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Opinion Piece: Plant Breeder's Rights, Room for Maneuver?

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Introduction

Plant Variety Rights (PVR), often referred to as Plant Breeder's Rights (PBR), assignable in national law under the UPOV (English translation: International Union for the Protection of Varieties of Plants) Convention, are often pooled with institutional provisions and regimes of intellectual property such as patents and copyright in the contemporary discourse on innovation. While there are similarities in the appearance of some of the provisions of PVR and IPR in practice, we would argue that this represents more of a convergence of commercial imperatives than of a sharing of fundamental principles or philosophy, a convergence given weight and credibility by recent revisions to the convention. This convergence has put at risk the established norms and practices of sharing and cooperation in the breeding community. Whereas patents and copyright provisions support a system of exclusion from the intellectual content of the claimed right, PVR as originally conceived presents in our view a more inclusive mechanism in which the commercial right is limited to that of receiving royalties on seed sales and the dominant right is one of participation. Furthermore, against the conflationary tendency, we will argue that IP and PVR stand in a very different relationship with respect to innovation and the innovation processes of their respective contexts and that a constructivist re-evaluation of PVR might offer a position from which to overcome the current disconnection between plant breeding and the discoveries and enablement of modern plant science, via community action. We shall further argue that the input germplasm as well as the intermediate products of breeding and the output varieties should be accorded a status akin to common property within an operating framework based on open source working modalities.

Plant Breeding, Intellect or diligent best practice?

Plant Variety Rights arose from the context of a well established seed certification system which itself links back to the foundations of breeding as an

activity in the agricultural production chain (Sneep et. al 1979) (in fact the word breeding relates more to production that is to multiplication through reproduction, than to the practices of assortative mating coupled to recurrent selection). Breeding activities were initiated in many cases by cooperative farmer action and/or in public institutional settings, Svalov, PBI, Limagraine Van der Have being some European examples of the type. So, the setting for PVR is very much intimate with the practical assurance systems normally implicit with innovation and the production process itself. For what we might chose to call the innovatory process we can cite the development of the succession of quantally improved plant varieties which find their way into farming practice and the food production chain, each significant variety constituting an innovation, though rarely a radical one, once adopted. This innovation process has resulted in a steady year on year gain in field productivity of 1-3% depending on the crop generally with little other change in practice save the occasional novel agrochemical application and the similarly gradual scale up in mechanization. For those familiar with the expectations of technological discontinuities in other sectors of production then, this might seem an odd use of the term innovation. Within the agricultural sector, however, we are comfortable with this gradualist model of innovation. At the same time, we accept that occasionally step changes do come along, for example semi-dwarf wheat varieties (Lupton 1987), which change both practice and productivity expectations. However, as we shall see, Plant Variety Rights take no account of whether the new variety is of the gradual or the step-change persuasion, provided minimum standards of certifiable productivity advance are met (VCU, see box below). In the context of IP this seems bizarre that a semi-dwarf variety which embodies a significant intellectual input as well as lengthy trait-introgression activity attains the same status as a variety obtained merely by assiduous selection among the progeny of a pair of standard elite lines from last year's recommended list.

PVR should be seen for what it is, a narrow provision to enable the collection of royalties on varieties in use (a narrowly negotiable input levy on the user) and for supporting participation in the gradual innovation process. In fact, the very patchiness of the creative input into plant breeding makes the annexation or protection of this component problematic and puts it outside the scope of those things protected by conventional IPR. This is not to downplay the skills and tacit knowledge exercised by breeders in their practice, particularly in the recognition and selection of superior progenies. But although these are distributed, though not always continuously, across the breeding community they are not the basis for assigning rights. It is the properties and value of

Box 1 Assignment of Plant Variety Rights

Plant Variety Rights are assigned subject to written and material (seed or other propagation materials) to the national competent authority judged as supporting claim that the said variety is distinct and uniform, and is stable with respect its properties. This (DUS) requirement bears some resemblance to the "examples" of reduction to practice required in patent filings. A further requirement of variety registration is the demonstration, in competitive field trials that the said variety has value for cultivation and use (VCU). This has some resemblance to the utility requirement of patenting. However, VCU is different in so much as it relates to a set of definitive and material agronomic metrics rather than to the "novel solution" required of patent utility. The nature of the VCU/DUS requirement emphasises the roots of PVR within the seed quality control/certification system. Once assigned, the variety right grants to the breeder a temporary monopoly on the collection of royalties from those who propagate the variety. There is no right or, under normal circumstances, incentive to selectively exclude other parties from use of the variety.

the product (the variety) which decide. On these grounds one might argue that similarities with copyright remain. But copyright is awarded by default for originality per se regardless of the nature of the object whereas PVR are dependent on the utility of the object (VCU see box above) to which the assessment of creative content is secondary.

But we should remind ourselves that although the utility of the variety is the basis for assignment of the right, the right does not attach to that object. In the face of this apparent softness of PVR it is relevant to ask why we need them at all.

Why do we need PVR?

As highlighted earlier PVR are an evolved system functioning and integrated within the regime of seed certification, providing an assurance to the user, for which the input levy is paid. Their very closeness to the practical process of moving new things into use in farmers' fields sets them apart from patents which are erected as a barrier to wholesale exploitation.

Previous to the implementation of PVR either farmers cooperatively supported breeding by nominated professionals via a mutual output levy, or the public supported breeding activities in state institutions by taxation in recognition of a public good. F1 hybrids represent a special arrangement which served first to rupture the integration of farmers and breeders. Since the advent of PBR there has been an erosion of public sector breeding and a progressive domination by private companies.

As a distinct activity, plant breeding carries a heavy investment in work in progress. A breeding cycle can take 12 years from the point of choice of parents to commercialization of the selected variety. This means in effect that any breeder has 12 or more breeding cycles running in parallel, corresponding to very few royalty-generating varieties, at any one time. Given this investment and given that a variety is self replicating and effectively out of the breeder's hands once introduced to agriculture, the PVR provision provides an important driver in allowing cost recovery (plus a margin - usually pretty small).

Box 2 The breeding process

The breeding process in any of its guises may, as a generalisation, be regarded as the management of genetic variation. Central to the formalised process is the performance of sexual crosses either for the construction of superior parental lines or for the generation of diverse progeny from which artificial selections are made and, thereafter, varieties generated. Much of the expenditure of time and managerial effort in this multi-step process goes into the later steps encompassing the development of varieties to meet the criteria of seed certification and variety registration for Breeder's rights (DUS) i.e. remote from the original crosses. Technologies such as DNA marker assisted selection are brought in to the process to support the introgression of valuable traits into established varietal backgrounds whenever the former can be identified. Single seed descent and doubled haploid technologies may also be brought in to provide shortcuts to the generation of stable varieties. In short the process is driven in major part by the requirements of PBR and DUS. However, the role of natural selection in the early phases of selection, as an empirical and pragmatic component should be acknowledged.

In less formalised farmer-driven breeding the sexual cross is also central, though it often comes about as a consequence of in-field cross-pollination and the unscheduled traffic in germplasm across agro-ecological regions.

Simmonds (1993) has characterised this component of breeding as "base broadening" and it is characterised by such exemplars as the spontaneous hybridisation of indigenous rice (Oriza glaberima) and introduced alien species (Oriza japonica) in West Africa which has given rise to a diverse set of "broadened" lines under local natural and farmer selection (Semon et al 2004).

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It has been said that this aspect of PVRs is what moved plant breeding from the public/cooperative sector into the commercial private sector although the advent of F1 hybrid varieties had made possible the sale of non replicating seed before this (Klopenberg 1988).

The concept of the variety being effectively out of the breeders hands has two important consequences. First and most important is the availability of the variety to other breeders as an input to their breeding activities. This underlines our previous comments concerning the support of participation. A way of regarding this is to consider plant varieties as existing in a public space as a form of communal property from which all aspiring breeders can draw. The

variety is further out of the breeder's hands in that no would-be user can be excluded though the right to collect a pre-fixed royalty is protected.

So the individual breeder can be viewed as a temporary custodian of part of the freely available pool of germplasm and as an almost seamless actor in the breeding community.

This vision (version) of breeding activity is not far removed from open source peer production systems discussed by Benkler[1]. The source code (the pool of genetic traits) is available to everyone; it is readily distributed and replicates itself so that like software, it is not depleted by use. Anyone with the requisite skills and experience can be an actor in the improvement process and the process itself, requiring no vast infrastructure, is relatively routine and well established in theory and practice.

This sustains a Mertonian vision of the plant breeder's reward being the opportunity to play a constructive role in a socially valuable process within which cooperation and sharing of knowledge and materials is an established norm (Gepts 2005).

Revisions to the UPOV Treaty

The idealistic vision of plant breeding articulated above as a distributed but communal activity based on an open resource (genetic variation) which is a sort of common property, is confounded by a more recent convergence with the patent system. In fact, the allowance of the so called double protection (the use of patent and PVR effectively to cover the same material) as furnished in the revision of the UPOV convention in 1991 is a perfect illustration of the trend (Hughes 2002). Additional rights have been granted to the breeder so that their permission is now needed before material can be multiplied or used for further breeding. The revision also provides for the extension of PVR to "reach-through" to harvestable agricultural products rather than just propagating materials. Reach-through provisions are a characteristic of patent licensing arrangements which allow licensors to recover royalties on the products subsequently derived from developments of the patented technology. Again we see an inexorable convergence of PVR with the practices of IPR enforcement via a sustained outreach over material in use, eroding further the material seed as a common property.

1 http://www.benkler.org/CoasesPenguin.html ; see also www.bios.net as an example of a contemporary initiative in knowledge and tool sharing in the field of plant science

TRIPs and CBD

Of major influence to the property status of breeding materials has been the Convention on Biological Diversity(CBD). Stemming from the Rio Summit it represents an institutional provision which assigns sovereignty over genetic resources to the state in which they are located. Its effect along with the revisions to UPOV is to fragment the principle of a common breeding resource by shifting not only responsibility for conservation but also ownership to the institutions of state. Further confounding to the principle of communal resource came the imposition of TRIPs (Trade Related Aspects of Intellectual Property) by the World Trade Organisation. TRIPs required the establishment and mutual respect of national systems for the protection of intellectual property by those prospective trading nations which did not already have them in place. The provision was expected to include the protection of plants and varieties (article 27.3B)and served to further conflate PVR with conventional IP (Blakeney 2004).

It also served to amplify the stark disparity between well resourced breeders of the developed world and the farmer/custodians of breeding materials in the developing world, the latter for whom the exercise of Plant Variety Rights is not an option or a practical or relevant proposition (see box 2). An intensification of the rhetoric on Farmers' Rights has been the understandable response to this disparity. Also, states have been advised by advocacy groups against subscribing to national PVRs (GRAIN[2]) or at least to undertake careful analysis of their ambitions or expectations for participation in competitive breeding or export trade before doing so(IPGRI 1999).

The aforementioned disparity falls into sharp focus when we reconsider the diverse ways in which breeding materials are deployed. As was discussed in box2 Farmer's varieties tend to be a dynamic breeding resource in themselves rather than the detached fixed end product characteristic of varieties subject to PVR protection. Commercial breeders, so far as I'm aware have not been obliged or expected to open up their intermediate material, crosses, backcross populations, progenies and selections, to the community, whereas farmers varieties with their dynamic continuous improvement trajectories are regarded as appropriate for collection and deposition in ex-situ seed banks as a common resource. The disparity is one of historically and institutionally "closed" versus "open" breeding systems. The concept of Farmers' Rights, to

2 GRAIN Ten Reasons not to join UPOV http://www.grain.org/briefings/?id=1

a small degree, comprises a response to this disparity in recognizing the contribution made by farmers' generations to the conservation of diverse germplasm. As we shall see, the right as configured within international agreements is a right to some form of sharing in the benefits accruing from their labors when the germplasm is incorporated in profit-making varieties elsewhere, as well as a right to be consulted and to have a role in decision making concerning the deployment of material in their custody (Andersen 2006).[3]

Internationally Farmers' Rights are accorded recognition in the International Treaty on Plant Genetic Resources for Food and Agriculture, within which a multilateral system for managed access to plant genetic resources in particular those held in ex-situ germplasm collections under the FAO international Undertaking has been negotiated. Its mechanism is based upon a material transfer agreement (MTA)[4] which contracts those who draw and exploit accessions from the collections to share a part of the financial benefit stemming from subsequent protected varieties with the administrators. This levy, it is expected, will be deployed in some way favor of the farmers who contributed material to the collection. This mechanism, acting via the major germplasm collections, does not exclude the possibility of bilateral agreements between the custodians and users of germplasm based on informed consent and formal terms (Andersen 2006). Either way, farmers are drawn in to a form of closed institution of complexity and transaction costs and into a concept of ownership and empowered exclusion. We can imagine their enthusiasm or rather lack of it, to participate.

A consequence of this is that current PVR and Farmers' Rights in seeking a balanced justice for breeders' and farmers' contributions to society at large, effectively conspire to restrict and encumber the exchange of materials. The burden extends to international agricultural research centres such as IRRI (The International Rice Research Institute) which have been obliged to devote resources to management of the increasing impact of material transfer agreements and intellectual property and the obligations associated with them in relation to the custody and traffic in breeding materials (Egelyng 2005).

All of this prompts the question of how we might secure justice while promoting community action in plant improvement, of how to sustain a traffic in plant traits which allows for the construction of optimal trait combinations in varieties for local use. Local use as used here applies to the combined inputs

3 for the sake of brevity I have not included the equivalent and parallel discourse on farmer knowledge within the discussion of Farmers' Rights

4 see http://www.fao.org/ag/cgrfa/itpgr.htm

of local materials, exotic materials, local knowledge and formal scientific knowledge to construct a range of varieties for selection in specific agro-ecological circumstances.

Impressed by the communal principles supported by the original PVR in relation to the common pool of varieties as breeding resources and its similarities to the principles of Open Source working, but aware of the disparities in how breeding resources are conceptualized between farmers and breeders, we are inclined to the principle that re-embracing of the former and a leveling of the latter might constitute a valid approach.

Our suggestion would be that early material in breeders' programs be regarded as a part of the shared communal resource just as farmers varieties (as discussed above - *their* breeding material) have been. This would not erode the opportunity of breeders to recover their costs by registering finished varieties for PVR, but would reassure farmers that they would have equal access to materials such as the introgression lines of traits of which they or their peers had been custodians. This could remove the need for Farmers' Rights at least as a specific bolster against PVR. Concordantly the material transfer agreements associated with transfers of materials if required at all could be simplified to the form of the General Public License used in source code software exchanges. The obligation implicit in this would be that breeding materials derived from a germplasm accession would be assigned to the communal germplasm resource i.e. improvements would be shared with the community as was the original intent of PBR.

We might expect that such a radical proposition would be resisted by competitive plant breeders fearing for their competitive edge and lead time over their competitors and accustomed to the enclosure of their activities. But it should be possible to convince them of the merits of returning to an open system and the opportunity of collectively exploring a greater range of traits than they could individually, and of making their contribution to as well as benefiting from the sustainability of trait-traffic in the global community.

Of course, as with Open Source (Benkler 2001) there is always the potential problem of free-loading as has been the case where farmers' varieties have been directly registered for PVR in new jurisdictions, and also there is the possibility of the tricky use of double protection or strategic transgene introduction to dilute the breeder contribution to such an open system (Hughes 2002). However, such transgression is likely to have only a small impact on the global scale.

Genomic science has provided us with some excellent tools to support the introduction of novel diversity into plant breeding (Hughes 2006). We now need to facilitate equitable access to and dissemination of that diversity in the global context. The proliferation of exclusionary rights and sovereignties, however justly they might seem to balance one against the other is a barrier we have to surmount.

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