIOLOGICAL DIVERSITY

The United Nations Convention on Biological Diversity (UNCBD) which was conceived during the UN Conference on Environment and Development (UNCED) in 1992, and came into force in December 1993, covers all fields of biodiversity encompassing all issues concerning genes,

species and ecosystem.[37] In addition, UNCBD takes a comprehensive approach to all issues concerning conservation and sustainable use of biodiversity; and addresses issues such as access to genetic resources, sharing of benefits from the use of genetic materials and access to technology.[38]

The Convention recognizes that Sovereign States have rights over their natural resources and the authority to determine access to genetic resources based on respective national legislation.[39] However, the Convention also stresses the need to facilitate access to genetic resources and opposes imposition of restriction that run counter to its objectives; and further provides for access on mutually agreed terms and prior informed consent.

Importantly, the Convention recognizes the contribution of local and communities in conservation of biodiversity. This brings to fore the need to maintain local knowledge and practices of conservation and sustainable use of biodiversity; as well as the need to encourage equitable sharing of benefits derived from the use of the local knowledge.[40] This scheme of protection, sustainable use and fair and equitable benefit sharing is possible through the adoption of sound legislative, administrative and policy measures by a Member State to also provide for access to and transfer of technology to developing countries on mutually agreed terms, including technology protected by patents and other IPR.[41]

[37] FAO, *Resource Manual in Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement* (2000) <http://www.FAO.org> accessed 23 April 2015
[38] United Nations Convention on Biological Diversity 1992, Article 1
[39] ibid, Article 15 (1)
[40] ibid, Article 8 (j)
[41] ibid, Articles 15 (7) and 16 (3)

It is important to point out that after six years of negotiation, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity was adopted at the tenth meeting of the Conference of the Parties on 29 October 2010, in Nagoya, Japan.

The Protocol significantly advances the Convention's third objective by providing a strong basis for greater legal certainty and transparency for both providers and users of genetic resources. Specific obligations to support compliance with domestic legislation or regulatory requirements of the Party providing genetic resources and contractual obligations reflected in mutually agreed terms are a significant innovation of the Protocol.

These compliance provisions as well as provisions establishing more predictable conditions for access to genetic resources will contribute to ensuring the sharing of benefits when genetic resources leave a Party providing genetic resources. In addition, the Protocol's provisions on access to traditional knowledge held by indigenous and local communities when it is associated with genetic resources will strengthen the ability of these communities to benefit from the use of their knowledge, innovations and practices.

By promoting the use of genetic resources and associated traditional knowledge, and by strengthening the opportunities for fair and equitable sharing of benefits from their use, the Protocol will create incentives to conserve biological diversity, sustainably use its components, and further enhance the contribution of biological diversity to sustainable development and human well-being.

2.1.5 A CRITIQUE OF TRIPS *VIS-À-VIS* UNCBD

As has been outlined above, both TRIPS and UNCBD are two important international instruments for the protection of plant varieties. However, some areas of marked differences between the two regimes are apparent. First, in terms of overall framework, whereas the principle of sustainable utilization and conservation of biodiversity is central to UNCBD, for TRIPS the focus is on assuring rights and benefits of intellectual property rights holder.[42]

Second, UNCBD not only recognizes the sovereign rights of the states over their natural resources and the authority to determine access to genetic resources rests with the national governments. It has also made provision of prior informed consent from the national governments for the access and benefit sharing for providing such access. On the other hand, under the principle of national treatment, TRIPS enables persons or institutions to patent a country's biological resources or knowledge relating to the resources in countries outside the country of origin of the resources or knowledge.

Third, in regard to private rights *vis-à-vis* community rights, TRIPS propounds the former while UNCBD identifies itself with the latter. Thus, whereas TRIPS provides for exclusive private rights, UNCBD recognizes collective contribution to the conservation and development of local genetic resources by the local communities over generations. Evidently, the position taken by UNCBD is conducive for fair and equitable benefit-sharing arrangement.

[42]Khor, M., *Intellectual Property, Biodiversity and Sustainable* Development (Zed Books, Third World Network Penang Malaysia 2002)

2.1.6 INTERNATIONAL UNDERTAKING ON PLANT GENETIC RESOURCES

The 1983 FAO International Undertaking on Plant Genetic Resources (IUPGR) was the first comprehensive international agreement governing the conservation and sustainable utilization of agricultural biodiversity. The objective of the IUPGR is to ensure the exploration, preservation, evaluation and availability for plant breeding and scientific purposes, plant genetic resources of economic or social interest, particularly for agriculture.[43] A significant feature of the Undertaking is the 'Resolutions' therein.

Resolution 4/89 of IUPGR recognizes the rights of farmers of all regions based on their conservation and development of plant genetic resources in the course of plant production.[44] These rights are defined in the context of the past, present and future contributions by farmers.[45] Resolution 3/91 takes bold stance on three fundamental issues: reaffirming that 'plant genetic resources are heritage of mankind' and are subject to the sovereign rights of nations over their genetic resources; 'breeder's lines and farmers' breeding material should only be available at the discretion of their developers during the period of development;' and the principle of unrestricted access to genetic resources is access granted conditional to the adequate compensation for the access and subject to the sovereign rights of countries over their plant genetic resources.

2.1.7 INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) was adopted in 2001. It encourages contracting parties to protect and promote Farmers' Rights

[43] ibid (n 47)
[44] International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) 2001, Article 9
[45] FAO's International Undertaking on Plant Genetic Resources Agreement, Resolution 5/89

through national legislation for protection of traditional knowledge; right to equitably participate in sharing benefits arising from the utilization of genetic resources; right to participate in decision making at national level; and rights to save, use, exchange and sell farm- saved seed and propagating materials.

2.2 REGIONAL LEGAL FRAMEWORK FOR PLANT VARIETY PROTECTION

The African scenario with regard to plant variety protection is best viewed through the African Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources (2000); African States as signatories to global instruments; and in the context of the regional organizations for intellectual property.

2.2.1 THE AFRICAN MODEL LEGISLATION 2000[46]

The main aim of this legislation is to ensure the conservation, evaluation and sustainable use of biological resources, including agricultural genetic resources, and knowledge and technologies in order to maintain and improve their diversity as a means of sustaining all life support systems.[47] Part V of the legislation recognizes 'farmers' rights as stemming from the enormous contributions that local farming communities….have made in the conservation, development and sustainable use of plant and animal genetic resources that constitute the basis of breeding for food and agriculture production.'[48] The emphasis of protection of farmers' rights in varieties and

[46] African Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources 2000
[47] ibid, Part 1
[48] ibid, Part V, Article 24 (1)

breeds is 'under the rules of practice as found in, and recognized by, the customary practices and laws of the concerned local farming communities, whether such laws are written or not.'[49]

The model legislation, at Part VI, provides for breeders' rights. Breeders' rights stem from their recognition of the 'efforts and investments made by persons/institutions for the development of new varieties of plants…'[50] The condition attached to breeders' rights is that the varieties ought to be new, that is to say, clearly distinguishable, stable, homogeneous.[51] The breeders' rights are private and exclusive to sell, produce[52] and subject to the farmers' rights; and extinguishable after 20 years in the case of annual crops and 25years in the case of trees, vines and other perennials commencing on the day on which the successful application for a Plant Breeders' Rights in respect of the plant variety was accepted.[53]

2.2.2 AFRICA'S RELATIONSHIP WITH THE INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS (UPOV)

In the African context it may be argued that there is no formal Relationship between the African Union and UPOV *per se* to the extent that only four countries are formally members of UPOV and parties to the various UPOV Acts.[54] These are mainly the English speaking African States of Kenya[55] and South Africa[56] which subscribe to the 1978 Act; and Tunisia[57] and Morocco[58] which are parties to the 1991 Act.

[49] ibid, Article 25 (1)
[50] ibid, Part VI, Article 28
[51] ibid, Article 29
[52] ibid, Article 30
[53] ibid, Article 34
[54] Kenya, South Africa, Tunisia, Morocco and ARIPO
[55] Kenya became a member of UPOV and party to the 1978 UPOV Act on 13th May 1999
[56] South Africa became a member of UPOV on 6th November 1977 but became party to UPOV 1978 Act on 8th November 1981

However, one of the most significant developments in Africa in relation to UPOV since the adoption of the original 1998 African Model Law is the inclusion of Annex X in the 1999 Revised Bangui Agreement on the Protection of Plant Varieties. In a rejoinder, the 17th UPOV Council of April 2000 recognized Annex X of OAPI Agreement as being in conformity to the 1991 Act of UPOV. Consequently, all the 17 OAPI Member States[59] adopted the 1991 Act of UPOV as their sui generis system of protection of plant varieties in accordance with the TRIPS Agreement requirement. Formally, OAPI was admitted to the membership of UPOV and a party to the UPOV 1991 Act on 8th October 2014. Although the entire scheme of arrangement between OAPI and UPOV did not, as of necessity, constitute OAPI Member States becoming direct parties to UPOV, each one of their respective legislations on protection of plant varieties accord to the standards set in the 1991 UPOV Act. However, the ARIPO instrument-the Arusha Protocol for the Protection of New Varieties of Plants (the Arusha Protocol) was only adopted in July 2015, and should the requisite number of ARIPO Member States sign the instrument, will enter into force in January 2016.[60]

A third regional PBRs system, under the aegis of the Southern African Development Community (SADC) is also under negotiations. ARIPO and SADC have a combined membership of 26 countries. Should the negotiations towards the conclusion of the regional instrument under SADC be successful and all ARIPO and SADC member states each ratify its respective protocol, a regional PBR system will become available in at least 40 African countries.

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[57] Tunisia became member of UPOV and a party to UPOV 1991 Act on 31st August 2003
[58] Morocco became a member of UPOV and a party to UPOV 1991 Act on 8th October 2006

[59] Benin, Bukina Faso, Cameroon, Central African Republic, Chad, Congo, Ivory Coast, Equatorial Guinea, Gabon, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Senegal, Togo and Comoros.

[60] On adoption four countries signed the Arusha protocol, the Gambia, Ghana, Mozambique and Sao Tome Principe

The Arusha Protocol and the proposed Protocol for the Protection of New Varieties of Plants in the SADC Region (the SADC draft), do not intend to replace the national PBRs registration systems already in place in some ARIPO and SADC member countries.

It is notable that the PBRs standards proposed for inclusion in the Arusha Protocol and the SADC draft are those contained in the 1991 Act of the International Convention on the Protection of New Varieties of Plants (UPOV 1991). The PBR standards of UPOV have been set by the largely developed countries membership of UPOV in 1991 in response to the needs of their agricultural systems. The majority of agricultural systems in the ARIPO and SADC countries are significantly different from those in developed countries.

Until now, none of the ARIPO and SADC member countries are parties to UPOV 1991. Kenya and South Africa are parties to a 1978 version of UPOV. The PBR standards of this older convention are not as strict as those of UPOV 1991, and therefore may be more suitable to African countries.

However, UPOV 1978 is no longer open for new members. Although both the ARIPO and SADC draft regional instruments seek to provide standards for protection of PBRs at par with UPOV 1991, the standards so proposed are not identical. For the countries that are members of both ARIPO and SADC this is likely to present an implementation challenge. At the same time, 21 of the countries constituting ARIPO and SADC are parties to the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). The objectives of this Treaty are the conservation, sustainable use and fair and equitable sharing of benefits arising from the use of

plant genetic resources for food and agriculture[61]. These objectives are fulfilled through among others, the exercise of farmers' rights. Farmers' rights refer to the "enormous contribution that local and indigenous communities and farmers of all the regions of the world have made and will continue to make for the conservation of plant genetic resources for food and agriculture, recognizing that these genetic resources are the basis for food production."[62]

2.3 LEGAL FRAMEWORK FOR PLANT VARIETY PROTECTION IN KENYA

The Kenyan legal framework for the protection of plant varieties includes the Constitution of Kenya 2010, the international instruments ratified by Kenya and the Seeds and Plant Varieties Act, Chapter 326, Laws of Kenya.

2.3.1 THE CONSTITUTION OF KENYA 2010

Seeds and plant varieties, being intellectual property rights attributed to a rights' holder, find cardinal protection in the Constitution of Kenya 2010 (the Constitution).The Constitution categorizes intellectual property rights of the people of Kenya under Chapter Four, the Bill of Rights which ought to be supported, promoted and protected by the State.[63] To this extent, the Constitution provides that a s fundamental right, the intellectual property rights in seed and plant varieties cannot be limited except to the extent that is reasonable and justifiable as shall be provided for by law.[64] Due to the significance attached to our intellectual property in, and

[61] The international Treaty on Plant Genetic resources for food and agriculture, (ITGRFA), Article 1
[62] ibid, Article 9
[63] The Constitution of Kenya 2010 (Government of Kenya) Article 40 (5)
[64] ibid, Article 24 (1) (d)

indigenous knowledge of, biodiversity and genetic resources of the communities, the Constitution further obligates the State protect and enhance the same.[65]

In exerting its supremacy over all laws of Kenya, the Constitution binds all persons and all State organs at both levels of government and further provides that 'any treaty or convention ratified by Kenya shall form part of the law of Kenya…' In this regard, Kenya is bound by all the international instruments it has ratified for the protection of plant variety. These include TRIPS, UPOV, IUPGR, and ITPGRFA discussed herein above.

2.3.2 THE SEEDS AND PLANT VARIETIES ACT, CHAPTER 326, LAWS OF KENYA

The Seeds and Plant Varieties Act, Laws of Kenya, came into force on the 1st January 1975. It was enacted primarily 'to confer power to regulate transactions in seeds, including provision for the testing and certification of seeds; for the establishment of an index of names of plant varieties; to empower the imposition of restriction on the introduction of new varieties; to control the importation of seeds; to authorize measures to prevent injurious cross-pollination; to provide for the grant of proprietary rights to persons breeding or discovering and developing new varieties; to establish a national centre for plant genetic resources; and to establish a Tribunal to hear appeals and other proceedings.'[66]

It has been revised twice, in 1978 and 1991, and amended in 2012 to accord it to changing trends in international trade relating to plants and seeds. Given that Kenya is a party to the UPOV 1978 Act, the Kenyan legislation is, to a large extent, in conformity with the requirements of the 1978

[65] ibid, Article 69 (1) (c)
[66] The Seeds and Plant Varieties Act, Chapter 326, Laws of Kenya: The preamble

UPOV Act. In 1994, the responsible Minister (now Cabinet Secretary) promulgated the Plant Breeders' Regulations to further streamline the institution.[67]

The Act provides for breeders' rights to be granted for varieties of all plant genera and species upon satisfaction of prescribed conditions by both the applicant and the plant variety in question,[68] for a fixed period of twenty years from the date of the grant, except in respect of trees and vines where the period shall be twenty-five years from the date of the grant.[69]

The Act creates the Kenya Plant Health Inspectorate Services (KEPHIS) as a body corporate to administer the Act.[70] Established in 1996, KEPHIS is the UPOV liaison national office which regulates importation and exportation of plant materials; trade in bio-safety control organisms; and examines, approves and registers new varieties of plants and seeds. A Plant Breeders Rights Office created in 1997 under KEPHIS handles matters related to plant breeders' rights. The Act also establishes the National Plant Genetic Resources Centre responsible for the conservation and sustainable utilization of plant biodiversity in Kenya.[71]

2.4 SUMMARY

Although plants and seeds are not patentable, TRIPS Agreement allows States to provide for special forms of protection for such material.[72] As has been outlined, all the instruments for the protection of plant varieties be they global, regional or national, resonate strongly around

[67] Seeds and Plant Varieties (Plant Breeder's Rights) Regulations, 1994

[68] ibid (n 73), sections 17 and 18
[69] ibid, section 19
[70] Established by the Kenya Plant Health Inspectorate Service Order, 1996 (L.N. 305/1996) or its successor
[71] ibid, section 27A
[72] Trade Related Aspects of Intellectual Property (TRIPS) Agreement, Article 27 (3) (b)

adequate protection of new varieties. The script more or less is the same, regardless of the context, albeit with appropriate modifications.

Once protected, breeders acquire rights for the new varieties of plants they develop for a limited period of between 20-25 years. These rights allow the owner to have exclusive rights to exploit the variety, and entitle the breeder to prevent unauthorized use of their variety. A protected variety, therefore, is a plant variety for which plant breeder's rights have been granted to the owner of the variety and the variety complies with the internationally recognized standards, i.e. distinctness, uniformity, stability and novelty, and also designated by prescribed variety denominations. The protection is marked by a grant of special title of protection.[73]

The rights holder can exclude third parties from using the propagating material of the variety without his/her permission for production or reproduction; conditioning for the purpose of propagation; offering for sale or any other marketing activity; exporting or importing and stocking for any of the purposes mentioned above. Whereas farmers are not necessarily breeders, where their farming practices result to development of new varieties which meet the criterion for protection, they may then be considered breeders.

[73] Moni Wekesa and Ben Sihanya (eds), *Intellectual Property Rights in Kenya* (Konrad Adenauer Stiftung and Sports Link Nairobi, Kenya, 2009)

CHAPTER THREE

THE TRENDS OF PLANT VARIETY PROTECTION IN KENYA:

A CASE FOR MAIZE PLANT

3.0 INTRODUCTION

Despite leaps of development in the 21st century attributable to technological advancements, there continues to be need for plant genetic resources for food and agriculture (PGRFA) and their conservation and sustainable use. This is bound to be faced with numerous and new challenges. Food and fibre production will have to increase dramatically to meet the needs of a growing and modernizing population with a proportionally smaller rural labour force characterized with old age, disease and shrinking farm. Changes in diets and food habits will drive changes in crop and livestock production systems.

Plant genetic resources for food and agriculture serve as the raw material used by plant breeders and farmers to create new plant varieties. As such, they are viewed by many as the foundation for modern agriculture and essential for achieving global food security. The genetic diversity in these resources allows crops and varieties to adapt to ever-changing conditions and to overcome the constraints caused by pests, diseases and abiotic stresses.

Based on the observed increased food productivity over the last four decades as a result of plant breeding, the United Nations Food and Agriculture Organization (FAO) is convinced that, by

and large, the future global food security is hinged on the continued food crop varieties that are higher yielding, resistant to pests, diseases and extreme weather conditions such as draughts; and regionally adapted to different environments and growing conditions.

The success of agriculture in the 21st century and beyond will depend on how it reduces its negative impact on the environment and bio-diversity in adopting more efficient and sustainable production practices. Changes in land use resulting in limited area available for agriculture require adoption of new trends in agriculture. Agriculture, therefore, has no option but to cope with changes, whether environmental or socio-economic. Accordingly, continued improvements in development of new genes for improved crop varieties cannot be overstated, the ultimate goal being to ensure food security in all rural areas around the world. Thus, plant variety development and protection will continue to form essential components of the livelihood strategies of households.

Countries of the world are interdependent when it comes to PGRFA. Each relies on the other for the genetic basis of its major food crops and food security. Thus, the plant varieties in any one country are characterized by non-indigenous staple crop germplasm that comes from other parts of the world. Although this state of affairs argues for free access by countries to a wide range of plant resources from other regions, plant variety protection is the way to ensure future crop improvement and continued gains in agricultural productivity globally through innovation.

To illustrate this, when Kenya was faced with the problem of *lepidopteron* maize stock borer in the 1990s, the introduction of new stem borer technologies to reduce crop losses due to this pest

involved importation of *Bt* maize leaves into Kenya from Mexico in accordance with Kenya's Bio-Safety Regulations. This enabled Kenyan researchers at Kenya Agricultural Research Institute (KARI) to perform leaf bioassays to identify and infuse *Bt* genes that are effective against each of the target stem borer species in the maize varieties for different agro-ecozones country wide.[74]

The Plant Varieties Act[75] contains the legislation for the protection of plant varieties in Kenya. The Kenya Plant Health Inspectorate Service (KEPHIS) is charged with the mandate of granting plant breeders' rights in the country. To date, 591 applications have been received from local and international applicants, and 106 of which have been approved for grant of plant breeders' rights. The tests necessary for variety protection or grant of plant breeders' rights are underway for the remaining applications.

Basically, a protected variety is a plant variety for which plant breeders rights have been granted to the owner of the variety and the variety complies with the internationally recognized standards, i.e. distinctness, uniformity, stability and novelty, and also designated by prescribed variety denominations. The protection is marked by a grant of special title of protection.[76]
In Kenya it is a requirement of the law[77] that the Cabinet Secretary makes a scheme of plant varieties that are eligible for protection. Table1.1 below shows the crops that are eligible for protection in Kenya.

[74] Songa J. M., and others, 'Towards Development of Environmentally Safe, Insect Resistant Maize Varieties for Food Security in Kenya' (The Syngenta Symposium, Washington D.C., USA, June 25 2002) pp 1-3
[75] Cap 326 of the Laws of Kenya
[76] See the Baseline Study on the seeds sector in Kenya Available on<http://afsta.org> accessed 26 May 2015
[77] Plant Varieties Act, Chapter 326, Laws of Kenya

Table 1.1: Crops Eligible for Protection in Kenya

SCHEME	LEGAL NOTICE NUMBER
Fruit Nut and Tree Crops Scheme	70
Vegetables Scheme	71
Trees and Woody Climbers Scheme	72
Root and Tuber Crops Scheme	73
Maize Scheme	74
Ornamentals and Herbaceous Plants Scheme	75
Oil and Fiber Crops Scheme	76
Other Cereals Scheme	77
Pulse Scheme	78
Pasture Plants and Grasses Scheme	79

Table 1.1: Source: KEPHIS, 2011

Since the implementation of the PVP system in 1997, a total of 1056 applications for PVP had been received by September, 2010. Although there was a slow rate of application in the initial stages, by 2001 an up surge in PVP applications was received from local breeders reflecting an increased awareness among breeders in public institutions on the need to protect their varieties and the utilization of the notion of varieties of recent.

Local breeders have submitted 385 of the total PVP applications, while 671 are from foreign applicants. Of the local applicants, 330 applications are from Public Institutions, while 55 are from the Private Sector. Out of the total applications, Food crops account for 369, Cash crops 805, while Forest Trees (Eucalyptus) have 8 applications. The trends in applications by 2011 may be summarized in Figure 1.2 below.

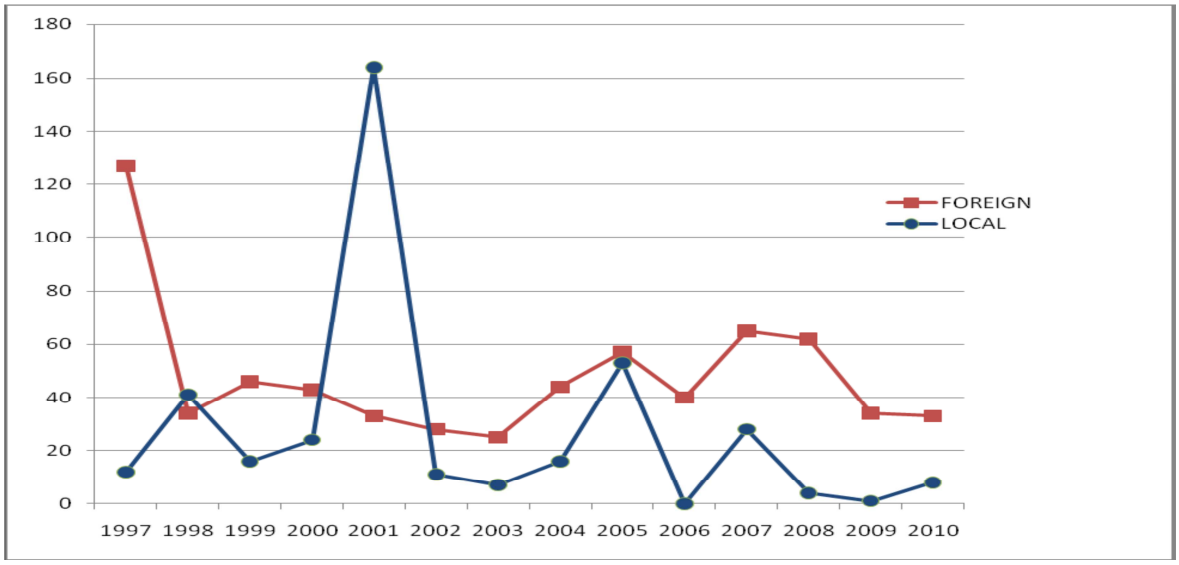

Table 1.2: Source: KEPHIS, 2011

3.1 THE RATIONALE OF PROTECTION OF PLANT VARIETIES

Plant variety protection is the protection of a plant variety against unauthorized or unlawful use without the consent or authorization by the owner of the variety who has been granted plant breeders' rights.[78] The breeders' rights (for protected varieties) are granted exclusively to persons or institutions discovering, breeding or developing new varieties. When a variety is protected in Kenya, the holder of the plant breeder's rights shall be entitled to reasonable compensation for anything done during the application period which, if done after the grant of the rights, would constitute an infringement on them.

According to FAO, government measures and increased public and private investment in the seed sector are required for the long term if agriculture is to meet the challenge of food security

[78] ibid

in the context of population growth and climate change.[79] To enhance this, intellectual property protection is crucial for a sustainable contribution of plant breeding and seed supply. An effective system of plant variety protection is a key enabler for investment in breeding and the development of new varieties of plants.

In most developing countries, although the agriculture sector is the back bone of the economy and employment, its productivity is characterized by unpredictability and extremely low yields from year to year. A large proportion of agriculture is subsistence farming, unable to generate any financial income and, insufficient to feed the farmers' families. As such, agriculture sector is unable to contribute to the overall economic development of the country concerned and is even less able to respond to the challenges mankind is facing.[80]

One of the reasons of poor performance of agriculture in many developing countries is the lack of progress in performance of traditional varieties over centuries. This situation contrasts with what has been achieved in developed countries where improvement in plant varieties has been taken seriously. In France and the United States of America where improvement of wheat and maize varieties has been respectively carried out for over two centuries, results of crop yields per acre are impressive.

In France, between 1815 and 1945 when the country did not invest in development and use of new wheat varieties, annual yields per acre were stagnant. This, however, drastically improved as from 1955 to date with an increased annual yield rate owing to development and use of new

[79] FAO, 'Responding to the Challenges of a Changing World: The Role of New Varieties and High Quality Seed in Agriculture' (The Second World Seed Conference, Rome 2009)
[80] Such as feeding a growing population; rural poverty; and climate change

wheat varieties.[81] In the United States of America, the yield rate of maize per acre between 1865 and 1933 was stagnant when the seeds were provided through open pollination. This improved drastically between 1943 and 1955 when seeds were provided through double cross hybrid technology. Excellent yields per acre have recently been achieved from 1956 to date owing to improved maize variety development using the single cross hybrid pollination.[82]

3.2 TESTS REQUIRED FOR PROTECTION

KEPHIS undertakes the tests to determine qualification for protection.[83] The tests are aimed at establishing that the variety distinct, uniform, and stable. The holder of plant breeders' rights whose variety has been protected would ensure that, throughout the period for which the protection has effect, he is capable of producing propagating material which is capable of producing the protected variety.

3.3 MAIZE VARIETY PROTECTION IN KENYA

3.3.1 INTRODUCTION

Maize varieties are marketed by the Kenya Seed Company (KSC) established in 1956. Until 1985, KSC relied on the varieties developed by the National Agricultural Research Program of the Kenyan Agricultural Research Institute (KARI). However since liberalization, many actors have come into play in the formal seed sector. As a result, KSC has also increased its scope and has intensified breeding programs for many other crops such as, wheat and sorghum. Today, the

[81] Bernard Le Buanec, 'Development History and Current Situation of the International Union for the Protection of New Varieties of Plants (UPOV)' (Second World Seed Conference, Rome, September 8-10, 2009) in Rolf Jordens, *Benefits of Plant Variety Protection* (UPOV 2010) p. 2
[82] ibid
[83] <www.Kephis.org> The Organization's mandate accessed 2 June 2015

formal seed sector has attracted a number of specialized players, both public and private ones who are involved either directly or indirectly in areas such as breeding, seed multiplication, quality control, processing storage, marketing and seed distribution.[84]

3.3.2 SIGNIFICANCE OF MAIZE CROP TO KENYA

Maize is the main staple food in Kenya.[85] Its availability and abundance determine the level of welfare and food security in the country as it is estimated to account for more than 20% of total agricultural production and 25% of agricultural employment.[86] It is cultivated on some 1.6 million hectares of land with an eminent limit in scope for further expansion since most of the arable land is already under cultivation.[87] FAO estimates that maize contributes about 68% of daily per capita cereal consumption, 35% of total dietary energy consumption and 32% of total protein consumption.[88] Thus, Kenya's national food security is strongly linked to production of adequate quantities of maize to meet an increasing domestic demand.[89]

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[84] Kenya Seed Company, 'Maize' (Kenya Seed Company 2010) <http://www.kenyaseed.com/maize.html>accessed 15 April 2015

[85] Wekesa E., E. Mwangi W., Verkuijl H., Danda K. and De Groote H., October, 'Adoption of Maize Production Technologies in the Coastal Lowlands of Kenya' (CIMMYT, Mexico, D. F. 2003)

[86] Muasya W. N. P. and A. O. Diallo, 'Development of Early and Extra Early Drought and Low Nitrogen-Tolerant Varieties Using Exotic and Local Germplasm for the Dry Mid-Altitude Ecology' in Friesen D. K. and A. F. E. Palmer (eds), *Integrated Approaches to Higher Maize Productivity in the New Millennium. Proceedings of the Seventh Eastern and Southern Africa Regional Maize Conference, February 5-11, 2001, Nairobi, Kenya* (CIMMYT and KARI 2001) pp. 253- 259

[87] Makokha S., and others, 'Determinants of Fertilizer and Manure Use in Maize Production in Kiambu District, Kenya' (Mexico, D. F, CIMMYT and KARI 2001) <http://apps.cimmyt.org/Research/economics/map/research_results/other_tech/Kiambu_Kenya.pdf> accessed 31 March 2015); Kibaara B., 'Technical Efficiency in Kenya's Maize Production: The Stochastic Frontier Approach' (Nairobi, Kenya, Tegemeo Institute of Agricultural Development and Policy, 2005b) <http://www.tegemeo.org/documents/policy/Tegemeo_PolicyBrief06.pdf> accessed 31March 2015

[88] FAO, '*Food Security Statistics.*' (Rome, Italy 2010) <http://www.fao.org/economic/ess/food-security-statistics/en/> accessed 30 March 2015

[89] Odendo M., De Groote H. and O.M. Odongo, 'Assessment of Farmers' Preferences and Constraints to Maize Production in Moist Mid-Altitude Zone of Western Kenya' (The 5th International Conference of the African Crop Science Society, October 21-26, 2001 Lagos, Nigeria 2001)

The current average maize yield in Kenya is approximately 1.8 tons per hectare however, a yield potential of over 6 tons per hectare is possible.[90] The yield potential is exploitable by focusing on improving maize yields through the adoption of productivity improving technologies, especially the development and use of new maize varieties to meet domestic demand and supply. The adoption, improvement and increased use of modern production techniques such as hybrid maize varieties technology are essential in addressing sustainability and supply issues.

3.3.3 DEVELOPMENT OF MAIZE VARIETIES IN KENYA

Development of maize hybrid breeding and maize hybrid seed industry in Kenya Maize has been the result of improvement efforts by various researchers and farmers dating back as early as 1920s. The government of Kenya responded to the demands by large-scale maize farmers by initiating a systematic germplasm improvement program in 1955.[91] This led to the development of late maturing varieties. Later, early maturing varieties were developed to respond to varying climatic conditions countrywide.

The first maize hybrid released in Kenya was H611, in 1964.[92] It was a cross between Kitale Synthetic II, an open-pollinated variety (OPV) and an improved Equadorian landrace (Equador 573). H611 had a 40% yield advantage over Kitale Synthetic II, had lower seed costs than conventional hybrids and had lesser loss of yield when recycled.[93] It diffused among the large-

[90] ibid 88; FAOSTAT, *'Production Crop'* (Rome, Italy, FAO 2010) <http://faostat.fao.org/site/567/DesktopDefault.aspx?PageID=567#ancor> accessed 31March 2015)
[91] Karanja D. D., 'An Economic and Institutional Analysis of Maize Research in Kenya' (1996) Michigan State University International Development Working Paper No. 57
[92] ibid; Smale M. and T. Jayne, 'Maize in Eastern and Southern Africa: "Seeds" of Success in Retrospect' (2003) EPTD Discussion Paper No. 97
[93] Smale (n 94)

scale and small-scale farmers in the high potential areas of Western Kenya[94] at a high rate. This formed the basis of maize hybrid development in Kenya, which seen a gradual diffusion in the low potential areas too.

Although a good portion of farmers among the rural poor still use local varieties and prefer improved OPVs over hybrids, it has, however, been shown that well-adapted maize hybrids could perform profitably in terms of yield and yield stability even in marginal production environments under low input conditions.[95] This therefore implies that well adapted maize hybrids would offer a significant potential to increase yields even under marginal agro-climatic conditions. As a result, currently, there are many maize hybrid varieties being released every year for the different agro-climatic zones.

According to Kenya Plant Health Inspectorate Services (KEPHIS) Annual Report (2010), there were a total of 111 maize varieties submitted for National Performance Testing (NPT) during the 2008-2009 period.[96] Because maize crop is grown in all agro-ecological zones in Kenya, hybrid varieties are released with respect to their suitability for different climatic conditions prevalent in different agro-ecological zones.[97]

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[94] Highland Tropics and Moist Transitional Zones

[95] Hassan R. M., Corbett J. D. and K. Njoroge, 'Combining Geo-Referenced Survey Data with Agro-climatic Attributes to Characterize Maize Production Systems in Kenya' in Hassan R.M. (ed) *Maize Technology Development and Transfer - A GIS Application for Research Planning in Kenya* (Oxon, UK, CAB International 1998) pp. 43-68; Mugo S. and others, 'Advances in Developing Insect Resistant Maize Varieties for Kenya within the Insect Resistant Maize for Africa (IRMA) Project' in Friesen DK and AFE Palmer (eds) 'Integrated Approaches to Higher Maize Productivity in the New Millennium: Proceedings of the Seventh Eastern and Southern Africa Regional (Maize Conference, Nairobi, February 5-11, 2001) pp. 31- 37; Heisey P.W. and others, 'Economics of Hybrid Maize Adoption' in Morris L., (ed), *Maize Seed Industries in Developing Countries* (London, UK and Boulder; USA, Lynne RiennerPublisher1998) pp. 143-158

[96] Kenya Plant Health Inspectorate Service (KEPHIS), 'Annual Report and Financial Statements July 2008-June 2009' (KEPHIS 2010) p. 5; Kenya Seed Company, 'Maize' (Kenya Seed Company 2010) <http://www.kenyaseed.com/maize.html> accessed 15 April 2015

[97] ibid, Kenya Seed Company

The maize varieties suitable for medium to high altitude areas (1500-2100m) with day temperatures of up to 28 °C during the day and with night temperatures dropping to 8 °C are H627, H626 and H625. They give high yields under precipitation ranges of 800-1500mm.[98] The zones of medium altitude which fall between 1000 to 1700m of altitude require the H513, H515 and H516 maize varieties. These varieties are commonly planted in coffee growing belts, with rainfall of 750-1000mm, where they mature in four to five months.[99]

As for the transitional zone lying at altitudes of 1000-1700m with temperatures of 12°C to 30°C; and with rainfall of 1000-1800 mm, the recommended maize varieties are H624 and H623. They are highly prolific, short, green-stemmed maturing in 150 days from planting to yield huge thick cobs and large dent kernels.[100] The low land agro-ecozones of altitudes of 0-1250 m prevalent at the coastal region, on their part, are adapted to the Pwani Hybrids, PH1 and PH4, developed and released in 1987. These varieties are fairly short, resistant to logging, more tolerant to moisture stress and most leaf and ear diseases. They are highly productive and have good husk cover which reduces crop loss due to birds and weevil attacks.[101]

The Katumani Composite (KCB) is a short and fast growing open-pollinated variety and produces short cobs. This variety is drought escaping, being adapted to dry land transitional agro-ecozones of altitudes of 500-1000 m. It matures within 90-120 days. It performs well in altitudes of 500-1000m with rainfall of 50-500 mm.[102] The dryland mid- altitude agro-ecozones which experience short rains (about 350 mm) are adapted to Dryland Composite 1 (DLC1) and

[98] ibid
[99] ibid
[100] ibid
[101] ibid
[102] ibid

Dry land Hybrid 1 (DH01). These are open-pollinated varieties suitable in semi-arid regions of altitude of 1000-1900m. They mature within three to four months and can produce 14 bags per acre. They are short, uniform and tolerant to most ear diseases.[103]

3.4 CONCLUSION

Maize has two distinct reproductive characteristics which, together with wind pollination, make it suitable for maximum cross-pollination. It is both a monoecious[104] and protandrous[105] plant. To produce hybrid seed, reception of pollen is controlled by mechanical emasculation or genetic methods. Because of unwarranted wind pollination which occurs naturally in the farm, yields from maize may suffer segregation. Recycling such seeds may lead to a decline in yield of the progeny of F1 generation. Thus, to realize full potential of maize hybrids, farmers need to plant fresh seed in every planting season.

Maize being a key food crop and an important source of income and employment for majority of rural farm households, Kenya's food security and the welfare of its farming population is strongly linked to the increase in the national maize production. Owing to limited availability of arable land, there is no doubt that increases in maize yields can only be achieved by the use of modern technologies, in particular by the use of improved maize varieties such as maize hybrids. To complement government and public private sector's contribution to development of new maize varieties in Kenya, every effort ought to be put in place to encourage the use of maize hybrids among resource poor farmers in marginal areas; and key factors affecting the adoption of

[103] ibid
[104] Having both the male and female reproductive organs/systems
[105] A hermaphrodite plant/flower having the male reproductive organs come to maturity before the female

hybrid seeds by farmers country wide addressed. In this regard, maize sector policy interventions should, *inter alia*, be designated to: facilitate and broaden smallholders' access to insurance and financial services for maize production;[106] strengthen extension services especially in areas where lack of awareness /knowledge is cited as a hindrance to adoption; encourage participatory breeding to develop varieties adapted to local conditions and acceptable to the farmers; liberalize the seed market; and to enhance the effectiveness of KEPHIS as a regulatory body to ensure that only quality maize varieties are released into the market.

Finally, the use of maize hybrids by all maize farmers offers a great potential in terms of economic development and food security. Framework conditions ought to offer favorable environment for the adoption of the hybrids. Challenges of increasing the adoption rates for all may be met through combined and concerted efforts of all stakeholders: farmers, researchers, extension agents, policy makers, seed companies, and marketers. Partnership and cooperation of all stakeholders in the complex process from maize breeding to production and marketing is desirable. Meanwhile, the information displayed show as appositive trend meant to cater for all types of agro-ecological zones: there is an upward trend in the number of registrations of maize varieties being received by KEPHIS. The implication therefore is that the number of protected maize seed variety increases yearly.

[106] The World Bank, *World Development Report 2008: Agriculture for Development* (Washington, D.C., 2007) p. 143-145

CHAPTER FOUR

THE ECONOMIC IMPLICATIONS OF PVP: THE CASE OF MAIZE IN KENYA

4.0 INTRODUCTION

In Kenya, the legal rules for determining whether an inventor is entitled to a patent are presently enforced in the first instance by the Kenya Industrial Property Institute, Patent Department, through *ex parte* examination of patent applications. Plant variety protection, being a *genus* of patents protection, is subject to similar *ex parte* examination like any other innovation. The successful application accords the applicant/breeder a grant of breeders' rights for 20 years from the date of application by the Plant Breeders' Rights Committee established pursuant to Regulation 3 of the Seeds and Plant Varieties (Plant Breeder's Rights) Regulations, 1994.[107]

Arising from breeders' rights are farmers' rights with regard to the new maize varieties. In Kenya, a number of known new maize variety breeders include: Western Seed Company, Pioneer Hi-breed, Kenya Seed Company, KARI, PANAR Seed Company, KARI, KARI Embu, AgriSeed, MONSANTO, FICA Seed, Longrotech Limited, KARI Kakamega, OCD, KARI Kitale, NARO, and KARI/KSCO. It is imperative to note that between 1964 and 1989 when the

[107] The Committee comprises the Director of Agriculture (Chairman); the Director, Kenya Agricultural Research Institute; the Director, KIPI; the General Manager, Horticultural Development Authority; the Director, Kenya Forestry Research Institute; the Director, National Seed Quality Control Service; one representative from seed merchants; and on representative of plant breeders. The Committee may co-op at most three members representing various interest groups.

first 15 maize varieties were released into the market, it took the combined and concerted efforts of the Kenya Agricultural Research Institute and Kenya Seed Company to jointly research on maize varieties.

The new maize variety breeders have protected their varieties under H500-series, H600-series, PH-series, DH-series, D-series, DLC-series, CCM, KAT CB, SC-series, KH 600-series, KSTP-series, PAN-series, FS-series, Monsanto, WH-series, Longrotech, KSH-series, DHC-series, WS-series, KK SYN-series, EMB, Ua Kayongo, Punda Milia, PHB-series, EVO, KEMBU, and KS-series. Accordingly, questions may arise as to the economic implications of plant variety protection. This Chapter takes an in depth view of the economic implications of maize variety breeders subject themselves and the new maize varieties to by so protecting the varieties.

4.1 ECONOMICS OF PLANT VARIETIES PROTECTION

Plant breeders' rights are a kin to patents in the following manner. Whereas a patent must meet the conditions of novelty, inventive step and industrial application;[108] a new plant variety[109] may only be registered upon meeting the conditions of novelty;[110] distinctness;[111] uniformity;[112] and stability.[113] It is to be noted that distinctiveness and uniformity for plant varieties go hand in hand with patents' inventive step as stability for plant varieties accord to industrial application in patents. These similarities aside, both rights are protectable for a period of 20 years from the date

[108] TRIPS, Article 27 (1)
[109] African Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources, Article 29
[110] UPOV, section 6
[111] ibid, section 7
[112] ibid, section 8
[113] ibid, section 9

of application thereof.[114] In order to adequately discuss the economics of plant varieties protection, it is desirable to first put the breeders' and farmers rights in perspective.

4.1.1 PATENTS *VIS-À-VIS* INNOVATION AND INVESTMENT

4.1.1.1 INTRODUCTION

The effectiveness of patent system in fostering innovation and investment is best assessed upon the basis of a microeconomic reasoning. Knowledge generating activities continue to face generic problem of appropriability due to externalities, indivisibilities and uncertainty, being the three sources of market failure. As a result, various public responses systems, in particular patents as legal protection of intellectual property, are vital in addressing the appropriability problem.

Although this study deals with *sui generis* protection of plant varieties, the view introduced by patents *vis-à-vis* innovation finds a connected relevance for the reason that improvement of the existing plant varieties is a product of innovation. Thus, a correlation may be drawn between *sui generis* protection of plant varieties *vis-à-vis* innovation to mitigate for any market failures that may arise thereof.

[114] Seeds and Plants Varieties Act, Chapter 326, Laws of Kenya, section 19; UPOV, Article 19; TRIPS, Article 33; African Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources, Article 43

4.1.1.2 SOURCES OF MARKET FAILURE IN THE PRODUCTION OF INTELLECTUAL PROPERTY

Maize variety as a product of plant breeding is an intellectual property which requires patenting to protect the breeders' rights. Thus, plant breeding as an intellectual activity generates information or knowledge. This information/knowledge as a public good is exposed to externalities. In the process of plant breeders producing quality maize varieties for large scale farming, alongside, many externalities are also generated. These externalities may be responsible for market failure meaning that unless the information is adequately protected, incentives for innovation may dwindle leading to reduced investment.[115]

Although the general conviction is that innovation leads to incentives which lead to further investment to recoup greater economic rewards, there is however a likelihood that generated information such as quality maize variety may lead to market failure due to its nature as a public good. This is so because public goods, especially knowledge and information such as created through plant breeding, are characterized by "non-rivalness" in consumption; i.e. the consumption of the knowledge in the maize variety by one farmer would not prevent (rival) its consumption by another farmer. In a nut shell, the maize variety as a public good is considered a non-rival since for any given level of its production, the marginal cost of providing it to an additional consumer would be zero.[116]

[115] Anand, B. and Geletovic, A., 'How Markets can Protect Property Rights' (December 2004) Harvard Business Review 73-99

[116] Bellafame, P., 'Patents and Incentives to Innovate: Some Theoretical and Empirical Economic Evidence' (2006) 13 (2) Journal of the European Ethics Network 267

The non-rivalness of the knowledge in quality maize variety imports its non-exclusiveness as a breeder stands in no position to exclude a consumer farmer from consuming the knowledge and information thereat. This state of affairs therefore requires that a public mechanism be inputted to protect the breeder' rights in the knowledge, hence patent protection of the maize variety.

On its part, indivisibility, as a source of failure in intellectual property markets, may be explained from the view that creation of new knowledge and information, such as a quality maize variety, involves large fixed set-up costs. This has the potential of cutting off further innovations leading to monopoly which may not be healthy for investment.[117] This situation may be mitigated by a protection system which therefore opens up a leeway for further innovation and investment. Patents not only ensure total disclosure, but are also fixed in time to allow further research and development at the expiry of the patent period. As for uncertainty as a source of failure of intellectual property markets, the view held is that like any other intellectual property right, the breeding of plants involves two distinct aspects of uncertainty. Like any other research and development venture, plant breeding leading to quality maize variety is faced with both technological uncertainty and commercial uncertainty. Whereas technological uncertainty is in respect of how to make new things and how to make them work, commercial uncertainty refers to how to make new inventions adopted by consumers.[118] What these two aspects of uncertainty boil down to is that decisions to produce or invest in intellectual property such as the development of quality maize variety as of necessity be intertwined with decisions to bear risks thereof.

[117] ibid, p. 269
[118] ibid, p. 270

4.1.1.3 MITIGATING MARKET FAILURE IN INTELLECTUAL PROPERTY

Although there are several ways of mitigating the market failure in the production of intellectual property generally, with regard to plant breeding, this study will concern itself with only patent protection. Patent is a means by which knowledge is excludable by legal means so that the knowledge holder has ample time to recoup his economic benefits from his invention at the exclusion of others. In this regard, patents may be viewed as necessary incentive for invention. The exclusivity created by patents may be counter-productive to invention and development due to the resulting monopoly.

To balance this, the wisdom in patents law is the fixing of a time limit for the exclusivity period. Thus, once the time limit expires, the good falls within public domain enabling all users to access it for free. This dual approach responsive nature of patents is a necessary tool in achieving the objectives of dynamic efficiency considerations (how to provide the right incentives to create and innovate) and static efficiency considerations (how to promote the diffusion and use of the results of creation and innovation).[119]

4.1.1.4 CONCLUSION

Patent systems are heavily influenced by both utilitarian law and economics perspective. These law and economics approaches generally operate as to ensure that the patent system is a useful tool for achieving some particular goals. The interaction between law and economics with regard to patents is such as to highlight the different policy goals the economic approaches advance and the major areas of significant conflict in contemporary policy debates about patents. The basic theme is that enforcing patents as property rights can improve the socially constructive

[119] ibid, p. 271

coordination that facilitates the complex process of commercializing innovation thereby improving both access and competition. By contrast, avoiding property treatment can facilitate the socially destructive coordination among large players engaging in the strategy of anticompetitive collusion.

4.1.2 PLANT BREEDERS' RIGHTS

In Kenya, plant breeders' rights are granted upon successful application by the breeder, to the Plant Breeders' Rights Committee. The holder of plant breeder's rights in a plant variety shall have the exclusive right to do, and to permit others to do, the following: production or reproduction; conditioning for the purpose of propagation; offering for sale; selling or other marketing; exporting; importing, or stocking for any of the purpose set out in the foregoing paragraphs; and to sue for any infringement of the rights.[120] During the period of protection, the breeders' rights holder shall be under obligation to ensure sustenance of the variety by making the relevant returns to KEPHIS on reproductive material which is capable of producing the variety to which the rights relate with the morphological and physiological and other characteristics taken into account when the rights were granted in respect of the variety.[121]

Plant breeders' rights fall into exhaustion and shall not extend to acts concerning any material of the protected variety which has been sold or otherwise marketed by the breeder, among others.[122] The rights are also subject to exceptions and shall not extend to acts done privately and for non-commercial purposes; acts done for experimental purposes; and acts done for the purpose of

[120]Seeds and Plants Varieties Act, Chapter 326, Laws of Kenya, section 20; African Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources, Article 30; UPOV, Article 14.
[121] ibid, section 22
[122] UPOV, Article 16

breeding other varieties.[123] The African Model Law[124] extends the exceptions subject to farmers' rights.

4.1.2.1 PLANT BREEDERS' RIGHTS VIS-À-VIS PATENTS VIS-À-VIS *SUI GENERIS*

Article 27 (3) (b) of the TRIPs Agreement although excludes 'from patentability plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and micro-biological processes,' provides three options for the protection of plant varieties.

In this respect, the Article further provides:

> 'However, Members shall provide for the protection of plant varieties either by patents, or by an effective *sui generis* system or [special system] or by any combination thereof.'

Thus, whereas plant variety protection through UPOV is through *sui generis* system in line with the provision of TRIPs, this study adopts the view taken by Sihanya to the effect that what constitutes "effective" remains unclear under Article 27 (3) (b) of TRIPs.[125] This, therefore, has the potential of lending diverse interpretations of "effective," and hence a lee way for African States, and Kenya in particular, to decide for itself what would constitute an "effective" sui *generis* system for the protection of new maize variety.

In deciding for itself the "effective" *sui generis* system for the protection of maize varieties, Kenya would nonetheless inform itself of the need to put in place a system that meets certain *de*

[123] ibid, Article 15
[124] ibid 117, African Model Law, Article 31
[125] Ben Sihanya, 'Plant Breeder's Rights in Kenya: Appropriate IP for Biodiversity and Biotechnology' (2015) East African Law Journal 1, 75 - 76

minims requirements to enhance the protection of breeder's rights.[126] In sum, in view of the stringent conditionalities imbedded in patent protection, countries rich in plant biodiversity, such as Kenya, often opt to develop their own "effective" *sui generis* system of plant variety protection that suits their needs and circumstances.

4.1.3 FARMERS' RIGHTS

Although the Seeds and Plants Varieties Act and UPOV do not provide for farmers' rights Kenya, as a party state to the African Model Law, is subject to the provisions thereof. More so, this regional instrument forms part of the Laws of Kenya pursuant to Article 2(6) of the Constitution of Kenya 2010.

One of the African Model Law's objectives is to recognize, protect and support the inalienable rights of local communities *including farming communities* over their biological resources, knowledge and technologies. In particular, farmers' rights are recognized as stemming from the enormous contributions they have made and continue to make in the conservation, development and sustainable use of plant genetic resources that constitute the basis of breeding for food and agriculture production. Significantly, the Model Law provides that in so recognizing farmers, they shall have the impetus to continue propagating desirable plant genes.[127]

Farmers' Rights take cognizance of gender equity and include, *inter alia,* the right to: the protection of their traditional knowledge relevant to plant and animal genetic resources; obtain

[126] S. Bala Ravi, 'Effectiveness of Indian sui generis law on plant variety protection and the potential to attract investment in crop improvement (2004) 9 JPR 533, 543 as quoted in Ben Sihanya, 'Plant Breeder's Rights in Kenya: Appropriate IP for Biodiversity and Biotechnology' (2015) East African Law Journal 1, 75 - 76
[127] African Model Law (n 117), Article 24

an equitable share of benefits arising from the use of plant and animal genetic resources; save, use, exchange and sell farm-saved seed/propagating material of farmers' varieties; use a new breeders' variety protected under this law to develop farmers' varieties, including material obtained from gene banks or plant genetic resource centers; and collectively save, use, multiply and process farm-saved seed of protected varieties.[128]

4.1.4 THE ECONOMIC IMPLICATION OF MAIZE BREEDERS' RIGHTS

4.1.4.1 INTRODUCTION

Intellectual property rights (IPRs) are generally considered an efficient institution to stimulate innovation. Strong IPRs should provide incentives for innovation and expand investment and technology flows to developing countries. Maize breeding industry which is developing day by day is subject to different types of IP protection. IPRs are meant to support research and development, firms and public bodies such as KEPHIS involved in breeding should be the first actors to perceive their impacts.[129]

4.1.4.2 INCREASE IN INVESTMENTS

Various research conducted by different firms[130] for the purpose of investigating increases in the research expenditures on non-hybrid crops after the enactment of the PVP Act revealed that there was a moderate increase in investment in different crops. Various firms found it

[128] ibid, Article 26
[129] Intellectual property rights and their impacts in developing countries: An Empirical Analysis of Maize Breeding in Mexico<http://diw.de> accessed 23April 2015
[130] Such as Perrin, Hunings and Inhen (1983)

economical to invest in maize and other crops due to the protection provided by the PVP Act.[131] This trend was found to be similar for other plant varieties such as soybean varieties.

In the international context, an analysis of the data on grants of PVP certificates in a cross-section of 13 developed countries observed over a period of nine years suggested that stronger IPRs increase research and development. Hence, there might be a positive effect of strengthening protection in countries with weaker IPRs in PVP.[132] Essentially, farmers' privilege does not decrease but increases the incentives to invest in development of new varieties or their improvements. Thus, there is strong evidence on the hypothesis that the PVP Act has a positive effect on the economy.

The transformations noted in the maize breeders' sector suggest that agriculture has affirmed its centrality to the Kenyan economy. Agriculture remains the dominant engine of growth due to the fact that the sector employs some 70% of the labour force, generates 60% of the foreign exchange, and provides 75% of the raw materials for industry and 45% of governmental revenues. The strong ripple effect the sector has had across the Kenyan economy is exemplified in the fact that the sector has had a 1.64 multiplier effect in the economy.[133]

[131] Moschini, G., and Yerokhin, O., 'The Economic Incentive to Innovate in Plants: Patents and Plant Breeders' Rights' in J.P. Kesan, ed., *Agricultural Biotechnology and Intellectual Property: Seeds of Change*, CAB International, 2007 (pp.190-203) <www.Card.iastate.edu> accessed 4 May 2015
[132] ibid (n 132)
[133] Walter Odhiambo and Hezron O. Nyangito, 'Measuring and Analysing Agricultural Productivity in Kenya: a Review of Approaches' (Discussion Paper No. 26, Productive Sector Division Kenya Institute for Public Policy Research and Analysis KIPPRA, January 2003) p.7

4.1.5 ECONOMIC IMPACT OF MAIZE FARMERS' RIGHTS

4.1.5.1 INTRODUCTION

Economic analysis of IPRS is utilitarian, asking whether the benefits of any system outweigh its costs, both in static and dynamic terms. The anticipated benefits and costs depend on characteristics of markets, products, and social institutions. There are two central economic objectives of any system of intellectual property protection.

The first is to promote investments in knowledge creation and business innovation by establishing exclusive rights to use and sell newly developed technologies, goods, and services. Absent such rights, economically valuable information could be appropriated without compensation by competitive rivals. Firms would be less willing to incur the costs of investing in research and commercialization activities. In economic terms, weak IPRS create a negative dynamic externality. They fail to overcome the problems of uncertainty in research and development and risks in competitive appropriation that are inherent in private markets for information.[134]

The second goal is to promote widespread dissemination of new knowledge by encouraging (or requiring) rights holders to place their inventions and ideas on the market. Information is a form of public good in that it is inherently non-rival and, moreover, developers may find it difficult to exclude others from using it. In economic terms it is socially efficient to provide wide access to new technologies and products, once they are developed, at marginal production costs. Such

[134] Evanson, R. E. and Westphal L. E. 'Technological Change and Technology Strategy' in J. Behrman and T. N. Srinivasan (eds), *Handbook of Development Economics, Volume III* (Amsterdam, Elsevier Science, B.V, 1995)

costs could be quite low for they may entail simply copying a blueprint or making another copy of a compact disk or video.

4.1.5.2 POSITIVE IMPACTS OF MAIZE FARMERS' RIGHTS ON ECONOMIC DEVELOPMENT

Economists recognize several channels through which IPRS could stimulate economic development and growth. These processes are interdependent and it is appropriate to adopt a comprehensive view of the incentives associated with intellectual property protection.

Intellectual property rights could play a significant role in encouraging innovation, product development, and technical change. Maize farmers' rights therefore play an important role in ensuring growth in innovation, and product change which is crucial for the economic development of the country. Developing countries such as Kenya tend to have IPRS systems that favor information diffusion through low-cost imitation of foreign products which may impact on the economic growth.

It is widely recognized by economists that imports of goods and services could transfer and diffuse technology. Imports of capital goods and technical inputs could directly reduce production costs and raise productivity which is good for the economy. The extent of this benefit would depend on the technological content of imports, suggesting that close trade linkages with innovative developed economies could engender considerable productivity gains through trade flows.

Conclusively, it is possible to conclude that the strength of IPRS and the ability to enforce contracts should have important effects on decisions by multinational firms on where to invest and whether to transfer advanced technologies. This in itself impacts positively to the growth of the economy.

4.1.5.3 NEGATIVE IMPACT OF IPRS ON THE ECONOMY

While strengthening IPRS bears potential for enhancing growth and development in the proper circumstances, it might also raise difficult economic and social costs. Indeed, developing economies could experience net welfare losses in the short run because many of the costs of protection could emerge earlier than the dynamic benefits discussed above. This situation explains why it is often difficult to organize interests in favor of reform in developing countries.

Another major concern is the potential for IPRS to support monopoly pricing. The provision of product patents in pharmaceuticals, agricultural chemicals, and biotechnology, along with plant breeders' rights, should confer greater market power on rights holders. Such firms might then reduce sales to establish monopolistic prices in key medical therapies and industrial and agricultural inputs. There is evidence that patents generate considerably higher prices for protected drugs than for copied and generic drugs.[135] Thus, with reference to protection of maize varieties in Kenya, the maize farmers' rights impact the Kenyan economy both positively and negatively.

[135] Lanjouw, Jean O., 'The Introduction of Pharmaceutical Product Patents in India: Heartless Exploitation of the poor and Suffering?' (NBER Working Paper 6366, National Bureau of Economic Research, Cambridge, Mass, 1997); Maskus Keith E., 'The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer' (1998) Duke Journal of Comparative and International Law 109, 109-61

4.2 CONCLUSION

During its 50 years of development and application, UPOV's PVP system has proven effective in encouraging the creation of new varieties of plants and in introducing those varieties into agricultural and horticultural practice for the benefit of society. In conjunction with UPOV, the enactment of the Seeds and Plants Varieties Act, Chapter 326, Laws of Kenya has demonstrated that plant variety protection, especially the protection of maize varieties in Kenya, has significantly contributed to further innovation and investment in maize breeding; more and better maize varieties for farmers and growers; increased income for farmers from enhanced maize yields due to improved maize varieties; rural employment and economic development; and development of international markets.

A number of seed companies are operating in Kenya and have developed and released seed varieties that favor various regions in the country. It is recognized that the seed companies' research accomplishments have helped to stem a serious outbreaks of pests and diseases prone to maize farming since 1964. Remarkable success has also achieved with the development of *Striga*-resistant varieties that suppress the weeds, and other pest-resistant varieties that were released into endemic areas of Kenya.

Early, intermediate, and late maturing varieties have been developed with yields up to twice as much as traditional varieties. Early maturing varieties have enabled maize production to expand into new areas where the short rainy season had adversely affected maize cultivation in the past. These scientific breeding efforts by the seed companies have certainly helped realize increased maize production.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

5.1.1 THE ROLE OF AGRICULTURE IN KENYA

It is estimated that Kenya has a total land area of 58.26 million hectares of which only 11.6 million hectares (20 per cent) receive adequate rainfall for rain-fed agriculture. The rest is arid or semi-arid. Out of these 11.6 million hectares only 7 million are used for agricultural production. The agricultural sector contributes 26% of Kenya's Gross Domestic Product (GDP) directly and 60% of export earnings. This supports the estimated population of about 45 million people who majorly (about 80%) live in the rural areas and deriving their livelihood largely from agriculture.

It is apparent that for Kenya to adequately meet the ever increasing challenges of population growth vis-à-vis diminished land capable of sustaining rain-fed agriculture, it must not only focus on intensive utilization of high potential land and the sustainable use of arid and semi-arid areas (ASAL), it must as of necessity, enhance its focus on the adoption of appropriate technological packages including improved varieties and quality planting materials for all agro-ecological zones.

The diverse agro-climatic conditions that exist in Kenya have necessitated the production of a wide range of crops generally and maize varieties in particular, from tropical, sub-tropical and temperate varieties. In tandem with this, the economic reforms regime in the country is conducive to domestic and foreign investment. This has encouraged investment by both local and foreign investors in the wider economic sector; and in plant variety breeding in particular which has been enhanced by the imposition of plant breeders' and farmers' rights through local legislation. The enactment of the Seeds and Plant Varieties Act which provides for the plant breeders' rights and farmers' rights systems has encouraged breeding of new varieties, introduction of foreign varieties and improvement of various quality aspects in new varieties.

Maize is not only a key food crop but an important source of income and employment for the majority of rural farm households in Kenya. Thus, Kenya's food security and the welfare of its farming population are strongly linked to the increase in the national maize production. Increasing yields in maize is dependent on suitability of different maize varieties for different eco-agro zones scattered all over the country. The evolution of improved varieties of maize such as hybrids is achievable only by the use of modern technology. Looked at from the flip side, the potential of maize hybrids in Kenya actually lies in enhancing productivity and sustaining and improving food security.

The improved maize varieties require intellectual property rights protection so as to encourage both breeders and farmers. The intellectual property rights protection for maize varieties is secured through either utility patents or protection certificates under the Seeds and Plants Varieties Act, Chapter 326, Laws of Kenya. A crucial difference between these two modes of

protection would concern the so-called research exemption. Whereas Seeds and Plants Varieties Act, Chapter 326, Laws of Kenya certificates allow research exemption, patents do not.

However, due to the sequential and cumulative nature of innovation in plant breeding, the economic implications of research exemption are hardly fully understood. Although studies conducted in the United States of America suggest that research exemption inevitably weakens the *ex ante* incentive for private firms to innovate, in Kenya the general observation is that many private firms have come up to engage in plant breeding, especially maize breeding. The result has been ten folds of different maize varieties suitable for various eco-agro zones in the country.

5.1.2 SEED INDUSTRY DEVELOPMENT IN KENYA

Development of the Kenyan seed industry started in the early 20thcentury and was supported by research on food, industrial and export crops, which supplied seeds and planting material. The commercial seed sector started with the establishment of the Kenya Seed Company (KSC) in 1956 in Kitale to produce pasture seed for the colonial settlers. KSC continued to play a predominant role until the industry was fully liberalized in 1996. The result has been the rising number of registered companies in plant breeding, which currently stands at over 98, largely dealing in cereals: maize, wheat, barley, oats, triticale and sorghum; and oil crops: rapeseed, sunflower, pulses, vegetables, pasture seeds, other horticultural seeds and Irish potatoes. The increase in the number of registered seed companies is testimony to the value given to seed-quality matters and to the importance of improvement in agricultural production.

The seed companies operate a chain of agents, sub-agents and seed stockists who distribute their seeds throughout Kenya. However, some planting materials and seeds are distributed through

non-commercial channels. For example, farm-saved seed and farmer-to-farmer exchange may be used by small-scale farmers. Various non-governmental organizations (NGOs) and community based organizations (CBOs) play an important role in the distribution of non-commercial seed.

5.1.3 INSTITUTIONS INVOLVED IN VARIETY DEVELOPMENT AND THE SEED INDUSTRY

The Ministry of Agriculture has the major responsibility for creating and promoting an enabling environment for the players in the seed industry through development of effective policies and strategies. It plays an important role in facilitating research, providing advisory and information services, undertaking review of policies and regulatory framework, and ensuring sanitary and phyto-sanitary measures.

Previously, plant variety development in Kenya was done mainly by the Kenya Agricultural Research Institute (KARI) for food crops, horticultural crops, industrial crops, pasture and fodder crops; the Kenya Forestry Research Institute (KEFRI) for tree-seed development; the Coffee Research Foundation (CRF); the Pyrethrum Board of Kenya (PBK); the Kenya Sugar Research Foundation (KESREF); the Tea Research Foundation of Kenya (TRFK); universities; seed companies and the International Agricultural Research Centers (IARCs). Rose breeders have organized themselves into the Kenya Breeders Group, which represents about 13 international breeders, for development and propagation of roses.

The Kenya Plant Health Inspectorate Service (KEPHIS) was established in 1996 to provide effective service delivery to the seed industry. Its mandate includes, plant variety evaluation,

release and registration; plant variety protection; seed certification; plant protection and development and implementation of seed standards, as well as implementation of the national policy on introduction and use of genetically modified plant species in Kenya.

Under the Seeds and Plant Varieties Act, crops covered under the Second Schedule, such as maize crop, must undergo compulsory certification to be eligible for marketing as seed. Such crop varieties must be tested under the National Performance Trials for their Value for Cultivation and Use before they are released for commercialization. During the test the varieties must prove that they perform better than the existing varieties on the market. In other words, they are new and improved varieties. Upon release, these varieties are entered onto the National Crop Variety List, which includes all officially released varieties to be in commerce.

5.1.4 PLANT VARIETY PROTECTION IN KENYA

The provisions for the protection of new plant varieties are contained in the Seeds and Plant Varieties Act of 1972, which became operational in 1975. The Act was revised in 1991 and amended in 2012. The regulations to guide the implementation of PVP service was gazetted in 1994 and the plant variety protection schemes published in 1997. Kenya acceded to the 1978 Act of the UPOV Convention on May13, 1999. A revised draft of the legislation, which recognizes emerging national and global developments in the seed industry, has been done.

Kenya grants plant breeders' rights (PBRs) for all plant genera and species, other than algae and bacteria. Through the Seeds and Plant Varieties Act, Kenya has articulated the principle of

national treatment, which allows nationals of other State members of UPOV to be treated in the same way as Kenyan nationals, as far as plant variety protection is concerned.

The Act also provides for an interim protection to allow an applicant to request a protective direction (interim protection) when applying for plant variety protection. An applicant with a protective direction in force enjoys similar rights as if the right had been granted. The protective direction ceases when a decision on whether the application for the grant of plant breeders' rights is accepted or refused is made, or at such earlier time as is provided under the law.

Plant breeders' rights enforcement is the responsibility of the owner of the rights. However, the law provides for the plant breeder whose rights are infringed to seek redress in the courts of law by means of damages, injunction, account or otherwise. The Act also provides for a Plant and Seed Tribunal to determine any disputes arising from plant variety protection. Additionally, KEPHIS, being the designated Authority for phyto-sanitary, seed certification and PVP matters, has the added advantage of helping the enforcement of plant breeders' rights through the licensing and certification process.

5.2 RECOMMENDATIONS AND WAY FORWARD

The role of plant variety protection in responding to the challenges of a changing world is to provide a legal framework and system of implementation that encourages plant breeding. In order to respond effectively to the challenges of a changing world, there is an urgent need to provide an enabling framework that encourages creativity in all its forms, and maize breeding in particular. This requires an appropriate legal framework for an effective implementation of maize varieties protection.

There is need to intensify technology transfer in the development of breeding of new maize varieties. Modern technology on genetic engineering, management of bio-safety, entomology laboratories, and insect bioassays is of essence n the development of useful maize varieties. Where new technology is being developed and disseminated, communication is important for education and creating public awareness. Considerable effort has to be given to creating dialogue and raising public awareness about biotechnology in general and on protection of maize varieties in particular. This can be attained through stakeholder meetings; print materials to inform diverse audiences about maize varieties protection; maize varieties protection website; establishment of good media relations, including having journalists participate in workshops with breeders and farmers.

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