Jeffrey Wall

The Case for Folk Valuation Of Plant Genetic Resources: Redeeming Nikolay Vavilov's Multiculturalist Plant Conservation Principles

PLANT PERSPECTIVES
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ABSTRACT

This work brings together evidence from the historical, ethical and cross-cultural dimensions of Plant Genetic Resource (PGR) conservation to argue for an accounting of diverse folk value – i.e. value central to the cohesion and survival of particular peoples or nations – in the collection and safeguarding of the precise plants that humankind needs to survive well. I argue that, without the original commitment to the simultaneous defence of biological and cultural survival that gave rise to PGR conservation in the menacing Soviet Union, today's stringently utilitarian valuation of PGR risks further eroding the traditional and Indigenous motivations and traditions that have stewarded PGR into the present and that continue to power plant conservation around the world. By accounting for the breathtaking variation in folk value for plants within collections, PGR maintenance and conservation can construct and safeguard more desirable and more important plant collections than those that currently exist, while bolstering the world's persistent and diverse cultures of plant conservation. Such an approach is congruent with the deeper scientific truth for which Russian agronomist and botanist Nikolay Vavilov stood and for which he was martyred: that we shall not survive biologically without the cultural diversity that is the fountain head of humanity's global plant endowment.

KEYWORDS

Plant Genetic Resources (PGR), conservation ethics, Nikolay Vavilov, anthropology of value

INTRODUCTION

Common sense ideas of cultural survival and individual survival turn out to be radically different in origin and purpose. This essay deals squarely with this dissonance through a theoretical consideration of the global biological conservation program to conserve the plants humankind needs to survive. This large interconnected endeavour to collect and safeguard the seeds and tissues of valuable plant species is known as 'plant genetic resources' (PGR) conservation. In this work, I bring evidence from the historical, ethical and cross-cultural dimensions of PGR conservation to argue that meaningful consideration of folk value for these plant materials – that is, their value to the cultural cohesion and survival of specific peoples and nations – will lead to collections which can ensure better survival than current collections, stringently defined as they are

by individually oriented, utilitarian value. By better survival, I speak to that which makes survival worth striving for, for both individuals and cultures. I begin constructing this argument by showing that the inception of PGR conservation by plant scientists in the Soviet Union (Figure 1) represented a martyrdom on behalf of a deeply motivating truth: that persistent cultural diversity is necessary to the plant communities we need for biological survival. Next, I show how the practice of PGR conservation was taken up after World War Two by European and American powers, and that it began and carried on explicitly without the core charge of defending cultural diversity. I show how this deficient approach has led to notable internal contradictions of both biological and ethical natures. Drawing on environmental ethics, I argue that, to resolve these contradictions, PGR conservation must broaden the horizons of recognising value, or valuation, for plant materials in both collection and maintenance practices. In response to the expansive geographical, cultural and historical diversity of the plant materials, I frame the question of their value in light of the ethnographic record of value in general, and plant value in particular. I conclude by drawing all this evidence together to show how PGR conservation and management that internalises multiple, equally weighted value systems can become an invaluable resource for a survival worthy of humankind.

ORIGINS OF PGR CONSERVATION IN THE SOVIET UNION

It has been said that the enlightenment 'arrived in central and eastern Europe as a centralizing, rather than a liberating force' (Gellner 1994: 14). In this section, I show how much the same occurred, directionally in reverse, with the arrival of USSR-innovated plant genetic resource conservation in post-World War Two Europe and North America. It was in the USSR that PGR conservation was first developed and undertaken to salvage the extensive and diverse agricultural seed holdings of traditional peasant communities in the Soviet Union and all around the world. Then as now, these materials were an invaluable resource for plant breeding, and they were disappearing rapidly in areas under rapid industrial agricultural development. What is easy to overlook, however, is that this scientific program was insubordinate to a Soviet government set on the wholesale delegitimisation and elimination of the peasantry

FIGURE 1.

Top left: the Svalbard Global Seed Vault in the Norwegian Arctic (Source: Global Crop Diversity Trust). Center: Vavilov and his research assistant collecting wheat samples in remote Dagestan (photograph taken within the Vavilov Institute in St. Petersburg 2013, courtesy of the Lee-Hickey Laboratory, University of Queensland, Australia). Bottom right: aerial view (source: Google Earth, 2016 DigitalGlobe) of Mexico's Chihuahua Canyons, a secondary center of maize diversity in today's Mexico (Perales and Golicher 2014).

(Scott 1998; Fitzgerald 2003). This is because PGR conservation represented iron-clad, utilitarian proof of the necessity of diverse cultures and livelihoods at a time when the state was deeply invested in implementing programs of peasant dispossession and collectivisation throughout its territories.

Despite the political liability at its core, PGR conservation survived in the USSR due to two attributes: the potent vision and personage of the agronomist and botanist Nikolay Vavilov (1887–1943) and his unassailable utilitarian rationale for his plant protection programme which gave rise to modern plant genetic resources conservation. Vavilov's prognostications and prescriptions for preserving the world's PGR for food security, laid out in the classic work *Studies on the Origins of Cultivated Plants* (Vavilov 1926), have been validated over the last century (Nabhan 2009; Harlan 1992). These were founded on several original and interdependent assertions. Firstly, each of our domesticated species is the

descendent population of specific selection events which occurred in a discrete geographic area. This specific geographic place of selection, he called 'the center of diversity' for that crop. In other words, the highest phenotypic and genotypic diversity for a domesticated species could be found in the region where they were domesticated. Secondly, this genetic diversity in this place was invaluable as a resource for contemporary plant breeders in their continual search for novel traits, such as disease resistance and tolerance to climatic stress. Yet, the notable advances of industrial agriculture, driven in part by the replacement of old crop varieties with the newly bred, were rapidly deleting this invaluable diversity. Thirdly, it was essential to conserve this diversity by means of scientific intervention, primarily through the collection and maintenance of seeds. Vavilov demanded that seed collection protocol entailed a thorough and recorded exchange of knowledge with the human communities that actively and consciously maintain landrace varieties, as well as habitat for wild relatives in surrounding landscapes (Nabhan 2009). This final, necessary, point is often muted in narratives of Vavilov's scientific contributions, even though these public overtures to peasants in the USSR and abroad represented substantial legitimisation of their ways of life. This protocol exposed Vavilov and the practitioners he trained to significant political liability.

The unassailable utilitarian rationale that Vavilov established at the foundation of PGR conservation consisted of three nested claims that resemble, in their relations, that of a mission, a goal and an objective. The mission was exactly that of utilitarianism, the pursuit of 'the greatest good for the greatest number' (Bentham 1977). In service of this greater good, the express goal of PGR conservation was the prevention of famine. In service of this goal, the key objective of PGR conservation was the preservation of sufficient genetic diversity for maintenance and improvement – through plant breeding – of the world's food plant species, to the direct benefit of the USSR.

While this formulation allowed for the survival of the practice in its treacherous native political environment, it was not the full motivation behind its creation and implementation and it could not, in and of itself, explain the devotion of its founding practitioners – particularly Nikolay Vavilov. What is missing from this formula is this motivating tenet of PGR conservation, which remained muted due to absolute necessity:

the unified defence of biological and cultural diversity is essential for the greater good.

Lenin and his successor, Stalin, actively eroded the diversity of cultures and livelihood practices in the agrarian USSR (Fitzgerald 2003; Fitzpatrick 1996). They each did so according to their own definition of 'the greatest good for the greatest number', the fulcrum of any utilitarian calculation. For Lenin, urban industrial life was the ideal in quality of life, and he saw it as imperative to bequeath this lifestyle on as high a proportion of the USSR's population as was possible. Peasant life was decidedly not part of this grand vision (Kingston-Mann 1983). Stalin, in his turn, prioritised population growth (see Stalin 1945), while actively lowering the basic sense of entitlement to quality of life for the masses he cultivated (Fitzpatrick 1996). Neither interpretation boded well for deeply historical agrarian communities throughout the USSR, who were so central to Vavilov's work.

Between 1924 and 1935, Vavilov served in the powerful position of director of the Lenin All-Union Academy of Agricultural Sciences, a vast nation-wide system of agricultural research and field facilities charged with maintaining food security in the USSR. This tumultuous period saw the transfer of power from Lenin to Stalin, the perennial rampages of rural collectivisation (Scott 1998; Fitzpatrick 1996) and Stalin's accelerating tyranny and murder. His techniques for human slaughter included weaponised famines (Applebaum 2017) such as the infamous Holodomor in 1930's Ukraine, which took more than three million lives (Boriak 2008). Relatedly, this period also traced the collapse of esteem in the USSR for Mendelian concepts of genetics, which Vavilov championed, in favor of Lamarckian notions of heritable organismal change, championed by the infamous plant scientist, Trofim Lysenko (Ings 2016).

The science of genetics, and its development in the USSR, was of existential interest to communist party politics under Stalin. This same interest materialised in the form of Soviet policy on nationalities and minorities. Encapsulated by the slogan of 'national in form, socialist in content' (Stalin 1934), the merit of continuity of cultural diversity in the USSR hung exclusively on its congruence with Soviet prescribed futures (Gorshenina and Tolz 2016). Therefore, in the midst of 'the most extravagant celebration of ethnic diversity that any state had ever witnessed' (Slezkine 2000: 313), Secretary P.N. Yakovlev crisply explained

the intellectual origin of political favour for inheritable change to Vavilov's esteemed colleague Hermann J. Muller: 'ethnic minorities are, of course, inferior to us in every respect … but after two or three generations of living under the conditions of socialism, their genes will have so improved that we would all be equal' (quoted in Nabhan 2009: 184). Suffice it to say one would not need their genes at all, or those of their plants. Stalin rightly and rigorously understood that Lysenko's framework better supported his models of socially engineering a new breed of man, *Homo sovieticus*.

Vavilov's seed collecting work, in stark contrast, demonstrated that the world's most valuable plant resources were thankfully preserved by affiliation with and caretaking of the cornucopia of traditional agricultural lifeways maintained across the empire. In his hands, the enduring cultural value of peasant life became wedded to a substantial utilitarian instrumental value of the USSR's plant endowment. Because Soviet ideology under Stalin was anchored on the total interchangeability of all individuals and all cultures, this proof of the value of cultural diversity required packaging so that it did not draw the wrath of the central government. For this reason, the defense of diverse peoples and their way of life was concealed, while the utilitarian mission, goals and objectives were advertised. Vavilov revealed as much to his trusted friend, the plant scientist Theodosius Dobzhansky, when they were walking together in the privacy of Sequoia National Park, California, in October of 1930. He truly believed that,

> the opportunities for serving mankind which existed in the USSR were so great and so inspiring that for their sake one must learn to overlook the cruelties of the regime. (Dobzhansky 1947: 229)

In his understanding, he was 'employed by the Communists to work for the welfare of the people of the USSR, but I am still free to judge what is best' (Shantz 1978, quoted in Cohen 1991: 43). His plant conservation vision had high regard for the heterogenous and disparate agrarian people of the USSR and beyond. Despite their stigmatisation in Leninist and Stalinist ideologies as vestiges of petit bourgeois society, Vavilov travelled five continents to be with such people, to be seen with them, to admire, understand and share in their plant holdings and their livelihoods (Nabhan 2009).

In the end, Vavilov's political talent was insufficient to protect him from the inherent danger of pursuing his motives in the face of the regime's fixations. He strove to survive by mastering the art of generating rhetoric that would be pleasing to and approved by ideologues and authorities while shielding the nature of his work. He made an art of accentuating the authentic convictions he held that were in utter agreement with the Soviet enterprise. Vavilov was clearly a sincere believer in modernisation (Vavilov 1997), for instance. He made this rhetorical survival skill explicit in his letters recruiting scientists from abroad to join his efforts in the USSR (Pringle 2008). Yet, in the end, Stalin personally saw fit to order Vavlilov's arrest and starvation in 1942. Many of Vavilov's devoted staff were similarly punished (Pringle 2008). Others from his staff starved to death while guarding the seed collection from hungry looters during and following the Nazi Siege of Leningrad (Nabhan 2009). Very unfortunately, his necessarily silenced humanitarian motivations, and his scientific determination that meaningful plant heritage requires vibrant agrarian, cultural and livelihood diversity remain largely undetected and unamplified to this day.

CONTEMPORARY PGR VALUE: CRITICAL INTERNAL CONTRADICTIONS

As a major consequence of the silencing of Vavilov's motives, PGR conservation in the modern era has carried on without the original commitment to the unified protection of biological and cultural diversity. Consequently, the global programme has failed to appropriately honor local and traditional ecological stewardship as a precondition of the *very possibility* of conserving plant genetic resources, not to mention the fullness of Vavilov's career. This has led to serious ethical turbulence. A most prominent and heated ethical critique of PGR management surged in the wake of Pat Mooney's 1979 publication, *Seeds of the Earth* (Mooney 1979). According to Mooney, PGR, as they were then being appropriated and managed, were transparently benefitting the global north at the expense of the global south. The subsequent critical movement triggered a chain of social and institutional events. Two developments are pertinent to the present essay. Firstly, the velocity of the recoil of the scientific community from these accusations cannot

be understated. Many founding thinkers and practitioners of the PGR movement, though trained in plant and crop sciences, understood their work as unassailably ethical, moral and even humanitarian. Accusations suggesting that their principles were exploitative came as a terrific shock. Their counter manoeuvre was well orchestrated (Kloppenburg 1988). They argued that such claims were based on erroneous understanding of the nature of germplasm, plant breeding and the natural histories of cultivated plants (Harlan 1988).

Following these episodes, tremendous effort was made to cast the national breeding programmes, the network of ministries, universities and seed companies in each respective country as capable partners in the world germplasm accession, management and exchange network. These national programs, it was implied (Harlan 1988; Boyd-Orr 1966), were the natural channel between their countries' populations and the benefits of the PGR management system. Importantly, these institutional changes dealt with the issue of justice for the poor farmers who stewarded plant diversity through the requirement of standard material transfer agreements (SMTA). SMTA's theoretically allowed for revenues derived from particular accessions, defined as collected materials, to make their way back to their original plant stewards. However, internationalised germplasm exchange under SMTA mandate has been observed as frail and overwhelmingly complex from the vantage point of human resources (Chang 1994), law (Correa 2006) and enforcement (Hayden 2003).

Without the original, premier, encompassing value for cultural diversity, the ethical vulnerability of PGR conservation stems from several internal contradictions to be found within the strict utilitarian rationale. First, there is incongruence between the value for diversity and the limitations of accession and maintenance. In Vavilov's footsteps, accessions seek to capture genetic diversity, defined as the total number of genetic characteristics in a population. In a sampling event, much like the thousands of instances where Vavilov acquired plant and seed accessions, the way to capture diversity is to randomly select samples from the random geographic locations. Yet, these were always deliberate, non-random selection events. For certainly,

> [o]ne has to take into account the climatic conditions under which plants introduced were growing, and whenever possible, to select varieties from regions more or less similar climatically to our country. (Vavilov 1951: 45)

It is logical that collectors were charged with demonstrating applications for their own centralised institutions. This inherent feature of collection was exported to Europe and the West intact.

The understood value of PGR following World War Two was a confluence of such selection priorities, each hailing from specific geographies and interest groups. As Pistorius documents, without overtly known values of its own, the values which have remained most influential for PGR conservation practitioners are those of the international plant breeding complex (Pistorius 1997). The world's main orchestrator of PGR conservation, the FAO, exhausted its broad spectrum collection strategies early on. By 1957, they declared:

> The days of massive and random collection of hundreds or thousands of samples which completely swamped the limited facilities of plant introduction gardens are surely over. (FAO 1957)

The decades that followed saw the FAO and collaborating bodies forgo any broad-spectrum valuation, instead adopting collection procedures to perpetually select for and meet the demands of the breeders (Pistorius 1997).

In light of the overdetermining role of industrial plant breeding priorities in global plant collections, a second contradiction emerges in the ethical unsustainability of using people for a 'greater good' they do not necessarily benefit from. It is well known that plant varieties not collected at accession events – i.e. the left behind – may or may not survive the large-scale forces of genetic erosion. The failure to preserve the plant varieties that plant stewards would nominate in favour of those that plant breeders would nominate provides an opening for a lasting critique of utilitarianism waged by philosophers such as John Rawls and Robert Nozick. This is called the 'separateness of persons' problem for utilitarianism. In short, utilitarianism may justify and even mandate using a person and their property if that would bring about the 'greatest happiness'. As Nozick observed, however, this neglects a fundamental fact of existence, that

> [t]o use a person [to benefit others] does not sufficiently respect and take account of the fact that he is a separate person, that his is the only life he has. He does not get some overbalancing good from his sacrifice. (Nozick 1974: 33)

If plant collectors do not conserve the materials most valuable to their owners, but instead preserve those materials most valuable to their own internal operating concept of 'greatest good', then it is quite possible that such an owner, and his property, were being used.

Finally, at an aggregate level, utilitarianism is largely understood as incompatible with common sense aspirations for good survival. This is nowhere made more clear than in Derek Parfit's painstaking review of utilitarian population ethics and his 'repugnant conclusion'. This conclusion states that a pursuit of the greatest good for the greatest number must grant that

> [f]or any possible population …, all with a very high quality of life, there must be some much larger imaginable population whose existence, if other things are equal, would be better even though its members have lives that are barely worth living. (Parfit 1986: 387)

In this perspective, the best outcome for all concerned would be for as many individuals as is possible to exist, each enjoying a quality of life just above that which would certainly trigger suicide (Figure 2). In this would-be optimal scenario, very little plant diversity beyond one or two resilient staple crop species would be required from our PGR to achieve this dreadful per capita quality of life. Likewise, it is clear that

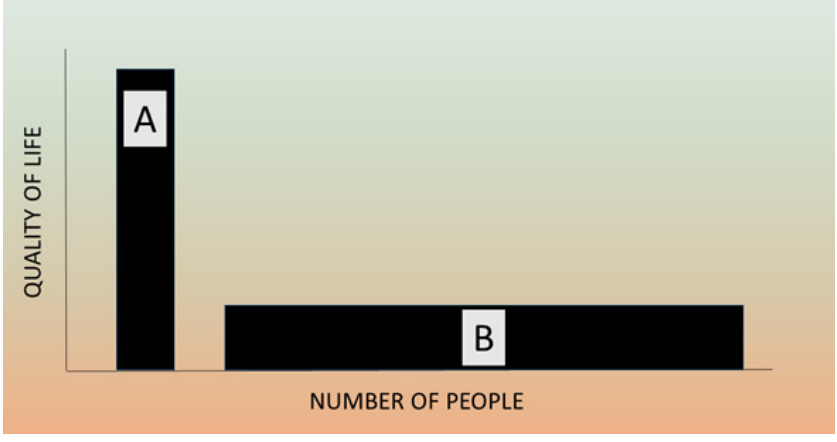

FIGURE 2.
Derek Parfit's 'repugnant conclusion'. Areas covered by A and B represent total well-being for each population.

no cultural diversity would be necessary for this outcome. It is beyond apparent that no such scenario is the aspiration of PGR conservation, yet driving global PGR conservation along the contours predetermined by utilitarianism arguably preconditions just this outcome.

CONCEIVABLE RECONCILIATIONS: ANTHROPOLOGY OF VALUE AND IMPLICATIONS FOR PGR

The internal contradictions I have raised in regard to PGR conservation may each be resolved, at least in part, by a PGR conservation agenda which is overtly committed to defending cultural diversity. Once again, considering the context of Vavilov and his colleagues proves illustrative. On the issue of sampling, it may be assumed that Vavilov was present at accession sites, in part, because he believed it would vindicate the livelihoods of his accession donors. It is very likely that he was aware that his prominent position would bring legitimacy to the agrarian citizens he courted for their holdings. This motive would have softened the instrumental nature of the sampling approach and allowed for a more generous inclusion of grower-preferred germplasm. In the same vein, any assertion that he may have used these individuals and communities would become less tenable since his presence and involvement were beneficial, however marginally so, to their cultural survival.

All this is to show that assigning substantial value for cultural survival may have strong precedent in PGR conservation and support in environmental ethics. Looking beyond plant genetic resources, environmentalism, though forged in the virtue ethics rhetoric of the Transcendentalists, was similarly given to snatching at economic justifications for conservation within utilitarian economic theory (Hargrove 1989). Efforts to quantify the monetary equivalent of natural value have gesticulated wildly (Costanza et al. 1997; Carson and Hanemann 2005). However, from the vantage ground of ethics and its insistence on bulletproof justification, this approach has never shown as much promise as resort to virtue ethics and aesthetics (Hargrove 1989; Passmore 1974; Sober 1986).

Ethicist Eugene Hargrove, for example, develops a unique argument for conservation by arguing that existence is a necessary attribute of natural and artificial beauty, and therefore to destroy or to allow the

destruction of such beauty is unethical. Still, since conservation is inherently an effort to salvage objects of value, there is an important skill to be applied in discrimination.

> Mere existence is therefore a necessary but not sufficient reason for preserving a natural object or natural system. To provide a basis for discriminating between and ranking candidates for preservationist action, we need to go beyond mere existence to the values associated with it. (Hargrove 1989: 178)

It turns out that a thorough accounting of values associated with PGR, due to their diverse cultural geographic history, is a very anthropological endeavor. In turn, in this section, I peruse the histories of anthropological theories of value to envision conceivable reconciliations for global PGR conservation.

An anthropological approach to value differs from economics chiefly due to its inherent endeavour to engage, understand and interpret the perceptions and contexts of those whose culture is different from the community of inquirers. It is important to state here the often-stated fact that PGR have been sourced primarily in societies other than modern Western societies. These materials were developed over millennia in a dynamic with the values of their associated human communities. What is important about an anthropology of value to plant genetic resource valuation is its illumination of value heterogeneity in the ethnographic record. Insights from ethnographic evidence render anthropology of value a formidable foil to assumptions that *Homo economicus* or *Homo sovieticus* existed in pre-industrial society, and tailored its plants and landraces with the respective premium on high yield, disease resistance and acceptable qualities.

Bronisław Malinowski, Marcel Mauss and Karl Marx represent the pantheon of such an understanding of value. Malinowski is the famous marooned anthropologist, whose visa quandary during World War Two caused him to reside for over two years with the Trobriand Islanders of today's Papua New Guinea. During this time, Malinowski had ample time to observe, ponder and document the elaborate and mystifying exchange of *Kula*, decorative strings of shells, which were exchanged between households and communities, but rarely if ever worn. What struck Malinowski, and what is an essential data point for an anthropology of value, is that this exchange system provided a rival model of currency to that which held in modern economies. Trobriand Islanders, with Kula,

as well as with other resources such as livestock and garden space, put a premium on painstaking aesthetic efforts that stanched productivity and efficient accumulation. The engine of Kula exchange, according to Malinowski, was not material accumulation; it was the prestige accrued through impressive, elaborate public giving in combination with heroic and risk-intensive ocean travel (Malinowski 1922).

Mauss fixated on the transsubstantive phenomena by which value came to inhabit media. One of his most famous bodies of work on this subject, *The Gift*, dealt with the strong undercurrents within gift exchange which bid the recipient of a gift to reciprocate. His approach to understanding this power was to review the available ethnographic accounts of three cultural cases: the Kula Ring on the Trobriand Islands, the Potlatch of the Northwestern North American Indigenous Kwakiutl and the gift-giving traditions of the Maori people of Aotearoa. His central assertion was that gift objects are everywhere perceived/known to absorb and carry some piece or amount of their owner. Therefore a gift, once given, exerts a desire to return to its owner while simultaneously embodying the interests and sentience of the giver as long as it remains in the possession of the recipient. He further posits, much like Malinowski, that those hoping to identify with the germ of *homo economicus* in pre-industrial exchange will come away empty handed. An enduring contribution of Mauss regarding value was to show that the sterile and conclusive exchange model central to utilitarian economics, if it is to be found at all in the ethnographic record, can be traced to the class of trade relations between enemies, or between those to whom the other's fate is of no importance (Graeber 2001; Mauss 1954).

Marx, in his ponderous studies of industrial capitalist economies, provides a third leg to an anthropological theory of value. His theoretical approach was founded on his labour theory of value; namely that value could be known as the proportion of a society's labour devoted to the manufacture or maintenance of a good, service or other entity (Marx 2012). Marxian Anthropologists have carved out a niche for themselves by seeking such principles at work in 'pre-industrial' societies. United by an evaluation of societies according to production and labour, this research is responsible for a noteworthy insight. Across much of the world, in societies most peripheral to globalised markets, the highest proportion of labour is devoted, not to commonly understood 'economic' endeavors like food production and item manufacturing, but

is instead devoted to the manufacture of satisfactory persons. In other words, child-rearing, facilitation of rites of passage, celebrations and the like commonly occupy much more social time and labour (Turner 1979; Fajans 1997; Munn 1986). The vast majority of labour in capitalist societies is devoted to the manufacture of commodities and to the delivery of services. Thus, while the production of human persons is no doubt necessary in this system, their value is redeemed in the form of commodities and services. Marxian ethnography has uncovered that the vast majority of pre-industrial societies demonstrate the precise opposite pattern; namely, labour which has been devoted to the 'economic' is redeemed in the form of socially determined quality persons.

A meticulous study of more-than-utilitarian plant value may not just benefit from an anthropological theory of value but may in turn strengthen such theory. The ethnobotanical record offers countless observations of values other than utilitarian instrumentalist ones that actively drive plant selection and plant modification. Three stand out. The first is cosmological value. Management and selection of specific varieties often take place for religious and cosmological purposes. For example, in West Java, Somaerwoto documents how landraces are linked to unique individual and household identities based on perceived similarities in what might be described as personality traits (Soemarwoto 2007). Here, selection of rice varieties for planting is decided through consideration of the variety's 'affective', or emotive, qualities (ibid. 2007: 91), followed by the physiological and culinary. Affective traits include the thoughts, ideas and personal styles attributed to the rice variety that determine the variety's suitability for use in certain rituals performed in various life stages of the plant and crop. In highland Argentina, Quechua farmers in the Andes cultivate the *culli* landrace of maize exclusively as a crop and household protector against malevolent spirits. To perform its function, this variety is planted in small plots adjacent to the larger crop, and later, pairs of cobs, bound together by their husks, are hung on the doorframe of the household kitchen (Hilgert et al. 2013). In early colonial Tenochtitlan, it was observed that an incredible premium was put on the earliest ripening varieties of amaranth for the manufacture of idols cannibalised ritually in the harvest festivities (Early 1992).

A second insight elicited from diaspora ethnobotany, is that plants hold irreplaceable value in a people's memory of their history. The botanical holdings of diaspora groups which originate in peoples' native

lands are understood to represent a quintessentially valuable selection of flora for the translocated groups. With the example of African populations in the Americas, plant holdings that originate in Africa are often found in the plant-use repertoires of maroon, freed-slave and other African descended communities (Voeks and Rashford 2012). Such plant species, which were brought in the face of tremendous hardship and risk, commonly have a multiplicity of properties including nutritional, ecological and spiritual. Examples include two native African tree species that are now well established in the new world: the African oil palm (*Elaeis guineensis*) and the baobab tree (*Adansonia digitate*). At the dawn of the slave trade, Indigenous coastal West Africans, especially those groups around the Gulf of Guinea, held the African oil palm as an invaluable species for nutrition and spirituality. Similar circumstances evolved in the Brazilian region of Bahia, where the locally prominent Afro-Caribbean religion of Candomblé features a number of specific uses for materials from the tree (Watkins 2011; 2015). The baobab tree has been observed in a number of African diaspora geographies in the Americas. In addition to a number of edible parts, including fruits, seeds and flowers, the tree's physiology manifests a completely distinctive ecology that houses bees, attracts bats, collects and holds water in its trunk and, in otherwise bare landscapes, provides copious shade. The tree is integral in numerous folkloric and spiritual traditions in both Africa and the new world (Rashford 1987b; 2015; 1987a). These trees and similar plants are inscribed on newly settled landscapes as a recording device for peoples history.

The obvious and unique value of the baobab may also lend support to a third insight from the ethnobotanical record and that is that the aesthetic value for plants, including crops, was and is a pervasive value. The baobab's appearance, distinct and touching by any account, makes it a revered icon of the African savannah landscape (Rashford 2015). This undoubtedly played a role in its urgent selection for transport to the new world. Aesthetic properties have been integral to crop selection and evolution throughout history (Hawkes 1983; McCouch 2004). Aesthetics remain the most significant historical driver of exotic plant trade in the modern era (Mack and Lonsdale 2001). Returning to amaranth, Aztec royalty demanded beauty from the crop to such an extent that the transfixed Spanish transported amaranth to Spain, initially as an ornamental, apparently unaware that the crop was one of

four grain crops acquired as tribute from Aztec territory (Early 1992). This pattern of mandating beauty in crop selection has been observed with crops throughout the Americas (Debouck 1989). Stepping back from the ethnobotanical record, it is a matter of common sense that the physical appearance of plants, including food plants, is of considerable day-to-day value. In fact, the extensive, informal, and decentralised conservation program that undergirds decorative horticulture all over the world bids a very weighty question: is the general neglect of aesthetic value in PGR conservation in harmony with the commonsense morality of the endeavour? One important way to address this question is to interrogate what it is that PGR are understood to be – in other words, to contemplate their ontology.

PGR ONTOLOGY

Simply beginning with the variation in available definitions, a broad ontology, or conception of being, for PGR can be readily acknowledged. There is an abyss to explore between the definition of PGR as 'the raw material used in the production of new cultivars' (FAO 1997: 1) and something like the 1996 Via Campesina claim that

> [g]enetic resources are the result of millenia of evolution and belong to all of humanity. They represent the careful work and knowledge of many generations of rural and indigenous peoples. (Via Campesina 1996)

A project to revisit the very being of PGR resonates soundly with the recent 'ontological turn' in the social sciences for both conceptual and ethical reasons. The 'ontological turn' refers to the surgent influence of ontology on anthropology, science and technology studies, archaeology and many other disciplines. In essence, post-humanist philosophical projects to deconstruct and revitalise concepts of 'the human' (Bateson 1972; Latour 1991) have sent fissures through conventionally held distinctions between humans and the nonhuman – i.e. humans and things, humans and nature as well as kinds of humans. Important works in this field have endeavored to reinstate the social consideration of material things (Henare, Holbraad and Wastell 2007), which Olsen argues have been 'marginalised' and 'stigmatised' in the previous century of social theory (Olsen 2010: 2). In other works, various species and creatures have been reified as social agents, even inspiring an entire genre

of ethnographies of nonhuman organisms known as multi-species ethnography (Kirksey and Helmreich 2010; Tsing 2012).

Martin Holbraad articulates how the principle improvements of all of these maneuvers have been ethical. In anthropological and archaeological theory, the turn to ontology was precipitated by the acute need for more reflexivity in encounters with alterity, or otherness. Holbraad argues that acknowledging the ontology of the other does more work towards achieving just interaction between cultures than does acknowledging the culture of the other. To illustrate how the concepts of culture and ontology diverge on the 'analytical issue of how to make sense of things that seem to lack one' (Alberti et al. 2011), he gives the example of a research participant declaring that a stone is a person. Acknowledging the participant's culture can readily let this dissonance be understood as a disagreement that results from the researcher and participant having different beliefs. A concept of ontology can do more, and it can provide more guidance by chalking up this dissonance as resulting from the researcher and participant talking about entirely different things. Importantly for the present case, recent work in ethnobotanical theory can further illustrate the value of ontological approaches to difference.

For a discipline such as ethnobotany, that has always dwelt and toiled in the interstices of cross-cultural human–plant mutualism, the ontological turn has brought a windfall of validation. It has always been the goal of the discipline to develop and spread awareness for the existential importance and ubiquity of human–plant relations. Reflexivity was always a strong suit in the discipline. Substantial regard for the knowledge of cultural others led to the bold declaration of 'folk taxonomy', 'folk biology' and 'folk systematics' as legitimate fields of knowledge exploration for the western academe (Berlin, Breedlove and Raven 1966). Yet, as described above, acknowledging another's differing ontology requires a researcher to go further, to react to any 'senseless' testimony, say, assertions that certain landraces have human personalities, by knowing that they themselves are the one confused, not necessarily the interviewee. For ethnobotany, this means acknowledging substantial differences in how others 'perceive, conceptualise, and value plant-life' – factors certain to influence forms of interaction and manipulation (Daly et al. 2016: 2). As Lewis-Jones has observed, such an approach can even reveal the influence of any number of non-utilitarian values which motivate

the professional duties of plant conservation practitioners themselves (Lewis-Jones 2016).

CONCLUSIONS

There is deep tragedy in the realisation that Nikolai Vavilov, and many of the colleagues he trained, died of starvation. The Soviet Union also did not survive. Though it may be a pressing question, the extent to which ethics motivated Vavilov's science may never be known. It cannot be known positively whether Vavilov recognised an ethical rivalry with Lysenko beneath the scientific one. Vavilov was motivated by the real threat of famine. He was also motivated by the real threat of persecution of himself and colleagues, brutal tyranny of his compatriots as well as genocide of his agrarian charges. When the severity of Vavilov's circumstances and the depth of his perception as a scientist and scholar under Stalin's reign is truly considered, it becomes infinitely more feasible that Vavilov foreswore his own survival to ensure something he deemed profound.

Similarly, the visions of survival that motivate PGR conservation in the modern era do not resemble those illustrated by Parfit's 'repugnant conclusion'. It is clear that, even at its inception, mere metabolic survival for a maximum number of human persons was never a sufficient motivation for PGR collection and maintenance. Underneath the rhetoric, a base level of cultural survival has always been ethically assumed. The essential value of plants in supporting cultural cohesion through cosmology, memory and aesthetics may be baked into the aspirations that motivate PGR conservation. However, due to the sheer acceleration of biological loss and the global economy, overt language and practices which validate these existential values are more necessary than ever. It is clear why Vavilov muted such discussion; what is not clear is why it is so muted today.

Ethnobiology and derived methods are integral in the accession and curation of Indigenous knowledge required under international protocol like the Convention on Biological Diversity, the Nagoya Protocol. Appropriately, the canon of ethnobiological methodology offers numerous techniques, in a range of intensities that can be deployed to study and engage local values associated with collected germplasm and *in situ*

conservation programmes. More time-consuming and qualitative work is always recommended and may be necessary to achieve certain goals. For instance, to allow for folk value to characterise the maintenance of collections such as the prioritisation and scheduling of grow-outs, when seeds are planted and grown out to produce new seeds, values associated with physiology, phenology and aesthetic properties would benefit from rich ethnographic context. In the digital age, data quantity is hardly a restriction. The restrictions more certainly turn on the perceived value of such an approach – and to the ways in which we envision our survival.

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Jeffrey Wall specialises in advancing ethnoecological methods and theories that bring the environmental values of distinct cultures and traditions into meaningful conversation with each other. He has focused on threatened culturally significant landscapes in numerous countries in the Near East, Central Asia and North America.

Email: jeffrey.wall@utu.fi