



## Book Review

### **Promoting Sustainable Innovations in Plant Varieties**

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Publishers: © Springer-Verlag Berlin Heidelberg

Year: 2016

ISSN 2199-7462 ISSN 2199-7470 (electronic)

Munich Studies on Innovation and Competition ISBN 978-3-662-52795-5

ISBN 978-3-662-52796-2 (eBook)

DOI 10.1007/978-3-662-52796-2

Library of Congress Control Number: 2016946352

Price: Euro 114.99

No. of pages: 335 + xxi p



Plant varieties are the genetic vehicles of crop species that enable crop productivity for food and fodder. The cassette of genetic information that prevail upon the performance of crop varieties for high yield, tolerance to various stresses as well as the preparedness for surviving aberrant weather patterns is developed through innovation. Plant breeding for improvement of crop traits has evolved from the farmers' efforts to the highly focussed efforts of the research scientists. The narration in the book by Dr Mrinalini Kochupillai develops around her doctoral research to study the facets of developing plant varieties through innovation. The perspective whether farmers own seeds have novelty in traits, distinctiveness and uniformity vis-à-vis that from plant breeders of the public institutions or from private seed companies is exhaustively discussed. Dr Mrinalini Kochupillai succinctly raises the arguments on the sustainability of crop plant varieties and agriculture based on her doctoral work including field studies in the context of Indian agriculture. Spread over seven chapters with useful seven annexure and robust bibliography, the book narrates the socio-economic panorama of sustainable innovation in the development of crop varieties at farmers' innovation level and that of seed industry.

The author adopted a multi-disciplinary approach in order to suggest means of promoting 'sustainable innovation'. Accordingly, a mixed methods approach comprising an exploratory approach, based primarily on qualitative analysis and a confirmatory approach, based on quantitative analysis, was selected to answer several hypotheses and research questions. The dominant design for the qualitative segment of this research was the historical method coupled with conventional legal research using the tools of literature review and legal interpretation and critique (e.g. of statutory provisions and decided case law). The dominant design for the quantitative segment was the collection and statistical/econometric analysis of non-experimental data, including available data on plant variety application trends and survey data.

The introductory chapter provides for an analysis of the philosophical and economic justifications of 'sustainable innovation'. The author dwelt deep into the Schumpeter's 'Creative Destruction' (as appeared in '*Capitalism, socialism and democracy*'), the destruction may or may not be complete and permanent—there is always a possibility that the old reappears, perhaps in an improved version or by virtue of its antique value. In Schumpeterian 'Creative Destruction,' therefore, while there is no forced destruction of the less desirable, there is nonetheless, a possibility that the old is completely destroyed, *inter alia*, due to obsolescence. 'Sustainable innovation' in plant varieties is accordingly defined in this book as the parallel promotion of both *in situ* agro biodiversity conservation and innovation in the form of crop improvement by both farmers (informal sector) and breeders (formal sector). The terms 'rural innovations', 'informal innovations' and 'farmer level innovations' in relation to seeds are used inter-changeably in this book. They refer to improvements and/or *in situ* evolution of seeds resulting from initiatives of individual farmers or farmer collectives without any intervention or support from the formal sector (i.e. the private or government sector plant breeders). The significance of conservation of crop genetic materials by farmers and communities fades out when old varieties are replaced with new ones.

The author develops strong parallel between Sombart and Schumpeter in elucidating the 'driving forces of transformation' and creative destruction. Innovations as drivers of capitalism for developing their ownership are prominent in the work of these authors. The farmers innovate

to select plant types of crops from available land races that have specific advantages of yield, resistance to prevailing agro-ecology and weather situations and with specific quality of the commodity. The evolutionary origin of land races as genetic cassettes of crop genetics has resulted in the utilisation by human beings into cultivable crop varieties by selecting and inbreeding them to create uniform agronomic characters. These selections are shared amongst communities and villages that become traditional crop varieties in large scale cultivation. In order to efficiently utilise such traits, modern plant breeding utilised higher level scientific tools and techniques to utilise these genetic traits and created open pollinated crop varieties and hybrids, as the case may be. While doing so, the author expresses reservation on the sustainability of traditional genetic make-up and traits and hence the Schumpeter theory of destructive creation is bought in.

The chapter 2 explains the notion of 'sustainable innovation' from an international legal perspective by providing an overview of the international legal framework within which plant variety protection laws and agro biodiversity protection laws, are contextualized today. The chapter also explains the motive behind the coining of the term 'sustainable innovation' and why a specific definition was assigned to the term.

The issue of sustainable innovation from a scientific and ecological perspective has been discussed in Chapter 3 by describing the traditional and modern methods used for crop improvement. Socio-cultural factors that affect and are affected by formal and informal/traditional seed improvement methods are also discussed in this chapter. It also delves into the economics of plant breeding associated with the direction in which modern plant breeding technologies are headed.

The next chapter 4 describes and analyzes the Indian agricultural sector and plant variety protection regime via the evolution of Indian national agricultural policies, recent case law, case studies and plant variety application trends. The discussions in the chapter identify a paradox in the laws and policies relating to plant varieties in India, and by extension, in any other country that seeks to simultaneously promote both *in situ* conservation of agro-biodiversity and formal innovations in plant varieties: laws that promote the latter appear to undermine or dilute the impact of laws and policies designed to promote the former, and vice versa.

Chapter 5 provides the details of the findings and conclusions drawn from the statistical analysis of the data collected via farmer surveys in India, including the method adopted for coding and analyzing the data, which helped confirm or tentatively reject the hypotheses emerging from the literature review and the qualitative research presented in the previous chapters.

Chapter 6 takes another look at Schumpeter's theory and definition of innovation and its relationship with modern intellectual property laws. It identifies (a) the specific market failures that plague the present day plant breeding/innovations sector and (b) an anomaly in the structure of intellectual property protection regimes (particularly patents and the plant variety protection regime under UPOV 1991) that interferes with their ability to address these market failures and promote 'sustainable innovations' in plant varieties.

Accordingly, the chapter 7 which enumerates a set of recommendations, concludes by suggesting that regimes beyond those designed to protect intellectual property rights would likely be necessary to promote 'sustainable innovation' in plant varieties in general, and *in situ* conservation of agro biodiversity in particular.

In the plant breeding, unlike in any other industry, the conservation and natural evolution of the 'old' is as important, if not more so, than the creation of new varieties. This is especially true because of the characteristics of the 'new' varieties: They not only are engineered to have severely limited genetic variability (making them unsuitable for marginal environments), but are also engineered to prevent *in situ* seed saving and seed improvement by farmers. The author develops this thought considering seed (plant breeding) industry as the major focus. In countries such as India, where the crop improvement has been entrusted to the public institutions from colonial times, the major crop varieties that farmers cultivated until the end of the last century was of public bred crop varieties. In the hope of exploiting hybrid vigour in crops such as rice, maize, sorghum and pearl millet as food crops and of cotton, research on hybrid vigour was intensified. Private entrepreneurs also developed for hybrid seed production of these crops. They blossomed into organised industries. In many other continents, private investment for crop improvement research and their hybrid seed production

was strong. The principle for introduction of new crop varieties shall be based on the addition of new genetic traits to make the new one superior to the old one. The spectrum of the catalogued local land races that are located through plant genetic surveys may not be complete and would always have scope for addition with new, unique land races that are evolved to adapt to present agro-climate and ecology. The investment for this is the key to innovation in seed sector.

Another facet that the author builds around is the right of farmers' innovations and commercial intent of seed industries' innovations in utilising genetic traits of land races and such plant types of crops with large number of useful characteristics. So the traditional knowledge and associated genetic materials to enable new knowledge and products need due recognition. Considering such common persons as 'partners of capitalist stratum' that thrive on new crop varieties is the advocacy developed in this book. This partnership of the seed industry with local communities/farmers in utilising ITK of genetic information and land races is argued in this book as the 'partnership at capitalistic stratum' and a 'symbiosis of the seed industry with farmers'. It is further argued that this relationship is stronger when the farmers utilise the improved crop varieties / hybrids to gain better economic return from their farms. The institution of traditional innovation system is destroyed in this process and new institutional system of seed industry for crop seed development is created. It is argued that intellectual property laws and associated policies do not secure *in situ* seed conservation. The author fears that the 'technologies that are designed' for new varieties rule out the possibility of seed saving and improvement.

Seed replacement has been an approach to sustain crop productivity by ensuring genetic purity. The seed replacement ratio (SRR) has been good in cereals such as rice and wheat while in pulses it is not so commendable. The issue of SRR in pulses has been discussed. Pulses have the dubious distinction of being cropped in marginal lands under rainfed agro-ecologies. SRR is a recourse to reduce genetic erosion due to the continuous use of seeds derived out of continuous self pollination over several crop cycles. This is mainly applicable to open pollinated seeds. Farmers' own seeds suffer from genetic degeneration after few crop cycles if the fields have adjoining plots cultivating other varieties of the same crop. Crop hybrid seeds do not have this challenge since annually fresh F-1 seeds are sold for cultivation.

The research leads to the recommendation with arguments on the need for relook on UPOV agreement and Protection of Plant Varieties and Farmers' Rights Act, 2001 to attain and promote 'sustainable innovations' in plant varieties. The author emphasised the need for managing agro-biodiversity conservation and land races are highlighted as sustainable innovations in plant varieties. Both 'formal sector' of plant breeders (both public and private) and the 'informal sector' of the rural folks in farms facilitate this process.

This book hence has intense analysis of the plant breeding for crop improvement through social, economic, legal and political framework. The highlight of Indian context for this analysis has been duly supported by the field research.. It is also noteworthy that the findings of this book are not only relevant to biodiversity rich developing countries like India, but also to those countries that do not have much agrobiodiversity of their own, but rely on agro-biodiversity emerging from other countries, to make their own plant breeding industry or agricultural sector more innovative in the short and long run. This book can be a good read for researchers, policy makers, academicians, law practitioners and civil society representatives working in the related domain. The book price in India is on a bit higher side. Maybe, the publishers think of bringing out a cheaper edition in future for its wider dissemination.

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