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Diffusion of agricultural biotechnology and intellectual property rights: emerging issues in India

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Abstract

Agriculture in developing economies is rural based with a majority of poor people dependent on it. Hence, any new technology that would result in improving the crop yield or reducing the cost will be highly useful. Particularly, biotechnology innovations have several useful applications in agriculture and are useful for developing countries. However, when such new technologies are protected by intellectual property the implications are different. The plant protection system available in India enables the farmer to save, use, sow, resow, exchange, or share the seeds of protected variety, besides offering protection on farmers' variety, extant variety and essentially derived variety. Such a system has scope for adoption of new technology as well as diffusion of the same. Whereas plant protection could boost research in the area of plant biotechnology by both public and private bodies, it could also result in higher prices for seeds, thus naturally excluding the small and marginal farmers from accessing such new technology.

Keywords: Agricultural biotechnology; Intellectual property rights; India

1. Introduction

Agriculture in developing countries is predominantly rural based with a vast majority of poor people dependent on it. Hence, any new technology that will result in improving the yield or reducing the cost of production will also directly reduce poverty and indirectly help the poor by lowering the price of food and by creating more employment opportunities. Traditionally, technical changes have occurred as on-farm experimentation, adapting different cropping pattern, and such improvements were kept out of intellectual property protection. For instance, during the Green Revolution (GR) period in India, many hybrid and high yielding varieties were introduced—particularly in rice and wheat. These were the types of seed variety that can be replanted each year, which made GR very successful. Furthermore, these seeds were then not protected by any intellectual property rights (IPR) measures. It was only after the Uruguay Round of talks in 1994 that IPR was extended to agriculture, mostly due to the insistence of developed countries, although some form of protection already existed in a number of developed countries. While the objective of providing protection is to promote innovation activities in agriculture, such IPR protection could limit the diffusion of

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technology by making agriculture more market-dependent and create more inequities in income and distribution partly as a result of size disparities.

There are three perspectives which are often discussed in the context of diffusion of technology. Diffusion of technology, in Economics, is characterized as involving the replacement of an old technology with a new one. In general, the characteristics of innovations identified as being most important in determining their rates of diffusion are their relative profitability and the required investment. According to this economic perspective, the delay in diffusion relate to uncertainty and risk, and lack of information about the new technology. In such cases, the degree of technical complexity or novelty of an innovation may be an important factor inhibiting diffusion (Basant, 1988). Applying this to seed technology, we observed that while Green Revolution made rapid strides in India and farmers adopted it on a large scale, it did not entirely replace the existing technology of using farm-saved seeds or the traditional cropping pattern. As commercialization started picking up, farmers' dependency on inputs from markets increased. The other question was whether the farmers with small and marginal land holdings would adopt the HYVs. However, several research studies have shown that small farmers do adopt new technologies (Shah et al., 1991; Muthiah, 1971). These studies also observed that the switchover from traditional to newer varieties has been more widespread among small farmers than among large farmers.

The role of diffusion agencies is emphasised in the geographic perspective. The establishment of diffusion agencies through which innovation is adapted to the regional specifics to make it appropriate for a larger population and induce adoption through aggressive propaganda measures is the salient feature of the geographic perspective on diffusion of technology (Basant, 1988). This perspective of diffusion emphasises the simple but important fact that unless some institution makes the innovation available at or near the location of the potential adopter, by establishing a diffusion agency, effective diffusion of technology does not take place. In Indian agriculture, the agricultural extension services provided by the central and state governments and agricultural universities serve this purpose. Seed companies and seed distributors also play a crucial role in disseminating knowledge about newly developed seeds and reaching the farmers with the newly developed seeds by providing line of credit or using promotional measures. Here the role of extension workers becomes very important. During the GR period, the extension workers, through the Training and Visit (T&V) program played a significant role. T&V extension suited the rapid dissemination of broad-based crop management practices for the high-yielding wheat and rice varieties that were released since the mid-1960s. But when new varieties like the transgenic ones are available, these diffusion agencies and the extension workers in the public and private sectors will have to play an active role in educating the farmers about the salient features of the seed, the nature of planting, requirement of fertilizer, timing of pesticides application etc. Adoption of new technology will be easy only if the farmers have adequate information about the new technology.

The economic history perspective of diffusion emphasises that innovation continuously undergoes technological improvement with different adopters and adoption to an increasing variety of users (Basant, 1988). According to this, diffusion and innovation overlap. When diffusion and innovation overlap, the profits of the original innovator declines. This is when protection of intellectual property rights becomes important for the innovators, especially in plant biotechnology.

One of the recent developments in plant biotechnology is in the area of genetically modified organisms (GMOs). Plant biotechnology refers to the alterations made in some of the basic traits of crops with the objective of enhancing the agricultural productivity or improving the value of the agricultural products by increasing the shelf life and availability of the product even during off seasons or by providing improved and hybrid seeds. Private investment in biotechnology research is far ahead of the public investment in developed countries ($5 billion), although public investment in biotechnology ($125 million) with the purpose of benefiting the farmers and consumers is increasing in developing nations (Qaim, 2001). Such huge investment has resulted in the demand for strengthening the IPRs in agriculture.

In this paper, an attempt is made to discuss the options available in providing IPRs in agriculture, which becomes essential with the growth in biotechnology-based innovations in agriculture. It also discusses