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Chapter 10

Seeds: from commodities towards commons

Guido Ruivenkamp

Introduction

Seed production in recent decades has been subordinated to the commodified system of global food chains steered by transnational corporations. The focus of this chapter, however, is on ways in which diverse groups of actors have begun resisting further appropriation by organising alternative and sustainable modes of seed production in common. The production of seeds is discussed as a domain through which the social struggle of commoning against commodification evolves. Referring to a long-developed research focus on seeds as ‘politicising products’ (Ruivenkamp, 1989, 2005, 2008), the discussion centres on how new alliances between immaterial and agrarian labour are emerging and thereby creating social relations that strengthen the perspectives for producing seeds for food crops as commons.¹

The first section presents a short overview of the history of the social transformation of seeds as natural commons (external to capital relations) into commodities (internal to capital). The following section looks at the social struggle over commons in the actual epoch of contemporary capitalism and discusses some oppositional movements for the re-commoning of seeds;² this comprises a consideration of some of the multiple practices of commoning in seed development and applications ongoing today. The chapter concludes with a reflection on the opportunities for

this immaterial and agrarian labour (the common) to produce something genuinely new – not, that is, new seeds as new objects per se, or not primarily this, but rather seeds as representing new social relations external to the social organisation of global food chains and thus creating new perspectives for diversity in producing and living – so diverse forms of life – outside of capital and its commodified relations.³

From natural commons to commodities: the social transformation of seeds

There is a long-standing practice among peasants⁴ in various regions of the world of exchanging plant genetic materials and seeds. The varieties (landraces) developed through this social cooperation are considered as natural commons, as a common heritage of mankind or at least as a common heritage of the communities in the region or of the nation of peoples. In recent times, however, the safeguarding, exchange and development of the plant genetic materials through the social cooperation of the peasants has been taken over by public and private institutions (see below). Thus, the crop genetic resources has become increasingly externalised, colonised, absorbed and put at the service of privatisation by these institutions, which modified the resources into commodities and made them into products of profit and command.

Through the change of the property regime of the seeds (previously controlled by peasant communities but appropriated by public and private institutions), seeds were transformed from a common natural resource (a natural commons) into commodities and developed immanence in the social organisation of global food production, absorbing the characteristic social relations

of that production system (Ruivenkamp, 1989). The modern farming style (van der Ploeg, 1999) thus became what Feenberg (1999) termed 'the cultural horizon' for the further development of seeds, with the selection of specific aspects to be inscribed into the new knowledge-intensive products. The production of these new 'informationalised seeds' (Ruivenkamp, 1989, 2005) was not only aimed at creating new crops, new objects as such, but also at creating *new social relations* in farming and food production. The new seeds mediated (Verbeek, 2000) the social organisation of labour in agricultural production systems and became 'politicising products' (Ruivenkamp, 1989, 2005), reinforcing and creating social relations internal to the capital arrangements of global food chains and controlling at a distance the social organisation of agricultural production. This process involves the transformation of seeds as pre-modern, natural commons into seeds as man-made, commodified products of cognitive labour – the seeds themselves increasingly become subjects, effecting drastic changes in the social organisation of labour in global food chains. It thus becomes relevant to develop insights into the ways through which the work of labour in seed production has been appropriated and transformed by public and private owners, and how a range of social forces are creating antagonistic practices of commoning that move plant-breeding knowledge from a positioning internal to capital to one that is external and relates it to new forms of careful *agri-cultural* production (Lemmens, 2010).⁵

The commodification of seeds

The societal transformation of seeds from an item of common heritage into commodified product is realised by changing the social relations with regard to the objects concerned (the seeds).

Of these social relations, the following three are considered here: the changing composition of labour, the tendential transformation of the immaterial/material composition of seeds and seeds as subjects for social transformation.⁶

The changing composition of labour

An important aspect that contributed to the historic trend of transforming seeds from common to commodity is the gradual change of the social group that holds and acts in relation to the plant genetic materials (the seeds). Originally – for centuries indeed – peasants and peasant communities safeguarded, exchanged and developed the plant genetic materials, managing them with a loose set of rules that were generally established by the cultural norms of the community. Generally these operated environmentally on principles of harmony with nature and socially on the basis of reciprocity and gift exchange (Kloppenburger, 2010; Martinez, 2015). Innovation occurred through this system of ‘eco-friendly’, *communal* development. The genetic diversity we find within the crop genetic resources today is a result of this sharing and exchange of plant genetic materials over generations. It is important to note that innovation through exchanging, producing and developing plant genetic materials took place despite the fact that there were no market mechanisms to control the production and distribution of the plant genetic materials, and that no community, state or company has had an exclusive proprietary right to claim ownership of them. The plant genetic materials were considered part of the common heritage, safeguarded and developed by the peasants in different ecological regions.

This changed in the nineteenth and twentieth centuries, when the project of modernity in agricultural production was

imposed, leading to what has been called the most dramatic change in the second half of the twentieth century: the creative destruction of the peasantry (Hobsbawm, 1995: 289), a social cleavage that forever cut the modern present from the agrarian past. An exemplar for that social transformation was the transfer of the safeguarding and development of plant genetic materials into the hands of public and private research institutions. This creation of a property regime now has its own history, a dynamic force in which there has been a growing awareness of the wealth of the diversity of plant genetic materials, originally conserved and developed *in situ*, on peasants' plots, embedded in their social and cultural relations. In other words, the development of the seed (genetics supply) industry has been based on the recognition and appropriation of the commons, by gradually dissolving the strong interrelationship between crop genetic resources and their social/cultural environment and its associated productive relations. Separated from these social relations, genetic wealth became an object in itself.

This objectified genetic wealth was first transferred and exhibited in botanical gardens and subsequently stored in international agricultural research centres, national research centres and by companies. Through this storage in the gene banks of public and private research institutions, the plant genetic materials came gradually into the possession of state and capital, and through this change of property, regime other social relations were modified. For example, the *ex situ* storage of plant genetic material by public and private institutions devalued the role of its *in situ* conservation by peasants.⁷ Moreover the changeover from *in situ* to *ex situ* storage concerned not only a relocation of the storage entity, but also, and more fundamentally, indicated a

reinforcement of the trend to disconnect plant genetic materials from their natural, social and cultural environments. The institutional installation of the gene-bank storage system enabled plant breeders to rewrite the plant genetic materials, increasingly referring less to their socio-cultural embedment and expressing the materials in scientific formulae.

As plant genetic materials were stored, evaluated and classified in terms of their genetic composition, only understandable and accessible to the scientific breeders working within the public and private research institutions (Patnaik, 2015, 2016), scientists rather than peasants became the experts in developing crop genetic resources, and they were able to modify these resources into the new 'miracle seeds' of the Green Revolution. Completing a kind of circle, the application of these crops in farming systems now needed to be 'explained to' the peasants – through a new group of professionals, the extension officers – which created new commodities (information, advice, communication) to be sold (or given as part of the seed sale) to the peasant farmers (or 'smallholders' as they had become known), who themselves increasingly became perceived as ignorant and passive receivers of these now externalised and commodified seeds and supporting chemicals.

The transfer of the possession and development of crop genetic resources from peasants into the hands of public and private institutions – referred to as the 'externalisation of agricultural research' (van der Ploeg, 1987) – converged with the industrialisation and commodification of agricultural production, built upon various institutional rearrangements.⁸ These rearrangements ensured the social (common-to-commodity) transition of seeds through which they became the products of

abstract labour, organised internally by capital relations. The further development and production of these commodified seeds became primarily (re)located within the social organisation of global food production chains, which enabled plant breeders to extend their (indirect) control over agriculture and its associated production process, and thence to further 'improve' the plant genetic materials.⁹ The improvement of the genetic composition of global food crops, whether for profit or to solve the global hunger problem, was – is – thus implemented through the inscription of specific traits in the seeds, strengthening the changing composition of labour in their material design and transforming the commodified products into agents for change.

The changing composition of the immaterial and material elements in seeds

In addition to the change in the social groups that hold (possess) and work on (develop) the plant genetic materials, the product itself is also changing. Characterised by their composition of immaterial (environmental, social, cultural, political) and material (physical) aspects, the development of seeds is interwoven with this totality of social relations embedded and expressed in them as an immaterial–material composite. The different environmental situations (cold/hot, dry/rainy climates, etc.) in specific sociocultural contexts (industrialised or small-scale farming) with associated political implications (multinational or peasant oriented) taken as a whole determine which plant characteristics are perceived as desirable to be bred for and thus eventually cause changes in the plant genetic material.

The use of agricultural crops in specific ecological zones and local climates was originally introduced as a process of

evolution through the interaction of the plant with its natural environment. Natural selection enabled plants themselves to internalise the requirements for good growth from their environment into their genetic programme (Ruivenkamp, 2005).¹⁰ For this reason some plants grow well at high altitudes, for example, and others at low. Indeed, as Martinez (2015) has shown, the peasantry developed and exchanged the landraces incorporating the different types of environmental and social aspects indicated above; it was this specific content of the im/material composition of the seeds that played a key role in the exchange and breeding activities among peasants

This practice of making use of the existing diversity of the im/material composition of seeds has gradually been replaced by the activities of research institutions aiming to *intervene* in the im/material composition of the seeds. These institutions direct their activities to changing the im/material composition and the narrow relationships between plant growth and natural surroundings. An illustrative example is that of the breeding during the Green Revolution, in which the im/material composition of seeds was changed by introducing other information into their genetic programme, especially for the purpose of higher crop yields. The commodification of seeds concomitant with the Revolution was based on a dualistic development: improved plant-breeding techniques ‘freed’ the agricultural varieties from the limiting characteristics of their natural surroundings, but replaced this with agricultural research incorporating into the seeds’ specific scientific information with related dependencies for inputs like extension officer knowledge and pesticides. It is clear that this transformation – the uncoupling of seed reproduction from its surroundings and re-coupling it to scientific

information – has not yet been completed, and offers new opportunities for commoning as well as for commodification.

Much in the same way as common land was claimed in the face of enclosure in Britain, some landraces are nowadays consciously and politically claimed as commons by local, indigenous peoples – such as in the case of potatoes in the Bolivian Andes (Rodriguez, 2010). This illustrates a new social struggle focused on the specific scientific information that may be incorporated in the seeds. Indeed, a division – and contradiction – *is* emerging between, on the one hand, breeding programmes focused on the development of informationalised seeds with their politically loaded, immaterial content (of the socioeconomic organisation of global food chains, i.e. the politicising seeds developed within the cultural horizon of global food-chain capital); and on the other, multiple, alternative forms of seed development in which other social objectives are incorporated and which are referred to through their products as sub-political seeds, developed from inside labour and through practices of commoning (Ruivenkamp & Jongerden, 2013).

The externalisation and scientification of seed production (van der Ploeg, 1987, 2008), referring to the cultural horizon of the modern entrepreneurial farming system embedded within global food chains, has stimulated the continuity of a specific plant breeding trajectory in which, among other practices, seeds are hybridised (Kloppenborg, 1988, 2010). This is a trajectory that has even led to a reproduction of crops that are disconnected from the plants themselves, and replaced in some limited (F1) lines possessed by public and private institutions and used for developing varieties without the vigour to self-propagate, (i.e. sterile, forcing farmers to buy new seed every year). This

is a trajectory of the biochemicalisation of seeds (Ruivenkamp, 1989), indicating that the scientific information incorporated in the seeds changes them in such a way that the research institutions become the agents able to control from a distance (through their seeds) not only the reproduction of the seeds but also the cultivation of their crops, programming things like whether the crops should be cultivated with or without herbicide and on a large-scale industrial farm or a smaller setting.

The sense in which seeds are imbued with a political meaning thus becomes perfectly clear: they contain a value-laden, immaterial content that prescribes a choice between referring either to the use of chemicals and high-yielding, hybridised varieties cultivated on mechanised and large-scale farms, or to the development of crops cultivated in farming systems built upon crop rotations on small farms embedded in local food networks. In other words, seeds are transformed into a politically loaded combination of material and immaterial content (politicising seeds) – which also transforms the researchers at public and private institutions into ‘political agents’ (Ruivenkamp, 2003a).

These researchers play a key role – through the development and manufacturing of the politicising seeds – in changing the social organisation of global food chains. This trajectory does not take place outside but, on the contrary, within an intensive social struggle around the creation of new social relations in the post-Fordist mode of food production, in which increasing opportunities also emerge to make other choices related to the informationalisation of seeds and to re-innovate the means–ends systems of these products. In other words, there is a potential to open perspectives for developing seeds as commons,

related to trajectories of sustainable, location-specific developments of agriculture that valorise and prioritise work (human rights), environment (sustainability) and food quality (health). This involves the appropriate introduction into locality-based farming systems of biogenetically engineered seed in a way that valorises well-being.

Seeds as subjects for social transformations

The transformation of seeds from a material into a primarily immaterial and (bio)politicising product has positioned them as a frontier of social change. On the one hand, public and private input-supplying institutions and companies are aiming to control agricultural production from a distance through their design of the im/material composition of the informationalised seeds, delivered to an increasing number of farmers around the globe. On the other hand, the relevance of the immaterial component in the seeds also enables researchers and farmers to create new alliances and develop other trajectories of seed development. Indeed, multiple efforts are being made to de-commodify seed production and to search for different means–ends systems in plant-breeding activities. A variety of strategies are being followed, embedded in quite contrasting systems of knowledge production – centralised versus decentralised, proprietary- vs. sharing-oriented, top-down vs. bottom-up and exogenous vs. endogenous.

It is apparent that the production of seeds can no longer be considered the production of pure products/objects, but that these objects are becoming subjects in the sense of creating new social relations. Considering ‘seeds as subjects’ implies that they can become a vehicle for social transformations, supporting

a range of forces to develop alternative systems of food production, creating ‘the event’ (Badiou, 2005) of a rupture of the presently operative and dominant production system. This process, moving towards the production of seeds as subjects – or their becoming a human commons, internal to the multitude – can already be discerned in various developments and different practices of commoning.

**From commodities to practices of commoning:
seed production reclaimed**

Three general levels of social struggle and change can be deduced from the multiple approaches to commoning seed production, with efforts made to

- Challenge the mode of ordering imposed by the global food-chain capital of commodified and informationalised seeds;
- Recompose the im/material combined form of seeds to revitalise local natural and social resources for development;
- Common the knowledge production with open-source approaches.

The overall aim of these efforts can be described in terms of a strategy to attune the science and technology of seed production to the perspectives of location-specific agricultural developments (‘tailoring biotechnology’), within a broad philosophy of re-territorialisation (Magnaghi, 2005, 2010), re-peasantisation (van der Ploeg, 2008) and agri-culture with care.¹¹

In the efforts to go beyond the limits of the imposed ordering of the seed products, social forces are developing a new kind of resistance. No longer a form of (defensive) reaction of ‘waiting

and refusing' – often exemplified in the approach of NGOs – this is an active form of production, involving the development of social cooperation through the design and implementation of seeds as subjects internal to the multitude. It is a new form of resistance based on innovativeness, on autonomous production between producing and consuming subjects (Negri, 2005; Lemmens, 2010), and on constructing local solutions to global problems by reassembling the resource base of food production within local food networks (van der Ploeg, 2008). It is important to emphasise that these various ways of producing seeds as subjects are not characterised by the desire for a confrontation with the genetics-supply industry, but rather by the work of developing continuously their own specific and dynamic practices. As Gorz correctly emphasises:

The movement against the commodification does not aim to take power, rather their objective is to change the world without taking power by hollowing out and delegitimizing the power of the institutions and authorities that hold it, by wresting ever larger spaces of autonomy from the planetary grip of capital and (re)appropriating the things capital has taken from people. (Gorz, 2010: 126)

The production of these ever larger social spaces takes place 'from within', with all those subjects who are indignant about and tend to refuse, resist and rebel against the ordering and subjugation of global food chains. It concerns a multitude of social forces, including peasant farmers aiming to reconstruct relations of care in agricultural production, regarding its natural environment, the soil on which crops grow, the landscape,

the local varieties, the food quality; peasants/farmers who are inclined also to create new social relations with the urban citizenry, offering holidays, relaxation and health care on their farms. It concerns members of unions reducing the environmental hazards of their agrochemical products and farmers' organisations widening the scope of the social objectives of their members to include the management and production of landscape and of diversity. It concerns researchers, entrepreneurs, consumers and citizens demanding the integration of broad ethical issues of 'justice' to be incorporated in production and consumption and the establishment of socially responsible entrepreneurship. It concerns organisations for animal welfare and many singular contacts between farmers and consumers at local level developing new strategies, from organic vegetable networking and regular farmers' markets to strengthening the trend towards a re-territorialisation of agricultural production and short food production-consumption linkages, and a whole host of other initiatives. It concerns fair trade and solidarity movements, emphasising the politics of food sovereignty and rights to food. It concerns the half-billion peasant-farmers in the world today and the one-third of the world's population that depends on small-scale farming to live.

That is, the practices of commoning seed production refers to a range of social forces that are constantly extending their social spaces within which new forms of seed production can be designed and implemented – seeds which, in their turn, may strengthen the socially transformative orientations of these countless initiatives through the embodiment of another, alternative political content. The co-evolving, transformative processes of the production of seeds from within these different

practices enable the creation of new alliances between different, apparently separated but actually closely interrelated actors (scientific researchers, entrepreneurs, workers in the genetics supply industry, farmers, consumers, environmentalists, ecologists, feminists, ethicists, etc.). Alliances emerge that, in their turn, may bolster these social forces to create new spaces for autonomy – ‘from inside their institutions, work-relations and domains of social life’ (Ruivenkamp & Jongerden, 2013: 306–12) – thus challenging the disciplinary command of global food chains and affording additional opportunities for practices of commoning in seed production. Taken as a whole, this comprises a clear trend towards an increasing variety of ‘oppressed voices and location-specific dialects of science and technology development’ (Ruivenkamp & Jongerden, 2013: 313–21).

Challenging the mode of ordering imposed by the commodified seeds

Various examples of practices of commoning in seed production have already been described (Ruivenkamp, 2005) and filmed (Ruivenkamp, 2008), but additional remarks need to be made reflecting on the social relevancy of these practices. Stimulated by Feenberg’s (1999, 2010) critical theory of democratising technology (also Veak, 2006), different tactics and strategies (Feenberg, 1999: 113, referring to De Certeau) can be discerned through which social forces in different regions struggle to de-commoditify and (re-)common seed production through the embodiment of another immaterial (political) content in seeds.

A concrete tactic of peasants/farmers who are technically managed¹² by the seeds is to cross hybrids with local varieties,

aiming to develop and improve the local varieties (landraces) by incorporating traits of the hybrids (e.g. high yield), but keeping the ability of the local varieties to propagate without losing their vigour. Hybrid seeds only give high yields during the first year of their existence; subsequent generations no longer have this hybrid power, so farmers are forced to buy new seed frequently instead of laying aside part of the harvest for sowing in the traditional way. By mixing local landraces with hybrid varieties, however, farmers undermine the embodied political content of the hybrids and thereby create a certain independence of the genetics supply industry, maintaining and mixing the desirable traits of both landraces and hybrids.

Further to these farmers' tactics, national research institutions in collaboration with farmer groups develop strategies to go beyond the embodied political content of hybrids by developing improved but open-pollinated varieties. For example, national research institutions and farmers' groups in northern Ghana have made clear choices to develop not hybrid but rather open-pollinated, enriched local maize varieties (called '*Obat-ampa*', which means 'good mother' in the local Twi dialect). These enriched varieties – well-embedded within local culture – are cultivated by farmers who deliver their products at the school feeding programme (Quaye et al., 2010), reinforcing the linkage of the improved varieties with local consumption needs and patterns.

Another strategy aiming to go beyond the ordering of hybrids is followed by some researchers making use of the apomictic properties of certain crops (i.e. their ability to reproduce asexually), so as to circumvent the biological protection of hybrid varieties. Cross-breeding apomixes into, for example, hybrid

maize varieties may create opportunities to remove the hybrids' biological protection against propagation and thus undermine the command of the genetics supply industry, thence allowing many more of the world's farmers an increased accessibility to seeds without the expensive disadvantage of regular seed purchase. However, this strategy can only be properly realised under one crucial condition – that the apomictic techniques become freely accessible, themselves commons.

Another option, less spectacular but possibly more convincing, are practices of changing the social organisation within which various techniques for breeding and reproducing crops are developed, specifically by modifying the vertical production chain of technology development into a horizontal network. For example, farmers in India together with NGOs and scientists combine science-based tissue culture applications in local tree species in India, such as amla, tamarind, custard apple and karaya, with people-based experiences of applying grafting techniques (Ruivenkamp, 2005). Another example is the cooperation between scientists and farmers in selecting, isolating, fermenting and distributing locally specific *Bacillus Thuriangiensis* (BT) material for their plant protective and growth stimulating characteristics (Vimala Devi & Rao, 2005). Through their social cooperation, scientists and farmers are challenging the ordering of a global production of pesticides by reorganising it into territorialised productions of things like BT sprays, as has been done in the south-eastern Indian state of Andhra Pradesh (Ruivenkamp, 2008).

Not only are the externally produced knowledge-intensive inputs rejected in these efforts, but also other products are produced, by combining traditional and modern knowledge

systems through which social identities are regrouped and reconstructed. This makes these scientists and farmers (farming communities) again co-innovators of a new production system within which plant growth protection and plant breeding are socially reorganised. The new varieties and techniques combining modern and traditional systems that are produced within this changed organisational setting actively challenge the social ordering and knowledge base of the entrepreneurial farming system embedded within global food chains.

Recomposing the im/material combined form of seeds to revitalise local natural and social resources for development

In various parts of the world, practices of commoning seeds are evolving with the aim of designing and implementing seeds that strengthen and/or create new linkages between agricultural production and its agro-ecological and social environment. Crop genetic resources are selected and added to scientific information to be introduced into cultivars in order to reinforce the regional quality of agricultural crops and/or refine a location-specific rotation of crops. A concrete example is the development of dual purpose, early maturing sorghum varieties in India, which not only facilitates the generation of additional incomes for farmers but also contributes to the restoration of soil fertility (Rana, 2000).¹³

Another strategy is to recompose the im/material combined form of seeds to reinforce the linkages between local crop development and local food production and consumption. Instead of developing the politicising seeds that disconnect crops from their local context and (re)connect the crop varieties to global food markets, the practices of commoning seeds

aim at producing seeds that reconnect them to the territorial (local, regional) potentialities for development. Vroom (2008, 2009), for example, has described how scientists, farmers and consumers in the Andean region are using local landraces to develop pest-resistant potato varieties, tailored to the specific food habits of the region. Another example is the development of the zinc and iron enrichment of local cowpea and maize varieties in Ghana, for which specific supporting measures have also been taken to relate the local cultivation of these crops to the local consumption of national dishes, such as *waakye* and *kenkey* (Quaye et al., 2010).

Various other examples of similar practices in other countries (Ruivenkamp, 2008) also show that research to enrich food crops needs to be strongly embedded within local food habits and actual social relations within which the technical improvements of the seeds are shaped. For example, the dissemination of protein-enriched maize varieties in Ghana cannot be separated from the smooth functioning of seed stations; in such a case, continuous consultation with the client groups is indicated. In Ghana also, farmers have emphasised the importance of maintaining specific traits in the nutritionally enriched maize crops – such as high yield, early maturation, resistance to heat and dryness and open pollination (enabling farmers to select their own varieties to plant after each season) – while local consumers have shown their preference for ease of cooking and fruit (pea) size and colour (Quaye et al., 2011). It is only the attuning of the breeding research goals to these specific needs of the local farmers and consumers that can guarantee the distribution of new crops and differentiate such practices of commoning from the application of similar efforts to enrich food crops (e.g.

golden rice) within a top-down, science-driven approach that links the enrichment of crops to the social relations of global food chains.

The practices of commoning that aim to revitalise local natural and social resources for a regional development has nothing to do with conserving traditional practices or a romantic return to the past. On the contrary, it represents a dynamic, progressive way forward (Manzini, 2005), towards a future of organising open local spaces from within endogenous developments (van der Ploeg & van Dijk, 1995). Concretely, the practices of commoning seeds realise the efforts of the common (the alliances of various forms of labour, the commonality) to restore (create and recreate) a territorial relation between the products of plant breeding and the local environment. This is done in many ways on various levels in different localities and carried out through different forms of partnership.¹⁴

The multitudinous production of seeds implies a continuing transformative process. Seeds are produced through the social cooperation of immaterial and agricultural labour. The seeds produced stimulate further institutional reorganisations and strengthen the alliances between immaterial and agricultural labour, which in turn creates new opportunities to continue producing seeds as subjects and vice versa. In short, a very dynamic process is set in motion, which includes a focus on changing the institutional base of the knowledge production.

Commoning the knowledge production

The practices of commoning seeds not only affect the embodied political content of the combined im/material form of the seeds, but also the institutional setting within which seeds are

developed as well as the agricultural setting within which they are implemented. In addition to changing the mode of ordering imposed by commodified seed, and further to a recomposition of the seed content, therefore, the practices of commoning also imply a change in the institutional setting within which the commoning of seeds takes place. The multitudinous production of seeds goes hand in hand with a reorganisation of the knowledge production system, hollowing out the power relations of the commodified seeds and global food chains.

It has been emphasised (Ruivenkamp, 2005) that the biopolitical, command basis of agricultural knowledge is built upon the non-transparent, complex setting of knowledge production. The knowledge production of informationalised seeds takes place in complex organisational settings, built upon fluid, hybrid, transnational networks of private/public and fundamental/applied research institutions. The complex organisational form of the knowledge production of the informationalised seeds is instrumental in the construction of an individualised research setting where the immaterial labourers have no opportunities to develop insights into the politicising content of the end products to whose development they contribute.

Although these end products are characterised by their contributions to the creation of new social relations, the very non-transparency of the complex knowledge production system leads researchers to be alienated from the social significance of their work. There is a disjunction or inherent tension between the organisational opportunities offered to the individual researcher to (technically) develop their work and the constraints placed on the individual researcher by the same organisational form with regard to critical reflection on

the social content of their work. The highly specialised type of work within these complex, opaque networks implies that the technical potentials of the immaterial production are increasingly separated from a political critical reflection, although that politicising content is, as argued, the single main characteristic of the products delivered.

This decoupling of the technical and politicising content in the production of the informationalised seeds due to the complex organisational form of knowledge production – resulting in an alienation of the immaterial labourers, in the classical (e.g. Sartrian) sense of a separation from the true self (simply, losing one's humanity) – is exactly what is challenged in the multitudinous ways of producing seeds as subjects. It is precisely because the immaterial labourers become aware of the politicising component as the core element of their products that they demand – and increasingly realise – the re-establishment of a direct connection between the technical and political content of their work, which involves, for example, consulting other knowledge providers, such as client groups.

It is important to observe that the multitudinous production of seeds as sub-political subjects occur in socially reorganised production systems.¹⁵ Systems no longer assume the rigid hierarchical and centralised and proprietary-oriented form but are increasingly horizontally organised in flexible and fluid networks built upon constant communication, information exchange, sharing and personal involvement.¹⁶ There is a social reorganisation of knowledge production that enables the immaterial workers to reflect on the means–ends relationship of their scientific research, and in which the consultation and participation of other actors play a crucial role. There is a

commoning, that is, of knowledge production, which opens the perspective of developing commons in the world of biotechnology and genomics. It is just this alliance of immaterial and agricultural labourers within the production of sub-political seeds that locates where concrete commoning choices about the specific information to be incorporated in the seeds can be made. This presupposes a dynamic and flexible form of knowledge development based on respect and exchange of different visions and knowledge systems. It also enables a transformation in the knowledge base of agricultural production that might reverse the trend of producing peasant ignorance and convert it into a revitalisation of their earth art, of their craftsmanship and their knowledge.

The radical break from the past that came with the wresting of, the ownership and control of plant genetic resources away from the peasants by public and private research institutions as outlined above involved also a drastic change in the knowledge base of agricultural production. The original knowledge base of farming practices built upon peasants' knowledge of their (own, pre-modern) farming practices was devalued and its role in the development of new seeds marginalised. As van der Ploeg (1987) observed, this implied that the craft of peasant farming – such as that related to the reproduction of crops – was no longer indispensable or even useful for good farming. The spread of the knowledge-intensive inputs still today 'produces ignorance' at smallholder level. Meanwhile, contemporaneous with the devaluation of pre-modern practice, a new market for information was being created, supplied by a new group of actors, the extension officers. Peasants increasingly became 'workers in the open air' remotely controlled by the life-sciences

companies and informed about farming practices by extension officers willing to sell their advice for a 'fair and friendly price' (Ruivenkamp, 1989, 2005).

This changing knowledge base is a dynamic process that can no longer be perceived merely as an imposition, for it has become the result of a common creation by different actors. Whenever the changed knowledge base for agricultural production is institutionalised, wherever the horizon of the modern entrepreneurial farming system is culturally established, the participatory plant-breeding methods within this institutionalised setting may contribute to a furthering of the trajectory of the commodification of seed production (internal to the capital of global food chains); this, in turn, can then integrate the residual informal knowledge systems of peasants into that commodified production of seeds. Still many other initiatives are evolving, as mentioned, that reverse this trajectory, challenge the functional relation of seeds to the modern farming style and change its design and implementation.

Seed production as a common(s) future

The social struggle around commodification and commoning manifests itself particularly in the design and implementation of various forms of seed production. Contrasting developments are taking place in the production of seeds as commodified products (internal to capital relations of global food chains) and seeds as commons (internal to the common, the alliances of immaterial and material labour). We are now witnessing the international consolidation in multi-billion dollar conglomerates of that historical development within which (politicised) commodified seeds are produced through the (literal) incor-

poration of (specific) scientific information referring to and strengthening the cultural horizon of modern entrepreneurial farming systems embedded within the social organisation of global food chains. Meanwhile, as an alternative to this, there is a range of decreasingly marginalised efforts compelled by a variety of social forces to common and develop (sub-political) seeds, themselves seeding a change in the embodied political content of the combined im/material form of the seeds aiming to reconnect crop development to local natural and social resources. There is a huge struggle unfolding that relates to little less than the future direction of world food production and consumption.

Yet there is no need for hyperbole. The simple, shocking reality of hunger today – approaching a billion ‘undernourished’ people, one in every seven of the world’s population – juxtaposed against science and technology development – some two-to-three billion dollars and euros invested every month in biotech R&D alone – illustrates the enormous gap that exists between those excluded from nutrition and well-being and the socioeconomic organisation of global food chains. Instead of passivity – waiting and hoping for the benefits of the present system to ‘trickle down’, or for multilateral institutional initiatives to eventually ‘manage development’ for those who are in need now – this article advocates for the initiatives of farming multitudes acting in common by setting up activities and alliances between immaterial and material labour in the domain of biotechnology and seed production. Peasant farmers around the world, reinforced by a variety of agents and actors, from research teams and consumers’ groups to charitable foundations and individual entrepreneurs, are beginning to cooperate

in a variety of novel, flexible ways to create social spaces in regional localities and international institutions, aiming to revitalise agriculture by reconnecting it to its local agro-ecological and social, cultural environment – its territory, its communities – with care.¹⁷

A range of innovative practices can be observed and envisaged through which the ‘tragedy of capital’, as it may be expressed, of the separation and devaluing of the common, here through commodified and informationalised seeds, is transcended, transformed by the common into seeds as human commons. The effect of this is to challenge the ordering and the embodied political content of the politicised seeds. The initiatives of the common are hollowing out the structure of command of the commodified seeds by deconstructing the abstract and de-localised technological developments and simultaneously rewriting the embodied political content of the seeds. They are changing the intermediate role of seeds as subjects in ways that form other social relations.

In respect of the deconstructive aspect of seed production, it is manifest that the initiatives of the common do indeed pose a challenge to the structure of command intrinsic in the commodified seeds. Instead of accepting the institution of dependence on the genetic supply industry, the production of ignorance on the farm and the detachment of local agriculture from its very ground through the introduction of abstract technological products, the common (the alliances of immaterial and material labour) aims to embody increased autonomy, a revalidation of local knowledge and reconnection of agriculture to local natural and social resources through the introduction of tailor-made artefacts.

In the process of rewriting the embodied political content of the seeds, the common refers to another cultural horizon for their design and implementation. No longer is reference made to a care-less agribusiness but to concerned agriculture, committed to its natural and social environment, the deep ecology. The common aims to design and implement seeds (e.g. dual purpose, early maturing sorghum) that aim to find local solutions for the global problems through a reassembling of the local natural and social resources (van der Ploeg, 2008). The common rewrites the embodied political content of the seeds not only to break through the dependence of peasant farmers on the seed multinationals, such as by restoring to crops their power to self-propagate, but also to weave in other social relations enabling the emergence of alternative forms of agricultural production and new modes of knowledge attuned to the development of local resources. In the production by the common of seeds as subjects is incorporated a dynamic in social relations that facilitates the growth of sustainable styles of agricultural production. No longer globally organised, overspecialised and brutally mechanised, this is rather location-specific and multipurpose-oriented, valuing skilled craftsmanship and bodily techniques. These seeds can also go beyond the urban–rural dichotomy of the conventional monolith of modern development, stimulating urban agriculture and rural food processing.

The deconstruction and rewriting enables the seeds as subjects (as human commons) to contribute to alternative systems in and of agricultural productions. Viewed in its entirety, this offers up the hope of a social transformation, from the uniform agri-business model of mass provision to heterogeneous forms of organic, location-specific agri-cultures that care for local natural and

social resources. Crucially, these new forms are embedded in the alternative knowledge base of agrarian human commons. Through the alliances of immaterial and agricultural labour, the production of immaterial (scientific and politicising) knowledge is changing. The production of seeds as subjects is being realised through the collective efforts of the common to constantly create new opportunities and perspectives, or possible autonomies for the common.¹⁸ Situated in the changing settings of agricultural production and consumption, as well as in the changing research settings of developing immaterial knowledge, the seed production as common(s) is characterised by an embodied political content that stimulates constantly transformative processes. Thus, the seed production as common(s) is ultimately a production of subjects, of new social relations; it is a strengthening of the common.

These seeds also reinforce the opportunities for place-bounded agricultures. Specified by the context of territoriality, they establish additional spaces within research frameworks to further develop new seeds, multi-modalities predicated on diversity – in contradistinction to the present sterility of monistic standardisation. These innovations in seed production in turn imply yet further social cooperation between immaterial, industrial and agricultural labour, each incorporating yet more new identities (Ruivenkamp, 2003). The multitudinous production of seeds implies a process of proliferation. The alliances of labour produce seeds (as subjects) and beget institutional reorganisations that yield new alliances and social relations (Ruivenkamp, 2003). In challenging the hegemony, ordering and command of the current biopower system at such a profound level, the political alliances of the multitude convened in the rewriting

and development of sub-political seeds can launch the epoch of a democratisation of production. According to Feenberg (2002: 3), this democratisation of technologies is the new challenge for humanity:

[W]hat human beings are and will become is decided in the shape of our tools no less than in the action of statesmen and political movements. The design of technology contains political consequences. The exclusion of the vast majority from participation in the decision-making process of the design of our tools is profoundly undemocratic.

The practices of commoning are beginning to enable the democratisation of seed production to be realised. A variety of alliances between immaterial and agricultural labour are already established, and multitudinous ways already exist to produce these (sub-political) seeds as subjects, as vehicles for the creation of new social relations, new forms of life. I conclude, therefore, with the statement that instead of asking whether the multitudinous production of seed production directed by the common is possible, it may be more appropriate to ask how these forms of seeds production can – will – become so dominant as to create a Badiouian ‘event-as-rupture’ from the existing entrepreneurial farming system of global food chains. Where is the tipping point, and how can we best progress from here? This may serve as the starting point for further critical theoretical reflections on how the commoning practices of re-seeding outlined here might continue.

Notes

1 The distinction between immaterial and agrarian labour here relates to the product of labour, where agrarian ('physical') labour – farming – results in material production (crops, etc.) as opposed to immaterial ('mental') labour – e.g. research – which results in cultural production (scientific information, system designs, etc.); immaterial and material productions thus combine in seeds, which gives them their specific 'political' content.

2 According to Silvia Federici (2010), the epoch of contemporary capitalism is structurally dependent on the appropriation and commodification of commons, including the appropriation of natural/cultural and social commons, products of labour and human interaction; here, I reflect on seeds as a juncture of the social struggle of commodification versus commonisation.

3 I refer here to Marxian analysis, that not only objects but also subjects are produced that may create new forms of life: 'Production not only creates an object for the subject, but also a subject for the object; creating new forms of life, a new seeing, a new hearing, a new thinking, a new loving' (*Grundrisse*, cited by Hardt, 2010: 141). Michael Hardt, here, emphasises that actually the object of production is really a subject defined by social relationship, or a form of life, which is the rationale for calling the actual form of production 'biopolitical'.

4 Van der Ploeg (2008: 23) characterises peasants by the way they actively pattern the agricultural production as a self-regulated resource base and an organisation of relations with markets that does not permit the market to become hegemonic (dominant over the production process itself).

5 Lemmens refers to the possibility of integrating care (for humans, work, environment, animals and plants) as well as the cultural diversity of food into a renewed social organisation of agricultural production, which we may thus dub 'agri-cultural'.

6 This tripartite division is stimulated by Pedersen (2010), whose jurisprudential analysis of 'property as social relations' distinguishes three social variables: the relating subject, the related-to object and the relational modality.

7 Although, wherever the *ex situ* conservation was well-established and institutionalised, new opportunities arose for *in situ* conservation – but mostly embedded in the framework of these institutionalised breeding programmes.

8 For the reorganisation of agricultural labour in global food chains, see Ruivenkamp and Jongerden (2013).

9 The improved varieties are better from the point of view of yield and also resistance to environmental pressures in certain conditions – especially irrigation and chemical applications (pesticides/fertilisers) – which implies monocropping for maximum quantity yield to supply markets, and thus the large-scale farming by well-capitalised enterprises (see below).

10 For the relation between genetic programmes and environmental influences, see Nicolosi and Ruivenkamp (2011).

11 See the journals *Tailoring Biotechnologies*, at <http://www.ctc.wur.nl>, and the *International Journal of Technology and Development Studies*, at <http://www.ijtds.com/>.

12 Feenberg (1999) differentiates between the tactics of those whose actions are managed by the artefacts and the strategies of those who own and manage these artefacts, which paves the way for discussion about how material and immaterial labour are connected within the practices of commoning.

13 This represents an exemplary project, since sorghum can be used as a food source for both humans and animals (as fodder), thus generating extra income for the farmers. Moreover, the use of early maturing sorghum means that the next crop in the rotation cycle – often used for soil improvement – can be planted earlier, which has the additional advantage that the main crop in the cycle will often need fewer fertilisers and pesticides, thus cutting overall costs. Introducing appropriate information into crops can create multiple social benefits – such as, in this case, improved nutrition, higher income for farmers and lower fertiliser/pesticide consumption.

14 The restoration of territoriality, it should be emphasised, is not the same as the restoration of the traditional practices of any given territory (Magnaghi, 2005). Territoriality restoration *may* involve

traditional practices (these are not rejected per se, any more than are the achieved results to date of biotechnology and genomics), but nor are they privileged (it is true that traditional practices will generally be territorial – locally suitable – and thus valued of themselves, but they are not necessarily very productive, for example, or egalitarian, for that matter).

15 The reorganisation of knowledge production due to open source and knowledge commons has been studied by Archana Patnaik (2016), Mithun Bantwal Rao (2015) and Soutrik Basu (2016) within the Rural Sociology department of Wageningen University.

16 It should be observed that there are simultaneously efforts to re-institutionalise these multitudinous ways of producing seeds into knowledge networks re-linked to capital and social relations of global food chains (Ruivenkamp, 2005).

17 Soutrik Basu has investigated how the scientific workers producing knowledge commons (i.e. drought-tolerant rice varieties) within the CGIAR Generation Challenge Programme in India (mostly) created social spaces to reconnect these knowledge commons to care-oriented agriculture (Basu, Ruivenkamp & Jongerden, 2011); Archana Patnaik has investigated the resistance of women's self-help groups against the dominance of 'miracle rice seeds' and their efforts to set up community seed banks as a vehicle for commoning the millet cultivation in their villages.

18 Berardi speaks about 'possible autonomy' as the translation of opportunities and perspectives of autonomous movements into concrete projects (discussion with Andreas Rostik in *Tageszeitung*, 22 December 1979, cited in van den Oudenrijn (1992: 188).

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