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Nature's Value: Evidencing a Moldovan Terroir Through Scientific Infrastructures

Daniela Ana

Researcher, Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Halle, Germany

ABSTRACT

Terroir can increase the exchange value of wine in competitive markets in global capitalism. Relying on ethnographic research in Moldova, this article shows how value is produced through infrastructures that evidence the environmental features of a wine's place of origin in the form of terroir. In these processes, genericness and uniqueness prove to be mutually constitutive. While the Soviet wine industry used evidencing infrastructures such as laboratories and measuring devices to produce decent and affordable table wine, old infrastructures have been adapted and new ones introduced to evidence terroir through analyses of soils and yeasts. The focus on scientific infrastructures of value connects new and historical materialist approaches in the conceptualisation of human-environment relations. It contributes to a new historical materialist understanding of value by highlighting the interrelation of political economic, environmental and technological dimensions in the making of terroir, through evidencing, measuring and standardising physical features of the environment.

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In early 2017, Moldova's National Office for Vine and Wine (ONVV) organised a series of wine tasting events in the capital city of Chişinău that it called *Descoperă terroir în pahar*, Romanian for 'Discover the terroir in the glass'. This was one of the projects developed by state institutions and private wineries with the aim of reforming production and discourses in the Moldovan wine industry in the aftermath of the Russian ban on Moldovan wine imports imposed in March 2006.¹ The first *Descoperă terroir în pahar* session was conducted in a restaurant in the city centre by Ştefan, who presented himself as a winemaker and hobby-sommelier. While the last preparations before the tasting were being wrapped up by the waiters, Ştefan gave

CONTACT Daniela Ana  daniela.elena.ana@gmail.com

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the tasting participants a crash course on the history and meaning of ‘terroir’ as it was understood in France and captured through the *Appellation d’Origine Contrôlée* system that ‘became a model of local origin protection throughout the world’. Agreeing to this model, Ștefan shared with us what we can understand through terroir: ‘the soil comes first, then the manner in which grapes are being taken care of, and then the time of harvest – this [knowledge] belongs to technology’.² We then tasted six terroir wines, one of the first of which was Negru de Purcari; it was produced at the Purcari winery, my main field site for ethnographic research,³ and this red wine was specially presented as boasting ‘fame’ and a ‘renowned terroir’.

As Purcari considers itself to be the oldest winery in Moldova, founded at the beginning of the nineteenth century and recognised across two centuries through numerous prizes and medals in international wine competitions, the winery seemed suitably selected to exemplify the presence of terroir on Moldovan lands. After the 2006 embargo, Purcari continuously funded research and consultancy in its vineyards and winery in order to evidence and harness the local terroir, as well as using the concept in marketing campaigns meant to popularise the wines it produces.

One of the aspects of terroir that Ștefan enumerated – the technological knowledge and its mobilised infrastructures used in production processes from the vineyard to the glass – is the focus of this article. How is value produced through terroir and what is the role of infrastructure in this process? I look specifically at the manner in which terroir is articulated by evidencing environmental characteristics of place, accepted to be at the foundation of quality wine production by Moldovan scientists and winemakers alike.

This special issue proposes the introduction of the concept ‘infrastructures of value’ (Lammer and Thiemann, this issue), which seeks to capture how agricultural commodities at any stage (production, exchange, consumption) are ‘processed’ into producing value and becoming profitable through a dialectic of uniqueness and genericness that is captured through a materialist approach, making a bridge between the diverging traditions of historical and new materialism (see Castree 2002; Choat 2018; Howard 2018; Ana 2022). I argue that terroir-making processes require legal and scientific infrastructures, which have the role of qualifying products through a dialectic of standardisation and singularisation processes. Such infrastructures of evidence have the capacity to connect ‘politics, science, technologies, and objects like genes, plants, geographical surroundings, and human bodies and promote different forms of ethical-political reasoning’ (Calkins & Rottenburg 2017: 254). Infrastructures of evidence assemble different elements in processes of production which are meant to create coherence and value. Like other infrastructures, those evidencing the unique and the generic shape value by ‘relating particular parts to larger wholes’ (Lammer and Thiemann, this issue).

Looking at terroir can be especially revealing for understanding how infrastructures are integral to producing value, although at a first glance this seems counter-intuitive. Terroir has been interpreted by winemakers to adhere to the natural characteristics of a place (Barham 2003), rather than to science and technology. While terroir is understood by winemakers as a convergence of the soil and geological features, climate and local knowledge and technology which endow a wine with unique properties

(Demossier 2011; Teil 2012), they also conceive it as a way of letting ‘nature’ speak through the wine. So the human intervention is, at least at a discursive level, presented as minimal, yet important, harnessing the ‘taste of a place’ for winemaking (Trubek 2008). Keeping in mind that *humans* and *local know-how* are a part of the winemakers’ understanding of terroir and have been extensively discussed in the anthropological literature on the topic (Barham 2003; Ulin 2007; Demossier 2011), here I focus instead on two elements of a *vineyard* which speak through the Purcari terroir wines: soils and yeasts.

Soil classification and yeast selection are two processes in which natural elements are evidenced and used or altered in such a way as to capture the taste of place, or the terroir taste. They are natural endowments of a vineyard which are invited to ‘speak through’ the wine (Demossier 2018). Winemakers and wine scientists employing scientific infrastructures analyse in detail which type of soil is present in every corner of the 260 hectares of Purcari vineyards. Afterwards, the spontaneous yeasts appearing on grape berries are collected and analysed in order to select only the yeast cultures most suitable for grape juice fermentation. In other words, to enable nature to speak through terroir wines, a complex production choreography is organised by winemakers with the help of infrastructures of value.

I start with a discussion of the main debates in materialist approaches and explain the concept of ‘infrastructures of value’ in relation to the process of terroir-evidencing analysed in the article, along with the economic and cultural aspects that combine to make terroir a powerful differentiation tool in processes of valuation. Further, I detail the processes of terroir-making with the help of scientific and legal infrastructures that evidence characteristics of soils and selected local yeasts. I then discuss the process of making wines from a post-Soviet wine region internationally marketable through responses to the unequal pressures to emulate and evidence terroir ideologies. Finally, the article shows that in the process of evidencing terroir through infrastructures of value, genericness and uniqueness appear as mutually constitutive strategies, thus contributing to debates in economic anthropology on the understanding of value.

Terroir, Infrastructure and Materialism

The concept of ‘infrastructures of value’ is bringing together approaches in historical and new materialism in a critical manner (Lammer and Thiemann, this issue), although the aim is not to merge both approaches seamlessly. Infrastructures of value act rather as a bridging concept between the two types of materialism, highlighting aspects in both theoretical approaches that can be combined productively.

New materialist approaches to terroir show us that the regime of existence among scientists and winemakers is contested (Teil 2012) but that, nevertheless, winemakers make decisions relying on composite scientific proofs of terroir (Brawner 2018; Certomà 2011); through scientific infrastructures, these properties are selected or evidenced in order to produce wine with a unique local taste and possibly with a higher market value. Historical materialist approaches to terroir enlarge the picture of how value is produced; they underline the political economic dimensions of wine quality

and value – for example, private property regimes make possible the monopoly claims to terroir uniqueness (Harvey 2002) and capital accumulation acts as a base for prestige claims (Ulin 1996; 2007) that strengthen the global hierarchy of value (Jung 2016; Demossier 2018). Analysing the Purcari terroir through the lens of infrastructures of value shows us in a similar vein that the scientific classification and selection of vineyard elements supports the monopoly claims to uniqueness, which allow the Purcari winery to belong to the higher ranks in the global hierarchy of value.

Approaching the Purcari terroir wine from the point of view of infrastructures of value shows us as well a close link between production, circulation and consumption of the product. Envisioned as a unique, high-quality product, Purcari wine is produced through scientific and manual labour in a manner allowing for the ‘taste of place’ to be captured. This production process enables in turn the circulation of Purcari wines in market segments which have higher value than those for cheaper, table wines. The consumption that follows may be influenced by this circulation (or exchange) level, where marketing strategies are deployed. For a terroir wine, this initial ‘preparing the ground’ stage, which is done through scientific and legal infrastructures, is mostly invisible and naturalised. As such, the assembling and classification work recedes into the background, and the consumers are usually informed about the qualities of the environment and climate in the region where the vineyards are located and about how these allow the production of unique wines (on the materiality and productivity of information infrastructure see Lammer, this issue). Sometimes these qualities are presented by winemakers as a ‘given’ in the world, something bestowed upon a community of vintners by divinity (Demossier 2018) or by the natural order (Ulin 2013). However, analysing the infrastructuring processes behind differentiated wines shows us an intense work of classification and evidencing, which can also depend on the amount of capital a winery or a wine region has already accumulated.

Furthermore, anthropologists and sociologists have pointed to two important approaches to deconstructing the image of a terroir unchanged from time immemorial (Demossier 2011). First, coming from a new materialist approach, Genevieve Teil (2012: 478) observes that terroir is interpreted differently by scientists and winemakers: scientists consider terroir to be a construct, ‘an unfounded notion’, while winemakers consider it to be ‘real’. She argues that researchers should engage with terroir rather than dismiss its existence on radical empiricist grounds; after all, actors involved with terroir (winemakers and consumers alike) grasp terroir and engage with it as with a very real object.

Historical materialist approaches show that, aside from the scientifically contested regime of existence of terroir, plain political-economic drivers and the position in the global hierarchy of wine value explain attitudes of accepting or dismissing terroir (Ulin 2013; Itçaina *et al.* 2016; Demossier 2018). In the case of Moldovan winemakers, producers at the periphery of the winemaking hierarchy of value, we can observe that evidencing terroir scientifically is their way of showing they belong to and are becoming competitive in the international wine markets where terroir wines are more prestigious and profitable than mass-produced, generic wines. Cultural-symbolic frameworks such as Protected Denomination of Origin (PDO) quality schemes, to which Eastern

European wine producers need to adhere in order to be recognised as unique, are ways to show a ‘cultural’ alliance with a way of understanding and evidencing quality.

Infrastructures that Evidence Terroir

The border-crossing legal-scientific infrastructure used in articulating and evidencing terroir in Purcari is constituted by an array of modules such as old and new soil analysis laboratories, new production technologies and sets of standards and yeast plants abroad, among others. These scientific processes of evidence gathering are intermediated by different infrastructures (see also Sippel, this issue). They help in producing distinctive wines in a market field structured by a political-economic logic of valuation.

Looking at soils draws attention to the extra profit that can come from land, by claiming monopoly rent for unique terroirs (Harvey 2002). Evidence for a prestigious terroir is gathered through following the procedures for acquiring a PDO label. Second, by analysing the selection of microscopic organisms that live and otherwise multiply spontaneously on the soil and on the grapes, one can gain a deeper understanding of the manner in which value is extracted from the environment. These two components convey uniqueness to the wine that is produced from them as much as they convey reassuring generic features, which align the product with international quality standards.

The ‘Truthfulness’ of Terroir: Soil Mappings

Winemakers increasingly seek ‘the authority of the map’ to evidence scientifically the soil and bedrock properties in their vineyards, and in this way they can increase the value of their wines (Skinner 2020: 87). Here I draw attention to the scientific and legal infrastructure which helps wine regions to differentiate and endow a terroir with durability. Explaining the evidencing of the Purcari terroir through scientific infrastructures within local research projects, the winery’s chief production officer, Alin, shared in an interview:

On the research segment, we are intensely developing the soil research side, the climate, in a word – the terroir. We are involved in projects with the ONVV, USAID; we want to develop the soil research through a thorough study. We have sent the soil samples [to the Soil Institute laboratories] to see its components, we have meteorological stations in every sector. We are following the climatic processes, we want something broader. (Chişinău, July 2017)

Comprehensive soil mapping was carried out on the Purcari estate in the late 2010s in the framework of two projects which had the common purpose of finding out which grapes grow best on Purcari soils and to favour those grapes with the most consistent varietal typicality.⁴ One project concerned the compilation of a file for a Purcari Protected Designation of Origin (PDO) label, and the second project, called ‘Best Grapes’, was developed together with the ONVV; both set out to refine knowledge about different vineyard spots on the Purcari estate, and involved the monitoring of weather, grapes and viticulture styles, soil mapping and archival research.⁵

At the time of my fieldwork in Moldova, forty wines with the Protected Geographic Indication (PGI) label were produced in the country, but there were no PDO labels yet. According to European legislation, PGI is a less strict control of origin than PDO: a PGI label requires only that at least one phase of the wine production takes place in the designated region. For the PDO label, an initial section of the file is concerned with the history of the production practices in the place.⁶ In the case of wine, the oldest winemaking practices that can be traced in the designated perimeter are required in the paperwork. Next, the infrastructures for the grape processing and wine bottling need to be placed in the designated region⁷ (on the importance of generic but in-situ bottling infrastructure for ‘singularising’ Italian *vino naturale*, see Krüger, this issue).⁸ Then, ‘the link with the geographical area’ – the influences of local geology, pedology, climate and hydrography on the product – need to be documented and included in the file. These are details that prove the uniqueness of a region and of its product, but at the same time they act as a standardising practice.

Indeed, Victor, the director of the winery, who is also trained as an oenologist and worked as an intern at Purcari during his studies in the 1980s, said that the more complex analyses carried out in the vineyards served to legitimate the Purcari wine-making area by emulating standards already recognised at international level:

We want to make a PDO region that is truthful, that corresponds to the most rigorous international requirements – French standards – meaning somehow to copy those restrictions of the French: yield per hectare, taste, quality, international competitions, medals. Because we do not have this practice in Moldova, it lacked in the past, this is why we have to do it now, and I believe the practice of the French is the best. It took them a few hundred years to create this system and it works very well. (Chişinău, July 2017)

Victor’s words suggest an implicit distancing from Soviet practice, when the wine taste from individual plots was less important than affordable, mixed-vintage wine and an inclination towards more closeness to the recognised *Appellations* system. The studies carried out in the 1930s and 1940s in some regions in the Soviet Union – primarily Georgia – were meant to delineate pedo-climatic ‘microzones’ and find the most suitable grapes for these areas (Walker & Manning 2013: 204), a practice which seems to have much in common with terroir at a first glance. But the notable difference between French terroir and Soviet microzones was the property system and the size of the microzones. While in Georgia the delineated areas were large and it was common for grapes from different plots of land to be mixed in the production process, in France the properties were private and small, and mixing grapes from different plots violated the definition of terroir.⁹

In post-Soviet Moldova, in the case of the Purcari winery, evidencing infrastructures have been mobilised to prove the presence of the internationally agreed scientific features for ‘proper’ winemaking environments. Moreover, the PDO standards are implemented at a national or regional level, so the requirements are generic but what is conveyed for each region is unique. By adopting terroir and carrying out the measurements which make the claims for a ‘unique terroir’ possible, the winemaker makes a distinction between the past, which was socialist and East European, and the present and the future, which belong to Europe and the global wine market.

In cases where a PDO application is successful, the quality scheme acts as legal infrastructure invested with authority in markets and expert circles. This authority allows a winery to sell its wine at a higher price, and in most of the cases, producers of PDO final products earn a higher gross profit than those of standard products (Areté 2013: 9). A PDO certificate attached to a wine is a token of recognition for the quality of a product that is strongly linked to a respective region.

The second project involving soil testing was named *'Best Grapes'* and exemplifies further how the uniqueness of a wine terroir is evidenced through scientific work. When the ONVV, together with the Soil Institute in Chişinău, began to carry out geomorphologic and pedological evaluations of experimental plots planted with grapevines in three regions, one of these regions was Purcari. In spring 2017, I met a television team in the Purcari winery vineyard that was filming a report about the project with soil scientists and wine marketing specialists from the ONVV. The lead soil scientist explained the soil data gathering process, which had become more complex in the present. In the first instance, measurement of slope orientation and terrain shape was carried out for the delineation of the demonstrative plots. Next, individual plots were mapped through GIS, generating both two-dimensional and three-dimensional maps. The final product of this analysis was a set of digital thematic maps of the vineyards, showing digital models of the vineyard landscape with measurements of landform, slope, sun exposure and altitude. A pedological digital map was also generated. After all the data were gathered, including archival meteorological data (recorded since Soviet times through the 1990s by a meteorological station in a neighbouring village), satellite imaging, new slope measurements and mapping, the scientists delimited plots of soil and dug soil profiles.¹⁰ On the Purcari estate, six plots of land measuring 4.25 hectares each were delineated and planted with three local grape varieties and three French ones.

Initially, just for one year, the behaviour of the vines was observed in order to grasp which soil gave the best expression to the grapes (Rozloga *et al.* 2017). There are international descriptions for each technical grape variety which suggest what taste, smell and colour a balanced varietal wine should have, and they are compared to what is the best result locally. In this way, a recognisable taste is mixed with a local nuance, leading to a typical Purcari terroir taste in the wines. Liviu, the lead soil scientist, told me later during a visit I paid to the Soil Institute that this kind of scientific investigation is very much in the beginning stages and that many wineries in Moldova cannot afford it:

[About] the soil ... eh, they [Moldovan winemakers] are just about to wake up. But still, the harvest grows on the soil. It does not grow on a hydroponic support which you might use to put the grapevine on. By that method, you can be sure you won't get wine. [The grapevine] depends on the quality of the soil, also the harvest ... and on some nuances related to micro-elements, this is what the quality depends on. And, for example, Purcari wine has its own conditions, its own soils, its own bedrock with their corresponding content. At Ungheni, at three hundred meters altitude, you have certain conditions, at seventy-five to two hundred meters others ... The quality, the different exposures, where there is more sun, many things matter: a complex of factors which in the end influence the [wine] quality ... every plot needs to have its own characteristics, so that the production there is good. (Chişinău, July 2017)

The Purcari winery mobilised legal-scientific infrastructure to evidence the natural endowments in the vineyard that Liviu mentioned. Through this, the wine world came to learn that the soils and bedrock in Purcari were particularly suitable for making red wines, as was already mentioned in Tsarist and French documents from the nineteenth and early twentieth centuries (Ana 2022: 47), this time with more comprehensive scientific backup. Purcari would also enter history as the first wine region in Moldova with a PDO label, a detail which gives the winery a unique position in the country. But the process of acquiring a PDO label was a standardised one, which asked for generic features to be evidenced in the vineyard and later in the wine. What is unique is relative to time and space, because at the European or global level, the same feature is a generic one.

The Moldovan wine industry, in the decade after the loss of a big part of its long-term market partner (Russia), is a specifically evocative case to explain further how the dialectic between uniqueness and genericness takes place in the creation of market value. Although wine has been produced commercially on Moldovan land for centuries, the country is very new in international markets. The strategy explained to me by ONVV experts (at the national level) and by Purcari employees (referring to the strategy of their company) is to bring to the fore specificities of Moldovan or Purcari wine – for example, descriptions of its unique terroir or the use of indigenous grape varieties. At the same time, they strive to construct parallels or express alliance with classical wine regions around the world, in order to orient the consumer to this new wine which might end up on their table. This strategy of mixing the local and the unique with the international and generic to become commensurable enough for the market (see Harvey 2002: 96; Karpik 2010: 11) is not just a discursive act. It entails adapting production processes and the materialities involved in the products, and infrastructures are crucial in this transformation. The result is a product with added value. Looking closer at one of the Purcari wines can further substantiate this dialectic.

The choice of grape varieties to be monitored is tied to Purcari's marketing strategy for its main target markets,¹¹ which relies on the balance between the unique and the generic in wine. In this sense, Purcari has started to make wines that blend local and international grapes, adopting the tendency to plant more indigenous grapes – what Monterescu and Handel (2019: 317) call 'varietal terroir' – where distinct identity does not come only from the environmental and technological features of the land, but also from the connection of a grape variety to it. Purcari's red Vinohora wine is a telling example; made from 51% Rară Neagră ('Black Rare') and 49% Malbec, it is described in the English-language leaflet as follows: 'Vinohora in Red is the expression of local and international spirits harmony, reunited in a Moldovan and Argentinian vinous dance. Unrepeatable character is transposed by combining the native variety Black Rare and classic Malbec from Argentina' (sic). In making this kind of wine, which tries to capture the 'Moldovan spirit' and combine it with a classical grape (an Argentinian variety grown in Purcari), the observations of the soil scientists and their classification work in the Chişinău laboratories helps by identifying the most suitable plots for Rară Neagră and for Malbec, respectively. The unique and the generic in

the terroir wines are speaking to the international markets in a way which makes it easier for the buyers to orient themselves.

Taming Terroir: 'Wild' Yeast Selection

Purcari was also a national forerunner in selecting indigenous yeasts to give a unique taste to a small part of their wines. This strategy of defining terroir by including 'indigenous', or 'wild' yeasts and other microorganisms that evolve in a particular vineyard to enhance the taste of the local terroir was still being characterised a few years ago as an 'extreme position' (Unwin 2012: 40); but in recent years, it has been gaining attention among winemakers across the world. Thus, in the autumn of 2016, the Purcari winery, together with the National Institute for Vine and Wine (INVV, the main wine research unit in Moldova), started developing a local yeast selection project in which scientists harvested local yeast cultures at Purcari so that in the future they could be used in winemaking in the factory.

Until the mid-2000s, wineries in Moldova could use locally produced liquid yeasts from the Chişinău yeast factory, founded in 1964 and part of the bread-making plant in Chişinău.¹² With access to international markets in the 1990s, because of competition with imported products, the sales of the local yeasts decreased. The Chişinău factory was producing only liquid yeasts for winemaking, and the active dry yeasts that became available for import were easier to handle and more stable, and eventually winemakers came to prefer them. Nevertheless, local yeasts in liquid form were available from this factory only until the early 2010s, after which the factory went bankrupt. At the time of my fieldwork, yeasts were imported predominantly from Italy, Germany and France.

On the day I visited one of the researchers in the indigenous yeasts project, Lilia, at the INVV in Chişinău, she explained to me the part of the yeast selection and multiplication process that could be carried out locally. Yeast cultures were isolated in order to be sent to a yeast factory in France to be processed.¹³ For the isolation of wine yeast cultures, Lilia took samples of fermenting juice from a batch of grapes that were fermented like house wine,¹⁴ and placed them in nutritive environments in Petri dishes, where the yeasts started to grow and develop in a day or two after seeding. The yeasts were selected from the wild yeast populations that appear on the plants and on the soil surface in Purcari, which make grape fermentation possible in homemade wine. She explained that the important difference between homemade wine and wine made by professionals was that, while the former contained hundreds of cultures of yeasts (some of which were not suitable for fermenting grapes), the latter used fewer selected cultures which 'were not wild', and made a wine organoleptically¹⁵ optimal and able to age well. Because of the presence of hundreds of yeast populations and other microorganisms in homemade wine, it spoils much more easily. The active dry yeasts contain cultures which take two to three weeks to consume all the sugar in the grape juice, whereas 'wild' mixes of yeasts and other microorganisms can take four to five weeks. On each Petri dish, a drop of growing yeasts contains large numbers of cultures, from which those that developed most uniformly were isolated, for, as Lilia said, 'they have to be pure cultures'.

These pure cultures are the basis for ‘microbial terroir’ or ‘signature flavours’ (Paxson & Helmreich 2014: 177), notions which are gaining importance in local or heritage food and wine markets, where the microbiome of an environment is recognised as a crucial actor in creating taste, but only certain species are eligible in this process, while others can be destructive (ibid. 167). The researcher showed me recent samples from Purcari which displayed a dotted pattern of beige drops that represented colonies of yeasts. Those which were growing isolated like ‘unique drops’ were selected and then observed through a microscope to check the uniformity of the cells. Some of them were elongated, some round, some ovoid, but the aim was to select those colonies which had the most uniform cell shapes that would also yield a more stable fermentation process. After these uniform cells had been harvested, they were introduced into grape juice to be preserved for six months. After that, another round of yeast samples was harvested and the same process was repeated, while the yeast’s capacity to transform sugars in the juice was observed. The cultures that fully fermented the juice and consumed all the sugar were selected. At the time of my visit, already several yeast cultures from Purcari had been isolated and the experiment was going beyond microvinification, extending to larger quantities of grape juice; however, it was still not used for commercial purposes.

Lilia explained that the isolation of local yeasts became popular around the world and that ‘this is the “terroir factor”: this is where the grape was grown, where it was processed, this is also where it is fermented, with those yeasts and this final product as original for that region.’ She concluded that ‘some winemakers are interested to use autochthonous yeast because it is something new and it will be like a brand ... when people hear that something is autochthonous it helps with trading [Romanian *face bine la comercializare*]’. Victor, the winery director, also told me that this would ‘allow us to have a better typicity and a more profound uniqueness to our wines. This is a very sought-for aspect by the true consumers, this is why we started this long- term project, lasting two to three years’.

The infrastructure producing the active dry yeasts – selection laboratories and processing plants – helps in achieving a ‘generic uniqueness’ by, first, isolating that which is unique and, second, by creating uniqueness around generic tropes. Through evidence of the organoleptic characteristics, the typicity of certain grapes, and in the end the claim for terroir, wines become subsumed under a globalised hegemonic discourse on taste and quality (Jung 2014), as the adopted standards for the selection of the yeast cultures come from the International Wine Office (OIV 2012). This story was, again, one about selecting local, specific yeasts which give a unique taste to the wine; but at the same time, it allows the winery to take part in a global (generic) trend of using indigenous yeasts.

Dialectics of Uniqueness and Genericness in a Post-Soviet Terroir

My interlocutors showed a clear awareness that their terroir and wine must play a contradictory game on several scales. As discussed in the previous sections, both Moldova and Purcari become competitive and viable in international markets by adhering to

standardised systems of value, but at the same time, they emphasise the uniqueness of their place to generate other sources of value through distinction strategies. This results in the final and unique product of Purcari terroir wine, but I have emphasised the backstage movements that have led to its making, capturing successively what has emerged now not as a duality, but a co-constitutive set of descriptors – the unique and the generic.

In this process of distinction, the adoption of production standards that rely on advanced and often expensive technical infrastructure (such as access to soil analysis labs or yeast processing plants) is necessary but not easily available to Moldovan wine producers in general. Moreover, EU production standards can ask for different infrastructure than the one that was in place before, and this can mean that producers who cannot afford this restructuring are left out of the market (cf. Dunn 2009). The whole process of implementing new standards in Moldova is ongoing and it is not always smooth, neither for Purcari and other wine producers, nor for the ONVV, the institution that decided on the conventions adopted and ‘installed’ the sets of standards locally (on ‘installing’ standards, see generally Star 1999: 382). Still, Purcari is a privileged example compared to other Moldovan wineries if not to western wineries. As a lawyer specialised in wine legislation told me when I explained my research topic to her: ‘you are looking at the Moldovan wine industry through rose-coloured glasses’ (Ana 2022: 150).

However, Purcari is still a producer at the periphery of the classical wine world and it has encountered a more complex set of challenges than already-established actors in the global wine market. As a post-Soviet wine region, Moldova is perceived by consumers and wine critics alike as a lower-quality producer (cf. Hann 2004 on Hungary; Jung 2016 on Bulgaria; Itçaina *et al.* 2016 on Romania), and it struggled at the same time with access to state-of-the-art technology due to the enduring poverty in the country. Alin, the chief production officer, explained that terroir was not known in Moldova until recently, and Sonia, a colleague working in the Purcari winery lab, said that while she was studying wine science at the university in Chişinău (between 2006 and 2009), terroir was seldom mentioned. In Alin’s words,

Terroir is a term that [in Moldova] was not known until now. The global tendency is to ask you to research more deeply to see what is at the root of quality grapes, of quality wine. Maybe earlier there was something, but it was not precisely termed ‘terroir’. There were microzones in which grapevine was cultivated, and they could obtain quality wines, yet I am not from that generation, and I cannot say what was then. But I believe that no one went more deeply into this matter. (interview, Chişinău, 2017)

The role of scientific infrastructure is central in this process of making wines marketable in international markets: having your terroir backed up by science is crucial for new or peripheral wine regions, while for classical regions this is not so central anymore (see Itçaina *et al.* 2016). This dynamic shows us as well how the hierarchy of value dominated by western, affluent wine regions yields unequal amounts of pressure at the periphery and at the centre, respectively.

This observation leads us closer to the theoretical bridge between historical and new materialism. Historical materialism shows us that certain actions and dynamics are not

only a summation of material possibilities, but that they are guided by intentionality embedded in a political economic context. In other words, using soils appropriate for winemaking and strains of yeasts that make better wine is not inherently related to a market dynamic, but the purpose of scientific evidencing of ‘nature’ is here motivated by a profit logic. New materialist approaches show us how materialities are assembled, but rarely focus on the political context in which these processes take place, which is frequently a context structured by inequalities and hierarchies of value that do not rely only on knowledge, technology and innovation. This differs from historical materialism, which includes analysis of the political economic dimension and its structuring effect (Howard 2018: 71), and explains that hierarchies of value in wine rely to a great extent on historically accumulated capital and prestige (Ulin 1996; Harvey 2002; Demossier 2018). The political economic side of mapping soils and selecting local yeasts tells us that there was human intentionality guiding the activities in order to forge a company identity that is able to operate competitively in the current market conditions, appropriating slices of nature (as monopoly rent) for that purpose.

Purcari used technical infrastructure to monitor, analyse, classify and select nature to capture terroir. In both cases I discussed above, some generic features were sought. Soil scientists analysed and classified soils first by ensuring collectively agreed standards were in place (closeness of bedrock to the roots, acidity of soils, humidity) while at the same time looking for specific, local characteristics (e.g. the amount of Rubidium in the soil, the combination of minerals). These characteristics were revealed and classified by scientists and engineers, bringing value closer to realisation. The case of yeasts was similar. Here, homogeneous *Saccharomyces cerevisiae* yeast cultures were selected from the totality of wild yeasts occurring on soils and plants of the estate. These selected yeasts ensured fermentation time and quality, which followed international standards set by the OIV, but in the end the selected cultures were local and specific, enabling the wine to have its most specific identity.

Conclusion

This article explains through the lens of infrastructures of value how terroir is evidenced through classifying, measuring and standardising physical features of the environment. I have shown that the articulation of terroir as a differentiating, value-adding tool in winemaking depends on legal and scientific evidencing infrastructures. The article looks specifically at two understudied facets of terroir and leaves out other prominent characteristics of terroir, such as human knowledge or climate, for analytical reasons. By breaking down the classificatory and selective processes achieved through laboratory analyses of soils and yeasts, it becomes apparent that the ‘unique’ and the ‘generic’ are co-constitutive categories in a commodity such as wine. During the vinification processes there are other factors strongly influencing the taste of the wine, from sunshine and the amount of sugar in the berries to the observations and tastings made by winemakers and consultants advising on global trends in taste. Nevertheless, this article seeks to understand and depict specifically

how, in order to create value in terroir wines, scientific infrastructures of value are crucial pillars of value creation which remain camouflaged behind the discourse presenting terroir as a way of winemaking that is 'letting nature speak'. The unique-generic dichotomy seems to be a useful toolbox for strategies of differentiation, used in emphasising that a terroir or a wine are unique but standardised, and ultimately valuable commodities. Infrastructures used to classify and evidence attributes of the environment, and yeast selection laboratories to domesticate it, substantiate the argument that different infrastructures shape value through a successive processing of uniqueness and genericness for competition on the market (Lammer and Thiemann, this issue). The materiality of these valuation processes is important, because material infrastructures are used to evidence, select, add, or take out other materialities which have effects that produce economic value. While infrastructures are generated by capital, in turn they generate value themselves. Harvey's (2002) reading of terroir as monopoly rent is helpful for conceptualising value in this context: the control of the land that 'hosts' the elements that make terroir, and the subsequent mobilisation of productive infrastructures, make possible differentiation and enhance value on the wine market.

The article's contribution to a critical materialist understanding of terroir relies on tracing how infrastructures of evidence are mobilised in substantiating terroir, and in evidencing it for the relevant environments, in order to create value through claimed uniqueness and recognised familiarity. 'Infrastructures of value' put a seemingly ahistorical material process (of assembling terroir) in its political and social context. The theoretical contribution of infrastructures of value to historical materialism is to gain insights into the 'how' of micro-scaling (making and breaking) of value gleaned from new materialism, while new materialism becomes invested in more holistic and political explanations of 'why' humans engage in the activities they do.

Notes

1. A second ban on the importation of Moldovan wines to Russia is still in place since September 2013 (only a few Moldovan wineries have been allowed to export to Russia since early 2017). The embargoes have been understood by many Moldovan winemakers and decision makers as political responses against Moldova's increasing closeness to the European Union, culminating in 2014 with the signing of the Association Agreement in the framework of the European Neighbourhood Policy. Moldovan commercial wine production over the Soviet and post-Soviet decades has been mainly export-oriented, with 80% to 90% of the total volume being sold abroad. As the Russian market has been progressively lost in recent years, the Moldovan wineries which did not file bankruptcy transformed by re-organising production infrastructures, adopting international quality standards, and crafting a new discourse on locality and distinctiveness based on the French, and now increasingly globalised, concept of 'terroir'.
2. He referred to the idiom in Romanian '*tehnologia vinului*', translating as 'wine technology' and pointing to the science of processing grapes into wine.
3. The data analysed in this article is based on one year of fieldwork in the Republic of Moldova, between August 2016 and August 2017. During this time, I carried out ethnographic fieldwork in the Purcari winery and periodically took part in wine events in Chişinău. The present analysis relies on participant observation in the winery and on interviews with winery employees, participation in wine events and analysing archival materials pertaining to the Moldovan

wine industry in the Soviet period and in the immediate post-Soviet years. The name of the winery and of the village is real, as Purcari is one of the most recognisable winemaking places in Moldova. However, I changed the names of my interlocutors in order to protect their privacy.

4. 'Typicity' is a term in wine tasting coming from the French word *typicité*, describing the characteristics of a varietal wine which denote the 'signature' characteristics of the grape.
5. Part of the ethnographic data and historical details used in this article appear in my monograph 'Wine is our Bread: Labour and Value in Moldovan Winemaking', published by Berghahn Books in May 2022, from pages 132–152. The parts of the book based on ethnographic data on soils and yeasts are part of an analysis of how scientific and marketing work contribute to the forging of a terroir's identity and how market competition affects which elements of a winemaking place are evidenced by winemaking companies.
6. EU Council. 2008. Regulation NO 479/2008. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008R0479>.
7. This aspect can still be an issue for other wineries which do not own a bottling line. This has historical reasons too; until 2006, more than half of the wine produced from Moldovan vineyards was exported in bulk because of the lack of bottling lines. During the Soviet Union, most of this wine was exported in bulk by train to other Soviet republics, such as Ukraine, Moscow, or as far as Barnaul in the Altai region.
8. The 'EU Council Regulation NO 479/2008' defines PDO wines as follows: 'Its quality and characteristics are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors' (referring to terroir). Furthermore, grape production and processing into wine need to take place in the designated geographical area.
9. Soil mapping was already a scientific module of the wine making infrastructure during socialism and its purpose of has thus been adjusted to make it compatible with terroir's infrastructure of value. This has meant demarcating vineyards that then represent protected origin labels. (On the varying stability and adjustments of different infrastructural modules of Serbian raspberry production after socialism, see Thiemann, this issue; on the modularity of infrastructure and the resulting question of compatibility see Lammer and Thiemann, this issue).
10. This is a cross-section of the soil which reveals 'horizons', or layers of soil which are parallel and different from the layers above and underneath. This helps in classifying soils and in deciding on optimal crops for those areas.
11. Currently, these are in Romania and the Central European countries. The winery is aiming to enter Western European and USA markets for bottled wine within the next two decades.
12. These yeasts were local in the sense that they were produced in Moldova, but there was no process of harvesting and selecting yeasts from Moldovan vineyards, as in the Purcari case discussed here (<https://mybusiness.md/ro/idei/item/991-este-nevoie-de-drojdie-%C3%AEnvinifica%C8%9Bie>, accessed 11 November 2019, and http://arhivaparlamentului.blogspot.com/2011/04/sa-fabrica-de-drojdie-din-chisinau_22.html, accessed 11 November 2019).
13. Wine yeasts can be processed outside the PDO perimeter as the final product, wine, does not include yeasts. They are removed during the processes of decantation and filtration of wine.
14. In house wine, the harvested grapes are crushed and in 2–3 days they start fermenting spontaneously, as yeasts ferment the sugars in the grape juice. This spontaneous fermentation occurs without any addition to the juice. The yeasts come from the grape skins, grapevine, soil, and air.
15. The characteristics of a food or drink experienced via senses – taste, smell, touch, sight – as recommended by OIV.

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