

©opyright

MUHAMMAD MUBEEN

ALL RIGHTS ARE RESERVED



Accession No. TH:18496 ^{Y2011}

M1.
215.544 0486
M11.

Plants, cultivated.

Plant breeding - Law and Legislation - Pakistan.
Seed industry and trade - Law and Legislation.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Dedicated to My Late Mother

“Our Lord! And make them enter the Gardens of Eden, which Thou hast promised them, with such of their fathers and mates and descendants as do right .Lo! Thou, only Thou, art the Mighty, the wise.”

(Al Qur'an 40:8)

Approval Sheet

This is to certify that we evaluated the thesis titled "Protection of Traditional Knowledge under the Plant Breeders' Rights Act 2016. An Analysis of Pakistan's indigenous communities rights and claims" submitted by Muhammad Mubeen under Reg.No.99-FSL/LLMITL/F15, in partial fulfillment of the award of the degree of LLM International Trade Law. This thesis fulfills the requirements in its core and quality for the award of the degree.

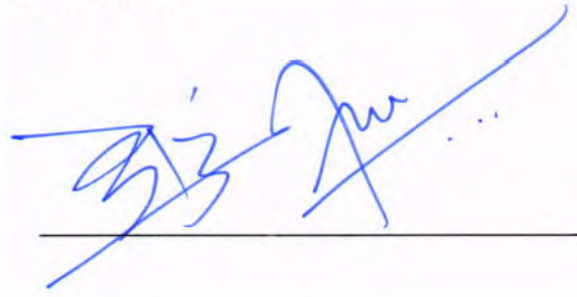
Dr. Hafiz Aziz-ur-Rehman

Supervisor

Assistant Professor

Department of Law, Faculty of Sarah & Law

International Islamic University Islamabad



Mr. Ahdul Rauf

Internal Examiner

Assistant Professor

Department of Law, Faculty of Sarah & Law

International Islamic University Islamabad



Mr. Aamir Latif

External Examiner

Assistant Director

Intellectual Property Organization of Pakistan (IPO)

Islamabad

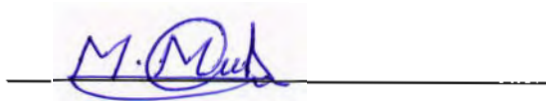


Declaration

I, Muhammad Mubeen, hereby declare that this dissertation is original and has never been presented in any institution. I, moreover, declare that any secondary information used in this dissertation has been duly acknowledged.

Student : Muhammad Mubeen

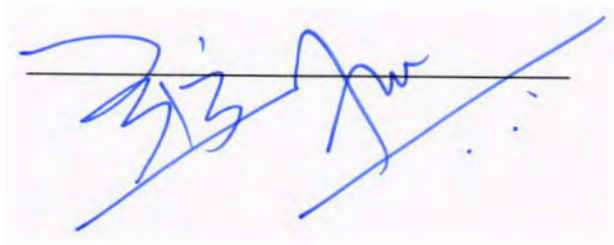
Signature



Date

Supervisor: Assistant Prof.Dr.Hafiz Aziz -ur-Rehman

Signature



Date

ACRONYMS AND ABBREVIATION

AARI	Aube Agriculture Research Institute
AERUs	Agricultural Economics Research Units
AZRC	Arid Zone Research Centre
CBD	Convention on Biological Diversity
CIMMYT	International Maize and Wheat Improvement Center
DUS	Distinctness, uniformity and stability
FAO	Food Agriculture Organization
FGROB	Federal Government Rules of Business
FSC a& RD	Federal Seed Certification and Registration Department
GDP	Gross Domestic Product
GMOs	Genetically Modified Organisms
HARI	Himalayan Agricultural Research Institute
HKH	Hindu Kush Himalaya
IABGR	Institute of Agricultural Biotechnology and Genetic Resources
IBC	Institutional Bio-safety Committee
ICARDA	International Center for Agricultural Research in the Dry Areas
IP	Intellectual Property
IPRs	Intellectual Property Rights
IRRI	International Rice Research Institute
ISF	International Seed Federation
ISTA	International Seed Testing Association
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
KARINA	Karakoram Agricultural Research Institute for Northern Areas
MNCs	Multinational Corporations

NARC	National Agricultural Research Centre
NBC	National Bio-safety Committee
NDUS	Novelty, Distinctiveness, Uniformity and Stability
NSC	National Seed Council
NTRI	National Tea Research Institute
OECD	Organization for Economic Co-operation and Development
PAEC	Pakistan Atomic Energy Commission
PARC	Pakistan Agriculture Research Council
PBR	Plant Breeder's Rights
PBR Act	Plant Breeders' Rights Act, 2016
PCCC	Pakistan Central Cotton Committee
PSC	Provincial Seed Councils
PGR	Plant Genetic Resources
PGRI	Plant Genetic Resources Institute
PIPs	Plant-incorporated protect ants
PLD	Pakistan Legal Decisions
PSC	Punjab Seed Corporation
PPVFR Act	Protection of Plant Varieties and Farmers' Rights Act, 2001
PVR	Plant Variety Rights
SCMR	Supreme Court Monthly Report
TAC	Technical Advisory Committee
TARC	Tropical Agricultural Research Center
TK	Traditional Knowledge
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UAF	University of Agriculture Faisalabad
UPOV	Union for the Protection of New Varieties of Plants
VCU	Value for Cultivation and Use

WHO	World Health Organization
WPADC	West Pakistan Agricultural Development Corporation
WTO	World Trade Organization

Acknowledgements

Praise is to Allah Almighty, the Sustainer of the worlds, the Merciful, the Compassionate! And may His everlasting and peace be on Muhammad (S.A.W), the last of His Messenger. After that my earnest gratitude goes to the Faculty of Shari'ah and Law, International Islamic University Islamabad and its entire staff.

I consider myself deeply indebted to a few people without whose assistance and guidance the completion of this dissertation would have not been made possible. I owe a debt of gratitude to my Honorable Supervisor, Assistant Professor Dr.Hafiz Azizur-Rehman, for his patience and insightful guidance, initially and throughout during the process of writing. My earnest gratitude is also due to Assistant Professor Dr.Muhammad Fahiem, Agriculture University Peshawar. I highly appreciate his intellectual input while carrying out this work. He also provided some invaluable material. I owe a lot to him. Here, It would be also necessary to mention the name of honorable Sir Dr.Muhammad Mustaque whose way of teaching in LLB(H) and LLM helped me a lot how to apply critical approach towards legal issues and how to take critical analysis on the legal issues during the process of writing my thesis.

Last but not least, I am grateful to my parents. I feel myself exceptionally fortunate to have the consistent guidance, support and love of my visionary parents who devoted their life to educate me in order to see me as a better human being. I have also been fortunate to have the company and sincere support of my elder brother Akhtar Ali Senior Civil Judge, Asghar Ali and Muhammad Farooq Historian, who have always been a source of strength for motivating me to think high and dream high in my life.

TABLE OF CONTENTS

INTRODUCTION.....	vi
Significance of research.....	x
Research methodology.....	xi
Literature review.....	xi
CHAPTER 1	
THE STATE OF PLANT BREEDING INNOVATION IN PAKISTAN	1
Introduction.....	1
1.1: The Importance of Quality Seed in Agriculture Sector.....	3
1.1.1: Characteristics of Quality Seed.....	4
1.1.2: Quality Checking of Seed.....	4
1.2: Basic Concept of Plant Breeding.....	5
1.2.1 Main Requirement for Plant Breeding.....	5
1.2.2: Clue of Biological Diversity.....	6
1.3: Plant Breeding in Pakistan.....	6
1.3.1: Development of New Varieties.....	9
1.3.2: Selection of New Variety after Testing.....	11
1.3.3: Requirement of Value for Cultivation and Use (VCU).....	11
1.3.4: Basic Requirements for Estimating the Distinctness, Uniformity and Stability	
1.3.4.1: Distinctness.....	12
1.3.4.2: Uniformity	13
1.3.4.3: Stability.....	13
1.4: New Variety Testing Procedure.....	14

1.5: Requirement of Pre-Registration Trial.....14

1.6: Features of Registration.....15

1.7: Approval and Release of Crop Variety.....15

1.8: National Seed Policy.....16

1.9: Variety Maintenance.....20

1.10: Pakistan’s Seed Production.....22

1.10.1: National and Multinational Seed Companies.....29

1.10.2: Informal Seed Production.....32

Conclusion.....34

CHAPTER 2

EVOLUTION OF LEGAL FRAMEWORK RELATED TO SEED SECTOR IN PAKISTAN.....35

Introduction.....35

2.1: Historical Background Seed’s Production in Pakistan.....37

2.2: Existing legal Arrangements on Seeds in Pakistan.....40

2.2.1: The West Pakistan Seeds and Fruit Plants Ordinance, 1965.....40

2.2.3: The Seed Act, 1976.....40

2.3: Federal Seed Certification and Registration Department.....41

2.4: Rules Developed under the Seed Act, 1976.....45

2.4.1: The Seed (Registration) Rules of 1987.....45

2.4.2: The Seeds (Truth-in-Labeling) Rules of 1991.....46

2.4.3: The Pakistan Fruit Plants Certification Rules of 1998.....47

2.4.4: Bio-safety Rules and Guidelines 2005.....48

2.5: The Plant Breeders’ Rights Act, 2016.....50

2.5.1: Overview of the Plant Breeders’ Rights Act.....51

2.5.1.1: Objectives.....	51
2.5.1.2: Registry of the Plant Breeders' Rights and its Functions.....	52
2.5.1.3: The Plants' Variety Protection Advisory Committee.....	52
2.5.1.4: Benefit Sharing.....	53
2.5.1.5: Compulsory Licensing.....	57
Conclusion.....	59

CHAPTER 3

COMPARATIVE ANALYSIS OF PLANT BREEDERS LEGISLATION IN INDIA AND PAKISTAN.....58

Introduction.....58

3.1: International Legal Framework for Plant Variety Protection and Management in perspective of India and Pakistan.....60

3.1.1: Convention on Biological Diversity CBD.....60

3.1.2: International Treaty on Plant Genetic Resources for Food and Agriculture

3.1.3: World Trade Organization and TRIPS Agreement.....62

3.1.4: International Union for the Protection of New Varieties of Plants.....64

3.2: Legislation on Plants or Seeds in India and Pakistan.....66

3.3: Comparison of PPVFR Act (India) and Plant Breeders' Rights Act.....67

3.3.1: The Objectives of PPVFR Act and PBR Act (Pakistan).....67

3.3.2: Provided Rights in both Acts.....68

3.3.3: Definition of Breeder.....69

3.3.4: Definition of Farmer in both Acts.....69

3.3.5: Establishment of Authority or Committee.....70

3.3.6: Eligibility for Registration.....70

3.3.7: Duration for Protection.....71

3.3.8: Payment of Annual Fee.....71

3.3.9: Farmer's Rights.....	72
3.3.10: Compulsory Licensing.....	77
3.3.11: Infringement of Rights and Suit for Infringement.....	79
3.3.12: Provided Penalties for applying false denomination.....	79
3.3.13: Plant Variety Protection Appellate Tribunal and right to Appeal.....	79
3.3.14: Storing of Reference Samples in Act.....	80
3.3.15: The Provided Fee Structure in Act.....	80
3.3.16: Legal Requirements for Applicant.....	81
Conclusion.....	81
CHAPTER 4	
CRITICAL ANALYSIS OF PLANTS' VARIETIES PROTECTION UNDER THE PLANT BREEDERS' RIGHTS ACT 2016	
	84
Introduction.....	84
4.1: Background History of Legislation.....	85
4.2: Controversies Federal verses Provinces.....	86
4.3: Challenges to Farmers' Rights.....	91
4.3.1: Farmers' Rights on Seed.....	91
4.3.2: Farmers' Rights to Register Traditional Varieties.....	92
4.3.3: Farmers' Rights for Reward and Recognition.....	92
4.3.4: Farmers' Rights for Benefit Sharing.....	92
4.3.5: Farmers' Rights to get compensation for the Loss Suffered from the Registered Variety.....	93
4.3.6: Farmers' Rights for the Seeds of Registered Varieties.....	93
4.3.7: Farmers' Rights for Receiving Free Services.....	93
4.3.8: Farmers' rights for Protection against Innocent Infringement.....	94
4.4: Criticism on PBR Act.....	94
4.4.1: Breeders' Rights Protection.....	96
4.4.2: Lack of Protection of Farmers Rights.....	96

4.4.3: Monopoly of Plant Breeders Companies.....	97
4.4.4: Deficiency of Damage Clause.....	98
4.4.5: Conflict between Breeders and Farmers.....	98
4.4.6: Lack of Compensation Clause.....	98
4.4.7: Absence of Women Farmer Rights.....	99
4.4.8: Protection of Traditional Knowledge.....	99
4.4.9: Danger to Genetic Diversity and Environment.....	99
4.5: Doctrine of Public Interest.....	100
4.5.1: Asghar Leghari vs. Federation of Pakistan.....	100
4.5.2: Sindh Institute of Urology and Transplantation vs. Nestle Milkpak Limited	
4.5.3: Pakistan Chest Foundation v Government of Pakistan.....	102
Conclusion.....	103
 CHAPTER 5	
CONCLUSION AND RECOMMENDATIONS.....	104
BIBLIOGRAPHY.....	108

INTRODUCTION

Article 27.3(b) of Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement states that the member nations shall provide protection of plant varieties either by a patent or by a compelling sui generis framework or by using both the methods at the same time. Pakistan is signatory of the World Trade Organization (WTO) and TRIPS when Pakistan passes laws it has to follow the International regulatory framework. Under the said Agreement, Pakistan has also introduced The Plants Breeders' Rights Act, 2016. The new law is the result of pressure on the government from the International community to present plant breeder's rights (PBR) to perceive business plant breeders' commitment in the advancement of new varieties, which was strengthened by rising private seed industry in Pakistan. The purpose of the law is to encourage plant breeders, seed organizations, development of superior varieties of field, protection of foreign varieties and new technology, creating healthy competition for variety development etc. The existing legal system required more improvement, and it particularly does not fulfill the requirements of farmers and modern time needs.

The core purpose of plant breeding program is to produce new plant varieties for improving farm productivity and economy. Plant breeders have very successfully increased the potential crop yields; however, the negative impacts of crop breeding on health and environment are significant issues. The plant breeders when innovate the seed variety, it has to pass through different stages like variety testing, "value for cultivation and use¹ (VCU), distinctness, uniformity and stability (DUS)".The plant breeders both private and public sectors give

¹ Value for Cultivation and Use (VCU) is the testing system of new variety. It based upon the results of field trials organized in different areas of the country. These trials are organized like a one-factorial (variety) experiment in three-four replications. The trial results are supplemented with the laboratory result and especial tests. For detail visit http://www.coboru.pl/English/Badania_WGO_eng/badania_wgo_eng.aspx last accessed date January 11, 2017.

preference to seek verity tested officially. It helps to improve and develop the system of official variety testing and release. Agriculture sector in Pakistan is considered as the leading component of all economic activities. According to recent report, the sector contributed 19.8 percent in GDP² and it remained the largest employer absorbing sector by employing 42.3 percent of the country's total labor force.³The seed's varieties played a pivotal role in boosting agriculture production of the country. Regulatory mechanism exists in Pakistan for controlling and regulating the quality seed which generally include National Seed Council, Provincial Seed Council, Federal Seed Certification and Registration Department (FSC&RD).The Federal Minister for Food and Agriculture has full authority over policy making. The research institutions are supported by the concerned provincial government and some of the projects of these research institutions are funded and coordinated by (PARC) at the Federal level. "The seed business in Pakistan is consisted of the formal and informal sectors, the former in turn comprising the public and private sectors."⁴ The formal seed structure comprises of nearby, national, worldwide public and private sector organizations. Business affiliations are included in preparing, showcasing and appropriation of seeds. Multinational companies are playing major role in seed sector of Pakistan.

²Through the Gross household item (GDP) appraisal framework all the completed merchandise and enterprises created inside a nation's fringes in a particular time period.GDP is generally computed on yearly in a nation. It ought to be ascertained on a quarterly premise too. It incorporates all private and open utilization, government costs, 'fares and short imports ventures that happen inside a region.

For details visit <http://www.investopedia.com/terms/g/gdp.asp>, (Last accessed January 12, 2017).

³ Agricultural Ministry of Pakistan, "Agricultural report 2015-2016 of Seed" visit <http://www.finance.gov.pk/survey/chapters_16/02_Agriculture.pdf (Last accessed date January 12, 2016).

⁴ Lahore University of Management Sciences, "A notion on the seed Business in Pakistan" (2004),2 <http://www.policy.hu/ali/LUMS%20paper%20on%20the%20seed%20industry.pdf> (last accessed date January 12,2017)

Pakistan's seed sector has great importance in agriculture and seesaw economy. The country has formulated different laws and rules for regulating the seed sector in areas including permitting of seed makers, variety discharge methods, quality control, and access to open germplasm, Intellectual property rights (IPRs), compulsory license, and import and export matters. One chapter of the thesis gives a general overview of the evolution of laws on seed sector of Pakistan since its independence in 1947, until the enactment of the Plant Breeders' Rights Act 2016. The Seed Act, 1976 and rules created under the Act gave the structure to the operation of nation's seed division. It controls and regulates the quality of various varieties of crops and the concerned legal issues. The Bio-safety Rules and Guidelines are also another essential part of the seed sector legal framework. Bio-safety Rules and National Bio-safety Guidelines of 2005 are also main tools. These legal documents made under the Pakistan Environment Protection Act, 1997. The rules legalize different aspects of the manufacture, trial, import, export, and sale of genetically modified organisms (GMOs). International organizations, conventions and treaties are dealing with the regulation of seed. They provide an international regulatory framework by controlling the interests of producers, breeders, and consumers.

Pakistan and India have ratified different treaties which lead to the legal arrangement for plant variety protection. Although, both the countries have passed relevant laws for the protection of plant varieties, breeders and farmers rights, however, some of the issues are even still remained unsettled. The reasons for this includes as the TRIPS Agreement provides the introduction of plant variety protection. The Biodiversity Convention and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) are also of major

importance due to their membership.⁵ Both of the countries have passed their laws complying with these treaties except UPOV. The understudy research also examines the International legal framework on plants varieties protection generally from India and Pakistan perspectives. Afterwards, comparatively analyses of PPV&FR Act with Plant Breeders Rights Act 2016 have been made. The main concern of these countries is the advancement of seed sector by securing the reward of the breeders, seed organizations and agriculturists by giving a powerful system or protection of plant varieties and rights of farmers. The PBV&FR Act is a lengthy document and it discussed the breeders, researchers and specifically the farmer's rights in detail while PBR Act is short document and it provides these rights in different manner. The study also endeavors to break down most parts of the enactments while carrying out the comparative studies for judging its utility in the relevant countries.

The PBR Act is still controversial among the Federal and Provincial governments. The Provinces claim that the PBR Act legislation is unconstitutional and the subject of Plant Breeders' Rights Act is a provincial subject over which the Parliament cannot exercise its legislative jurisdiction under Article 141 of the Constitution (Eighteenth Amendment) Act, 2010. The 18th Amendment provides that parliament may make laws for whole or part of Pakistan, and province may make laws for the Province or any part thereof. Article 142 provides that Parliament shall have exclusive power to make laws with respect of any matter in the Federal Legislative list. Parliament shall not have power to make laws respect to any matter not enumerated in the Federal Legislative list. The civil society's activists, NGOs and indigenes communities of farmers are opposing the Act. They claim that the proposed legislation only protects the breeders' rights and while it secludes the farmers as well as traditional knowledge of

⁵ Dr Philippe Cullet ,Rradhika Koluru, "Plant Variety Protection and Farmers' Rights" *Delhi Law Review* ,2002(2003),p.41, Last accessed date March 15, 2017, doi:hhttp://www.ielrc.org/content/a0304.pdf.,

indigenous communities from the sphere of legal protection. It aims to give breeders complete monopoly over the seed market and entitles the companies to royalties for at least 20 years⁶ on each variety for which they hold PBRs.

SIGNIFICANCE OF RESEARCH

The significance of research that motivated the undertaking of this dissertation topic is mention below:

- To define and determine the states of plant breeding innovation in Pakistan in the perspective IPRs
- To research the various dimensions of the subject with respect to different authors, legal experts and scholars to drive useful knowledge from.
- To answer the framed legal questions in order to achieve the desired conclusion
- To draw the pros and cons of Plant Breeders' Rights Act, specifically in the area of intellectual property protection
- To briefly examine the existing seed laws in Pakistan
- To draw the general comparative analysis of both laws of India and Pakistan
- To suggest ways and means that can secure the rights of Pakistan's farmers
- To add to the work previously carried out in the field of that subject in hope that the research proves to be a step forward

⁶ Section 24 of Plant Breeders' Rights Act 2016. For detail text is available at http://www.senate.gov.pk/uploads/documents/1480330690_813.pdf Last time accessed date April 25, 2017.

RESEARCH METHODOLOGY

The study is library based explanatory, analytical and partially based on case study. Furthermore, most of the data is collected from books, articles, research papers, law journals, magazines, conferences, reports of International organizations, Governmental and Non-Governmental Organizations (NGOs), national and international instruments, and electronic media.

LITERATURE REVIEW

Article 27.3 (b) of TRIPS Agreement states that the member countries shall provide protection of plant varieties either by a patent or by a compelling sui- generis framework or by using both the methods at the same time. Pakistan has ratified different treaties which lead to the legal arrangement for plant variety protection. The country has passed relevant laws for the protection of plant varieties, breeders and farmers' rights, however, some issues are even still remained unsettled. The research is unique in itself as the area of this research has not been touched by any other researcher in Pakistan. In this research, prime consideration and effort have been made to highlight those aspects that are very much related to plant breeders, researchers and farmer communities. Efforts have also been made for describing the state of plant breeding innovation in Pakistan. The plant breeders have successfully increased potential crop yield; however, the negative impacts of crop breeding on health and environment are significant issue. Proper focus is given in order to bring out the benefits and effects of legislation of Plant Breeders' Rights Act 2016 on breeders and specifically the farmers for serving in best possible manner.

CHAPTER ONE

THE STATE OF PLANT BREEDING INNOVATION IN PAKISTAN

Introduction

The core purpose of plant breeding program is to produce new plant varieties for improving farm productivity and economy. Plant breeders have very successfully increased potential crop yields; however the negative impacts of crop breeding on health and environment is a significant issue. The plant breeders when innovate the seed variety, it has to pass through different stages like variety testing, “value for cultivation and use¹ (VCU), distinctness, uniformity and stability (DUS)²”. The plant breeders both private sector and public sector give preference to seek variety tested officially. It helps to improve and develop the system of official variety testing and release. Agriculture sector in Pakistan is considered as the leading component of all economic activities. According to recent report, the sector contributed 19.8 percent in GDP³, and it remained the largest employer absorbing sector by employing 42.3

¹VCU is the testing method of new variety. It based upon the results of field trials organized in different areas of the country. These trials are organized like a one-factorial (variety) experiment in three-four replications. The trial results are supplemented with the laboratory result and especial tests. For detail visit http://www.coboru.pl/English/Badania_WGO_eng/badania_wgo_eng.aspx last accessed date 11, 2017.

²DUS testing is a method for deciding if a recently reared assortment varies from existing assortments inside similar species (the Distinctness part), regardless of whether the attributes used to build up Distinctness are communicated consistently (the Uniformity part) and that these qualities don't change over resulting eras (the Stability part). DUS tests exist so that new assortments can lawfully access their market by means of the UK National List or for the giving of Plant Breeders Rights. A type of licensed innovation rights intended to defend the generous financial venture required in present day plant reproducing. For details visit <http://www.sasa.gov.uk/variety-testing/distinctness-uniformity-and-stability-dus-testing> ,> last accessed date(january 12,2017)

³Through the Gross household item (GDP) appraisal framework all the completed merchandise and enterprises created inside a nation's fringes in a particular time period.GDP is generally computed on yearly in a nation. It ought to be ascertained on a quarterly premise too. It incorporates all private and open utilization, government costs, fares and short imports ventures that happen inside a region.

For details visit <http://www.investopedia.com/terms/g/gdp.aspl>, (Last accessed January 12, 2017).

percent of the country's total labor force.⁴The seed's varieties played pivotal role in boosting agriculture production of the country. International organizations, conventions and treaties are dealing with the ruling of seed. They give a global administrative system by control the interests of makers, reproducers, and customers. The organizations contain the International Seed Testing Association (ISTA)⁵ internationally recognized procedures for seed sampling and testing, the Organization for Economic Co-operation and Development (OECD)⁶, its Seed Systems are universally acknowledged for the affirmation of seed in global exchange. 'The International Union for the Protection of New Varieties of Plants (UPOV)⁷ deals with new seed varieties and an intellectual property protection. The International Seed Federation (ISF)⁸ and (FAO)⁹ give the universal administrative system to related parts of seed exchange. It incorporates plant wellbeing and phytosanitary measures, get to and advantage sharing for

⁴ Agricultural Ministry of Pakistan, "Agricultural report 2015-2016 of Seed" visit <http://www.finance.gov.pk/survey/chapters_16/02_Agriculture.pdf (Last accessed date January 12, 2016).

⁵The International Seed Testing Association (ISTA) was built up in 1924.It has more than 100 individuals in the world.ISTA is a relationship of labs which are approved to keep an eye on the attractiveness of seed as characterized in many nations' laws. Its different capacities incorporate deciding the capacity to sprout, the force of seed, and the substance of hereditarily changed life forms (GMOs) in seed. ISTA ensured test result acknowledged by the exchanging accomplices of the World Trade Organization (WTO) in worldwide seed movement. For details visit https://en.wikipedia.org/wiki/International_Seed_Testing_Association last accessed date january11, 2017.

⁶The Organization for Economic Co-operation and Development (OECD) was established in 1960.It is an intergovernmental financial organisation.It was built up by the collaboration of 35 part nations. The principle capacity of this association is to improve the monetary advance and world exchange. It is a gathering of nations portraying themselves as focused on popular government and the market economy, giving a stage to analyze arrangement encounters, looking for answers to basic issues, recognize great practices and organize residential and global strategies of its individuals. Another capacity of this Organization is to advance the strategies that will enhance the financial and social prosperity of individuals internationally. For more detail visit, <http://www.oecd.org/about/> Last accessed date January12, 2017.

⁷All around the world, the UPOV was formed in 1961, it was reconsidered in 1972, 1978 and 1991in Paris.It manages the plants related matters. It is an intergovernmental association, its headquarter is situated in Geneva (Switzerland).It was built up by the International Convention for the Protection of New Varieties of Plants. The purpose of this association is to advance a viable arrangement of plant assortment assurance, 'with the point of empowering the improvement of new assortments of plants, for the advantage of society. For details visit <http://www.upov.int/portal/index.html.en/> .accessed January 12, 2017.

⁸ ISF (2011), Seed Statistics. Available at: http://www.worldseed.org/isf/seed_statistics.html

⁹ FAO (2009), "High-Level Expert Forum on How to Feed the World in 2050, Rome," 12-13 October.

plant germplasm and utilization of pesticides¹⁰. Regulatory mechanism exists in Pakistan for controlling and regulating the quality seed which generally include National Seed Council, Provincial Seed Council, FSC&RD. The Federal Minister for Food and Agriculture has full authority over policy making. The research institutions are supported by the concerned provincial government and some of the projects of these research institutions are funded and coordinated by (PARC) at the Federal level. “The seed business in Pakistan consisted of the formal and informal sectors, the former in turn comprising the public and private sectors.”¹¹ The formal seed structure comprises of nearby, national, worldwide public and private sector organizations. Business affiliations are included in preparing, showcasing and appropriation of seeds.¹² Multinational companies are playing major role in seed sector of Pakistan.

1.1: The Importance of Quality Seed in Agriculture Sector

Seed is “the unit of reproduction of a flowering plant, capable of developing into another such plant”¹³. Seed is a material source which is used for regeneration or planting purposes.¹⁴ It is a source to shift the genetic potential of a variety to the next plant generation. “Subeejam Shushereto Jaayat Sapadayaty” means “the good seed in a good field produce abundantly”.¹⁵ Therefore, farmers should use healthy and pure seeds as per the minimum certification standards. “Adage is as per you sow as per you reap”. The good quality seeds are those which have genetically pure, health standards, physical purity, and germinability and

¹⁰ OECD Seed Schemes, “A Synthesis of International Regulatory Aspects that Affect Seed Trade” September 2012.

¹¹ Lahore University of Management Sciences, “A notion on the seed Business in Pakistan” (2004), 2 <http://www.policy.hu/ali/LUMS%20paper%20on%20the%20seed%20industry.pdf> (last accessed date January 12, 2017)

¹² Ibid 3.

¹³ <https://en.oxforddictionaries.com/definition/seed> Last accessed date January 13, 2017.

¹⁴ “MIT Technology Review Pakistan,” State of seeds in Pakistan>, (last accessed December 30, 2016).

For details visit <<http://www.technologyreview.pk/state-seed-pakistan/>

¹⁵ JS Lal, former officer of NSC and Marketing of VNR Seed Pvt. Ltd: Importance of seed Available at, <https://www.vnrseeds.com/Uploadimage/Article_Importance%20of%20Seed.pdf> (accessed December 30, 2016)

moisture percentage. Hence, the farmers can increase more or less 20% production of crops while using the standard quality of seed. The seed is the chief arrangement among the other arrangements of the farmers. The low quality seed waste the labor and other expenses of the farmers. The farmers should keep in mind the following seed's characteristics at the time of sowing crops.

1.1.1: Characteristics of Quality Seed

Generally, it suggests that if a seed meets the confirmation standard, it is great quality seed and if does not meet the accreditation gauges, it is unmistakably of a lower seed quality¹⁶.

The following distinctive nesses are necessary for a quality seed.

- a) It must be genetically pure:
- b) Breeder/nucleus seed¹⁷: 100 percent
- c) Foundation seeds: 99.5percent
- d) Certified seeds varieties¹⁸: 98percent
- e) Certified hybrid seeds: 95percent
- f) Certified hybrid cotton: 90percent
- g) Certified hybrid castor: 85percent
- h) It should have required level of physical purity: All crops: 98percent,
Carrot: 95percent, Ragi¹⁹: 97percent

¹⁶ https://www.indiaagronet.com/indiaagronet/seeds/CONTENTS/seed_quality.htm Last accessed date January 13, 2017.

¹⁷ Nucleus Seed produced by the breeders it by genetic way. Breeder Seed produced by the breeder from Nucleus Seed.

¹⁸ Certified seed mean which is verified by an official agency after inspection. It is the result of a production process to deliver specific plant breeding achievements to the farmers.

For detail visit < <http://seedgrowers.ca/seed-growers/what-is-canadian-certified-seed>> accessed January 13, 2017.

¹⁹ Africa is the origin country of Finger millet. It has been cultivated for many thousands of years in Uganda and Ethiopia. The crop was probably introduced 4000 years ago in India. It has been found in 'archeological excavations in the Harappan Civilization'. For details visit< <http://isha.sadhguru.org/blog/lifestyle/food/7-health-benefits-of-ragi-6-great-ragi-recipes>>, last accessed date January 14, 2017.

1.1.2: Quality Checking of Seed

The purpose of quality checking is to provide accurate and clear information about seed. Furthermore, Seed testing provides necessary knowledge for determining the quality of a shipment of seed concerning parameters like ‘germination, physical purity’ and moisture content. Seed testing should be carried out in a national seed laboratory or ISTA²⁰ accredited laboratory.²¹

1.2: Basic Concept of Plant Breeding

“Plant breeding is the process by which humans change the characteristics of plants over time to make them better crops and more nourishing food.”²² In other words, breeding consists of choosing the best seed or plant and using this seed or plant to grow further generations. The procedure of plant rearing changes the hereditary capacity of the plants with section of time. Breeders in Pakistan have introduced many productive varieties of rice and wheat for improving the quality food production.

1.2.1: Main Requirement for Plant Breeding

The main factor that is involved in plant breeding is genetic variation²³ in the seed according to the most wanted feature. For example, an agriculturist needs to choose a plant assortment

²⁰ (ISTA) was established by 100 nations worldwide in 1924. ISTA has set up of a relationship of research centers. These approved research facilities check the attractiveness of seed. The other capacity of the association is to decide the capacity to develop, and the substance of hereditarily altered creatures (GMOs) in seed. ISTA research centers ‘come about acknowledged by the exchanging nations of the World Trade Organization (WTO) in global seed activity.

²¹ Seed and Seed Quality: Technical Information for FAO Emergency, “*Staff FAO Seed and Plant Genetic Resources Service Rome, Italy*”.

²²For details visit <<http://b4fa.org/bioscience-in-brief/plantbreeding/what-is-plant-breeding/>> (last accessed January 13, 2017)

²³ Hereditary variety implies that organic frameworks, every quality pool incorporates different alleles ‘(hereditary qualities both of a couple (or arrangement) of option types of a quality that can involve a similar locus on a specific chromosome and that control a similar character)’ of qualities. Hereditary variety is achieved, ‘on a very basic level, by arbitrary transformation. It is a lasting change in the compound structure of chromosomes. Hereditary recombination likewise creates changes inside alleles.

with imperviousness to a bug will look for the plants which survive a creepy crawly assault.²⁴In many developing countries plant breeding is playing particular role to provide food, feed, fiber, pharmaceuticals, and shelter for humans. In addition, plants are used for aesthetic and other functional purposes in the landscape and indoors.²⁵

1.2.2: Clue of Biological Diversity

Generally, diversity of life on land is called biological diversity. "It includes all species of plants, animals and 'micro-organisms'²⁶, their genetic material and the 'ecosystems'²⁷where they live. The many different forms of life have taken millennia to develop through a process of natural selection and evolutionary change."²⁸Article 2 of the Convention on Biological Diversity (CBD)²⁹ specify biological diversity resources "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems",³⁰

1.3: Plant Breeding in Pakistan

Bioscience for farming in Africa, "plant genetics and crop breeding" (last accessed January 4, 2017)

²⁴ Available at .<<http://b4fa.org/bioscience-in-brief/plantbreeding/main-requirement-basic-plant-breeding/>

²⁵ History and role of plant breeding in society, p 3.

²⁶ A microorganism is a microscopic organism. It found in two forms which may be single-celled or cellular. The study of microorganisms is called microbiology. It was discover by Antoine van Leeuwenhoek in 1674 by using a microscope of his own design.

²⁷Ecosystem: It is a gathering of interconnected components, shaped by the cooperation of a group of living beings with their condition. Ecosystem includes all of the living things (animals, plants and organisms) in a given area, interacting with each other, and also with their non-living environments (earth, weather, sun, soil, atmosphere and climate).

<http://www.dictionary.com/browse/ecosystem>

For detail visit,><http://eschooltoday.com/ecosystems/what-is-an-ecosystem.html>(Last accessed date 12,2017)

²⁸ Habibi, Biological Diversity in Pakistan,"2 (last accessed, January5, 2017)

Available at, <<https://portals.iucn.org/library/sites/library/files/documents/1997-073.pdf>.

²⁹ In 1992, CBD was marked by 150 government pioneers at the Rio Earth Summit. The essential reason for this Convention to advancing supportable improvement .The Convention perceives that natural differing qualities is about more than plants, creatures and small scale living beings and their biological systems.

³⁰For detail visit<http://www.biodiv.be/biodiversity/about_biodiv/biodiv-what>, (accessed, January 5, 2017).

Agriculture sector of Pakistan has a great significance. It is one of the dominant sectors for making its contribution to Pakistan's economy. For meeting the need of seed in agriculture, plant breeders are playing their extensive role in Pakistan. Agriculture's examine and variety development plan consist of 13 multidisciplinary, four agricultural universities and 14 mono-commodity research institutes.³¹ Out of the 13 multi-disciplinary research institutes, four are established in Punjab, four in Khyber Pakhtunkhwa and three in Sindh and two in Balochistan. These colleges are covering every monetary yield and the related orders which are being instructed there had an expansive number of areas and sub-stations.³² Punjab Agriculture College and Research Institute Lyallpur³³ had been recognized in 1909. When Pakistan was established in 1947; it was the only one Agricultural education cum research institute; that was later separated and upgraded to university of Agriculture Faisalabad (UAF) and Aube Agriculture Research Institute (AARI), Faisalabad in 1961.³⁴

The establishment of multi-disciplinary research institutes in province was due wide diversity of Agro-ecological reasons. These organizations have the order to grow better adjusted assortments for nearby agro biological prerequisites³⁵ Larger part of research establishments are supported by the separate commonplace government. A couple of projects of these institutes are facilitated and partly financed by the Pakistan Agriculture Research Council (PARC)³⁶ and National Agricultural Research Centre (NARC)³⁷ at the Federal level.

³¹ Akhlaq Hussain and Abdul Rauf Bhutta, "Federal seed Certification and Registration Department, "The focus on seed programs the Pakistan seed industry,"

³² Federal Seed Certification and Registration Department, "Variety Development, Testing, Registration, Approval and Release in Vegetable Crops in Pakistan," 1.

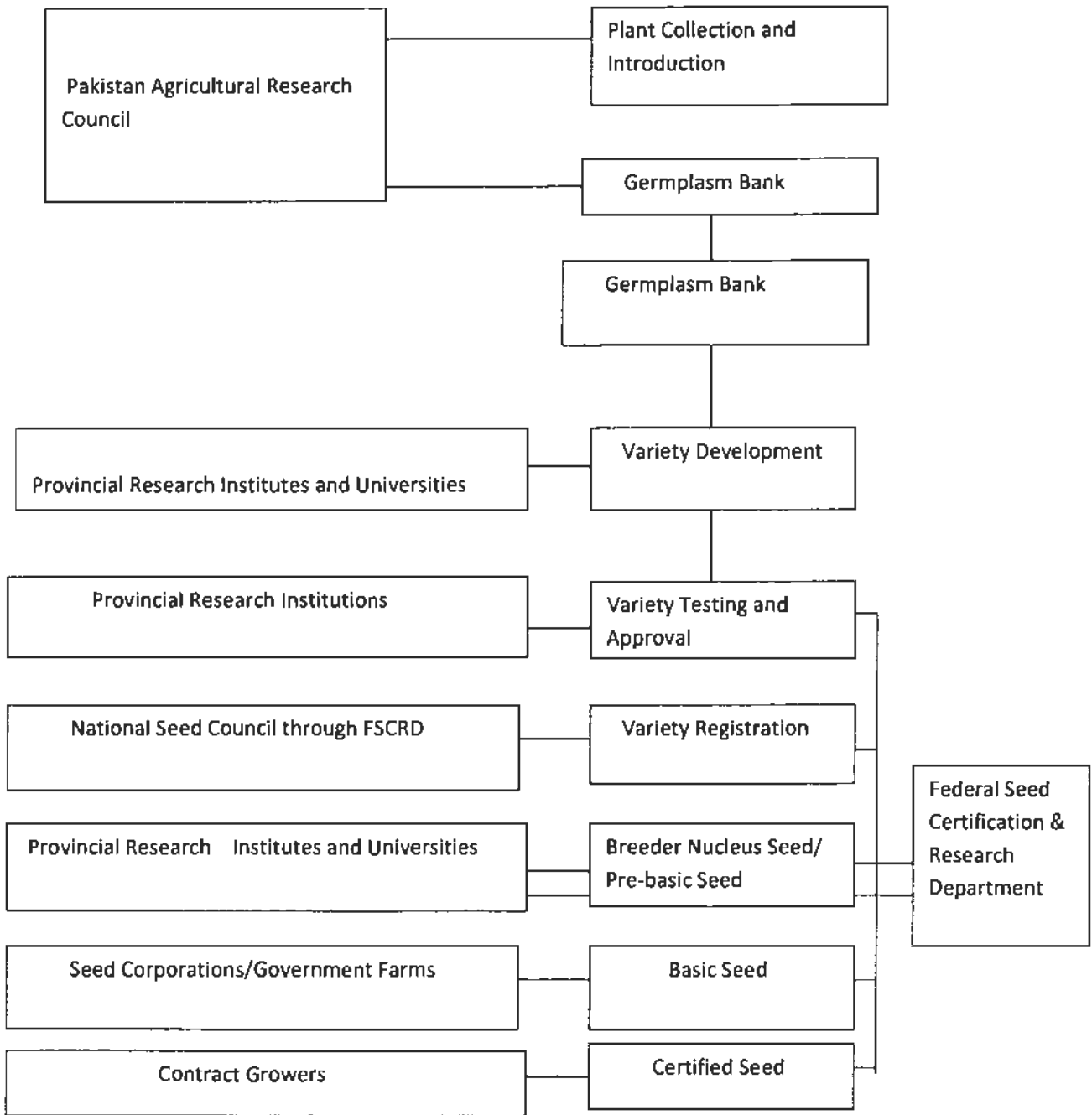
³³ Lyalpur is a big city in Central Punjab (Faisalabad). The College was built up in 1909.

³⁴ Formal and Informal Seed Supply system in Pakistan, "A perspective for farmer's Seed Rights" (last accessed date January 18, 2017).

For detail visit, <<http://documents.mx/documents/formal-and-informal-seed-supply-system-in-pakistan.html/>>

³⁵ Ibid

³⁶ Available at <http://www.parc.gov.pk/index.php/en/pakistan-agriculture-research-council/parc-profile>,> (Last accessed January 14, 2017).



Data Sources: Federal Seed Certification and Registration Department, Islamabad Fig.

Pakistan Agricultural Research Council (PARC) is the incomparable association. It is functioning in near cooperation with other government and commonplace establishments in the nation. It gives logical based answers for agribusiness of Pakistan through its statutory capacities.

³⁷ National Agricultural Research Center (NARC), Islamabad built up in 1984. It is the biggest research focal point of the Pakistan Agricultural Research Council (PARC). NARC, add up to possessed land zone of around 1400 acres of land, is situated close RawalLake, six kilometers south-east of Islamabad. Physical offices in term of test fields, research centers, green houses, quality bank, library/documentation, hall, apparatus and lab repair workshops, stores, lodgings, cafeteria, varying media studios, are additionally accessible.

Organization of variety development, registration and release in Pakistan³⁸

The collection of germplasm³⁹, safeguarding, assessment and protection is approved by the Plant Genetic Resources association, ARC (for cotton by PCCC)⁴⁰. These materials are made available to plant breeders. The variety's development, testing and evaluation are being undertaken by the Provincial Agricultural Research Institutes, Pakistan Agricultural Research Council, PCCC, Pakistan Atomic Energy Commission (PAEC) and Agricultural Universities. Since the plant breeding activities are dominantly oriented by the public sector. In the development of agricultural and horticultural crop varieties it played important role. In the development of plant breeding with help of the research institutions Punjab has played prominent role.⁴¹

1.3.1: Development of New Varieties

Federal and provincial Agricultural Research Institutes are mainly developing new varieties through conventional Plant Breeding. Mainly, breeders are using atomic radiation for the development of new varieties significantly of 'legumes'⁴², cotton and rice. Pakistan's privatization support Policy has urged the emergence of multinational seed's companies like

³⁸ The data of this fig collected from FSC&RD, fig idea is taken from the paper "Focus on Seed Programs The Pakistan Seed Industry." p.7.

³⁹ University of California Seed Biotechnology Center defines " Germplasm" It is living tissue from which new plants can be developed. It can be a seed or another plant part – a leaf, a bit of stem, dust or even only a couple of cells that can be transformed into an entire plant. Germplasm contains the data for animal varieties' hereditary cosmetics, a profitable normal asset of plant differing qualities.

⁴⁰ Pakistan Central Cotton Committee (PCCC) is a semi-self-ruling body, with the Federal Minister for Textile Industry as its President'. In 1948, it rose as consolidated organization on the national skyline. 'Its goal is to focus its endeavors on acquiring a change developing cotton, cotton promoting and assembling of cotton and cotton by-items through a broad innovative work (R&D) program in all its possible view points'. For detail visit, <<http://www.pccc.gov.pk/>> (last accessed date January 6, 2017).

⁴¹ Federal Seed Certification and Registration Department, "Variety Development, Testing, Registration, Approval and Release in Vegetable Crops in Pakistan,"1-5.

⁴² A legume is basically a vegetable plant. 'Vegetables are developed horticulturally, essentially for their grain seed called beat, for trained creatures rummage and silage, and as soil-enhancing green compost. Comprehended vegetables consolidate horse nourish, clover, peas, beans, lentils, lupin bean, mesquite, carob, soybeans, peanuts and tamarind..

Syngenta⁴³ (Pakistan) Ltd, Pioneer Pakistan Seeds Ltd, ICI (Pakistan) Ltd and Monsanto Pakistan Seed (Pvt) Ltd. The mentioned companies have in progressed breeding programs and varieties for evaluation and registration. Hybrids of Maize, sunflower and 'Sorghum' are included in these varieties.⁴⁴ For promoting and strengthening the national plant breeding programmers, the country had been contacted with International Agricultural Research Centers as ICARDA⁴⁵, IRRRI, CIMMYT, AVRDC, IITA and CIAT for obtaining germplasm. The insurance of Plant Breeder's Rights may increase research toward improvement of germplasm assets, new reproducing techniques and identification of superior breeding lines.⁴⁶

⁴³Syngenta Pakistan limited is a subsidiary company; it incorporated in year 2000. It is performing its role in developing the agricultural production through new products and farming advisory facilities. The fundamental capacity of the organization contain detailing, repacking, advertising and circulation of 'farming items' are including Seeds. It as of now utilizes 323 perpetual and around 700 impermanent care staff. The harvest insurance and seed business got incorporated internationally to give finish edit answers for producers in 2012. "The item portfolio includes bug sprays, herbicides, fungicides and half breed seeds covering every single real product running from cotton, wheat, rice, corn, natural products, vegetables, sunflower, and so forth. The association conveys the items through a select establishment arrange called "Nayasavera" and is at present working through 66 focuses in Pakistan.

For more detail visit, > <https://www.syngenta.com.pk/about-us> (Last accessed date January 12, 2017).

⁴⁴Sorghum is genuinely an adaptable harvest that can be developed as a grain, scavenge or sweet yield. Sorghum is one of the main five grain trims on the planet. The United States is the world's biggest maker of grain sorghum, having delivered 597 million bushels in 2015. Sorghum is among the most productive yields in transformation of sun powered vitality and utilization of water and is known as a high-vitality, dry spell tolerant harvest that is earth amicable. Because of sorghum's wide uses and adjustment, "sorghum is one of the truly irreplaceable products" required for the survival of mankind (From Jack Harlan, 1971). For more details visit, > <http://www.sorghumcheckoff.com/all-about-sorghum> Last accessed date January, 13, 2017.

⁴⁵The ICARDA was founded in 1977. It supported by the Consultative Group for International Agricultural Research (CGIAR) Its fundamental reason to advance agrarian improvement in the dry zones of creating nations. It works with a prime concentrate on the critical thinking needs of asset poor agriculturists, accomplishing this through the in-field conveyance of its exploration yields. Albeit worldwide sustenance creation has expanded by 20 % in the previous decade, nourishment instability and destitution stay broad, while the characteristic asset base keeps on declining. For more detail visit, > <http://www.icarda.cgiar.org/mission-and-vision> (Last accessed date January 13, 2017)

⁴⁶ Federal Seed Certification and Registration Department, "Variety Development, Testing, Registration, Approval and Release in Vegetable Crops in Pakistan," 1-6.

1.3.2: Selection of New Variety after Testing

The breeders test and assess the new variety at research centers. Breeders organize proper assessment micro varietal trials and out-station zonal varietal trials. They judge the occurrence of change in the genotypic environmental interaction. The most zonal trials are led in the region of flexibility in collaboration with edified cultivators and on government ranches. They present the new seed assortment's specimen to the National Seed Registration Department to decide the Distinctness, Uniformity and strength with the end goal of setting up portrayal and enrollment. It is important to give an example to the Variety Evaluation Committees of Pakistan Agriculture Research Council (PARC) for products in the meantime as cotton's seed tests are submitted to Pakistan Central Cotton Committee. Another assortment that satisfies the necessities of significant worth for development and utilizes (VCU) and Distinctness, Uniformity and Stability is endorsed for discharge and registration.⁴⁷ The Seed Act 1976, S.2 (n) provides "a released variety means a registered variety having agricultural value for growing in a Province and approved by the Provincial Seed Council"⁴⁸

1.3.3: Requirement of Value for Cultivation and Use (VCU)

The VCU is the important standard for a profitable variety improvement. The provincial Agricultural Departments organize agronomic trials at their research farms, Seed Corporation and progressive growers' farms. The vital part of testing for VCU is the yield execution; in addition, there are some different elements which must be surveyed. Attributes of field may

⁴⁷ Ibid.

⁴⁸Section 2(n) Seed Act 1976 of Pakistan

vary from one harvest to other product i.e. for wheat imperviousness to rusts and other cabin, bread quality and "pathogens"⁴⁹ etc. The product of crop must be the real quality.⁵⁰

1.3.4: Basic Requirements for Estimating the Distinctness, Uniformity and Stability (DUS)

The following are the basic requirements for new and pure seed's variety production:

1.3.4.1: Distinctness:

The purpose is to check the candidate variety is different from the other commonly known varieties. "A variety is considered distinct from another when the differentiations significant and consistent at least at one testing place. If two different varieties exhibit greater differences than the natural fluctuations of characteristic expression found within one variety, then they are distinct."⁵¹ A new seed's variety should be known and clearly distinguishable from all other varieties (color, shape etc.), metric characteristics (height, leaf length etc.) and physiological (maturity, resistance etc.)⁵²

⁴⁹ The term Pathogens is frequently utilized for operators that 'upset the typical physiology' of a 'multicellular creature' or plant. Pathogens can contaminate unicellular life forms from the greater part of the 'natural kingdoms'. 'There are a few substrates and pathways whereby pathogens can attack a host. The human body contains numerous regular guards against some of basic pathogens as the human safe framework and by some "accommodating" microscopic organisms exhibit in the human body's typical vegetation'.

For more detail visit, > <https://www.sciencedaily.com/terms/pathogen.htm> Last accessed date January 14, 2017.

⁵⁰ Federal Seed Certification and Registration Department, "Variety Development, Testing, Registration, Approval and Release in Vegetable Crops in Pakistan,"

⁵¹ Julia Borys, Hanna Grzesiek and Joanna Waszak, " Plant Breeding and Seed Science", *The Research Center for Cultivar Testing*, 63-022 Słupia Wielka, Poland-Volume 48(no.2/2), (2003),160, Last accessed date January 15,2017,

⁵² Federal Seed Certification and Registration Department, "Variety Development, Testing, Registration, Approval and Release in Vegetable Crops in Pakistan,"⁶

1.3.4.2: Uniformity (Homogeneity)

“The assessment of uniformity of parental lines and single hybrids is done on the basis of number of types in tested sample of plants.”⁵³ Uniformity relates to the degree of variability within the new variety. The new assortment of seed ought to be sensibly uniform inside its stand singular plant could be recognized.⁵⁴

1.3.4.3: Stability

It is fundamental necessities for immaculate seed generation that it must stay consistent with its depiction after rehashed multiplication. A steady cultivar is constantly advanced the reason is that it can be conveyed and expanded without numerous complaints. For the most part, it is extremely troublesome amid a period two to three years to perform solidness tests like the testing of homogeneity and uniqueness. Regularly, in two developing years, when a submitted test has appeared to be homogenous, it would be consider stable in light of the fact that the foundations or reproducers have the obligation to keep up the assortment and its dependability in coming era. The variety would be considered unfit for certified seed production as the failure in stability is detected in coming generation. Pre and post control trials are the source to further ascertain the stability of new variety.⁵⁵

⁵³ Julia Borys, Hanna Grzesiek and Joanna Waszak, *Plant Breeding and Seed Science*, 160.

⁵⁴ Federal Seed Certification and Registration Department, “Variety Development, Testing, Registration, Approval and Release in Vegetable Crops in Pakistan,”⁶

⁵⁵ *Ibid.*

1.4: New Variety Testing Procedure

The procedure and growing tests are nearly similar in many countries for establishing Distinctness, Uniformity and Stability as being practiced for Plant Breeder's Rights. In Pakistan, DUS function is approved by the FSC&RD. Breeders submit the seed sample along with the following documents to the FSC &RD:

- a) Application in written form for registration of the new seed variety
- b) Data regarding value for cultivation and use (VCU)
- c) Actual specimens of plant variety and plant parts
- d) Detailed about the botanical characteristics of the variety along with comparable variety closely resembling to the candidate variety - it may also include brief breeding history and parentage.

1.5: Requirement of Pre-Registration Trial

The purpose of pre-registration trial is to determine the distinctness, uniformity and stability of new seed's variety. The trial is conducted under normal agronomic practices for two years with a minimum of two replications. The candidate varieties are compared with already registered varieties and among themselves. Closely resembling varieties are cultivated in one group for next year assessment. The distinctness of the candidate variety is known within one class during the second year. When the variety does not fulfill Distinctness, Uniformity and Stability the FSC& RD has right to set back for registration. The new variety meets its DUS and VCU characteristics, according the data issued by the Federal Seed Registration Committee (FSRC).After the approval of variety, it is sent to the National Seed Council

(NSC) for confirmation of registration. Through the Federal Seed Certification Department the new registered varieties become entitled for quality control.⁵⁶

1.6: Features of Registration

- I) the registered variety secures the rights of Plant breeder.
- II) The registration of new assortment gives the premise to genuine sort upkeep of raiser's Nucleus Stock of the assortment for the generation of pre fundamental seed.
- III) The quality of new variety control easily through Federal Seed Certification Department.

1.7: Approval and Release of Crop Variety

At the provincial stage, the provincial governments are answerable for distribution, processing and arranging production of quality seed of released variety. The registered variety is recommended and released for cultivation by the concerned Provincial Seed Council. The following are the steps for approval and release of variety.

The breeders and agricultural experts are the representative of Expert's subordinate committee. At the provincial level, committee receives the proposal of candidate variety. The committee assesses the data of breeders with the reports of FSC & RD. An expert sub-committee submits the report of the varieties for approval which are considered proper for cultivation to Provincial Seed Council.

⁵⁶ Ibid.

Under section 9 of the Seed Act 1976, Provincial Seed council has been established. It works in same lines in its relevant province. It can approve the variety; a notification is issued by the Federal Government after registration. In every region, the Provincial Seed Council is spoken to by the seed makers, quality control offices, illuminated cultivators and reproducers. They talk about the proposition of the applicant assortment in the light of the remarks and suggestions of the Expert Sub-board of trustees support and discharge the new assortment.

The issues are cited to the National Seed Council, while there is different opinion among the members of Provincial Seed Council. The Federal Seed Certification & Registration Department considers the report of the crop specialists and submits the cases for final decision to the National Seed Council. For the most part, the choice of the Provincial Seed Council with respect to endorsement and arrival of assortment is consistent. Moreover, the procedure of registration and release of vegetable varieties are almost the same except for their testing not on such a scale as that of cotton and cereals. The reason is that the most of the vegetable crops have limited localized preference and adaptability. Breeders provide the data on the basis for agronomic value regarding the performance of the varieties.⁵⁷

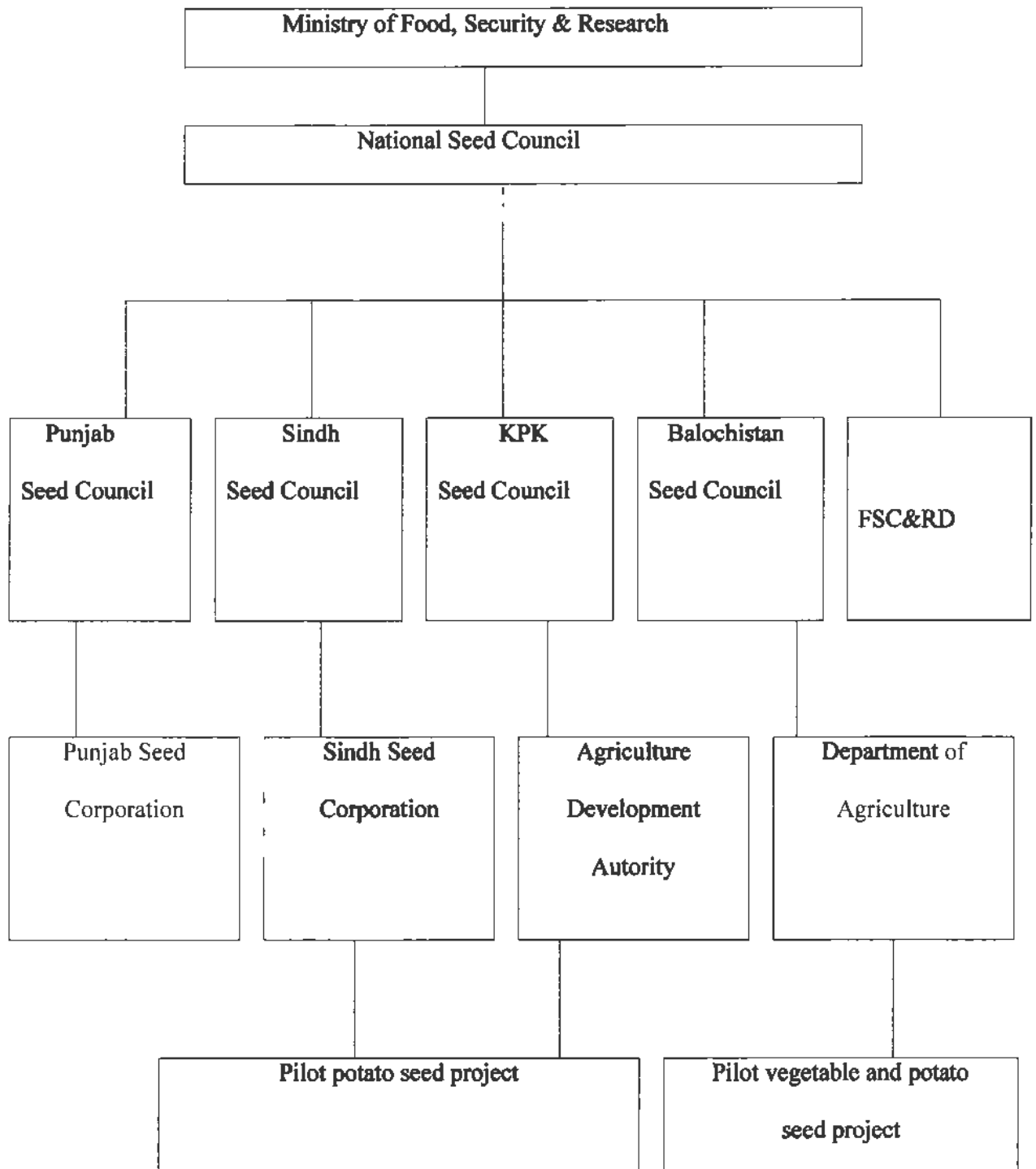
1.8: National Seed Policy

A seed is a central source in agriculture production. It requires particular attention of the government for promotion and innovation of seed. The government is attached with agricultural research, seed promotion and variety development, distribution, extension and quality control; however, the measurements are not sufficient. There is massive need to promote the seed sector of Pakistan.

⁵⁷ Ibid

The Seed Act 1976 gives a lawful edge to variety registration and seed quality control by setting up the 'institutional foundation. It included the FSC&RD, National Seed council (NSC) and the Provincial Seed Councils (PSC). The basic seed's infrastructure based on the federal and provincial levels⁵⁸.

⁵⁸ Akhlaq Hussain and Abdul Rauf Bhutta, "Focus on Seed Programs the Pakistan Seed Industry,"3.



Organizational Structure of the Public Seed Sector in Pakistan

Ministry of Food Security and Research is the incomparable body for planning national strategies and directing the seed segment of Pakistan. The NSC is regulated by the Ministry of Food Security and Research. It embraces approves on seed's quality and coordinates interprovincial advancements of seed. All establishments related to the progression of seed's industry in Pakistan are addressed by the National Seed Council. It has been resolved to endorse trim assortments for seed generation, make courses of action for seed duplication, handling and advertising in the applicable province.⁵⁹

The free market economic policies preferred by the government to encourage privatization and several companies have been granted permission to produce and market in the country. "The new policy defines the roles of agricultural research, private sector and NGOs and a legal framework to prevent adulteration of inputs."⁶⁰The National Seed Council has accepted the 'Rules for Certification of Fruit Plants'. This step may improve the quality of nursery stocks for fruit tree crops. This rule helps develop the production, distribution, disease free fruit and good quality plants.

According to the agro-ecological need of various regions, Pakistan Agriculture Research Council (PARC) has seven major research establishments in Pakistan:

1. National Agricultural Research Centre (NARC), Islamabad
2. Karachi Sugarcane Research Institute (SRI), Thatta
3. Karakoram Agricultural Research Institute for Northern Areas (KARINA), Gilgit
4. National Tea Research Institute (NTRI), Mansehra

⁵⁹ Ibid.

⁶⁰ Ibid.

5. Tropical Agricultural Research Center (TARC), Karachi

6. Himalayan Agricultural Research Institute (HARI), Kaghan

7. Arid Zone Research Centre (AZRC), Quetta

Pakistan Agriculture Research Council (PARC) has Federal Pesticide Research Lab, Multan; 'Beach front Area' Research Station, Karachi; and it incorporated Pest Management Laboratory, Multan, Agricultural Economics Research Units (AERUs) are working in every one of the areas and Azad Jammu and Kashmir. The PARC has its provincial workplaces in Lahore, Karachi, Peshawar and Quetta its examination units in Rice Research Institute Dokri Sindh and Kala Shah Kaku, Lahore. The agrarian research organizations support close cooperation with universal farming examination focuses like CIMMYT⁶¹, CIAT, ICARDA, ICRISAT, IITA and IRRI.

1.9: Variety Maintenance

After the endorsement and arrival of new assortment, the concerned foundation has the obligation regarding upkeep and generation of Breeders Nucleus Seed (BNS), it duplicate to Pre-fundamental seed. Breeders work with the FSC&RD to deliver the pre-fundamental seed by Public Sector Corporation. Under the new government approaches and laws, it appears that the private part will build its part in creating essential seeds.⁶²

⁶¹ CIMMYT became out of an experimental run program supported by the Mexican government and the Rockefeller Foundation in the 1950s went for bringing ranch profitability up in Mexico. The wheat expert in that program, Norman Borlaug, worked with Mexican specialists and agriculturists to create hardier, short-stemmed wheat assortments that opposed crushing rust ailments and yielded considerably more grain than customary assortments. For more detail visit >, <http://www.cimmyt.org/organization> Last accessed date Last accessed date January 18, 2017.

⁶² Akhlaq Hussain and Abdul Rauf Bhutta, "Focus on Seed Programs the Pakistan Seed Industry,"3-5.

Number of Crop Varieties Released and Registered from 1947 to 2016 in Pakistan

Crops	No. Of Registered and Released Varieties						
	Punjab	Sindh	KPK	Baluchistan	Islamabad	Private	Pakistan
Wheat	61	24	44	08	04	---	141
Barley	03	---	03	04	---	---	10
Maize	14	---	12	---	---	02	28
Rice	20	14	07	---	---	---	41
Cotton	85	23	02	---	---	18	128
Sugarcane	15	10	16	---	---	01	42
Pulses	46	04	21	01	05	---	77
Oilseeds	22	05	23	---	08	05	63
Fodders	29	---	07	01	---	02	39
Vegetables	40	01	13	08	---	---	62
Fruits	10	---	36	---	---	---	46
Flowers	03	---	---	---	---	---	03
Total	348	81	184	22	17	28	680

Sources from: Federal Seed Certification & Registration Department, Islamabad

1.10: Pakistan's Seed Production

Seed production of Pakistan is based on both public and private sectors. "The formal sector is expected to supply 100%, 33% and 20%, respectively of seed requirement for cotton, maize and cereals".⁶³

In practice, more than 90 per cent of the cereal seed needs, and almost the entire requirements of legumes, oilseeds and fodder crops, continued to be met from other sources able to adequately supply the seed requirements of the farming community of Pakistan. Public sector agencies had pioneered the production of quality seeds for the major crops, and fostered farmer awareness for the use of certified seed. However, the public sector could not meet even the replacement rate of seed for the major crops: indeed its availability remained under 10 per cent of demand.⁶⁴

The seed processing focused on Sindh and Punjab. An open segment had three portable seed cleaning units and five seed handling plants. The four seed plants had a limit of 103,000 metric tons (mt) every year for harvests as rice, maize, wheat cotton. The seed stockpiling and handling limit of the formal division was not meeting the national seed prerequisite in correlation of the formal part.⁶⁵

The Seed Act 1976 provides the legal framework to the seed system in Pakistan. According to the requirement, a few alterations were received to give authorization to the private division to deliver the essential seed. General society segment essentially manages the high volume, minimal effort seed of real harvests, for example, rice, and cotton and wheat varieties. In spite of the fact that, the mid 2000s, people in general division could supply seeds for under 35 percent of cotton, 3 percent rice, 5 per cent maize and 15 per cent of wheat. The

⁶³ Ibid.

⁶⁴ Lahore University of Management Sciences (LUMS), "A notion on the seed business in Pakistan", p.2

⁶⁵ Ibid 3

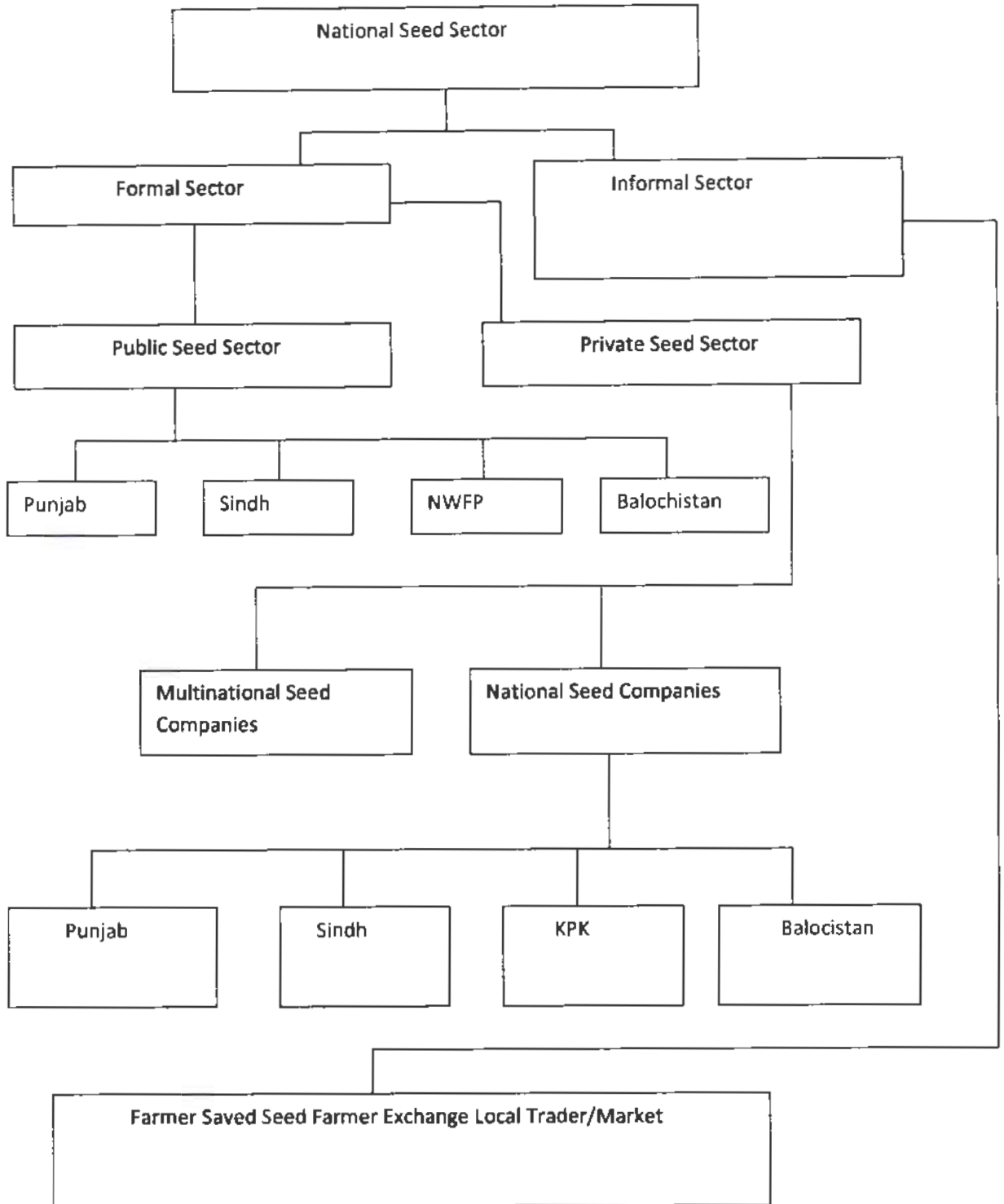
real seed production and processing were managed at the provincial level. The Punjab and Sindh Seed Corporations were established with help of International donors, particularly the World Bank. Khyber Pakhtunkhwa and Balochistan have not established seed corporations. The Agricultural Development Authority was granted this mission in Khyber Pakhtunkhwa ; however it ceases to role in 2001. Thus, the responsibility was taken by various components of the Department of Agriculture; same was the case in Balochistan.⁶⁶

The Punjab Seed Corporation (PSC) confronted misfortune, however later profit by more steady administration. There were two variables which change the PSC from a misfortune creator into an unassumingly beneficial open substance. The first was the quality control and second was the demonstration program. The PSC began furnishing agriculturists with free seed for a section of land of yield, under the condition that they will take after the suggestions. Nearly, 1,000 such plots were distributed and created in the Punjab. After this transformation method, the PSC succeeded over 20 per cent growth in seed sales in the late 1990s.⁶⁷ However, the country should to pay attention to domestic seed's production. There is positive requirement for straightforward, air and impartial checking to the market. Global agricultural framework is astounding with novel creation from the hybrid seed and the seed part in Pakistan is stuck pre-essential seed.⁶⁸

⁶⁶ Ibid, p 3

⁶⁷ Ibid, p 3

⁶⁸ Pakistan Agrifarming Problem of seed sector in Pakistan and possible solutions, <http://pakagrifarming.blogspot.com/2013/08/87-problems-of-seed-sector-in-pakistan-and-solutions.html> (Last accessed January 20, 2017)



Seed Production and Supply in Pakistan

Area, Seed Requirement and Seed Availability for Sowing Rabi 2015-16 and Kharif 2016 in Pakistan

Crop	Area 000Ha	Total Seed Requirement	Targeted Seed Requirement MT	Seed Availability (MT)			
				Public	Private	Imported	Total (LOC+HMP)
Wheat	9,045	1,085,400	217,080	75,45	239,55	0	315,020
			---	7%	22%	---	29%
Cotton	3,200	40,000	40,000	960	33,561	0	34,521
			---	2%	84%	---	86%
Paddy	2,847	46,660	12,744	4,269	43,962	8,470	56,701
			---	9%	94%	18%	122%
Maize	1,064	31,914	9,574	70	3,105	13,919	17,094
			---	0%	10%	44%	54%
Pulses	1,337	47,496	9,499	230	1,259	0	1,489
			---	0%	3%	0%	3%
Oilseeds	830	10,582	2,116	2	95	494	591
			---	0%	1%	5%	6%
Vegetable	254	5,570	5,070	21	106	7,300	7,427
			---	0%	2%	131%	133%
Fodders	1,942	40,138	40,138	---	27	37,307	37,334
			---	0%	0%	93%	93%
Potato	149	372,725	74,545	---	---	3,051	3,051
			---	0%	0%	1%	1%
Total	20,68	1,680,485	410,766	81,07	321,60	70,541	473,228
			---	5%	19%	4%	28%

Data Sources: Federal Seed Certification & Registration Department, Islamabad

Summary of Imported Seed 2015-2016 in Pakistan

Crops	Total Quantity (MT)	Total Value (Rs.Millions)
Alfalfa	858.3400	333.8725
Berseem	16088.0000	2134.2696
Grass	32.7500	63.0016
Oat	0.0000	0.0000
Millet	1878.9250	106.1555
Sorghum	10970.2460	946.9298
Sesbina	0.0000	0.0000
Fodders	29828.2610	3584.2289
Canola	14.0000	11.0086
Sunflower	343.2860	209.3369
Jatropha	0.0000	0.0000
Oilseeds	357.2860	220.3454
Corn	8331.5418	3025.9163
Paddy	1943.5900	893.0700
Cereals	10275.1318	3918.9863
Potato	3050.6750	200.4671
All Crops	43511.3538	7924.0278
Vegetables		
Angled Gourd	0.0000	0.0000
Beans	109.7250	44.2997
Bittergourd	66.9970	141.3845
Bottle Gourd	36.1170	815.5860

Beet	0.4000	0.4650
Broccoli	0.0430	1.7986
Cabbage	7.0820	66.1987
Carrot	305.9430	147.5996
Cauliflower	19.0200	167.6624
Cucumber	31.0350	232.1231
Cucumber hyb	0.8180	196.8587
Corriander	114.7500	18.4462
Eggplant/Brinjal	5.4330	12.5101
Hot Pepper	11.6910	255.8802
Kohl Rabi	0.0000	0.0000
Lettuce	0.6150	1.3081
Leek	0.2000	0.5434
Long Melon/chichinda	8.0580	9.9006
Melon/Musk Melon	3.6520	36.5711
Moongra	2.7950	0.6465
Luffa	0.1190	0.9869
Okra	2450.6320	528.5030
Onion	220.8830	218.1269
Peas	1223.0780	177.9643
Pumpkin	0.1700	0.3897
Radish	108.4420	45.7780
Rape	0.0200	0.0010
Red Gourd	8.1700	7.1625

Ridgegourd	20.4930	13.1382
Round Gourd	297.6220	64.9910
Snak	0.7800	0.2226
Spinach	100.1320	22.0667
Spong Gourd	20.3180	44.0564
Squash	86.8140	362.1496
Sugar Beet	12.2860	29.0487
Sweet Pepper	1.7250	30.3030
Tinda	38.6210	414.6962
Tomato	162.9230	348.8600
Watermelon	31.1560	243.7935
Others/Veg.Marrow	3.6250	2.6374
Total (Veg)	5568.8220	4847.7870
Grand Total	49080.1758	12771.8147

Data Source: Federal Seed Certification and Registration Department, Islamabad

1.10.1: National and Multinational Seed Companies

An extensive number of seed organizations were set up in 1991, providing diverse product seeds including vegetable and legumes. The government perceived the seed business as an industry in 1994. After affirmation of seed business as an industry, there was a consistent increment in the quantity of seed organizations. In one decade, no less than five multinational and more than 400 national seed organizations were enlisted. They were granted permission to produce and market seed. These companies were allowed to import and export seed.

Multinational seed companies operating in Pakistan included Bayer Crop Science Pakistan (Pvt.) Ltd. ,ICI Pakistan (Pvt.) Ltd.(Agro Chemical &Seed),Monsanto Pakistan Agri. Tech.(Pvt.) Ltd. Pioneer Pakistan Seed (Pvt.) Ltd and SyngentaPak. Seeds Pvt. Ltd. These companies mostly imported and distributed seeds of sunflower, maize, canola, fodder and sorghum hybrids.

Monsanto Pakistan is headquartered in Lahore. It had extended set-up of 35 distribution and sale centers, selling several varieties of improved and traditional seeds. Monsanto acquired the Cargill hybrid seed business internationally in 1998. However, it later on acquired to grow and Dekalb Genetics businesses worldwide. It gives access to Pakistan to wide range of superior hybrids.⁶⁹It provides sunflower, corn, forage sorghum hybrid and marketed wheat, cotton and rice certified seed in Pakistan. Monsanto has large influence in research, production, processing quality assurance and development of a viable marketing infrastructure in

⁶⁹ Lahore University of Management Sciences, "A Notion the Seed Business in Pakistan"
<http://www.lahoreindustry.com/monsanto-pakistan-agritech-pvt-ltd-co4271> (Last accessed date January 23, 2017).

<http://www.monsanto.com/whoweare/pages/pakistan.aspx>, accessed (Last accessed date January 23, 2017).

TH: 1849/

Public and Private Seed Organizations in Pakistan Up to 2015 (Updated on 15-12-2015)

Type of Company	Punjab	Sindh	KPK	Gilgit	Balochistan	Total	Status
Public Sector Companies	1	1	1	---	1	4	Active
National Seed Companies	645	96	25	3	5	774	Active
Multinational Seed Companies ⁷⁰	4	1	---	---	---	5	Active
Total Active	650	98	26	3	6	783	Active
Total Cancelled	217	43	5	---	3	268	Cancelled
Grand Total	867	141	31	3	9	1051	

Data Source: Federal Seed Certification & Registration Department, Islamabad

⁷⁰ Bayer Crop Science Pakistan (Pvt.) Ltd. ,ICI Pakistan (Pvt.) Ltd.(Agro Chemical & Seed),Monsanto Pakistan Agri. Tech.(Pvt.) Ltd. Pioneer Pakistan Seed (Pvt.) Ltd and Syngenta Pak. Seeds Pvt. Ltd

Pakistan. Monsanto introduced herbicides⁷¹ for combating damaging weed, it has been claimed that it is very dangerous for environment and human health.⁷² World Health Organization (WHO) has issued warning that Monsanto developed weed killer Roundup –an active ingredient Glyphosate that is commonly used on Genetically Modified Organism (GMO) crops which causes cancer in human. Many countries have banned its usage or put limitation on its uses. Recently, Bermuda’s Environment Minister Cole Simons is not ready to lift the ban on weed killers containing glyphosate.

The Pakistani seed market pioneer⁷³ had the second multinational company. It started its business in the country back in 1989 with Pakistan’s based partners. The Pioneer provided a wide variety of agronomic services in the country. In Pakistan, the Pioneer’s main brands are maize, corn, pearl millet, sunflower, sorghum and fodder hybrid.⁷⁴ Moreover, there are

⁷¹ A herbicide is a pesticide used to execute undesirable plants. Specific herbicides slaughter certain objectives while leaving the coveted product generally unharmed. Some of these demonstrations by meddling with the development of the weed and are frequently in light of plant hormones. Herbicides used to clear waste ground are nonselective and murder all plant material with which they come into contact. For detail visit, <<https://www.sciencedaily.com/terms/herbicide.htm> (Last accessed date January 24, 2017).

⁷² Ibid 9,10

⁷³ Pioneer Hi-Bred DuPont business headquartered is arranged in Des Moines; Iowa. It is the world's driving designer and provider association. It is giving top notch seeds to ranchers in more than 90 nations. 'Pioneer gives agronomic support and administrations to help build rancher efficiency and benefit and endeavors to create manageable rural frameworks for individuals all over.'

Pioneer Pakistan Seed Limited is an auxiliary of Pioneer Hi-Bred International, USA. It started its capacity in 1989 in Pakistan. 'Pakistani specialist is additionally working with Pioneer Seed Limited as accomplices. Exclusive Pioneer mark include corn, pearl millet, sunflower, half and half rice. Other half and half seeds are sold in Pakistan through deals agronomists and merchants who connect Pioneer with Pakistani ranchers. Furthermore, Pioneer gives a wide assortment of agronomic administrations. Pioneer is a main half and half seed organization in Pakistan, fortifying its position in different products as well. Pioneer is all around presumed in the commercial center for its exploration based items being offered for various portions

For more detail ,< visit <https://www.pioneer.com/home/site/pakistan/about-pioneer> (Last accessed date January 14,2017)

⁷⁴ Lahore University Management sciences, “A notion on the seed business in Pakistan”, 10.

some other prominent companies are doing their business like ICI Pakistan(Pvt.)Ltd.(Agro Chemical &Seeds),Bayer Crop Science Pakistan(Pvt.) Ltd.

1.10.2: Informal Seed Sector's Production

“An informal seed sector is usually defined as the total of seed production activities of farmers, and small-scale farmers”.⁷⁵ Other forms of the casual division incorporated the "bazaar" or unregistered part. The informal seed production was the main source of seed supplier; it had great potential in Pakistan. Generally, seeds originate from agriculturists or different sources like little retailers and gents. The informal seed division provided roughly 99 percent vegetables, 90 percent of wheat, maize and rice, 23 percent of vegetable seed, and 45 percent of cotton.⁷⁶ According to a survey, 80 percent of seeds planted in developing countries were the farmer produced seeds. “Small-scale farming was estimated to contribute more than 50 per cent of the total food production in developing countries.”⁷⁷ Likewise, like other developing countries, Pakistan too has deep continuation of the informal sector of the seed provide for crops which is very important to food security, like wheat, rice and pulses.

The general view is that the informal seed systems are not able to meet the seed's requirement; they were backward and should be replaced by the improved practices like western agricultural example, especially those chosen during the 'Green Revolution'⁷⁸.The

⁷⁵ Technology and Agrarian Development Wageningen University, “The importance of Informal Seed Sector and Its Relation with the Legislative,” (Paper Presented at a Conference, GTZ-Eschborn, July 4-5, 2000).For details visit<<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.195.468&rep=rep1&type=pdf>>, last accessed date January 22, 2017).

⁷⁶ Lahore University Management sciences, “A notion on the seed business in Pakistan”, 12.

⁷⁷ Ibid 12

⁷⁸The term Green Revolution' was initially utilized as a part of 1968 by previous US Agency for International Development (USAID) chief 'William Gaud,' who noticed the spread of the new innovations. The Green Revolution expanded the oat grains creation in India, Pakistan, the Philippines, Mexico, and other creating nations in the 1970s. 'This framework mixture strains of wheat, rice, and corn (maize) and the selection of present day farming advancements, including water system and overwhelming measurements of synthetic compost. The Green Revolution was presented by research foundations in Mexico and the Philippines that were supported by the legislatures of those countries, global 'contributor associations', and the U.S. government. Comparable work is as yet being done by a system of establishments around the globe. For detail visit <http://www.encyclopedia.com/plants-and-animals/agriculture-and-horticulture/agriculture-general/green-revolution> (Last accessed date January 24, 2017).

current national regulatory seed system does not provide proper regulatory and legal framework to the informal seed sector. The informal seed producers in marginal areas had no such support and the national seed regulations were also based on international standards. These regulations were incompatible with farmer's realities and the international slanders often impose restrictions on free exchange and free marketing of alternative seed system. Pakistan should change the international perception, as well as local advocacy on sustainable development in informal seed sector. Moreover, the informal seed sector itself collapsed, that old age system would not be recovered easily. In these circumstances, the national and local varieties were easily lost and supersede by relief seeds.⁷⁹

⁷⁹ Lahore University of Management Sciences, "A notion on the seed business in Pakistan;"12

Conclusion

Pakistan has extraordinary potential for creating a wide range of nourishment products. The country has rich and immense common assets, covering natural and climatic zones. Seed is basic component in agriculture production. It needs special attention on part of the policymakers. Currently, the important framework for the seed sector exists in Pakistan at both the federal and provincial level. The Federal Seed Certification and Registration Department (FSC&RD), Provincial Seed Council (PSC) and Seed Organizations are controlling the seed's related activities. Despite the availability of many natural genetic resources and seed varieties, Pakistan is not creating enough amounts of seed for the cultivating group, aside from cotton. To sum-up, the country is relying mainly on imported seed and multinational seed companies; however, the government formulative policies and strategy can increase the seed production in Pakistan.

CHAPTER TWO

EVOLUTION OF LEGAL FRAMEWORK RELATED TO SEED SECTOR IN PAKISTAN

Introduction

Pakistan's seed sector has great importance in agriculture and seesaw economy. The country has formulated different laws and rules for regulating the seed sector in areas including permitting of seed makers, variety discharge methods, quality control, and access to open germplasm, Intellectual property rights (IPRs), Compulsory license, and import and export matters. This chapter gives a general overview of the evolution of laws on seed sector of Pakistan since Pakistan independence in 1947, until the enactment of the Plant Breeders' Rights Act 2016. The Seed Act, 1976 and rules created under the Act gave the structure to the operation of nation's seed division. It controls and regulates the quality of various varieties of crops and the concerned legal issues. The Bio-safety Rules and Guidelines are also another essential part of the seed sector legal framework. Bio-safety Rules and National Bio-safety Guidelines of 2005 are also main tools. These legal documents made compliance with the Pakistan Environment Protection Act, 1997. The rules legalize different aspects of the manufacture, trial, import, export, and sale of genetically modified organisms (GMOs). International organizations, conventions and treaties are dealing with the regulation of seed. They provide an international regulatory framework by controlling the interests of producers, breeders, and consumers. Pakistan is also the part of international community; it is signatory of World Trade Organization (WTO) and Trade-Related Aspects of Intellectual Property

Rights (TRIPS) when Pakistan passes law it has to follow the International regulatory framework. Under the said Agreement, Pakistan has also introduced The Plants Breeders' Rights Act, 2016. The new law is the result of pressure on the Government from the International community to present plant breeder's rights (PBR) to perceive business plant reproducers' commitment in the advancement of new varieties, which was strengthened by the rising private seed industry in Pakistan. The aims of the law is to encourage plant breeders, seed organizations, development of superior varieties of field, protection of foreign varieties and new technology, creating healthy competition for variety development etc. The existing legal system required more improvement, and it particularly does not fulfill the requirements of farmers and modern time needs.

2.1: Historical Background of Seed's Production in Pakistan

Since the foundation of Pakistan in 1947, seed sector creation in Pakistan has gone through four distinctive advancement stages. The initial stage began from 1947 to late 1950s in which small-scale research and growth focused major crops of Pakistan's two agricultural provinces, Punjab and Sindh.⁸⁰ "The second phase-late 1950s to the mid-1970s was characterized by development of an elaborate network of public-sector organizations designed to develop and deliver improved cultivars."⁸¹ In third stage, mid 1970s to 1990s was the duration of laws and establishment of institution. In fourth stage, from mid 1990s to date are an improvement of the private area and a steady move of a few seed supply capacities to seed organizations and different on-screen characters in formal and casual markets.⁸² Pakistan inherited only one institute i.e. the Punjab Agriculture College and Research Institute, Lyallpur⁸³ (Faisalabad) upon its independence in 1947. There was no appropriate arrangement of assortment endorsement and enrollment; these assortments were just given over by reproducers to the common farming office⁸⁴. The division had set up a Seed Wing in 1929 to create seed on government cultivates and to disperse the seed through its authorities. Seed affirmation was not a completely obscure idea .It couldn't formally actuate due to a wrong

⁸⁰ USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan," Working Paper No.019 (February 2014),2

⁸¹ Muhammad Ahsan Rana, David j.Spielman, and Fatima Zaidi ,Suleman Dawood School of Business, Lahore University of Management of Sciences,Lahore,International Food Policy Research Institute, Washington,DC,USA, "The Architecture of the Pakistan Seed System: A Case of Market-Regulation Dissonance," *International Conference of Agricultural Economists ,Milan Italy (2015)*
Visit available at :
http://ageconsearch.umn.edu/bitstream/211560/2/Rana_et_al,_Sced_systems_in_Pakistan,_ICAE_15%5B1%5D.pdf (Last accessed date February 8,2017)

⁸² USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan," Working Paper No.019 (February 2014),2

⁸³ Lyallpur (now this city called Faisalabad) city is located in Central Punjab. The College was built up in 1909.

⁸⁴ The College was built up in 1909.

"The Architecture of the Pakistan Seed System: A Case of Market-Regulation Dissonance,"6. The Food and Agriculture Organization of the United Nations is working for United Nations that leads international efforts to on those varieties that it later registered.

lawful and institutional foundation. By and large, these open area stations and sectors assumed a little part in seed sector, and producers stayed subordinate for the most part all alone seed creation.⁸⁵

In 1961, the administration reacted through two noteworthy activities. The first was the bifurcation of the Lyallpur College and Institute into an Agricultural University at Lyallpur and the Aube Agricultural Research Institute (AARI). Second was the establishment of the West Pakistan Agricultural Development Corporation (WPADC)⁸⁶. These associations developed rapidly and acquired the status of committed institutional center points for horticultural research and educating, cultivar advancement, and seed creation, separately.⁸⁷ After 1972, the capacity of seed obtainment and dispersion turned into the obligation of provinces. In 1973, Food Agriculture Organization (FAO)⁸⁸ figured a Seed Industry Project with investment of private division. In 1976, the World Bank assented to the desire of Provincial Government to establish Seed Industry Project in public sector. Moreover, in 1976, Seed Act was the most leading aspect of this project.⁸⁹ This was the beginning of the fourth stage; the first seed corporation was properly registered in 1981. In the 1990s the pace got. The seed business was formally arranged as an industry and was conceded benefits related with that assignment in 1994. In 2000, around 291 private seed companies had registered with FSC&RD. In that order, Sindh established its seed company in 1969. KPK and

⁸⁵ USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan," 2.

⁸⁶ Four provinces and tribal areas were merged in 1954 into single unit that called West Pakistan. The one unit was dissolved in 1970.

⁸⁷ "The Architecture of the Pakistan Seed System: A Case of Market-Regulation Dissonance," 6.

⁸⁸ The Food and Agriculture Organization (FAO) is an office of the United Nations that leads global endeavors to annihilation neediness and yearning. It is serving both created and creating nations, it goes about as a nonpartisan discussion where all countries meet as equivalents to arrange assent ions and open deliberation strategy. For more detail visit, > <http://www.fao.org/home/en/> (Last accessed date February 13, 2017)

⁸⁹ Seed Association of Pakistan, for more detail visit, > <http://sap.com.pk/about-us/> (Last accessed February 12, 2017)

Balochistan had their first seed companies in 1996, and 1998. Some multinational companies also recognized their affiliation with country for the period of the 1980s and 1990s: Monsanto⁹⁰ (1984), Pioneer⁹¹ Seeds (1989), Syngenta⁹² (1991), and ICI Pakistan (1998). In 2012, 963 companies had registered with FSC&RD.⁹³ According to Federal Seed Certification and Registration Department's sources, 1051 public and private seed's organizations had registered, in which 783 are working up to January 2016 with FSC&RD.⁹⁴

⁹⁰ Monsanto Company is a traded on an open market American multinational agrarian biotechnology and agrochemical enterprise. It is headquartered in Creve Coeur, Greater St. Louis, Missouri. It is a main maker of hereditarily designed Genetic Engineering (GE) seed and Roundup, a glyph satisfy based herbicide.

⁹¹ Pioneer Pakistan Seed Limited is a backup of Pioneer Hi-Bred International; Company started operations in Pakistan in 1989 and is a joint hazard with Pakistan based accomplices.

For more detail ,< visit <https://www.pioneer.com/home/site/pakistan/about-pioneer> (Last accessed date February 14,2017)

⁹² Syngenta Pakistan is an auxiliary of Syngenta Participations AG, Basel, Switzerland consolidated in year 2000.

For more detail visit,><https://www.syngenta.com.pk/about-us>(Last accessed date February 15, 2017).

⁹³ USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan,"4.

⁹⁴ Sources collected from Federal Seed Certification and Registration Department, Islamabad.

2.2: Existing legal arrangements on Seeds in Pakistan

2.2.1: The West Pakistan Seeds and Fruit Plants Ordinance, 1965

The West Pakistan Seeds and Fruit Plants Ordinance was promulgated in 1965, it was the first seed law. It was an exceptionally essential law that accommodated the enrollment of cultivators for creation of confirmed seeds and foundation of nurseries. "Registered growers could voluntarily apply for certification. Certified seed was to be sold to the government while only leftover certified seed could be sold in the open market"⁹⁵. The law did not disallow creation of unofficial seed (except the seed of organic product plants), which implied that seed producers could create seed for the market, yet needed to enroll with the administration and to keep up models on the off chance that they wished to have their seeds certified.⁹⁶

2.2.3: The Seed Act, 1976:

The Seed Act, 1976 and rules created under the Act give the structure to the function of Pakistan's seed sector. The Bio-security Rules and Guidelines are additionally some other critical piece of the seed lawful system.

The Seed Act's goal is controlling and managing the nature of seeds of different varieties of harvests and for matters associated therewith, it applies to the entire of Pakistan⁹⁷. "The Provincial Assemblies of the Punjab, Sind, the North-West Frontier Province and Baluchistan have passed resolutions under Article 144 of the Constitution of the Islamic Republic of Pakistan to the effect that Parliament may by law regulate and control the quality of seeds of various varieties of crops."⁹⁸ The most salient feature of this act is that, it gives the systems to

⁹⁵ USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan,"3.

⁹⁶ Ibid,3.

⁹⁷ The main Objective of Seed Act 1976.

⁹⁸ Ibid

varieties enlistment and seed affirmation. The Act has made foundation for its usage, which incorporated the accompanying organizations:

- The National Seed Council;
- Provincial Seed Councils;
- FSC&RD

Section 4⁹⁹ of the Seed Act defines the functions of the National Seed Council:

I) The National Seed Council prompt on strategy for the improvement, operation and direction of the Provincial seed enterprises;

II) It has expert to keep up a watch on the operation of the arrangements of Seed Act;

III) It can direct initiation of Provincial Seed Projects and to guide in administering the seed quality control services;

IV) It has authority to regulate inter-Provincial seed movement, and approve and sanction on seed standards;

V) The Council has right to educate on imports with respect to seeds, and arrange increase and supply of seeds of endorsed varieties;

VI) It has expert to help with creating affirmed seed generation cultivates and to organize the courses of action for the support of genetic potential.¹⁰⁰

2.3: Federal Seed Certification and Registration Department

The FSC&RD is Pakistan's primary establishment for controlling seed arrangement. It is driven by a Director General, who is helped by experts in the Islamabad office and local

⁹⁹ Section 4 the Seed Act 1976.

¹⁰⁰ Section 4 of the Seed Act, 1976.

directorates for Punjab, KPK, and Sindh. Seed accreditation work in Baluchistan territory is taken care of by the Sindh Directorate, which FSC&RD deal with a system of 28 research centers.

Section 6¹⁰¹ of the Seed Act has identified the Functions of FSC&RD has authority to perform the following functions:

- I) the establishment has right to control the quality and confirmation of seeds;
- II) It controls the field review of the yields of enrolled assortments and discharged assortments planned available to be purchased as essential seed or confirmed seed;
- III) It handles sampling and testing of seed;
- IV) It issues certificates in respect of seed;
- V) It keeps up inspecting and dissecting seed parts conveyed to the handling plants to set up a reason for the buy of such parcels;
- VI) It arranges training courses for Seed Certification Officers;
- VII) The organization has given specialized and authority counsel and help to the National Seed Council in the execution of its capacities;

Moreover, clause (k)¹⁰² Section 6 of the Seed Amendment Act 2015 has increased the powers of the FSC&RD. Now, it can carry out pre registration checking of varieties of both public and private sectors presented for the following aims:

- (a) To determining agronomic value regarding regional suitability for registration as a plant variety or hybrid evaluated by variety evaluation committee;

¹⁰¹ Section 6 of Seed Act, 1976

¹⁰² The clause was inserted by the Seed (Amendment) Act, 2015; and published in the Gazette of Pakistan (Extraordinary), Part I, dated 29.7.2015, pages 545-556, s.5.

(b) To providing definitive botanical description of plant varieties and providing information on genetic suitability and adaptability of varieties;

(c) To register seed varieties

(k) and issue a list of registered plant varieties.¹⁰³

The Seed Act does not characterize the private breeders' capacities, nor does it show the elements of provincial seed councils. Thus, Federal government assigns role in meeting with the provincial government. The Seed Act of 1976, which provided the basis for legal and institutional framework of the seed sector. Act overlooked large areas of the seed provisions system. Firstly, the law did not assign the role of private seed organizations, and did not it provide for their regulation and registration. It only discussed seed multiplication on the matter of private sector participation. It did not consider the storage, production, or sale of unauthorized varieties. There were no provisions to ban the production or sale of a seed variety on any grounds.¹⁰⁴The act did not fulfill the requirement of the modern seed sector and variety registration with FSC&RD did not confer associated intellectual property rights to the breeder.¹⁰⁵

Several drafts have been presented by different stakeholders for the duration of the past 2 decades to amend the Seed Act,1976.Finally,the Act was amended ,now , “this act may be called the Seed (Amendment)Act,2015”¹⁰⁶.The Seed (Amendment) Act’s draft was offered by FSC&RD to the Ministry of Food and Agriculture. Its prominent characteristics are:

¹⁰³ Ibid

¹⁰⁴ Muhammad Afzal (The writer is executive director Crop Life Pakistan),Published April 27,2015 06:42am

<http://www.dawn.com/news/1178360> Last accessed date February 22,2017

¹⁰⁵ Ibid.

¹⁰⁶ The Seed (Amendment) Act, 2015; and published in the Gazette of Pakistan (Extraordinary), Part 1, dated 29.7.2015, pages 545-556, S.1.

- 1) The Seed (Amendment) Act, 2015 is designed to improve the existing law on seeds so as to enable it to meet the requirements of the modern seed sector and with the Pakistan's obligations under the World Trade Organization (WTO)¹⁰⁷ regime.
- 2) The Act creates a larger space for the 'private sector'¹⁰⁸ in the seed sector and introduces latest developments in the country's agriculture.
- 3) The new law provides that seed dealers and companies would allow carrying out commercial activity of seeds which would be registered with the concerned authorities.¹⁰⁹
- 4) It includes and adjusts the Act's definitions. Essential Seed, which as yet is characterized as "seed produced by an organization setup by a Provincial Government (Section 2(b) of the Seed Act,1976)"¹¹⁰ is defined again like "progeny of the pre-basic seed produced by any public sector or private sector organization and certified by the Federal Seed Certification and Registration Department."¹¹¹
- 5) According to Section 22D of The Seed (Amendment) Act, 2015, anybody needs to do seed business, to set up a seed preparing plant, or to fill in as a seed merchant to enroll with FSC&RD.

¹⁰⁷ The World Trade Organization (WTO) is the main worldwide global association managing the guidelines of exchange between countries. At its heart are the WTO assentions, arranged and marked by most of the world's exchanging nations and approved in their parliaments. The essential reason for existing is to help makers of merchandise and ventures, exporters, and shippers lead their business in the world

For more detail visit,> <https://www.wto.org/> Last accessed date 23, 2017.

¹⁰⁸ The dynamic cooperation of the formal private division began in 1991 when many seed organizations were set up creating diverse products seeds containing vegetables and vegetables. At present 242 national and four multinational seed organizations have been enrolled and conceded consent to deliver and showcase seed. There is no confinement on the private part to offer seed of any harvest which offers ideal business openings. They are additionally permitted to import and fare seed.

¹⁰⁹ Muhammad Afzal (The writer is executive director Crop Life Pakistan),Published April 27,2015 06:42am

<http://www.dawn.com/news/1178360> Last accessed date February 22,2017

¹¹⁰ Section 2(b) The Seed Act, 1976 of Pakistan.

¹¹¹ Section2 (iii) The Seed (Amendment) Act, 2015.

- 6) The Act disallows a few exercises including: (i) doing seed business without enlistment; (ii) offering, bringing in, stocking, dealing, or generally providing seed of an unregistered varieties; and (iii) offering, and selling etc., mislabeled seed. Any encroachment might be rebuffed by detainment for a period stretching out up to three months, or by a fine, or by both.¹¹²
- 7) The Act puts the seed business both open and private under FSC&RD's administrative control. Not exclusively will a seed organization require administrative endorsement to begin its operations, it will likewise need to report routinely on its exercises to remain in the business.¹¹³

2.4: Rules developed under the Seed Act, 1976

Three arrangements have been confined to actualize the Seed Act: (i) Seeds (Truth-in-Labeling) Rules, 1991; (ii) Seed (Registration) Rules, 1987; and (iii) Pakistan Fruit Plants Certification Rules, 1998. Each is briefly discussed below.

2.4.1: The Seed (Registration) Rules of 1987

The Seed (Registration) Rules of 1987 build up a Federal Seed Registration Committee to be led by the Secretary of the Ministry of Agriculture and included different irregular state authorities from open division investigate associations. The Rules require the Committee to survey competitor assortments for consistence with assortment enlistment models. These principles are subordinate enactment. They expand and disclose as opposed to add to or restrict the parent 1976 Seed Act. Manage 7 portray another assortment to be both (a) better than existing assortments in no less than one critical perspective, and (b) at any rate

¹¹² Section 22C and 22D, The Seed (Amendment) Act, 2015.

¹¹³ USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan," Working Paper No.019 (February 2014), 23

reasonable in other real attributes. Rule 9¹¹⁴ express the impacts of non-enlistment of an assortment, and precludes any seed of an unregistered assortment incorporated into a Schedule¹¹⁵ to the Rules 9 from being delivered or ensured in Pakistan, unless the varieties is legitimately enlisted with FSC&RD. This is unordinary on the grounds that such principles are intended to be subordinate enactment did by the legislature without plan of action to the Parliament or a provincial assembly. They are intended to expound and clarify, instead of add to or repudiate the parent enactment. In any case, by restricting generation of seed of unregistered variety, Rule 9 is successfully an unlegislated expansion to the Seed Act which is quiet on the creation of seed of unregistered varieties. The Act shows that if a reproducer needs to enroll his variety with FSC&RD, he may apply in the given frame and the variety will be enlisted on the off chance that it meets the criteria. Once the assortment has been exhorted, he may search for affirmation. Look at with the Seed (Registration) Rules, 1987; the Seed Act demonstrates that if a breeder does not enlist his variety or his application comes up short, seed of such variety cannot be delivered.¹¹⁶In 2003 the Federal Government had passed some of the amendments in the Seed (Registration) Rules, 1987.¹¹⁷

2.4.2: The Seeds (Truth-in-Labeling) Rules of 1991

The Seeds (Truth-in-Labeling) Rules of 1991 address with labeling seed packets and containers.

¹¹⁴ “9. Effect of non-registration—No variety of the crop specified in Schedule 1 shall be eligible for seed production and certification in any Province of Pakistan or part thereof unless the said variety has been registered and the necessary certificate to that effect has been obtained from the National Registration Agency.”

¹¹⁵ The schedule is an extensive list and includes all major and minor crops.

¹¹⁶ USAID-Pakistan Strategy Support Program, “The Seed Industry in Pakistan,” Working Paper No.019 (February 2014),6

¹¹⁷ Amendments, 2003 in Seed (Registration) Rules, 1987,

Seed has to conform the standards. (1) Only the pure seed as specified in schedule-I¹¹⁸ shall be offered for sale in Pakistan or for export.(2) All seed offered for sale in Pakistan or export shall carry a label on each container for the purpose of reflecting the quality of seed not below the standards as given in Schedule-II¹¹⁹. Provided that the standards may be relaxed by the Federal Government under abnormal seed supply situations for a particular period of time.¹²⁰

These guidelines require all seed offered available to be purchased in Pakistan or for fare to convey a name to be joined conspicuously on the bundle or holder indicating fundamental data about the seed for instance, the names of the variety and maker and its immaculateness rate, germination rate, creation month, lapse date, and parcel weight. Comparative data is additionally required for imported seed. For fulfillment of the need of time, the Seed (Truth-in-Labeling) Rules, 1991 amended in 1993 and 1998.

2.4.3: The Pakistan Fruit Plants Certification Rules of 1998

The Pakistan Fruit Plants Certification Rules of 1998 particularly manages the systems for enlisting plant 'nurseries'¹²¹, ensuring organic product plants, and labeling guaranteed rootstock. "Pre-basic class (Foundation Block)¹²².-A planting of fruit trees to be established at research institutes or universities and trees of such planting shall be certified and serve as a

¹¹⁸ The schedule I is about the Pure Seed's slandered.

¹¹⁹ The schedule II is an extensive list and includes minimum Seed Standards for truth in Labeling

¹²⁰ Rule 3, Seed (Truth-in-Labeling) Rules, 1991

¹²¹ Rule 1, Sub-rule (h) Pakistan Fruit Plants Certification Rules, 1988, defines "nursery" implies any grounds or premises on which nursery plants are proliferated, developed or acquired for resale and held available to be purchased consistently.

¹²² Rule 2 Sub rule(d) of Seed (Truth-in-Labeling) Rules, 1991 "establishment piece" implies planting of organic product trees to be built up at research organizations or colleges and confirmed to fill in as an essential wellspring of proliferating materials

primary source of propagating materials.”¹²³ Rule 5 gives that a planting started from a pre-essential source should incorporate scion,¹²⁴ ‘rootstock’¹²⁵ blocks and seed beds, etc. They might build up enlisted nurseries or at suitable places so declared by the FSC&RD.¹²⁶ “Certified cases (Nursery Plants).- A nursery grown seedlings, colonel root-stocks, and nursery grown trees propagated by using scion from registered trees and rootstock originating from registered trees.”¹²⁷

2.4.4: Bio-safety Rules and Guidelines 2005

The Pakistan ‘Bio-safety’¹²⁸ Rules and National Bio-safety Guidelines of 2005 are very essential mechanism of the seed division legal structure. Rules Framed under the Pakistan Environment Protection Act, 1997. These set of laws control a range of aspects of the import, export, manufacture, trial, and sale of genetically modified organisms (GMOs)¹²⁹. They restrict the fare import, deal, buy, or exchange of GMOs and their items without acquiring a permit from the central government. They additionally accommodate the foundation of three boards a National Bio-safety Committee (NBC)¹³⁰ and a Technical Advisory Committee

¹²³ Rule 4, Pakistan Fruit Plants Certification Rules, 1988.

¹²⁴ A disengaged living bit of a plant (as a bud or shoot) joined to a stock in uniting and as a rule providing exclusively flying parts to a join ,> <https://www.merriam-webster.com/dictionary/scion> Last accessed date 24, 2017.

¹²⁵ A rhizomatous underground part of a plant.

¹²⁶ Rule 5 of Seed (Truth-in-Labeling) Rules, 1991.

¹²⁷ Rule 6 of Seed (Truth-in-Labeling) Rules, 1991.

¹²⁸ Rule 3 sub rule(c) of Pakistan Bio-safety Rules, 2005, “Bio-safety means the mechanism developed through policy and procedures to ensure the environmentally safe application of biotechnology”.

¹²⁹ A "Genetically Modified Organism changed life form (GMO)" is a life form or microorganism whose hereditary material has been modified to contain a "portion of DNA" from another living being. Present day recombinant DNA innovation empowers the sewing together of bits of DNA, paying little heed to the wellspring of the pieces. This innovation has been utilized generally in the lab by analysts for incalculable purposes, since the 1980s: to decide quality capacity, to make duplicates of qualities or proteins, to study quality expression designs, and to make " models for human illness".One application has been to create sustenance trims that are altered in a way that is worthwhile to either the maker or the purchaser. Right now the GM trims available have bacterial qualities brought into their genomes that encode for vermin or herbicide resistance. In principle, this ought to eliminate the measure of chemicals an agriculturist needs to shower, yet by and by that objective has not been acknowledged as vermin and weeds wind up noticeably impervious to the chemicals being utilized.

For more detail visit,> <http://knowgenetics.org/introduction-to-genetically-modified-organisms-gmos/> Last accessed date 25, 2017.

¹³⁰ National Bio-safety Committee (NBC) means the committee constituted under rule 4 of Pakistan Bio-safety Rules, 2005.

(TAC)¹³¹ at the federal level as part of the Ministry of Environment, and an Institutional Bio-safety Committee (IBC)¹³² at all public or private institute's responsibility handling of living organisms at the molecular level.

Its recommendations are submitted to the NBC, which is the top social event for bio-security heading ¹³³ at all public or private institutes undertaking manipulation of living organisms at the molecular level. In Pakistan, main research primary companies and institutes have reputable Institutional Bio-safety Committees (IBC) to oversee bio-safety aspects of their research and development programs. These IBCs comprises of the chief, a subject expert a social analyst, and a representative of general society. These advisory groups are the main purpose of bio-safety rule and do a scope of capacities. Their examination reports are sent to the Technical Advisory Committee (TAC) nearby their recommendations. The TAC is driven by the Director General of the Environmental Protection Authority and contains twelve specialists and two people from individuals when all is said in done. Its ability is to survey IBC applications and IBC evaluation reports, screen field activities, and accumulate data that may be required for bio-security purposes.

In Pakistan, some important research leading companies and institutes have recognized Institutional Bio-safety Committees (IBC) to oversee bio-safety aspects of their research and development projects. These IBCs consists of the head, a subject matter specialist a social scientist, and a representative of the community. These committees are the first point of bio-safety parameter and carry out a range of functions. Their assessment

¹³¹ Technical Advisory Committee (TAC) means the committee constituted under rule 6 of Pakistan Bio-safety Rules, 2005.

¹³² Institutional Bio-safety Committee (IBC) means the committee constituted under rule 8 of Pakistan Bio-safety Rules, 2005.

¹³³ USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan," Working Paper No.019 (February 2014),6

reports are forwarded to the Technical Advisory Committee (TAC) after including their recommendations. The TAC is regulated by the Director General of the Environmental Protection Authority and comprises twelve officials and two members of the public. Its function is to evaluate IBC applications and IBC assessment reports, monitor field activities, and collect data that may be required for bio-safety purposes. Its recommendations are submitted to the NBC, which is the top forum for bio-safety regulation.¹³⁴ In spite of the fact, it has permitted constrained trials for a scope of genetically modified (GM) crops, including dry season tolerant wheat¹³⁵ and 'herbicide-tolerant'¹³⁶ and bug safe maize.¹³⁷

2.5: The Plant Breeders' Rights Act, 2016

Pakistan has been a member of World Trade Organization (WTO) since its establishment in January 1995. Pakistan being a member of WTO is liable to comply with the trade-related aspects of intellectual property rights (TRIPS)¹³⁸ Agreement. "Plant Breeders Rights are specific types of intellectual Property Rights granted to the breeders of new varieties of plants."¹³⁹ Government of Pakistan has passed a few laws in the field of Intellectual Property like copyrights, licenses, trademarks; Industrial Designs etc. Under the said Agreement

¹³⁴ . Bt cotton is a hereditarily altered variety of the plant that includes qualities for a bug spray. 'The cotton plants incorporate *Bacillus thuringiensis* (Bt), spore-forming microorganisms that produces cry proteins. At the point when bugs eat these cotton plants, the cry proteins attach to cells inside the creepy crawly, irritating the stream of potassium through the bug, in the long run murdering it. Bt cotton is delivered by Monsanto and developed in Asia'

¹³⁵ Arash Nezhadhamadi, Zakaria Hossain Prodhan, and Golam Faruq, *ScientificWorldJournal*. 2013: 610721. Published online 2013 Nov 11. doi: [10.1155/2013/610721](https://doi.org/10.1155/2013/610721)

¹³⁶ 'Herbicide tolerant harvests' are intended to endure particular expansive range herbicides,' which slaughter the encompassing weeds, yet leave the developed yield in place. Hereditary building (GE) alludes to strategies used to control the hereditary piece of a creature by including particular qualities. The upgrade of coveted characteristics has generally been attempted through traditional plant rearing. GE products are regularly separated into two classes, herbicide tolerant and Plant-joined secure ants (PIPs). Crops are likewise designed or stacked to express different qualities like yields that are impervious to various herbicides or are impervious to herbicides and fuses bug sprays.> For more detail visit <http://www.beyondpesticides.org/programs/genetic-engineering/herbicide-tolerance>, Last accessed date 26, 2017,

¹³⁷ USAID-Pakistan Strategy Support Program, "The Seed Industry in Pakistan," Working Paper No.019 (February 2014), 6

¹³⁸ The TRIPS Agreement, 'which became effective on 1 January 1995, is to date the most extensive multilateral concession to licensed innovation. For more detail visit,> https://www.wto.org/english/tratop_e/trips_e/intel2_e.htm Last accessed date February 27, 2017.

¹³⁹ Statement of Objective and Reasons, The Plant Breeders' Rights Act, 2016, Pakistan.

Pakistan has additionally presented The Plants Breeders' Rights Act, 2016. The law is "aimed at establishing a viable seed industry in Pakistan, essential for food security and availability of high-quality seeds and planting material to the farmers"¹⁴⁰. It additionally secures protected innovation privileges of seed organizations that present new assortments. It is the result of weight on the Government from the world framework to present Plant Breeders' Rights (PBR) to perceive business plant reproducers' commitment in the advancement of new Varieties, which was fortified by the rising private seed industry in Pakistan. The private seed industry in Pakistan contended for the acquaintance of PBR with cover the horticultural part from that point onward. Its entrance on a noteworthy scale was encouraged after the revision of the Seed Act in 1976, which gave more prominent space to the private segment to work in the seed sector. The fundamental contention of the seed organizations was that motivators for supply of enhanced varieties of seeds must be given by proper PBRs.

Conversely, agriculturists were recipients of the rearing action embraced by openly financed foundations, which from the mid 1960s had given the enhanced assortments of seeds that made the Green Revolution in Pakistan a reality. These openly subsidized foundations did not rely on upon IPRs; their exercises were controlled by government strategy making. The adjust in any case, moved for developing IPRs in agriculture after Pakistan accepted enrollment of the WTO.

2.5.1: Overview of the Plant Breeders' Rights Act

2.5.1.1: Objectives

The Plant Breeders' Rights Act seeks to achieve the following objectives;

¹⁴⁰ <https://tribune.com.pk/story/1023147/senate-body-approves-plant-breeders-rights-act/> Last accessed date February 28, 2017.

The Plant Breeders' Rights Act energizes plant raisers and seed associations of both open and private area to put resources into research and plant reproducing; it serves to improvement of prevalent assortments of field, vegetable and elaborate yields; Act encourages in access to secured remote assortments and new innovations; It makes rivalry for assortment advancement among public and private area associations;

It controls threat of falsifying in the Seed part for improvement of agriculturist group and sustenance security in the nation; Act produces incomes for Research organizations and budgetary motivating forces for plant breeders.¹⁴¹

2.5.1.2: Registry of the Plant Breeders' Rights and its Functions

The plant breeders are bound to register the new variety under the Ministry of National Food Security and Research. "The head quarter of the Registry shall be at Islamabad and for the purpose facilitating the applicant"¹⁴². With the approval of Federal Government, the Ministry of National Food Security and Research will set up offices of the registry at such place where there is requirement. The basic function of registry is to facilitate protection of new plant varieties according to the defined conditions and issue certificate according to the Plants Breeders' Rights Act. It helps to manage characterization and documentation of varieties.¹⁴³

2.5.1.3: The Plants' Variety Protection Advisory Committee

Section 10 specifically deals with the Plants' Variety Protection Advisory Committee. In scientific and technical matters, the committee is responsible to advise the concerned Ministry or the Registrar. Advisory Committee can take help from any other person who is an expert in a particular field "when a question related to that field of technology is under

¹⁴¹ Statement of Objective and Reasons, the Plant Breeders' Rights Act, 2016, Pakistan.

¹⁴² See Section 3(2) of the Plant Breeders' Rights Act 2016, Pakistan.

¹⁴³ See Section 3,4 of the Plant Breeders' Rights Act 2016, Pakistan.

consideration.¹⁴⁴”With the permission of Ministry of National Food Security and Research, Committee has right to make rules and regulations for regulating its business.

2.5.1.4: Benefit Sharing

Section 32 of the Act provides the rights of benefits sharing. The registrar publishes variety protection official document “and invite claims of benefit sharing to the variety protected under such certificate in the manner as may be prescribed.”¹⁴⁵After request of claim “any person or group of persons or firm or governmental or non-governmental organization submit its claim of benefit sharing to such variety in the prescribed form within such period, and accompanied with such fees, as may be prescribed”¹⁴⁶.

“Any person or group of persons have right to submit their benefit sharing claim, if such person or every person constituting such group is a citizen of Pakistan; or firm or governmental or non-governmental organization, if such firm or organization is formed or established in or outside Pakistan.”¹⁴⁷The act decide the sum of benefit distribution to a variety under the define manner reference made to the registrar.¹⁴⁸

2.5.1.5: Compulsory Licensing

“Compulsory license¹⁴⁹ is a license issued by a state authority to a government agency a company or other party to use a patent without the patent holder’s consent” (Paris Convention, 1883). In other words, “Compulsory licensing is when a government allows

¹⁴⁴ See Section 10(5) of the Plant Breeders’ Rights Act 2016, Pakistan.

¹⁴⁵ See Section 32 of the Plant Breeders’ Rights Act 2016.

¹⁴⁶ Ibid.

¹⁴⁷ Ibid.

¹⁴⁸ Ibid.

¹⁴⁹The introduction of the idea of ‘mandatory licenses’ is connected to the commitment, presented by the United Kingdom (UK) Statute of Monopolies in 1623. Necessary permitting has been accounted for to be mainstream in Brittan as ahead of schedule as 1850s.Later it was perceived by the worldwide group through Paris Convention of 1883.

someone else to produce the patented product or process without the consent of the patent owner”¹⁵⁰. It is one of the adaptabilities on patent security incorporated into the WTO's agreement to licensed innovation and the TRIPS (Trade-Related Aspects of Intellectual Property Rights) Agreement. An imperative element of the Plant Breeders' Act is the need joined to the general population enthusiasm over the Interest of the business reproducers (Chapter VII). The enactment approves the conceding of mandatory licenses to guarantee accessibility of seed plant or regenerative material of the secured assortment in sensible amount at sensible cost under the accompanying conditions:

- a) Three years have slipped by since the date of issue of an authentication of enrollment,¹⁵¹
- b) Sensible necessities of the general population for seeds or other proliferating material of the varieties have not been fulfilled, and
- c) The seed or other spreading material of the variety is not accessible to the general population at a sensible cost.

In the event that the above conditions exist, the concerned Authority can mediate. Subsequent to giving a chance to the reproducer of such an assortment to record a resistance and, in the wake of hearing the gatherings, the Authority may, on grounds (b) and (c), arrange the breeder to permit anybody keen on undertaking creation, conveyance and offer of the seed or other engendering material of the varieties. The Authority will decide the period for which mandatory licenses are conceded for each situation, mulling over the 'incubation periods'¹⁵² and other significant components and will likewise give due thought to the interests of the plant reproducer. The terms and states of a necessary permit ought to guarantee:

¹⁵⁰ https://www.wto.org/english/tratop_e/trips_e/public_health_faq_e.htm Accessed date March 3, 2017.

¹⁵¹ Section 33(e) of the Plant Breeders' Rights Act 2016,

¹⁵² Each living thing has a development period. 'For instance, we realize that it takes nine months from origination until another conceived infant is conceived. There is a development period for plants from seedling to delivering vegetables or natural products.

I) reasonable pay to the reproducer of the assortment under the obligatory permit observing the way of the assortment, the consumption caused by the raiser in creating it and other significant components, and

II) That the obligatory licensee can give agriculturists the seeds or other propagating material of the assortment in an opportune way and at a sensible market cost.

Act endeavors to accept the commitments made by the diverse partners in plant reproducing. Apparently this framework is reliable with the TRIPS Agreement because first, the TRIPS Agreement does not characterize a compelling sui-generis framework ¹⁵³ for PVP, and also, there are no impediments on individuals giving security to agriculturists and additionally ensuring plant assortments. Section 35 gives specialist of the disavowal of mandatory permit to the Registrar, all alone movement or the on the use of abused gathering. Enlistment center repudiates permit under the condition "that the licensee has violated any of the terms or

¹⁵³ The term 'sui generis framework' or, to take the correct wording of Article 27.3(b) of the TRIPS Agreement, 'a successful sui generis arrangement of insurance for plant assortments. The expression has no uniform significance. When all is said in done, it alludes to an exceptional type of assurance, a frame that is especially adjusted to a particular subject or to particular conditions, that is particularly custom fitted to particular needs, needs and reality.

After the utilization of this expression in the TRIPS Agreement, one ought to attempt to comprehend it against the recorded foundation and with regards to this Agreement. Improbable, the expression is not characterized in it nor was it the subject of a particular, wide-achieving dialog amid the TRIPS transactions. In all actuality, " it appears that there is no drafting history that could help us clarify the correct significance of the expression the 'compelling sui generis framework' alluded to in Article 27.3(b) of the TRIPS Agreement is unmistakably expected to be a contrasting option to the patent framework. In this association, it is valuable to review that the UPOV framework was likewise settled, in 1961, as an extraordinary type of security, in lieu of the patent framework, covering just plant assortments and particularly adjusted to plant assortments. In this way, the UPOV framework was at that point considered in 1961 as a sui generis type of security, other option to the patent framework. Nonetheless, as specified in Module IV.2, the TRIPS Agreement utilizes the idea of sui generis plant assortment insurance by and large, without restricting it to the UPOV Convention, leaving open the likelihood of other sui generis frameworks with various arrangements. <http://www.fao.org/docrep/003/x7355e/x7355e07.htm> sit Accessed date March 2, 2017.

conditions of the license or it is not appropriate to continue such license further in the public interest”¹⁵⁴.

¹⁵⁴ Section 35 of the Plant Breeders’ Rights Act 2016, Pakistan.

Conclusion

The general analysis of the existing laws on seeds in Pakistan provides the opportunity to understand the legal measurements which are not satisfactory. The Seed Act, 1976 and set of laws formulated under the Act provided the basic legal structure for the operation of country's seed sector. Although the Seed Act has been amended with the title of 'the seed (amendment) Act 2015' however, its new included provisions are facing controversies among International laws on seeds, Federal government, Provincial governments and farmer communities. Same situation exist with the Plant Breeder Rights Act 2016, it is the truth that Pakistan is the part of international community and it has to pass the laws on seed compliance with International legal standards. Simultaneously, it is also necessary that these laws should compliance and meet the needs of nation specifically the farmer's community in the country.

CHAPTER THREE

COMPARATIVE ANALYSIS OF PLANT BREEDERS' LEGISLATION IN INDIA AND PAKISTAN

Introduction

The Indian Government passed the Protection of Plant Varieties and Farmers' Rights Act in 2001 and Pakistan passed the Plant Breeders' Rights Act 2016. After India and Pakistan moved toward becoming signatory to the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPS), an enactment was mandatory to be figured out.

Article 27.3(b) of this agreement states that the member nations shall provide protection of plant varieties either by a patent or by a compelling sui generis framework or by using the both methods at the same time.¹⁵⁵ Both of the states have ratified different treaties which lead to the legal arrangement for plant variety protection. Although, both the countries have passed relevant laws for the protection of plant varieties, breeders and farmers rights, however, some of the issues even still remained unsettled. The reasons for this includes as the TRIPS Agreement provides the introduction of plant variety protection. The Biodiversity Convention and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) are also of major importance due to their membership.¹⁵⁶ Both of the countries have passed their laws complying with these treaties except UPOV. This chapter generally examines the International legal framework on plants varieties protection in India and Pakistan perspectives. Afterwards, comparatively analyses of PPVFR Act with Plant

¹⁵⁵ Pratiba Brahma, Sanjeev Saxena, B.S.Dhillon, "The Protection of Plant Varieties and Farmers Rights Act of India" Current Science, vol. 86(2004),3 Last accessed date, March 15,2017,doi: https://www.researchgate.net/publication/228968363_The_Protection_of_Plant_Varieties_and_Farmers%27_Rights_Act_of_India

¹⁵⁶ Dr Philippe Cullet, Radhika Koluru, "Plant Variety Protection and Farmers' Rights" *Delhi Law Review*, 2002(2003),p.41, Last accessed date March 15, 2017, doi:<http://www.iclrc.org/content/a0304.pdf>,

Breeders Rights Act 2016 have been made. The main concern of these countries is the advancement of seed sector by securing the reward of the breeders, seed organizations and agriculturists by giving a powerful system or protection of plant varieties and rights of farmers. The PBVFR Act is a lengthy document and it discussed the breeders, researchers specifically the farmer's rights in detail while PBR Act is short document and it provides these rights in different manner. The study endeavors to break down most parts of the enactments while carrying out the comparative studies for judging its utility in the relevant countries.

3.1: International Legal Framework for Plant Variety Protection and Management in perspective of India and Pakistan

India and Pakistan have passed laws for the protection of plant varieties and its development. These laws are compliance with the International legal framework. The common ratified treaties include Biodiversity Convention, International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), World Trade Organization and TRIPS Agreement etc.¹⁵⁷ Both countries have ratified nearly the similar international treaties concerning the plant variety protection and management.

3.1.1: Convention on Biological Diversity CBD¹⁵⁸

India has confirmed the Biodiversity Convention which gives essential system to the protection and the utilization of biological assets. It asserts India's sovereignty over its biological assets, however, qualifies India's power with the presentation of the thought of regular which suggests that the protection of biodiversity in India is of intrigue to this nation as well as the international community at large.¹⁵⁹ Pakistan marked this treaty in 1992 and it was approved by cabinet in 1994. Later in 2002 a biodiversity activity arrange with the assistance of International Union for Conservation of Nature (IUCN)¹⁶⁰ was produced.

¹⁵⁷ Dr Philippe Cullet, Radhika Koluru, "Plant variety Protection and Farmers' Rights", 2002(2003), p.41,

¹⁵⁸ The Convention on Biodiversity was all around received on 29 December 1993. It was the main universal settlement that recognized the part of biodiversity in reasonable improvement.

The CBD characterizes biodiversity misfortune as "the long haul or lasting subjective or quantitative diminishment in parts of biodiversity and their capability to give great and administrations, to be measured at the worldwide, territorial and national levels". The three and fundamental parts of CBD on which rest of the content is based are the preservation of biodiversity, the reasonable utilization of its segments, and the reasonable and fair sharing of advantages emerging out of the use of genetic assets, For more detail visit <http://envirocivil.com/environment/convention-on-biodiversity-and-pakistan> , Last accessed date March 15,2017.

¹⁵⁹ Dr Philippe Cullet, Radhika Koluru, "Plant variety Protection and Farmers' Rights", p.4.

¹⁶⁰ Made in 1948, IUCN has developed into the world's biggest and most assorted ecological system. It bridges the experience, assets and reach of its 1,300 Member associations and the contribution of exactly 16,000 specialists. IUCN is the worldwide expert on the status of the characteristic world and the measures expected to defend it. The International Union for Conservation of Nature (IUCN) is a participation Union particularly made out of both government and common society associations. It gives open, private and non-legislative associations with the learning and instruments that empower human advance, monetary improvement and nature preservation to happen together. For more detail visit, > <https://www.iucn.org/about> Last accessed date March 16,2017.

Pakistan presents its national execution answer to CBD after each 3 or four years.¹⁶¹ The Convention states that government should save traditional knowledge and encourages its application. It gives in any event the lineaments of an approach system in such manner. Contributor nations of micro-organisms¹⁶², plants or animals used commercially have the right to take a fair share of the benefits derived from use. Furthermore, the Convention forms only a couple of settlements which offers a particular explanation in relation between the administration of natural assets and intellectual property rights. Article 16 of CBD obviously shows that intellectual property rights are not undermining the working of the Convention.¹⁶³

3.1.2: International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

India and Pakistan have ratified the ITPGRFA Treaty. The ITPGRFA is an agreement which has similar almost the same objectives as CBD. This treaty has close link with CBD, it provides the three unified goals like conservation, sustainable use and benefit sharing. Its "principle aim is to facilitate the exchange of seeds and other germ-plasm¹⁶⁴ to be used for research, breeding and crop development."¹⁶⁵ Besides this the PGRFA Treaty offers acknowledgment to farmer's contribution to conserving and enhancing plant genetic resources for food and agriculture. Contrary to this, the treaty does not provide or discussed the farmers' rights over their landraces.

¹⁶¹ <http://envirocivil.com/environment/convention-on-biodiversity-and-pakistan/> Last accessed date March 16, 2017.

¹⁶² micro-organisms is a microscopic organism, particularly, a bacterium, virus, or fungus.

¹⁶³ Dr Philippe Cullet, Radhika Koluru, "*Plant variety Protection and Farmers' Rights*", p.4.

¹⁶⁴ Germplasm are living hereditary assets, for example, seeds or tissues that are kept up with the end goal of creature and plant breeding, safeguarding, and other research uses. For more detail visit <https://en.wikipedia.org/wiki/Germplasm> last accessed date March 17, 2017.

¹⁶⁵ Food and Agriculture Organization, *Intellectual rights in Plant Varieties: International legal Regimes and Policy Options for National Governments: Working Paper, 2004*, (Rome), 87

In fact, the 'recognition 'of farmers' contribution to plant genetic resource conservation and enhancement does not include any property rights. In this context, the only rights that are recognized are the residual rights to save, use, exchange and sell farm-saved seeds. The overall significance of the PGRFA Treaty lies in the fact that it is the first treaty providing a legal framework which not only recognizes the need for conservation and sustainable use of plant genetic resources for food and agriculture but also delineates a regime for access and benefit sharing, and in this process provides direct and indirect links to intellectual property right instruments.¹⁶⁶

The agreement creates a joint system for "facilitating access to plant genetic resources for food and agriculture, and sharing, in a fair and equitable way, benefits arising from the utilization of these resources, on a complementary and mutually reinforcing basis."¹⁶⁷ Pakistan is a member of ITPGRFA. The Institute of Agricultural Biotechnology and Genetic Resources (IABGR) of Pakistan Agriculture Research Council (PARC) is the national institution answerable for conservation, collection, evaluation and distribution of PGRFA.¹⁶⁸

3.1.3: World Trade Organization and TRIPS Agreement

Both the Asian countries - India and Pakistan are the members of World Trade Organization (WTO) since 1 January, 1995. Founding members of the WTO should implement the TRIPS Agreement provisions relating to the plants protection. Normally, in all member states TRIPS describes lowest levels of intellectual property rights protection. The Patents Act, 1970 differed in considerable compliment to what is essential under TRIP in the patent field which has brought about a considerable modification.¹⁶⁹

Article 27 of TRIPs has wider implications for plant protection; article 27.3.b of TRIPs Agreement defines:

¹⁶⁶ Dr Philp pe Cullet, Radhika Koluru, "Plant variety Protection and Farmers' Rights", p.4.

¹⁶⁷ Article 10 of ITPGRFA

¹⁶⁸ Food and Agriculture Organization, Enhancing Understanding and Implementation of the International Agriculture in Asia: Final Report, 2013, (Bankok), 13, Last time accessed date March 17, 2017 <http://www.planttreaty.org/sites/default/files/gb5re.pdf>.

¹⁶⁹ Philp pe Cullet, Radhika Koluru, "Plant variety Protection and Farmers' Rights", p.5.

3. Signatories countries may also rule out from patentability:

(b) Plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof. The provisions of this subparagraph shall be reviewed four years after the date of entry into force of the WTO Agreement.

The above article provides that member countries opted for saving plant variety by means of patent or by effective “sui-generis system”¹⁷⁰ or using both the methods. It also gives a reasonable flexibility for developing countries to choose the best option to protect their plant and biological processes. The article uses the word “effective” but it does not explain the meaning of “effective” in context of plant protection. Thus, it depends upon the countries to develop and make suitable protection system for their plants according to their own policies, goals and objectives.

Article 27.3.b provides multiple options of Patent or Sui-generis system or any mixture thereof to member countries. These options have been divided among the developing and developed countries as in two blocks. Many developed countries have granted patent protection to plant, whereas the developing countries being known as economically reliant on agriculture are focusing on making their own kind of PVP mechanism. India, Pakistan, Thailand, Philippines and some other Southeast Asian countries have prepared different PVP

¹⁷⁰At the point when the TRIPS Agreement, with regards to Article 27.3(b), alludes to a sui generis framework, it infers that it must be a type of licensed innovation assurance, an option (in connection to licenses) protected innovation right particularly applying to plant varieties. Last accessed date March 18,2017
https://www.google.com.pk/?gws_rd=cr,ssl&ei=7M7jW16_Bebi6ASxyrww#q=sui-generis+system+&/

system of their own.¹⁷¹ Furthermore, they are still struggling to constitute effective sui-generis system in accordance with TRIPs and CBD requirement.

3.1.4: International Union for the Protection of New Varieties of Plants (UPOV)

The Headquarter of UPOV is located in Geneva (Switzerland). The Convention was held in Paris in 1961 which was reexamined in 1972, 1978 and 1991.¹⁷² The UPOV's history started from the breeding business. In the mid 1900s, the reproducing or breeding business assisted the possibility of PBRs¹⁷³ and campaigned for improvement in trade for quality of seeds.¹⁷⁴ In 1961, the national confirmation plans for giving reproducers' rights were coordinated into UPOV, with the particular target of empowering private sector business breeding.¹⁷⁵ The UPOV Convention, for example, tried to advance value between reproducers, creators and innovators keeping in mind the end goal to improve seed trade.¹⁷⁶ To date, the UPOV holds its unique feature as a tool of the breeders. The consequent modifications of the Convention in 1978 and later in 1991 expanded the extent of breeders' rights.¹⁷⁷ UPOV's favoritism position towards breeders, however, has resulted in developing countries' wariness not in

¹⁷¹ Rajeswari Kanniah, Christoph Antons, "Plant Variety Protection and Traditional Agricultural Knowledge in Southeast Asia" *Australian Journal of Asian Law*, Vol. 13, No. 1, 2012 Last accessed date March 18, 2017

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2159488

¹⁷² See home page UPOV and visit for more detail, > <http://www.upov.int/portal/index.html.en> Last accessed date March 18, 2017.

¹⁷³ PB Rights in other words called plant variety rights (PVR), are rights conceded to the breeder of another assortment of plant. It provides the reproducer selective check over the propagating material and collected material (cut blooms, natural product, and foliage) of another assortment for various varieties. For more detail visit, > https://en.wikipedia.org/wiki/Plant_breeders%27_rights Last accessed date March 18, 2017.

¹⁷⁴ "Seminar on the Nature and Rationale for the Protection of Plant Varieties Under the UPOV Convention 25-26 (1994)."

¹⁷⁵ Supra note 8 of UPOV, and also see for detail the Press Release, Action Aid, "Plant breeders' rights and food security," (2000).

¹⁷⁶ Heitz, supra note 40, p. 34.

¹⁷⁷ Conventions on UPOV of 1961 and 1978, See, supra note 8 of UPOV, > For more detail visit <http://www.upov.org/en/publications/conventions/index.html>. Last accessed date March 18, 2017

favor of using the form as the choice of sui-generis framework.¹⁷⁸ Lack of any acknowledgment of farmers' rights are the biggest defect of UPOV. Concerning with farmers' rights two main issues occurred. Firstly, it was related to traditional rights of farmers, as the right to re-sow, relevant to new varieties. Secondly, the rights of farmers, provided source.¹⁷⁹ Both issues are not totally tended to in UPOV. As a substitute, UPOV, is designed as a component for reproducers' rights and along these lines treats privileges of different players in rural exchange as exemptions to the breeders' rights.¹⁸⁰

India and Pakistan are not the members of UPOV. Below are the considerable reasons why India and Pakistan should made their own sui generis system instead of joining UPOV.

- a) It does not recognize indigenous people's inherent right to biodiversity and TK, as recognized under CBD and ITPGRFA.
- b) The UPOV's focus is only to protect Breeders MNCs rights and pay no attention to rights of the indigenous peoples and farmers entirety.
- c) It curtails farmers' rights to freely save seed for cultivation due to which farmers have to buy seed every season and it does not say about benefit sharing.
- d) In contrast to CBD and ITPGRFA, UPOV does not recognize, states sovereign right on genetic resources, exist in their territory.¹⁸¹

¹⁷⁸ Srividhya Raga van, Jamie Mayer, "Has India Addressed Its Farmers' Woes? A Story of Plant Protection Issues", *The Georgetown INT'L Law Review*, vol.20:97, (2007), 104.

¹⁷⁹ Ibid,p.110

¹⁸⁰ Generally See Robyn ,Protection of Plant Varieties and the Farmer's Rights Act,20KLA.J.L.& TECH. 14 (2004)

¹⁸¹ Naveen Erum, "A critical analysis of plant breeders' rights Bill –A Neo Imperialism; Counterbalancing the Sui Generis Regime of Intellectual Property and Plant Variety Protection between the corporate sector and Indigenous farming community of Pakistan"LLM thesis (2015),p.58.

International Treaties and Organizations on Plant's Protection and Membership of India and Pakistan:

International Treaties and Organizations	India	Pakistan	Current Status
WTO	Signatory	Signatory	Member
TRIPS	Signatory	Signatory	Member
CBD	Signatory	Signatory	Member
ITPGRFA	Signatory	Signatory	Member
UPOV	Non-signatory	Non-signatory	Non-member

3.3: Comparison of PPVFR Act (India) and Plant Breeders' Rights Act (Pakistan):

The Indian Government cleared the Protection of Plant Varieties and Farmers' Rights Act in 2001. A law was required to be formulated, after India became party to the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPs) in 1994.¹⁸⁵ Article 27.3(b) of this agreement provides that the member countries will protect the plant varieties by a patent or by an effective sui generis system or by mixing both.¹⁸⁶ Likewise, Pakistan introduced the Plant Breeders Rights Act 2016 after long debate in public and parliament. Here, the concern is to generally analyze both the legal documents of PPVFR and PBR Act.

3.3.1: The Objectives of PPVFR Act and PBR Act

The PPVFR Act was passed under the following objectives:

- Act accommodates the foundation of a useful framework for protection of plant varieties.
- It provides the rights of plant breeders and farmer rights.
- It stimulates development, research growth of seed in the seed sector.

¹⁸⁵ Pratibha Brahmi, Sanjeev Saxena and B.S.Dhillon, "The Protection of Plant Varieties and Farmers' Rights Act of India", *Current Science*, Vol.86:3,(2004), Last accessed date, March 19,2017, doi: https://www.researchgate.net/publication/228968363_The_Protection_of_Plant_Varieties_and_Farmers%27_Rights_Act_of_India

¹⁸⁶ Prabhash Ranjan, "Recent Developments in India's Plant Variety Protection, Seed Regulation and linkages with UPOV's Proposed Membership", *The Journal of World Intellectual Property*, Vol.12:3,(2009), Last accessed date March 20,2017, doi: <http://onlinelibrary.wiley.com/doi/10.1111/j.1747-1796.2009.00365.x/pdf>

- It ensures accessibility of high quality seeds and planting resources of better varieties to farmers.

In the same way, Pakistan passed the PBR Act under the following objectives:

(i) The main objective of the PBR Act is to support the plant breeders and seed organizations in public and private sectors to spend in research and plant breeding;(ii) The Act facilitates in access to protected foreign varieties, new technologies and development of superior varieties;(iii) It's another important objective is to encourage and build healthy competition among the public and private sector organizations for variety development.¹⁸⁷

3.3.2: Rights Provided in both Acts

The PPVFR Act provides three types of rights;(i) Breeders' Rights which give special rights to produce, sell, market, distribute, import or export seed of the protected variety;(ii) Researchers' rights which provides a researcher to use the variety as basic source for the purpose of development of another variety;(iii) Act recognizes the rights of farmers as breeders' rights.

On the other hand, section 22 of PBR Act provides the rights of the plant breeders; in respect of variety the owner of a protected variety has exclusive rights: "(a) offering for sale or selling or marketing of the reproductive or vegetative propagating material of the protected variety in Pakistan;(b) importing the reproductive or vegetative propagating material of the protected variety into Pakistan or exporting it from Pakistan etc."¹⁸⁸ Section 25(d) provides that the farmers are entitle "to save, use, sow, re-sow exchange, share or sell his farm produce provided that the farmer shall not be entitled to sell seed of a variety protected under this Act

¹⁸⁷ The statement of Objects and Reasons of PBR Act 2016, Pakistan.

¹⁸⁸ Section 22 of PBR Act,2016,Pakistan

on a commercial basis”¹⁸⁹ without complying with the requirements of Seed Act, 1976 (XXIX of 1976)¹⁹⁰, and regulation made therein. Thus, PBR Act provides limited rights to farmers as compare to PPVFR Act.

3.3.3: Definition of Breeder

PPVFRS’ Section 2(c) defines “breeders mean a person or group of persons or farmer or group of farmers or any institution which has bred, evolved or developed any variety.”¹⁹¹ While Section 2 (ii) of PBR Act defines “Breeder means a natural or legal person, an institution, a farmer or an organization which has bred, discovered or developed a new plant variety.”¹⁹²,

3.3.4: Definition of Farmer in both Acts

The Act defined farmer as who (i) “cultivates crops by cultivating the land himself; or (ii) cultivates crops by directly supervising the cultivation of land through any other person; or (iii) conserves and preserves, severally or jointly, with any person any wild species or traditional varieties or adds value to such wild species or traditional varieties through selection”¹⁹³ and identification of their useful properties¹⁹⁴. In comparison with PBR Act, farmer mean “any legal person or natural person who cultivates crops either through cultivating land himself or through a person employed for the purpose”¹⁹⁵. So, the main difference in definition of PBR Act PPVFR Act is that it includes the legal person as well as natural person.

¹⁸⁹ Ibid.

¹⁹⁰ The Seed Act 1976, Pakistan.

¹⁹¹ Section 2 sub Section (c) of PPVFR Act 2001.India.

¹⁹² Section 2 subsection (ii) of PBR Act 2016.Pakistan.

¹⁹³ Section 2 of PPVFR Act 2001.India.

¹⁹⁴ Section 2 (k) of PBR Act 2016, Pakistan.

¹⁹⁵ Ibid

3.3.5: Establishment of Authority or Committee

PPVFRS' Section 2 subsection (c) define "Authority means the Protection of Plant Varieties and Farmers' Rights Authority established under sub section (1) of section 3" The Central Government has the power to set up an authority. It may call the Protection of Plant Varieties and Farmers' Rights by notification in the Official Gazette.¹⁹⁶ The Authority should be consisted of a Chairperson and fifteen members. The Central Government shall appoint a Chairperson, a person of outstanding caliber and distinction. It also requires "the person has long experience to the satisfaction of that Government, especially in the field of plant varietal research or agricultural development".¹⁹⁷

Alternatively, the PBR Act provides that a Committee should be established, a Committee means the Plant Variety Protection Advisory Committee. Section 10 subsection (1) states that the Federal Government shall establish a Plant Variety Protection Advisory Committee including a Convener and some other members from the public and private sector. The Committee shall advise the Ministry or the Registrar on such scientific and technical issues.

3.3.6: Eligibility for Registration

Section 15 of the act provides detail about register able varieties. A new variety must confirm "to the criteria of novelty, distinctiveness, uniformity and stability" (NDUS). "A new variety shall not be registered under this Act if the denomination given to such variety ;(i) is not capable of identifying such variety; or consists of solely of figures; or (iii) is liable to mislead or to cause confusion concerning the characteristics, value identity of such variety

¹⁹⁶ Section 3 sub section (1) of PPVFR Act.

¹⁹⁷ Section 3 subsection (3,4,5) of PPVFR Act.

etc.”¹⁹⁸Section 12 of PBR Act is similar with the Section 15 of PPVFR Act, both the sections provide the criteria for protection of plant breeders ‘rights and criteria for registration.

3.3.7: Duration for Protection

Section 24 states about the certificate of registration that certificate shall be considered valid for nine years in the case of trees and vines and six years in the case of other crops. It might be explored and restored for the rest of the period on installment of such charges as might be settled by the management subjected to the conditions that the aggregate time of legitimacy should not surpass.

(i)In the case of trees and vines, eighteen years from the date of registration of the variety;(ii) in the case of extant varieties, fifteen years from the date of the notification of that variety by the Central Government under Section 5 of the Seed Act, 1996, and (iii) in the other case, fifteen years from the date of registration of the variety.¹⁹⁹

Under the PBR Act section 24 of the term of the protection “is twenty five years in the case of trees and vines and twenty years in the case of all other plants from the date of filing of the application.”

3.3.8: Payment of Annual Fee

The concerned Authority may, with the permission of the Central Government, require a fee to be paid annually, “by every breeder of a variety, agent and licensee thereof registered under this Act determined on the basis of benefit or royalty gained by such breeder, agent or licensee, as the case may be, in respect of the variety, for the retention of their registration

¹⁹⁸ Section 15,subsection (4) of the PPVFR Act.

¹⁹⁹ Section 24, subsection (6) of the PPVFR Act.

under this Act”²⁰⁰In PBR Act section 29 states that the owner of the certificate shall pay the fee prescribed by the Federal Government. The Registrar has right to forfeit the certificate if the owner of the certificate fails to pay the fee.

3.3.9: Farmer’s Rights

A significant feature of the PPVFR Act is that it includes the farmer’s rights as positive rights that go away from the general description of farmer’s rights in the international treaties.²⁰¹ International organizations like the Food and Agriculture Organization (FAO) resolution 5/89²⁰² and International treaty on Plant Genetic Resources (ITPGR)²⁰³, despite the fact that perceive the worries identified with business misuse of the germplasm by the plant reproducers where no advantage is given to agriculturists.²⁰⁴ Some International legal instruments define the farmer’s rights for example, rights emerging from past, present and future role of farmers in conservation, enhancing and making accessible PGR, specifically those in centers of origin or diversity.²⁰⁵ Article 9.3 of the ITPGR recognize subject to national laws of the country the farmers have rights to save and use exchange and sell the farm saved seeds. It is pertinent to note here that the Treaty permits member states to build up their own types of securing agriculturist's rights.²⁰⁶

²⁰⁰ Section 35, subsection (1) of the PPVFR Act.

²⁰¹ Prabhash Ranjan, “Recent Development in Plant Variety Protection, Seed Regulation and linkages with UPOV’s Proposed Membership”, *The Journal of World Intellectual Property*, Vol.12:3,(2009), Last accessed date March 22,2017,doi: <http://onlinelibrary.wiley.com/doi/10.1111/j.1747-1796.2009.00365.x/pdf>

²⁰² Resolution 5/89, Adopted at the 25thSession of the FAO Conference – Rome 1989 available at <http://www.fao.org/3/a-bb057e.pdf> Last accessed date March 22,2017.

²⁰³ ITPGRFA was gotten by the Thirty-First Session of the Conference of the Food and Agriculture Organization of the United Nations on 3 November 2001.

It provides: seeing the main responsibility of agriculturists to the different characteristics of harvests that encourage the world; setting up an overall structure to give agriculturists, plant breeders and scientists with access to plant innate materials; it assures that receivers share benefits they get from the use of these genetic materials.

²⁰⁴ Esquinas Alcazar, 1996, p.2-4.

²⁰⁵ Article 9 of International Treaty, available at <http://www.fao.org/3/a-i0510e.pdf> Last accessed date March 23, 2017.

²⁰⁶ See Article 9.2 of the International Treaty,

The rights of farmers may define as the rights provided from their past contribution like rights to save, use, exchange or sell farm saved seeds.²⁰⁷ Secondly, “the right to be compensated for providing the PGR used by the commercial breeder in developing new varieties”²⁰⁸ and right to save and register their varieties.²⁰⁹

The PPVFR Act 2001 recognizes the farmer’s rights to benefit sharing and the positive right of ownership of a farmer over the PGR. The Act provides the opportunity to farmers to develop and register their own varieties while it also requires that the variety complete the other requirements for registration.²¹⁰ The PPVFR Act’s definition of breeder explicitly includes farmers.²¹¹ PPVFR gives the chance to enlist their varieties under the surviving assortments. It is a different novel element of the PPVFR Act that enables enrollment to farmers of officially accessible assortments.²¹² Extant variety is farmer’s variety which is obtainable in India or variety notified under the Section 5 of the Seed Act, 1966²¹³ or a variety about there is common knowledge or any other variety in public domain.²¹⁴ Thus, farmer’s variety can be enrolled under the category of extant varieties and alone.²¹⁵

On the other hand, the PBR Act provided that a farmer to be permitted to save, use, sow, re-sow, exchange, share or sell his farm produce variety. It is provided that the farmer shall not be allowed to sell seed of a variety protected under this Act on a commercial basis without complying with the requirements of Seed Act, 1976 and developed regulations

²⁰⁷ See Article 9.3 of the International Treaty

²⁰⁸ Article 10.2 of the International Treaty and Article 8 (j) of the Convention on Biological Diversity

²⁰⁹ Prabhash Ranjan, “Recent Development in Plant Variety Protection, Seed Regulation and linkages with UPOV’s Proposed Membership”,

²¹⁰ Sections 39.1 (I), 14 and 15 (1) of the PPVFR Act, 2001.

²¹¹ Sections 2 (c), 14 and 15 (1) of the PPVFR Act, 2001.

²¹² Section 8 (2) (a) of the PPVFR Act 2001.

²¹³ Seed Act 1966 of India

²¹⁴ Section 2 (J) of the PPVFR Act 2001.

²¹⁵ Prabhash Ranjan, “Recent Development in Plant Variety Protection, Seed Regulation and linkages with UPOV’s Proposed Membership”, p.8.

developed under the Act.²¹⁶ Thus, provided farmer rights in PBR Act are limited in comparison with PPVFR Act. Rights of farmers are necessary for the purpose of conservation and existing genetic variability and the generation of new ones. The role of farmers' rights has great importance in countries like India and Pakistan due to the high wealth of varieties present in our ecosystem and the agriculture nature of the national economy.

The criterion of registration is not easy for registering farmer's variety in the PPVFR Act and PBR Act. The truth is that in current practical situation only commercial plant breeders and public research institutions will be able to register their variety. The reason is that they have the facility to manage modern scientific breeding to fulfill the NDUS OR DUS criterions in case of registration of an extent variety. As an outcome, a small number of farmers' varieties will benefit from the registration method provided in the PPVFR Act and PBR Act.²¹⁷

²¹⁶ Section 25(d) of PBR Act ,Pakistan.

²¹⁷ Ibid.p.8.

Comparison of PPVFR Act 2001(India) and PBR Act 2016(Pakistan) with help of following diagram

Terminologies	India	Pakistan	Status
1-Act Name	PPVFR Act 2001	PBR Act 2016	Enforced
2-Passing Years of Law	Passed In 2001	Passed In 2016	In different Time
3-Application of Law	Applicable In whole India	Applicable In whole Pakistan	Similar
4-Authority	PPVFRA -F	Not-defined	Different
5-Committee	Not-defined	PVPAC-f	Different
6- Definition of Breeder	Defined	Defined	Different
7-Definition of Farmer	Defined	Defined	Different
8-Essential Derived Variety	Defined	Defined	Similar
9-Registrar and Registry	Defined	Defined	Similar
10-Definiton of Seed	Defined	Non-defined	Different
11-Definition of Plant	Not Defined	Defined	Different
12-Plant Variety	Defined	Defined	Similar
13-Application for Registration a variety	Defined	Defined	Different
14-Testing a New Variety	Procedure Available	Procedure Available	Similar
15-Amendment in Application and Advertisement	Section 20,21 Exist	Section 17,18 Exist	Similar
16-Grounds for Opposition	Section 22 Exist	Section 19 Exist	Dissimilar

17-Registration of essentially derived variety	Procedure Exist in Section 23	Procedure Exist in Section 20	Similar
17-Issue of Registration of Certificate	Procedure is Lengthy	Procedure Exist in Section 21	Dissimilar
18-Reserchar,Breeder and Farmer Rights	Explained in Detail	Not Explained in Detail	Different
19-Exemption of Fee	Farmers and Village Community	Any Section not Exist in PBR Act 2016	Dissimilar
20-Compulsory Licensing	Chapter VII Exist	Chapter VII Exist	Similar
21-Suit for Infringement	Districts Court	District Court	Similar
22-Appeals	Appeal to Tribunal	Appeal to High Court	Different
23-Panalities	Chapter X	Section 41 Define	Different
24-Total Sections in Act	Consist of 97 Section	Consist of 49Sections	Different

3.3.10: Compulsory Licensing

The PPVFR Act and PBR Act Chapter VII provides novel basis on which the registration of plant variety can be challenged. Section 47 of PPVFR Act provides that the authority can allow compulsory license, if there should be an occurrence of any grievances about the accessibility of the seeds of any enrolled assortment to open at a reasonable cost. The permit can be allowed to any individual intrigued to take up such exercises after the expiry of a time of three years from the date of issue of certificate of registration to undertake distribution and sale of the seed or other propagating material of the variety.²¹⁸ The PBR Act Section 33 provides the power to Registrar to issue compulsory license in the following circumstances:

- (a) For public interest particular in the matters (b) in case the owner of the certificate become the case of exploitation (c) when the seed variety is not accessible to the public at a reasonable price. (d) the owner of the certificate refuses to grant a license to a third party on reasonable commercial terms and conditions.(e)the Registrar has right to issue compulsory license after the expiry of three years from the date of grant of a certificate.²¹⁹

(A)Duration of Compulsory License:

Section 50 of PPVFR Act states about the duration of compulsory license that the Authority should decide the length of the obligatory permit such duration may shift from case to case keeping in view the growth time frames and other pertinent considers yet any case it might not surpass the aggregate outstanding period. Section 34 of PBR Act discusses about the duration of compulsory license ,this section is similar with Section 50 of PPVFR but it further add that the period of compulsory license shall not surpass five years from the date of grant.

²¹⁸ Section 47(1) PPVFR 2001.

²¹⁹ Section 33 of PBR 2016,Pakistan

(B) Revocation of Compulsory license:

Section 52 of PPVFR Act and Section 35 of PBR Act provides the same reasons under which a Compulsory license can be revoked. The Authority or Registrar can revoke the license on an application made in the prescribed manner from an aggrieved person. Here, it is necessary to be satisfied that the licensee is not fulfilling the terms and condition of the license, further it is not appropriate to continue such license further in the public interest.

(C) Modification of Compulsory License:

The both Acts have inserted the Sections for modification of Compulsory license the Authority or Registrar has right to modify the license in case of public interest.²²⁰

3.3.11: Infringement of Rights and Suit for Infringement

Section 64, 65 of PPVFR Act and Section 38 of PBR Act deal with the infringement and suit for infringement as in matter of infringement, both the acts are different while in matter of suit for infringement they are the same. The PPVFR Act states that any person who is not actual breeder of a variety registered and who sells, exports or produce such variety that person is committing infringement. Section 38 of PBR Act provides that any action in violation of the granted rights to breeder under section 22 shall be considered infringement. The infringement suit shall be brought in any lower court to the Court of District Judge having jurisdiction contained by the local limit of whose jurisdiction the cause of action originate.

(A) Relief to the aggrieved party in suits for infringement:

Section 66 of PPVFR and Section 39 of PBR Act provide same relief to the aggrieved party in infringement matter. The alleviation which a court may give in any suit for infringement

²²⁰ Section 53 of PPVFR Act 2001, India and Section 36 of PBR Act 2016, Pakistan.

may incorporate an order at the alternative of the offended party, either damages or a share of the benefits.

(B) Time limitation on an infringement suit:

According to Section 40 of PBR Act, an aggrieved party may file suit within three years time duration. “Damages will not be assessed against a defendant for infringement committed before actual or constructive notice is given to the defendant that the concerned variety is a protected plant variety”.²²¹ On the other hand, PPVFR Act of India does not provide the time limitation on an infringement suit.

3.3.12: Provided Penalties for applying false denomination

Any person who (a) applies any false denomination to a variety;(b) indicates the false name of a country or place or false name and address of the breeder of a variety registered under this Act in the course of trading such variety, be punishable with imprisonment for a term which shall not be less than three months but which may extend to two years, or with fine which shall not be less than fifty thousand rupees but which may extend to half million rupees, or with both.²²² In comparison with PPVFR Act, the PBR Act does not provide any provision for penalty for applying false denomination. Section 41 of PBR Act provides that penalties for contravention of this Act or rules shall be framed in light of this act.

3.3.13: Plant Variety Protection Appellate Tribunal and right to Appeal

Chapter VIII of PPV&FR Act deals with the Plant Variety Protection Appellate Tribunal and with its composition, appeal, order and procedure. The tribunal will be set up by an official notification by the Government to use jurisdiction, power given on it under this Act. The PVPAT will comprise of legal and also technical member. A Judicial Member might be a

²²¹ Section 40(2) PBR Act 2016, Pakistan.

²²² Section 70 of PPVFR Act, India.

man who has for no less than ten years held a legal office in the domain of India or who has been an individual from the Indian Legal Service and has held a post in Grade-II of that Service or any proportionate or higher post for no less than three years or who has been a advocate for no less than twelve years.²²³ In comparison with PBR Act, It does not allowed to establish appellate tribunal, although, any aggrieved party has the right to appeal in High Court after the decision of District Court, within sixty days of the decision.²²⁴

3.3.14: Storing of Reference Samples in Act

The PPVFR Act allows the storing of reference samples. It takes enough and proper storage infrastructure. The Authority creates suitable set up for furnishing storage services at particular places in the state. The National Gene Bank at National Bureau of Plant Genetic Resources provides facilities and technical expertise.²²⁵ In this mater PBR Act is silent.

3.3.15: The Provided Fee Structure in Act

Section19 of the Act gives that a breeder to present an amount of seed incorporating with parental lines as indicated and determined by the regulations. Moreover, the seeds saved are to be monitored and regenerated if important for DUS testing for support. Some extra fee may be charged for protection and regeneration, other than testing expenses. For the purpose of financial autonomy of the authority the fee for registration and other processes as well as annual fee should be reasonably determined.²²⁶ Respectively, Section 47of PBR Act states that the Federal Government may by notification in the official Gazette ,set down a schedule of fee and charges for services rendered to the applicants and the public under this Act and any fee or amount collected shall be deposited in the manner as may be prescribed.

²²³ Section 55 of PPVFR Act 2001,India.

²²⁴ Section 46 of PBR Act 2016,Pakistan.

²²⁵ Paatiba Brahma, Sanjeev Saxena ,Saxena,B.S.Dhillon, "The Protection of Plant Varieties and Farmers' Rights Act of India",*Current Science*, Vol.86:3 (2004),397 available at https://www.researchgate.net/publication/228968363_The_Protection_of_Plant_Varieties_and_Farmers%27_Rights_Act_of_India Last accessed date March 24,2017.

²²⁶ Section 19 of the PPVFR Act 2001.

3.3.16: Legal Requirements for Applicant

The Act bound the applicant when one submit his/her application, it must be sure that the genetic material was acquired by proper legal way that the genetic or parental material used for breeding. This sort of affirmation would be difficult in situations where the basic information identifying with the material has not been recorded. Besides, it is difficult for a breeder to get information relating to the contribution of former, town group, and so on. Since such data may not be dependable. On the off chance that this sort of information not accessible, might be left to the expert to choose which can welcome claims later through media etc.²²⁷

On the other hand, Section 15 of PBR Act states that the application for protection shall be with reverence to a new plant variety. The application must state a suitable denomination assigned to such variety by the candidate. In case of genetically modified plant variety, it require endorsement from the National Bio-safety Committee constituted by the Federal Government to this impact genetically modified plant assortment might have no unfriendly impact on the earth ,human, creature or vegetation and health.

The PPVFR Act and PBR Act provide a new regime in the seed sector in India and Pakistan. This law can be utilized for the security of its hybrid breed seeds. The seed sector expects that plant assortment security administration will bring another strategy that gives the more prominent access to public germplasm. It is also interesting that the initial stage on the PPVFR bill, the seed sector in India was not content with those arrangements of the PPVFR charge that offered rights to agriculturists to offer seeds contending that this will undermine the very reason for having an enactment on plant assortment protection.²²⁸“However, the

²²⁷ Section 18 (J) of the PPVFR Act 2001.

²²⁸ Prabhash Ranjan, “Recent Development in Plant Variety Protection, Seed Regulation and linkages with UPOV’s Proposed Membership”,p.11.

seeds industry, later on, softened its stand on farmer's rights provisions in a process of accommodation and compromise where industry understood that the concept of farmer's rights as an alternative means of intellectual property protection reinforced their position on IPR and enabled them to gain PBR rights in India.²²⁹

Enforceability of the PPVFR Act and PBR Act is also considerable issue in India and Pakistan. The majority of the farmers are illiterate and poor in both the countries. They are not well aware from their rights due to this reason enforceability of the legislation will be difficult in India. Alternate issues identified with the enforceability may run from choosing fitting locales for NDUS testing, creating regulatory systems to direct profit sharing and guaranteeing that there are no encroachments of the rights that spill out of the assurance of plant variety. The Protection of Plant Variety and Farmer's Rights Authority of India has been set up for the effective implementation of the PPVFR Act.²³⁰ The effective enforcement of the Act will take some time.

²²⁹ Ibid.p.11.

²³⁰ Ibid.

Conclusion

The comparative analysis of the PPV&FR Act of India and PBR Act of Pakistan provides the opportunity to understand how these laws are effective in the respective countries, how they are different from each other and how much they are complying with International legal framework. The common purpose for both the laws are the improvement of seed industry by ensuring the interest of the breeders, producers, seed organizations and farmers by giving an effective system for protection of plant varieties and rights of farmers. Both the Asian countries - India and Pakistan have signed the same International treaties like TRIPS Agreement, ITPGRF, and Convention on Biological diversity for the protection of plants varieties. India is one of the principal nations on the planet to have passed enactment conceding rights to both breeders and farmers under the Protection of Plant Varieties and Farmers' Rights Act, 2001. India's Plant Variety and Farmers' Rights Act is considerable both in the domestic and international perspective. The both countries' Acts allow four sorts of varieties to be enrolled for securing the interest of actors: New Variety, Extant variety, Essentially Derived Variety and Farmers' Variety. The PPVFR Act has discussed the farmer's rights in detail as compare to PBR Act. Both of the laws provide that in case of infringement of rights, the aggrieved party has the right to bring a suit in District Court while in matter of appeal the legal instruments have different channels such as Tribunals and High Courts.

CHAPTER FOUR

CRITICAL ANALYSIS OF PLANTS' VARIETY PROTECTION UNDER THE PLANT BREEDERS' RIGHTS ACT 2016

Introduction

The Government of Pakistan passed the Plant Breeders' Rights Act 2016, the approval of which took more than one and half decade. During the process, the bill of the Plant Breeders' Rights Act was presented for approval several times with amendments. However, the Act is still considered controversial between the Federal and Provincial governments. The Provinces claim that legislation of PBR Act is unconstitutional as the subject of Plant Breeders' Rights Act is a provincial subject over which the Parliament cannot exercise legislative jurisdiction under the Article 141 of the Constitution (Eighteenth Amendment) Act, 2010. According to the 18th amendment, the laws may be made by the Parliament for the whole country or any part of Pakistan. Furthermore, provinces have also the right to pass the laws for the province or any part thereof. Article 142 provides that with concerned of any matter in the Federal Legislative list, Parliament shall have undivided power to make laws. However, the Parliament does not have the authority to pass any law which is not mentioned in the Federal Legislative list. The civil society's activists, NGOs and indigenous communities of farmers are opposing the Act. They claim that the proposed legislation only protects the breeders' rights and secludes the farmers as well as traditional knowledge of indigenous communities from the sphere of legal protection. It aims to give breeders complete monopoly over the seed market and entitles the companies to royalties for at least 20 years²³¹ on each variety for

²³¹ Section 24 of Plant Breeders' Rights Act 2016. For detail text is available at http://www.senate.gov.pk/uploads/documents/1480330690_813.pdf Last time accessed date April 25, 2017.

which they hold PBRs. The main purpose of this chapter is to take critical overview from different aspects of Plant Breeders' Rights Act.

4.1: Background History of Legislation

It is submitted during the 1960s and 1970s that developed countries began to grant plant breeders' rights and patent rights on seed varieties. The background history of PBR Act, 2016 has close link with international legal regulatory framework. Pakistan has ratified to the World Trade Organization (WTO)²³², World Intellectual Property Organization (WIPO)²³³ and Trade Related Aspects of Intellectual Rights (TRIPS)²³⁴. It is obliged to provide minimum level of protection to the plant varieties either by an effective sui generis system or patents or by the combination of these systems under the 27(3b) of TRIPS agreement.²³⁵ The IPR regime in Pakistan consisted of Trade Mark Act 1889, Patents and Designs Act 1911, Patents and Designs Rules 1933, Secret Patents Rules 1933, Trademarks Act 1940, Copyright Ordinance 1962, Trademarks Rules 1963, Customs Act 1969, and Pakistan Penal Code. The government of Pakistan has already introduced several laws to comply with the WTO and TRIPS Agreements in the area of IP law such as patents, trademark, industrial Designs etc.²³⁶

²³² The World Trade Organization (WTO) is the main worldwide global association managing the guidelines of exchange between countries. It regulates the international trade among different countries around the world. The essential reason for existing is to help makers of merchandise and ventures, exporters, and shippers lead their business in the world

For more detail visit, > <https://www.wto.org/> Last accessed date April 23, 2017.

²³³ WIPO is a global Intellectual Property Organization; it deals with the international Intellectual Property matters. It has 189 members and it was established in 1967. WIPO is one of the 17 specialized agencies of the United Nations.

For more detail visit <http://www.wipo.int/portal/en/index.html> last time accessed date April 26 2017.

²³⁴ The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) is a global lawful assertion between all the part countries of the World Trade Organization (WTO). It sets guidelines for the control by national administrations of many types of protected innovation (IP) as connected to nationals of other WTO part nations. A TRIP was consulted toward the finish of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994 and is regulated by the WTO. For more detail visit https://en.wikipedia.org/wiki/TRIPS_Agreement last time accessed date April 27, 2017.

²³⁵ FSCRD 2002, *Focus on Seed Programs*, Federal Seed Certification and Registration Department, Islamabad.

²³⁶ Objective Statement of 'Plant Breeders Rights Act 2016', Pakistan

The Government of Pakistan opened its agricultural market under international trade agreements to foreign investors. Moreover, the country also introduced the Plant Breeders' Rights Act to satisfy the commitments under the TRIPS agreement as per the demand of multinational organizations²³⁷. The government motive behind this law was to support the public breeding program in order to make sure the accessibility of better varieties and quality seed for the benefit of farmers. The first draft of PBR Act was drafted by the Federal Seed Certification Department (FSC&RD) in 1999²³⁸, and after that several versions of the bill were prepared on different occasions in 2000,2007,2010,2014 and finally in 2016.

4.2: Controversies Federal verses Provinces

The Plant Breeders' Rights Act 2016 is controversial between the Federation and the Federating Unites. The provinces claim that the subject of Plant Breeders' Rights is a provincial subject over which the Parliament cannot exercise legislative jurisdiction .In this regard it is submitted:

Article 141 Constitution of Islamic Republic of Pakistan, as amended by the Constitution (Eighteenth Amendment) Act, 2010 "18th Amendment", provides that Parliament may make laws for the whole or any part of the country. Provinces may make laws for the province or any part thereof.

Article 142 provides that:

- (a) Majlis-e-Shoora (Parliament) shall have exclusive power to make laws with respect to any matter in the Federal Legislative List;
- (b) Majlis-e-Shoora (Parliament) and a Provincial Assembly shall have power to make laws with respect to criminal law, criminal procedure and evidence;²³⁹

²³⁷ FSCRD 2002. *Focus on Seed Programs*, Federal Seed Certification and Registration Department, Islamabad.

²³⁸ The Seed Industry in Pakistan working paper No.019/February 2014

²³⁹ Sub Section, Constitution (Eighteenth Amendment) Act, 2010 (10 of 2010), s. 49, for —Paragraph (b)

(c) Subject to paragraph (b), a Provincial Assembly shall, and Majlis-e-Shoora (Parliament) shall not, have power to make laws with respect to any matter not enumerated in the Federal Legislative List;²⁴⁰

(d) Majlis-e-Shoora (Parliament) shall have exclusive power to make laws with respect to all matters pertaining to such areas in the Federation as are not included in any Province.²⁴¹

The growth of new plant varieties and to protect the rights of breeders and Plant Breeders' Rights are not discussed in the Federal Legislative List. It is, therefore, submitted that Parliament had no authority to make the impugned legislation and the same is an attempt to subvert the object and purpose of the 18th Amendment. Without prejudice to the above, the Impugned Legislation has not been passed in accordance with the provisions of the Constitution. Article 144 of the Constitution sets out the power of Parliament to legislate for one or more provinces by consent as under:

If one or more Provincial Assemblies pass resolutions to the effect that Majlis-e-Shura (Parliament) may by law regulate any matter not enumerated in the Federal Legislative List in the Fourth Schedule, it shall be lawful for Majlis-e-Shoora (Parliament) to pass an Act for regulating that matter accordingly, but any act so passed may, as respects any Province to which it applies, be amended or repealed by Act of the Assembly of that Province.²⁴²

Although the Preamble to the Impugned Legislation states that it has been approved in conformity with the provisions of Article 144 while it is unable to locate a single resolution from any Provincial Assembly requesting Parliament to control and formulate the law on Plant Breeders' Rights and matter linked therewith. If it can be argued that the Impugned Legislation was passed in harmony with Article 144 of the Constitution, the Impugned

²⁴⁰ Ibid.

²⁴¹ Section 143, the Constitution of the Islamic Republic of Pakistan.

²⁴² Section 144, the Constitution of the Islamic Republic of Pakistan.

Legislation is still violation of the procedure prescribed for such legislation in the Federal Government Rules of Business (FGROB)²⁴³ as amended up to 18 December 2015.

The FGROB are issued under the powers conferred by Article 90 and 99 of the Constitution onto the Federal Government to make rules of the allocation and transaction of its business. The Rule 15 of the FGROB states that without the approval of the Prime Minister, order shall not be issued in cases where it is planned that the Federal Government undertake the implementation of an international agreement relating to a subject in the provincial field.

Plant Breeders Rights and seed are subjects within the exclusive legislative domain of the Provincial Assemblies. However, the preamble of PBR Act states, "It is imperative to give effect to the sub-paragraph (b) of paragraph 3 of Article 27 of Part II of the Agreement of Trade Related Aspects of Intellectual Property (TRIPS) which the Government of Pakistan has ratified".²⁴⁴

The language of the relevant provisions of TRIPS and the preamble of the PBR Act clearly allows Member States to prohibit from patentability plants and animals, but nevertheless requires protection of plant varieties. As the subject of plants and animals and protection of plant varieties are provincial subjects. It is not enumerated in the Federal Legislative List of the Fourth Schedule to the Constitution; the implementation of TRIPS could only be accepted by Parliament (i) in compliance with Article 144 of the Constitution; and (ii) pursuant to the requirements of Rule 15 (1) (c) of the FGROB. It is submitted that as neither the requirements of Article 144 have been fulfilled nor the provisions of the FGROB

²⁴³ Available at, <http://www.establishment.gov.pk/estab/userfiles1/file/ROB-estab-amended-18-december-2015.pdf>, last accessed date April 25, 2017.

²⁴⁴ Preamble of Plant Breeders' Rights Act 2016. Full text is available http://www.senate.gov.pk/uploads/documents/1480330690_813.pdf Last time accessed date April 28, 2017.

followed, the Impugned Legislation is violation of the Constitution and merits to be struck down.

The PBR Act attempts to vest the Federation with executive powers it cannot and does not possess. In this regards, it is submitted:

The Constitution limits the (i) executive and (ii) legislative jurisdiction of the Federation and of Parliament and the Provincial Assemblies, respectively, as under:

(a)Extent of executive authority

The article 97 of the Constitution states, “Subject to the Constitution, the executive authority of the Federation shall extend to the matters in respect to which Parliament has powers to make laws, including of rights, authority and jurisdiction in and in relation to areas outside Pakistan”²⁴⁵. The proviso to Article 97, however, provides the executive authority of the Federation “shall not, save as expressly provided in the Constitution, or in any law made by Parliament, extend in any province to a matter with respect to which the Provincial Assembly has also power to make laws”.²⁴⁶

Article 137 of the Constitution provides, “Subject to the Constitution, the executive authority of a Province shall extend to the matters with respect to which the Provincial Assembly has power to make laws”. The proviso to article 137, however, provides “that, in any matter with respect to which both Parliament and the Provincial Assembly of a Province have powers to make laws, the executive authority of the Province shall be subject to, and limited by, the executive authority expressly conferred by the Constitution or by law made by Parliament upon the Federal Government or authorities thereof.”²⁴⁷

²⁴⁵ Article 97 of Constitution of Islamic Republic of Pakistan.

²⁴⁶ Ibid.

²⁴⁷ Article 137 Constitution of Pakistan.

(b)Limits of legislative authority

Article 141 of the Constitution, as amended by the Constitution (Eighteenth Amendment) Act, 2010, provides that the Parliament may make laws for the whole or part of Pakistan. Furthermore, provinces have legal right to pass laws for the province or any part thereof. Article 142 provides subject matter of Federal and Provincial Laws.

It is therefore submitted that the executive authority of the Federation is limited to those subjects over whom it has power to make laws, namely subjects determined in the Federal Legislative List or provided for in Article 142(b) of the Constitution. Conversely, it is submitted that, following the 18th Amendment, Provincial Assemblies and no other shall have the right to make laws regarding subjects are not mentioned in the Federal Legislative List and to exercise executive authority with respect thereto.

The development of new plant varieties and to protect the rights of breeders and “Plant Breeders’ Rights” is not found in the Federal Legislative List. It is already submitted that Parliament had no power to pass the Impugned Legislation and the same is an attempt to subvert the object and purpose of the 18th Amendment and so it is further submitted that the executive authority of the Impugned Legislation seeks to confer onto the Federal Government is also unconstitutional. The numerous provisions in the Impugned Legislation for procedures to be prescribed by rules exemplifies the extent of executive authority of the Federation which seeks to snatch from the federating units and are all challenged on the grounds above.

It is clear that “development of new plant varieties and to protect the rights of breeders” and “Plant Breeders’ Rights” are not in the Federal Legislative Lists of the Fourth Schedule of Constitution. Furthermore, the Impugned Legislation has not been passed in accordance with Article 144 of the Constitution. Therefore, it is submitted that neither the Federation nor the

Parliament have the executive or legislative jurisdiction, respectively, to regulate and make on the “development of new plant varieties and to protect the rights of breeders” and “Plant Breeders’ Rights” unless in accordance with Article 144 of the Constitution, it was observed in case of *Syed Imran Ali Shah vs. Government of Pakistan* (2013 PLC 143)²⁴⁸ and *Ashraf Industries (Pvt) Ltd. Vs. Federation of Pakistan and others* (2013 PTD 1732)²⁴⁹. Without prejudice to the above, the Act is violation of the Fundamental Rights to the public-at-large.

4.3: Challenges to the Farmers’ Rights

The Farmers’ Rights as set out in the ITPGRFA²⁵⁰ and their supporting principles as set out in the CBD²⁵¹ and elaborated above. Pakistan is a signatory to the ITPGRFA and CBD and obliged to enact local legislation in light of their provisions. However, the PBR Act, being the first time since accession to the ITPGRFA, has completely failed to consider the Farmers’ Rights.

Therefore, it is asserted that Farmers’ Rights are composed of separate rights, as follows:

4.3.1: Farmers’ Rights on Seed

All along the history of the agriculture farmer’s rights on seeds is a traditional right enjoyed by the farmers. This right includes multiple things like the right to save the seed from one’s crop and use the saved seed for sowing, sharing, exchanging or selling to other farmers. The

²⁴⁸ See, <http://sys.lhc.gov.pk/appjudgments/2016LHC1410.pdf> Last time Accessed date May 6, 2017.

²⁴⁹ Case is available at, <https://joshandmakinternational.com/oil-gas-and-energy-law-projects/oil-and-gas-court-decisions/ashraf-industri> Accessed date May 6, 2017.

²⁵⁰ ITPGRFA was come on 3 November 2001, by the 31st Session of the Conference of the Food and Agriculture Organization of the United Nations.

It provides: seeing the main responsibility of agriculturists to the different characteristics of harvests that encourage the world; setting up an overall structure to give agriculturists, plant breeders and scientists with access to plant innate materials. It assures that after using the genetic materials benefit holder share the benefits.

²⁵¹ The Convention on Biodiversity was all around the world received on 29 December 1993. It was the main universal settlement that recognized the part of biodiversity in reasonable improvement.

The CBD characterizes biodiversity misfortune as “the long haul or lasting subjective or quantitative diminishment in parts of biodiversity and their capability to give great and administrations, to be measured at the worldwide, territorial and national levels”. The three and fundamental parts of CBD on which rest of the content is based are the preservation of biodiversity, the reasonable utilization of its segments, and the reasonable and fair sharing of advantages emerging out of the use of genetic assets, For more detail visit <http://envirocivil.com/environment/convention-on-biodiversity-and-pakistan> , Last accessed date May 8, 2017.

method of conservation covers the complete genetic variability in time and space, including traditional and new varieties. The farmer's rights on seeds cover the complete genetic variability, including protected varieties.²⁵²

4.3.2: Farmers' Rights to Register Traditional Varieties

Traditional varieties of plants are either preserved or formulated by a group of farmers and thus new varieties formulated by them are eligible for registration. It is necessary to involve all communities associated with its conservation, in the case of registration of a traditional variety.²⁵³

4.3.3 Farmers' Rights for Reward and Recognition

Farmers should be rewarded and recognized for their contributions in terms of incentives to support the preservation undertaken by the farming communities.²⁵⁴

4.3.4: Farmers' Rights for Benefit Sharing

The farmers' varieties or their derivatives are used as parents to develop new variety. The variety may be discovered to have been lead by one farming community. It cannot be denied that the new registered variety has become popular among the farmers. Due to its registration, its plant breeding rights holder alone is allowed to market and commercially produce its seed. Here, it is possible that special marketing right may lead to vast seed sale and profits to the right holder.²⁵⁵ The general laws should provide fair and reasonable sharing of the benefits

²⁵² Farmers' Rights, "Challenges, success stories and ways forward" Slide presented by Dr. Regine Andersen June 2008. Available at www.farmersrights.org/pdf/side-event_GB3-ed.ppt last accessed date May 8, 2017.

²⁵³ S.P Bala Ravi, " Farmers' rights, their scop and legal protection in India" p.317

Available at https://www.biodiversityinternational.org/fileadmin/user_upload/online_library/publications/pdfs/Community_biodiversity_ma Last time accessed date May 9, 2017.

²⁵⁴ Ibid.

²⁵⁵ Dr Philippe Cullet, Rradhika Koluru, "Plant Variety Protection and Farmers' Rights" *Delhi Law Review* ,2002(2003),p.41, Last accessed date April 15, 2017, doi:<http://www.ielrc.org/content/a0304.pdf>.,

gained from the new variety to farming or tribal communities that had contributed varieties used as parents.

4.3.5: Farmers' Rights to get compensation for the Loss Suffered from the Registered Variety

The registration of a plant variety gives exclusive commercial right on the variety to the breeder. A breeder enjoys commercial right after the registration of plant variety.²⁵⁶ Commercial demand depends on the quality of the variety for improved agronomic performance. Companies encourage and promote their seeds by raising claims on the agronomic performance of their varieties. At the time of cultivating such seeds, farmers may realize the fact. The country seed's laws should include such unsuitable provisions to verify such marketing practices by seed sellers and breeders.

4.3.6: Farmers' Rights for the Seeds of Registered Varieties

The objective of local legislation on seeds should support the easy use of high quality seed and planting material to farmers for accelerating agricultural growth. The local legislation should try and attain this goal by ensuring sufficient accessibility of registered varieties to farmers at the sensible price tag.

4.3.7: Farmers' Rights for Receiving Free Services

Local laws should completely free the farmers from paying any fees. In view of considering that this economic weakness shall not be a problem for accessing farmers' rights. This facility should include to the single, group or community of farmers. They should be free from the required fees to be paid for registration of farmers' varieties, for managing tests on them, for the renewal of registration and the fees defined for opposition, profit claim etc.

²⁵⁶ Biswajit Dhar, "Sui Generis Systems for Plant Variety Protection"
Paper available at <http://quakerservice.ca/wp-content/uploads/2011/07/SGcol1.pdf> April 16,2017.

4.3.8: Farmers' rights for Protection against Innocent Infringement

In legal Jurisprudence, infringement of law committed out of ignorance is not detained as permissible innocence. In country like Pakistan, farmers are economically poor and uneducated, there is a need to safeguard their rights against the innocent infringement .Exceptional provision should be given in local laws while considering the legal literacy of traditional-bound farmers and to put off petty legal harassment to farmers from seed companies.

The PBR Act fails to recognize the Farmer's Rights elaborated and asserted above. The phrase "Farmers' Rights" is not even properly acknowledged in the Impugned Legislation, even though Pakistan is signatory to the ITPGRFA and is deemed to have recognized the same. On the other hand, the Farmer's Rights legislation passed in India mentions Farmers' Rights in its title, preamble and throughout its text. This oversight in recognizing and protection the Farmers' Rights stems from Parliament's usurpation of a legislative subject in the provincial domain.

4.4: Criticism on PBR Act

Many NGOs, civil society activists and indigenous communities of farmers have criticized the Plant Breeders Rights Act (PBR).Their main objection is that the Act does not give anything new instead it is only a replication of a previous legislation .²⁵⁷They have demanded the farmer's protection provisions in the Act according to Convention on Biological Diversity (CBD) and International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).Because of this criticism, the PBR Act was not passed quickly by the parliament, rather it was presented in the legislature multiple times and finally passed by the parliament

²⁵⁷ Speaker for leaving law making for next NA,"The Nation, Accessed date May 9,2017. <http://nation.com.pk/islamabad/27-Dec-2012/speakers-for-leaving-law-making-for-next-na>

after a period of sixteen years. Mushtaq Gaddi, a lecturer, NIPS, Quaid-i-Azam University Islamabad stated that “the propose bill is a form of neo-imperialism; it is an attempt to give rights to the multinational corporations to exploit people and the resources of third world.”²⁵⁸

Progressively evolving a sui generis and Plant variety protection in an agriculture economy especially Pakistan calls for a farmer-friendly legislation because it is the indigenous community’s hard work, labor and Traditional Knowledge (TK) free application which could make the agricultural economy grow and develop. Therefore, satisfying the indigenous farming society by a positively proactive role of corporate sector and the civil society is significant. Moreover, the opponents of this law claim that agricultural techniques of sub-continent would affect centuries old traditional methods of cultivation and seed harvesting practiced by farmers in Pakistan. The conflict arising from this debate is creating Monsanto and Syngenta²⁵⁹ like controversies in Pakistan, where these companies seek dependence of farmers on their products. This type of protection mechanism of privilege plant breeders would cause destruction to Pakistan’s agricultural sector, since a significant portion of national economy as the country cannot afford to lose labor force is constituted by the agriculture sector.

The famous case of a Canadian farmer “Percy Schmeiser” is a good example, wherein he was accused of using Monsanto seeds illegally and in April 2001 Supreme Court of Canada ordered him to pay eighty thousand Canadian dollars to Monsanto for

²⁵⁸ Ibid.

²⁵⁹ Excessive seed patented have allowed these companies to maintain monopoly in the seed markets around the world, which adversely affected farmers, now each year farmers have to buy protected seed in return of royalties to these companies. A conspicuous case of monopolistic lease looking for one could refer to in Pakistan in the cost of maize seed that Monsanto sells. The Monsanto built up the restraining infrastructure on maize seed the costs have gone up from 20 rupees to 250 rupees/kg. The imposing business models on seed won't just give an opportunity to MNCs to make benefit, will likewise have genuine repercussions for the nourishment security of the country.

violating the patent laws, although the truth was that infringement was accidental, taken place through flight of pollens from Monsanto fields to the farmers' fields.²⁶⁰

The following are some other objections and reservations on PBR Act:

4.4.1: Breeders' Rights Protection

The PBR Act protects the breeders' rights, and secludes the farmers as well as the traditional knowledge (TK) of indigenous communities of Pakistan from the sphere of legal protection. Under the Act, breeder will enjoy complete monopoly over the seed market and entitle the seed companies to royalties for at least 20 years²⁶¹ on each variety for which they hold PBRs.

4.4.2: Lack of Protection of Farmers Rights

The PBR Act does not provide and explain the farmers' rights as compare to Indian Protection of Plant Varieties and Farmers' Rights Act in 2001. Though protecting the farmer's rights is a key in ensuring food security and sustainable agriculture, the Act does not discuss the farmer's rights as required by CBD and ITPGRFA, and demanded by the farmers, civil society activists and NGO's, like benefit sharing mechanism, legal protection for innocent infringement, PIC.²⁶²

Farmers' Rights constitute the customary rights that farmers have had as stewards of agro-biodiversity since the dawn of agriculture to save, grow share, develop and maintain plant varieties, of their legitimate right to be rewarded for their contribution to the global pool of genetic resources as well as the development of commercial

²⁶⁰ Hasnaian.T, "TRIPS Agriculture with Special Refrence to its Impact on Farmers' Rights,Indigenous Knowledge, Biodiversity and Food Security , "2001,as quoted in Sustainable Development Policy Institute, "Trade Related Aspects of Intellectual Property Rights (TRIPS)Agreement :Impacts o food Security of the People Living in HKH:Plolicy Brief Series 17," <https://www.sdpi.org/publications/files/PB17-Trade-Related%20Aspects%20of%20Intellectual%20Property%20Rights.pdf> Last accessed date May 10,2017

²⁶¹ Section 24 of PBR Act 2016,

²⁶² Right of Prior Informed Consent of a Local Community as acknowledge in Article (15) of CBD.

varieties of plant, and to participate in decision making on issues that may affect these rights.²⁶³

It is essential to protect the breeders' rights for the sake of seed sector, but depriving farmers from their inherent rights is highly inappropriate. It is important for the cultivating group to control over plant assortments so they could keep on innovating, enhance and adjust assortments to suit changing necessities and conditions.²⁶⁴

4.4.3: Monopoly of Plant Breeders Companies

The Act regularizes the sui-generis regime, attempts to empower the private corporate sector, especially by rendering all the exclusive commercial right²⁶⁵ to the Multinational Companies (MNCs), a monopoly will be created over the seed industry of Pakistan and all the benefit arising out of agricultural activity by the use of protected seed will go to them, and the poor farmers will suffer, and have to pay royalties to the breeders. These given rights to breeders would also restrict farmer's rights to freely use, reuse and exchange of seed, and "this treat becomes more severe for the fragile and vulnerable areas such as Hindu Kush

²⁶³ Mushita Andrew Mushita Carol, "Thompson Agricultural Biodiversity: African alternatives to a 'green revolution'" *Volume 51, Issue 4*, December 2008.

<http://link.springer.com/journal/41301/51/4/page/1> Last accessed date May 11, 2017.

²⁶⁴ See, Objectives 3.1 and 3.4(d) of the Plan of Action supra n.3, as quoted in Cullet and Koluru, "Plant variety protection and farmers rights :towards a broad understanding ," *24 Delhi Law Review 2002* (2003),2.

²⁶⁵ Section 22 of PBR Act 2016.

Himalaya (HKH) region where livelihood depends upon local produce and the people have to save the grain and seeds for future consumption.”²⁶⁶

4.4.4: Deficiency of Damage Clause

The absence of damage clause shows the government’s intention to give priorities to protect the breeder’s rights over the farmers. The damage clause for the benefit of the farmers was not inserted in the Act which was widely demanded by the farmers and the civil society, whereas, the demand of removal of damage clause by the major seed selling companies was accepted overnight.

4.4.5: Conflict between Breeders and Farmers

The Act has created a conflict amongst the farmers and breeders of the country. Breeders and MNCs being educated and well aware of new technology are able to protect more varieties of Plants and GM crops based on traditional farming methods and TK, rendering farmers their sole dependent.

There was much need to include the provision of PIC, so that farmers may now which varieties are protected and which not. This provision can also safeguard them against infringement.

4.4.6: Lack of Compensation Clause

The PBR Act 2016 does not provide any remedial provision in case of crop failure and for the security of a farmer’s future and money, whereas this provision is necessary in the legislation. This is one of the main rights; Indian government has provided this right to its farmers in Protection of Plant Varieties and Farmer’s Rights Act 2001(PPV&FR).²⁶⁷

²⁶⁶ Sustainable Development Policy Institute, *TRIPS Agreement : Impact on Food Security of the People Living in HKH: policy Brief Series 17, 2003*(Islamabad)

²⁶⁷ Section 39(2) of PPV &FR Act 2001, India.
http://nif.org.in/dwn_files/ipr/Questionnaire.pdf Last accessed date May 12, 2017.

4.4.7: Absence of Women Farmer Rights

The Act is also silent about the rights of women farmers. The role of women farmers in agriculture sector is significant. Agriculture is impossible without the contribution of women farmers in Pakistan. The Act should include some provisions to protect the rights of women farmers which are not indicated.

4.4.8: Protection of Traditional Knowledge

The PBR Act does not explicitly protect and recognize TK of indigenous people. The Act should protect the TK and genetic resources which should be properly documented. The proper documentation of TK may consequently help in challenging the issue of bio-piracy by the breeders and developed world. The Act should include the provisions conforming to the legislation on access to Biological resources and community rights.²⁶⁸

4.4.9: Danger to Genetic Diversity and Environment

Intellectual property on plant varieties have created an atmosphere of competition, breeder's and MNCs are in effort to have more protected varieties causing damage to world's biological diversity, centuries old traditional methods of farming and etc. It is accepted that licenses and other type of IP security on the genetic assets for food and agri-business diminish the agriculturist's entrance to seed, decrease endeavors in openly financed plant reproducing, increment the loss of genetic assets, forestall seed sharing and could make farmers out of business.²⁶⁹ As Pakistan's plant genetic resource is subject to the Doctrine of Public Trust, the PBR Act violates the Doctrine as it places the public resource into a system that diminishes Pakistan's genetic resource in favor of private seed companies.

Environment is defined by the Pakistan Environment Protection Act, 1997 and the Punjab Environment Protection Act, 1997 is meaning, interalia, all organic matter and living

²⁶⁸ Legislation on Access to Biological Resources and Community Rights, <http://www.farmersrights.org/database/pakistan.html> Accessed last date May 13, 2017.

²⁶⁹ Sustainable Development Policy Institute, Trade Related Aspects of Intellectual Property Rights (TRIPs) Agreement :Impact on Food Security of the People Living in *HKH*: Policy Brief Series 17,2003 (Islamabad)

organisms, the ecosystem and ecological relationships. The plant genetic resource of Pakistan is well within the legal definition of the word environment.

4.5: Doctrine of Public Interest

The plant genetic resource of Pakistan, as a public resource, falls under the protection offered by the Doctrine of Public Trust. Reliance is placed on *Sindh Institute of Urology and Transplantation vs. Nestle Milkpak Limited* (2005 CLC 424), *Muhammad Tariq Abbasi vs. Defence Housing Authority* (2007 CLC 1358), *Arshad Waheed vs. Province of Punjab* (PLD 2010 Lahore 510), *In re: Cutting of Trees for Canal Widening Project, Lahore* (2011 SCMR 1743), *Chamber of Commerce and Industry in Quetta, Balochistan vs. Director-General, Quetta Development Authority* (PLD 2012 Quetta 31), *Maulana Abdul Baque Balock vs. Government of Balochistan* (PLD 2013 Supreme Court 641) and *Young Doctor's Association vs. Government of Pakistan* (PLD 2015 Lahore 112). The Doctrine of Public Trust orders upon the Government to secure common assets for the pleasure in the overall population as opposed to allow their utilization for private proprietorship or business purposes. The doctrine was absorbed in the following cases.

4.5.1: Asghar Leghari vs. Federation of Pakistan

All people are qualified to be dealt with as per law and the Superior Courts have perceived the privilege to protect the healthy environment as a feature of the Fundamental Right to life enshrined in the Constitution. Recently, vide Order dated 4 September 2015 passed by the Green Bench of the Honourable Lahore High Court in the matter of *Asghar Leghari vs. Federation of Pakistan* (Writ Petition No. 25501 of 2015)²⁷⁰, the Green Bench recognized Climate Change Justice in the following terms:

²⁷⁰ Visit for further detail, <http://delawarelaw.widener.edu/files/resources/pakistanashgarleghari.pdf> Last accessed date May 14, 2017.

Climate Change is a significant challenge. On a lawful and Constitutional plane, it is a clarion requires the assurance of the Fundamental Rights of the residents of Pakistan. The current natural law must be molded to address the issues to something more earnest and overwhelming i.e. Environmental Change. From Environmental Justice, which was generally restricted and constrained to our own biological systems and biodiversity, we have to proceed onward to Climate Change Justice. Basic rights establish at the framework of these two covering equity of frameworks. Right to life, right to human dignity, right to property and right to information under articles 9, 14, 23 and 19A of the Constitution read with the constitutional values of political, economic and social justice provide the necessary toolkit to address and monitor the Government's response to climate change.

4.5.2: Sindh Institute of Urology and Transplantation vs. Nestle Milkpak Limited²⁷¹

For this situation the foundation of a water-packaging plant that utilized the regular aquifer was tested in light of the fact that such utilization of characteristic assets was an infringement of the regulation of public trust. In conveying its judgment, the Sindh High Court noted:

It is well-settled that natural resources like air, sea, waters, and forests are like Public Trust. The said resources being a gift of nature, they should be made freely available to everyone irrespective of the status. "Doctrine of Public Trust" as developed during the days of ancient Roman Empire, enjoins upon the Government to protect the resources for the enjoyment of the general public rather than to permit their use for private ownership or commercial purposes. Even under the Islamic law certain water resources are to be protected from misuse and over exploitation.²⁷²

²⁷¹ Facts and adopted procedure is available at <http://www.waterlex.org/waterlex-legal-database/index.php?r=legalDocument/customView&id=329> Last time accessed date 7, 2017.

²⁷² 2005 CLC 440 (Karachi)

4.5.3: Pakistan Chest Foundation v Government of Pakistan²⁷³

In *Pakistan Chest Foundation v Government of Pakistan*, for preventing tobacco advertisements from being broadcasted on Pakistani television, the petitioners filed a writ petition. The Lahore High Court, while considering the writ petition, brought the case within the right to life principle pronounced in *Shehla Zia*:²⁷⁴

Applying the principle of law enunciated in *Shehla Zia*'s case (*supra*) to the facts and circumstances of the present case, the citizens of this country and particularly the younger generation are entitled to protection of law from being exposed to the hazards of cigarette smoking, by virtue of the command contained in Article 4 (2)(a) of the Constitution.²⁷⁵

In the same way, in *Rana Ishaque vs. DG, EPA*²⁷⁶, Lahore High Court controlled one hundred and twenty one (121) mechanical units of Punjab, barring those that had as of now introduced treatment plants, from releasing effluents into channels and waterways on an appeal to expressing that these were being depleted without medications.²⁷⁷

²⁷³ Available at <https://pakistanilaws.wordpress.com/tag/public-interest-litigation/> Last time accessed date May 8, 2017.

²⁷⁴ Dr. Prarvez Hassan, "Environment Jurisprudence from Pakistan: Some Lessons for the SAARC Region" *A paper presented at the South Asia Conference on Environment Justice organized by the Supreme Court of Pakistan on 24-25 March 2012, at Bhurban, Pakistan*. Paper available at https://www.iucn.org/sites/dev/files/import/downloads/pk_1_environmental_jurisprudence_from_pakistan_so_me_lessons_fo Last time accessed date May 8, 2017.

²⁷⁵ 1997 CLC 1425 (Lahore).

²⁷⁶ Writ Petition No. 671 of 1995 before the Lahore High Court, Lahore. For more detail visit <http://www.pljlawsite.com/2009art11.htm> Last time accessed date May 12, 2017.

²⁷⁷ Dr. Prarvez Hassan, "Environment Jurisprudence from Pakistan: Some Lessons for the SAARC Region"

Conclusion

Pakistan passed Plant Breeders' Rights Act with efforts to make an efficient sui-generis system for the protection of plant varieties. The Act, however, does not seem to protect and provide sufficient legal protection to farmers' rights like Indian PPV&FR rather it aims to protect only the breeders and multinational companies. The approval of the Act without protecting the rights of farming community would create chaos in the agriculture community and seed sector of Pakistan. The Act was passed by the Federal government without the consultation of provinces; however, the provinces claim that the Parliament does not have the constitutional right after the eighteenth amendment in Constitution of Pakistan to pass the Act. It is legal right of the provinces to make law for the protection of plant varieties with safeguarding breeders, civil society and the farmers' rights. The protection of Breeders' rights is essential according to the International mechanism like TRIPS and CBD for the development of seed sector in Pakistan. In addition to that the protection of indigenous communities' rights is also necessary.

CHAPTER FIVE

CONCLUSION AND RECOMENDATIONS

Pakistan has extraordinary potential for creating a wide range of food products. The country has rich and immense assets covering natural and climatic zones. Seed is considered as one of the basic components in agriculture production. However, it needs special attention of the government in terms of policy making. Currently, the important framework for the seed sector exists in Pakistan both at the federal and provincial level. The Federal Seed Certification and Registration Department (FSC&RD), Provincial Seed Council (PSC) and Seed Organizations are controlling the seed's related activities. Despite the availability of many natural genetic resources and seed varieties, Pakistan is not creating sufficient quantity of seed for the cultivating group, aside from cotton. The country is relying mainly on imported seed and multinational seed companies; however, the government formulated policies and strategy can increase the seed production in Pakistan.

The general analysis in this dissertation of the existing laws on seeds in Pakistan provides the opportunity to understand the legal measurements which are not satisfactory. The Seed Act, 1976 and set of laws formulated under the Act provided the basic legal structure for the operation of country's seed sector. Although the Seed Act has been amended with the title of 'the seed (amendment) Act 2015' however, its new version included the provisions are being faced with controversies among International laws on seeds, Federal government, Provincial governments and farmer communities. The same situation exists with the Plant Breeder Rights Act 2016, it is true that Pakistan is part of international community and it has to pass the laws on seed compliance with International legal standards.

Simultaneously, it is also necessary that these laws should compliance with and meet the needs of nation, especially the farmer's community in the country.

The comparative study of the PPVFR Act of India and PBR Act of Pakistan provides the opportunity to understand how these laws are effective in their respective countries, how they are different from each other and how much they are complying with International legal framework. The common purpose for both the laws are the improvement of seed industry by ensuring the interest of the breeders, producers, seed organizations and farmers by giving an effective system for protection of plant varieties and rights of farmers. Both the Asian countries - India and Pakistan have signed the same International treaties like TRIPS Agreement, ITPGRF, and Convention on Biological diversity for the protection of plants varieties. India is one of the nations on the earth to have passed establishment surrendering rights to both breeders and agriculturists under the Protection of Plant Varieties and Farmers' Rights Act, 2001. India's Plant Variety and Farmers' Rights Act is considerable both in the domestic and international perspective. The both countries' Acts allow four sorts of varieties to be enrolled for securing the interest of actors: New Variety, Extant variety, Essentially Derived Variety and Farmers' Variety. The PPV&FR Act has discussed the farmer's rights in detail as compare to PBR Act. Both of the laws provide that in case of infringement of rights, the aggrieved party has the right to bring a suit in District Court while in matter of appeal the legal instruments have different channels such as Tribunals and High Courts.

Pakistan passed Plant Breeders' Rights Act with efforts to make an effective sui-generis system for the protection of plant varieties. The Act does not protect and provides sufficient legal protection to farmers' rights like Indian PPV&FR rather it aims to protect only the breeders and multinational companies. The approval of the Act without protecting the rights of farming community would create chaos in the agriculture community and seed

sector of Pakistan. The act was passed by the Federal government without the consultation of provinces; however, the provinces claim is that the Parliament has no constitutional right after the eighth amendment in Constitution of Pakistan. It is legal right of the provinces to make law for the protection of plant varieties with safeguarding breeders, civil society and the farmers' rights. The protection of Breeders' rights are essential according to the International mechanism like TRIPS and CBD for the development of seed sector in Pakistan meanwhile the protection of indigenous communities rights are also necessary.

Trade liberalization in agriculture sector will have disastrous effects on indigenous farmers, who work with old traditional methods of farming. They do not have basic and necessary education and financial capacity as well as the government support to use new technology for the cultivation of their crops. Small farmers would be unable to compete with MNCs and local resources will be no more in the hands of indigenous farmers, therefore, there is need proper support and funding to the farmers. Their production will be no more competitive in the market their food safety and production would be on high threat. Pakistan must take steps on providing necessary education of new technologies and financial support to the indigenous farmers for better results and to strengthen their position to compete in international markets and developed world.

It is also one of the important recommendations that the government of Pakistan should organize farmers' training program on regular basis in which they should be trained about the proper use of new technology in agriculture sector and new methods of cultivation.

Pakistan should make relevant policies to encourage sustainable use of biological resources. It should involve local communities by managing their indigenous knowledge and genetic resources and government should financially support farmers by providing more funding which will help in food security and in sustaining biological diversity. The government should also make efficient institutional mechanism to regulate plant breeding

activities to ensure that plant genetic resources are used in manner that gives incentive to farmers and breeders for the conservation of the genetic resources.

Plant Breeders Rights Act should protect farmer's exclusive right to freely save, sell and exchange seed instead of buying it by paying huge royalties to breeders every season. Providing this right will save half of the rights of farmers and traditional methods of farming.

Pakistan should have an effective enforcement mechanism to stop and eliminate infringement of protected material, and traditional knowledge and should have strict punishment provisions related to infringements and bio-piracy. Documentation of traditional knowledge will help minimizing bio-piracy done by the big multi-national companies of the developed countries, minimizing their monopoly over seed sector and genetic resources of the third world country.

A balanced Sui-generis regime for Pakistan would be a regime which will protect farmers and breeder's rights. Meanwhile, the provisions related to prior informed consent, equitable benefit sharing, grant access to biological resources to private sector for research and development, protection traditional knowledge and rights of the indigenous people, complying with TRIPSs and CBD requirements at the same time.

Controversies about the Plant Breeders' Rights Act between Federal and Provinces should be resolved as soon as possible because without the solution of the problem, proper implementation of the legislation is not possible.

Some explanatory provisions should be included for the protection of farmer's indigenous communities' rights. The Indian Plant Protection Varieties & Farmers' Rights Act discussed the rights of farmers in detail and provides a proper mechanism for the protection of their farmer's rights. The legislatures should examine the Indian legislation and then it may be adopted as model law in Pakistan.

Bibliography

Articles:

ALI,S.I. "Significance of Flora with Special Reference to Pakistan ." *Pak. j. Bot* Vol.40, Issue.3 (2008), pg 967-971.

Barley, Frankin. "Patent Law and Plant Breeders' Right." *Murdoch University Electronic Journal of Law* Vol.10,Issue no 4 (2003),pg 2.

Brahmi,P,Dhillon, "The Protection of Plant Varieties and Farmers Rights Act of India". *Current Science* 86:3 (2004).

Beck, Ryann. "Farmers Right and open source licencing." *Arizona Journal of Envoirmental law&Policy* Vol.1,Issue no2 (2010),pg 167-218.

Bonadio, Enrico. "Crop Breeding and Intellectual Propert in the Global Village." *European Intellectual Property Review* (2007),pg1-6.

Bragdon, Susan. "International Law of Relevance to Plant Genetic Resources: A Practical; view for Scientists and other Professional's working with Plant Genetic Resources." *IPGI*, Issue no10 (2004).

Cullet, Philippe. "Plant Variety Protection and Farmers Rights:towards a broad understanding." *24 Delhi law Review* 2002,(2003),pg.41.1.

Donninworth, Jean, Grace,John and Smith, Stephen. "Intellectual Property Rights, Patents, Plant Variety Protection and Conctrects; A Perspective from the Private Sector." *IP Strategy Today*, Issue No.9 (2004).pg 19-34.

Espinosa, Sohia. "Legal Protection of Ecuadorian Biodiversity and Traditional Knowledge: The existing Intellectual Property Rights Syetem VS. Asui Generies System." *Washington University School of law*,(2010).

Habibi, Khushal. "Biological Diversity in Pakistan ." *IUCN* (1997),pg 1-16.

Kanniah , Rajeswari and Antons, Christon. "Plant Variety Protection and Traditional Agricultural Knowledge in Southeast Asia." *Australian journal of Asian Law* Vol. 13,Issue No 1 (2012),pg 1-23.

Ker, Caroline. "Agricultural Resources and the TRIPS Agreement." *CRID*.

Lesser, W.H. "The Role of Intellectual Property Rights in Biotechnology Transfer under the Convention on Biological Diversity. " *ISAAA*, Issue no 3(1997).

Lahore University of Management Sciences. "A notion on the Seed Business in Pakistan"(2004).

Lawson, Charles. "The Breeder's Exemption under the 1991 International Convention for the Protection of New Plant Varieties and the Convention on Biological Diversity and its Nagoya Protocol"*Oxford Journal* Issue 10 (2015):526-535

Mcmanis, Charles. "The Interface between International Intellectual Property and Environmental Protection: Biodiversity and Bio Technology." *Washington University Law Review* Vol:76,Issue 1 (1998),pg 255-279.

McManis, R.Charles. "The Interface between International IP and Environment Protection: Biodiversity and Biotechnology." *Washington University Law Review* Vol.76, Issue 1 (1998).

Overwalle, Van Geerui. "Protection and Sharing Biodiversity and Traditional Knowledge: Holder and User Tools." *Ecological Economics*, (2005),pg 585-607.

Ramanna, Anitha. "India's Plant Variety and Farmers' rights Legislation: Potential Impact on Stakeholder Access to Genetic Resources". *EPTD Discussion Paper* No.96.(2003).

Ravi, S. Bala. "Effectiveness of Indian Sui Generis Law on Plant Variety Protection and its Potential to Attract Private Investment in Crop Improvement." *Journal of Intellectual Property Rights* Vol.9 (2004),pg 533-548.

Ragavan,S.Mayer,J. "Has India Addressed Its Farmers' Woes? A Story of Plant Protection Issues". *The Georgetown Int'L envtl. Law Review* 20:97 (2007).

Singh,k. "Intellectual Property Rights in Agricultural Biotechnology and Access to Technology: A Critical Appraisal". *Asian Biotechnology and Development Review* 18:3 (2016).

Singh Pertab, Anshu and Manchikanti, Padmavati. "Sui Generis Intellectual Property Laws vis-à-vis Farmers Rights in Some Asian Countries :Implications under the WTO." *Journal of Intellectual Property Rights* Vol:16 (2011),pg 107-116.

Stephen, Bent. "Intellectual Property Rights in Agricultural Developments: History and Prognosis." *Farm Foundations*, 2003.

Wiessner, Siegfried. "The Cultural Rights of Indigenous People: Achievements and Continuig Challenges." *The European Journal of International Law* Vol.22,Issue no 1 (2011),Pg 121-140.

Books:

Biber-Klemmm, S. &Cottier, T. *Rights to Plant Genetic Resources and Traditional Knowledge* UK:CABI,2006.

Chaudhry G.M, *The intellectual property intellectual property law in pakistan and international treaties on IPRs* - Federal Law House; Rawalpindi:2005 - 1500p. (modified on 2010)

Debra, J Halbert. *Intellectual property in the information age : the politics of expanding ownership rights* - Quorum, ; Westport, Conn. ; 1999 (modified on 20/06/2012)

Fowler, Cary. *Unnatural Selection: Technology, Politics, and Plant Evolution*. US: Gordon and Breach, 1994.

Glowka, Lyle, Burhenne –Guilmin, Françoise and Synge, Hugh. *A Guide to the Convention on Biological Diversity*. UK: Gland and Cambridge, 1996.

Hansen, A. Stephen and Vanfleet, W. Justin. *Traditional Knowledge and Intellectual Property*. Washington, DC: AAAS, 2003.

Heller, Michael. *The Gridlock Economy*. New York: Basic Books, 2008.

Robinson, F. Daniel. *Confronting Biopiracy: Challenge, cases, and International Debates*. UK: Earthscan, 2010.

Legal Instruments:

The Seed Act, 1976

The Plant Breeders' Rights Act, 2016

The Protection of Plant Varieties and Farmers' Rights Act 2001 (India)

International Instruments:

Paris Convention for the Protection of Industrial Property, 1883.

Convention on Biological Diversity, 1992.

The Agreement on Trade-Related Aspects of Intellectual Property Rights, 1994.

The International Convention for the Protection of New Varieties of Plants, 1978 and 1991.

TRIPS Agreement (1 January 1995)

Convention on Biological Diversity (1992)

Websites:

Plant Treaty, "Multi-lateral System." Accessed January 12, 2017.

http://www.planttreaty.org/sites/default/files/MLS_evanson_Jan2011.pdf.

ITPGRFA, "International Treaty on Plant Genetic Resources for Food and Agriculture

<http://www.fao.org/plant-treaty/areas-of-work/the-multilateral-system/overview/en/?q=content%2Fmultilateral-system> Accessed date January 20,2017.

http://www.coboru.pl/English/Badania_WGO_eng/badania_wgo_eng.aspx last accessed date (January 11, 2017).

<http://www.sasa.gov.uk/variety-testing/distinctness-uniformity-and-stability-dus-testing> last accessed date(january 12,2017)

<http://www.investopedia.com/terms/g/gdp.asp> (Last accessed January 12, 2017).

<http://www.oecd.org/about/> Last accessed date January 12, 2017.

<http://www.upov.int/portal/index.html.en/> .accessed January 12, 2017.

<http://www.policy.hu/ali/LUMS%20paper%20on%20the%20seed%20industry.pdf> (last accessed date January 12,2017)

<https://en.oxforddictionaries.com/definition/seed> Last accessed date january 13, 2017.

<http://www.technologyreview.pk/state-seed-pakistan/>

https://www.vnrseeds.com/Uploadimage/Article_Importance%20of%20Seed.pdf(accessed December 30,2016)

https://www.indiaagronet.com/indiaagronet/seeds/CONTENTS/seed_quality.htm Last accessed date January 13, 2017.

<http://seedgrowers.ca/seed-growers/what-is-canadian-certified-seed> accessed January 13, 2017.

<http://isha.sadhguru.org/blog/lifestyle/food/7-health-benefits-of-ragi-6-great-ragi-recipes>,last accessed date January 14, 2017.

<http://eschooltoday.com/ecosystems/what-is-an-ecosystem.html>(Last accessed date 12,2017)

http://www.biodiv.be/biodiversity/about_biodiv/biodiv-what>, (accessed, January 5, 2017).

<http://documents.mx/documents/formal-and-informal-seed-supply-system-in-pakistan.html/>

<https://www.syngenta.com.pk/about-us> (Last accessed date January 12, 2017).

<http://www.sorghumcheckoff.com/all-about-sorghum> Last accessed date January, 13, 2017.

<http://www.icarda.cgiar.org/mission-and-vision> (Last accessed date January 13, 2017)

<https://www.sciencedaily.com/terms/pathogen.htm> Last accessed date January 14, 2017.

<http://www.cimmyt.org/organization> Last accessed date Last accessed date January 18, 2017.

<http://www.lahoreindustry.com/monsanto-pakistan-agritech-pvt-ltd-co4271> (Last accessed date January 23, 2017).

<http://www.monsanto.com/whoweare/pages/pakistan.aspx>, accessed (Last accessed date January 23, 2017).

<https://www.pioneer.com/home/site/pakistan/about-pioneer> (Last accessed date January 14, 2017)

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.195.468&rep=rep1&type=pdf>>, last accessed date January 22, 2017).

<http://www.encyclopedia.com/plants-and-animals/agriculture-and-horticulture/agriculture-general/green-revolution> (Last accessed date January 24, 2017)

http://ageconsearch.umn.edu/bitstream/211560/2/Rana_et_al,_Seed_systems_in_Pakistan,_IC_AE_15%5B1%5D.pdf (Last accessed date February 8, 2017)

<http://www.dawn.com/news/1178360> Last accessed date February 22, 2017

<https://www.wto.org/> Last accessed date 23, 2017

<http://www.beyondpesticides.org/programs/genetic-engineering/herbicide-tolerance>, Last accessed date 26, 2017,

<https://tribune.com.pk/story/1023147/senate-body-approves-plant-breeders-rights-act/> Last accessed date February 28, 2017.

<http://envirocivil.com/environment/convention-on-biodiversity-and-pakistan> , Last accessed date March 15, 2017.

<https://www.iucn.org/about> Last accessed date March 16, 2017

<http://envirocivil.com/environment/convention-on-biodiversity-and-pakistan/>> Last accessed date March 16, 2017

<http://www.planttreaty.org/sites/default/files/gb5re.pdf>.

Southeast Asia, Australian Journal of Asian Law, Vol. 13, No. 1, 2012 Last accessed date March 18, 2017

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2159488

<http://www.upov.int/portal/index.html.en> Last accessed date March 18, 2017.

https://www.researchgate.net/publication/228968363_The_Protection_of_Plant_Varieties_and_Farmers%27_Rights_Act_of_India Last accessed date March 24, 2017