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RESUMEN

Según los diferentes actores implicados en el proceso de producción, el vino argentino ha vivido cambios radicales en las últimas décadas. Limitándose a la región de Mendoza, esta investigación intenta analizar algunos de los cambios observados en los viñedos desde una perspectiva socio-técnica. Siguiendo la forma como la definición de calidad es (re)construida, se busca comprender la relación existente entre la interpretación de la vid y el uso de ciertas tecnologías. El artículo muestra cómo las dinámicas entre grupos sociales y artefactos crean significados diferentes de calidad, lo que a su vez otorga diferentes papeles a las uvas en el proceso de producción de vinos. También muestra que los cambios descriptos no necesariamente implican que una 'nueva tradición' haya reemplazado a una 'vieja tradición', sino que diferentes grupos sociales son relevantes en diferentes marcos tecnológicos, desplazando a otros.

Palabras claves:
Estudios de la Ciencia y Tecnología - Cambio tecnológico - Grupos sociales relevantes - Marcos tecnológicos – Vinicultura – Viticultura – Mendoza - Argentina.

ABSTRACT

According to those involved, Argentine wine has changed radically over the past few decades. Limiting itself to the Mendoza region, this paper wants to analyze some of the changes observed in vineyards from a socio-technical perspective. Following the way that the definition of quality is (re)constructed, a relationship is sought between vines and wine and the use of certain technologies. The paper shows how the dynamics between social groups and artifacts create different conceptions of quality, which in turn lead to a different role of grapes in the wine making process. It also shows that the changes observed do not necessarily imply a 'new way' has taken over an 'old way'. It rather seems that different social groups are relevant in different technological frames, displacing others.

Key words:
Science and Technology Studies (STS) - Technological change - Relevant social groups - Technological frames - Wine production - Grape farming – Mendoza - Argentina.

How the vineyard came to matter: Grape quality, the meaning of grapevines and technological change in Mendoza's wine production
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HOW THE VINEYARD CAME TO MATTER: GRAPE QUALITY, THE MEANING OF GRAPEVINES AND TECHNOLOGICAL CHANGE IN MENDOZA'S WINE PRODUCTION

Polly Maclaine Pont (*)
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1. A SOCIO-TECHNICAL PERSPECTIVE ON ARGENTINE WINE PRODUCTION

When observing viticulture in the Argentine Mendoza region[1] over the past decades, through experts (see: interviews) and in literature (Azpiazu & Basualdo, 2001, 2003; Richard-Jorba, 2000), there seems to be general consensus on a shift from one way of producing wine to another: from antiquated mass production for mainly table wine to a technologically advanced and quality-conscious process. Though analyses have been made of these changes, they tend to focus on economical and / or technological developments. This research wants to analyze some of the changes from the point of view of the social groups involved, in the sociological tradition of Science and Technology Studies (STS)[2].

STS investigate changes in science and technology over the course of history

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[1] While this research covers many changes that have taken place on a national scale and uses data that apply to Argentina and many of its national institutions, this paper limits itself to the Mendoza region. One reason is the time and scope permitted in this limited work. Also, Mendoza is the country's oldest and largest wine region.

[2] The paper thus has no pretensions whatsoever to providing an economical analysis or any other. It is believed that for a thorough understanding of the changes that have taken place in Mendocino viticulture over the past decades, an integration would be needed of all the investigations at hand - economical, technological, geographical – and also that several other features would need highlighting, especially with regard to the social. This paper hopes to contribute input for that last category.

from a social perspective. Within STS, social constructivist theories[3] criticize the mainstream linear view on technology 'development', stating that technologies are not natural objects that develop autonomously. They are in stead co-defined by the social elements from which they surge and that surround them, as the social and the technological constantly construct and re-construct each other. The homogeneity often ascribed to technological development is also questioned, as this would be the outcome of "socio-technical" dynamics between a multitude of actors, objects and practices, rather than a given road[4].

Social groups have many different kinds of relationships, not only with other social groups, but also with objects. Each such relationship influences the meaning of the object, which then influences the proceeding of the relationship, and so on. Put differently, social groups and objects within a certain relationship are co-constructed. This is why here the term "artifact" is preferred for technological objects, as it stresses this constructive nature. For the same reason, the term "relevant social groups" is borrowed from Bijker (1995), by which he refers to all those groups that attribute a certain meaning to an artifact[5]. This includes the way that such groups define problems and solutions, as well as the artifacts that belong to this representation. To describe this whole of relationships between a new 'artifact-in-the-making', relevant social groups and all the elements involved for their making sense of things, Bijker introduces the concept of "technological frame"[6]. This concept explains how certain individuals stick together around certain artifacts, not only from the point of view of what binds them to a relevant social group or artifacts, but also how an artifact's physical form structures such interactions in a specific way. Technological frames thus structure both relevant social groups and their relationships. (Bijker, 1995)[7].

In the following section the differences between two technological frames for viticulture in the recent history of Mendoza are explored. Different meanings of grapevines are introduced, as well as the consequences this has for the artifacts involved in vineyard maintenance. Also, the relationships between relevant social groups and their artifacts are described, in order to explain how they hold together, creating and reinforcing the frame. The third section of this paper elaborates on the idea of technological frames, showing that while "quality" might seem to have been an issue over many decades, its conception has radically changed over the years. This will stress that a term like "quality" has a specific meaning, with specific artifacts and specific social groups relevant to the technological frame it belongs to. Finally the question is addressed how differences in meanings might come about. Recent

[3] The best-known school in STS is the Social Construction of Technology (SCOT) by Wiebe Bijker (1992, 1995) and Trevor Pinch (1987).

[4] Another important 'constructivist' school within STS, Actor-Network theory, radicalizes this idea, by taking the accent off the social and applying a symmetrical approach to all - social and non-social - 'actors'. E.g. Latour (1987, 1996) and Callon (1986a,b). For an overview of key texts in Spanish, see Domenèch and Tirado, eds. (1998).

[5] Each group is defined by the different meaning(s) that an artifact has to him.

[6] In all, the elements that make up a technological frame according to Bijker (1995) include: goals, key problems, problem-solving strategies, requirements to be met by problem solutions, current theories, tacit knowledge, procedures, methods, criteria, users' practices, perceived (substitution) functions, exemplary artifacts and all the artifacts that belong to the maintenance of the 'paradigms' of the relevant social groups.

[7] It must be stressed here that the analytical framework used in this paper is only loosely based on SCOT (as in Bijker, 1995), because the current status of this research – which is still very directly rooted in the information retrieved through interviews - does not yet allow for the critical analysis worthy of that tradition.

developments in one of the professional groups involved in wine making are taken as an example of how changes in one field can affect others, leading to radically new relationships. It will then also be shown that the "quantity frame" has not disappeared from the scene, but is dominated in certain respects by the "quality frame".

2. TWO FRAMES OF MIND? AN INTRODUCTION TO THE VINEYARD 1975 – 2000

2.1. The Quantity Frame

In the 1970's 95% of Argentine wine production consisted of cheap table wine for national consumption. Grape producers would deliver grapes to huge manufacturers who produced wine by the barrel or wagonload for mass consumption throughout Argentina. The producers were suppliers of primary product to the winery and little else mattered to this relationship than price. Vineyards were thus generally independent operations - although economically there was a very high income-dependency of farmers on wineries (Azpiazu & Basualdo, 2001). The most notable relevant social groups were the independent and cooperative grape producers, and the "trasladistas"[8] and table wine producers (wine makers, or grape buyers).

However, other social groups were also relevant. For example, the typical customer was the mass city population of low-wage laborers who with their predominantly Italian or Spanish background were used to drinking lots of wine, but had little to spend. Another relevant social group were the transporters, (re)sellers and distributors; as they worked on low margins, they valued wine that could be watered down. Finally, government authorities imposed several policy measures that contributed to the development of the sector in a specific way, for example by promoting the colonization of the East Mendoza region[9]. Each of these social groups have been relevant for forming the technological frame in a certain way, establishing for example low prices, high (initial) alcohol levels and the valuation of the hot, low-lying desert regions. This then had an important influence on how grapes were farmed.

Ine makers wanted a maximum of alcohol[10], which meant they especially looked out for high quantities of grape sugars. The main concern for grape producers was to maximize the quantity of grapes against the lowest cost. Quantitative measures defined what good grapes were to them, with major consequences for the vineyard. For one, the weight and size of grapes mattered most. The difference between types of vines was considered in terms of cost and yield rather than grape variety. When planting new vines, producers typically chose cheap plants with a high yield[11]. This explains why very different breeds like Criolla and Malbec[12] could be found mixed

[8] Whole-sale producers and re-sellers. See section 4.3 for a further explanation of this term.
[9] Tax incentives for investing in the Mendoza Eastern Region not only led to those territories being highly valued, but also induced many companies without any prior knowledge of wine production to invest in the cheapest possible way, for the mere interest of getting tax deductions in other areas of their business. Source: interviews.
[10] This is measured through the degree of sugars in the grape, stated in grades Brix, which indicate the alcohol percentage that can be reached.
[11] Thanks to this practice, of the 50.000ha of old Malbec vines that remained early 70's, 40.000 were eradicated and replaced with cheap varieties like Criolla, Cereza, Moscatel etc. Data: INV.
[12] Criolla is an umbrella term for a group of grapes which originated in the species left behind by the early colonists, which then adapted to the surroundings on their own. They are a rosé-kind considered of low enological quality. Malbec on the other hand is a so-called noble, red variety from France, where it is used in several traditional assemblages like Bordeaux (though not too often any more) and Medoc.

up in one plot[13]. Vines were sown relatively wide apart and left to flourish into large bunches, in order to maximize the yield per plant[14]. It implied low investments in vines and low maintenance costs. The need for plenty of fat juicy grapes made irrigation by gravity[15] a cheap and effective choice. The use of arbors ("parrales"), a pergola-like support system with poles and nettings that cover the top of the vineyard, allowed for many bunches and hand-picking. The working of the land could be labor-intensive, among other reasons, because labor was available and cheaper than machines.

In general, the vineyards described above are now classified by most as antiquated. A deep crisis in the wine industry over the 1980's radically changed their aspect (Azpiazu & Basualdo, 2001; Richard-Jorba, 2000). Wine consumption dropped steeply; while in 1975 the average Argentine drank around 90 liters per year, in 2000 this figure came under 30[16]. While there was a wish to export, efforts in the 1980's showed that Argentine wine was hardly accepted abroad[17]. Very different social groups now became relevant for Argentine wine production and the farming of grapes. The dominant technological frame for grapevines from that point on would become radically different.

2.2. The Quality Frame

In the technological frame of 'quality wine' importance is given to distinct colors, smells and tastes, mostly of fruit and oak, generally both with high intensity. Many technologies are considered a must not only to the producer, also to the consumer, who wants to read about them on the label. Though it would seem that the same relevant social groups are involved as in the previously described technological frame - grape producers, wine makers and consumers - on closer examination it becomes clear that they are actually comprised of very different people.

Grape producers now include many wineries that take an interest in the material they process, for example in grape varieties[18], and like to incorporate vineyards into their business to increase control over the quality of the grapes produced. Independent producers are being complemented or replaced by professional agronomists and other technicians, who play a central role as producer, winery employee or consultant, the latter especially through government agencies like the Instituto Nacional de Tecnología Agropecuaria (INTA)[19]. Enologists are also seen to take an interest in vineyard production, as will be further explained in the fourth

[13] In general there was very little awareness of the varieties grown, and when there was, many a time the knowledge was inaccurate. This 'confusión varietal' was largely enlightened by the work of among others ing. Alcalde (1989).
[14] As the vine is an usurer, the more it is let to grow, the more vigorous it will become.
[15] Either through the flooding of the entire vineyard or led through small canals ("surcos").
[16] This is ascribed among other things to changing eating habits and to the appearance of low or no alcohol substitutes like beer, soda and bottled or clean drinking water. Data from interviews and INV.
[17] Due to problems of mold, bitterness and oxidation (source: interviews with participants in export missions).
[18] This in order to make the varietal wines that made 'new-world wine countries' famous. After important innovative work during the 70's and 80's in especially California and Australia, other regions than the traditional European wine regions started gaining a share in the world market. A boom came in the 90's, when the 'old-world' countries were experiencing problems of their own. The 'new regions' distinguished themselves by offering variety wines and distinct oak flavoring. (Dominé, 2001)
[19] Not only through its proper research but also through special programs for re-educating producers, like for example "Cambio Rural". See also § 4.3.

section of this paper. With regard to the ownership of wineries, many new faces are involved like international winemakers and investors. These foreigners bring along different experiences, customs, relationships and artifacts. Another important relevant social group is the internationally oriented consumer, who brings along new demands as he has many different high quality offerings to choose from – as opposed to the average Argentine in the country's closed 1970's economy - and who also counts with an army of wine critics, magazines and wine courses to navigate him. In all, the influence of other wine regions and the 'global wine scene' has increased tremendously, also because wine makers and grape producers increasingly travel around the world to exchange knowledge.

The interest in improving quality has made systematic knowledge highly valued, thus incorporating the relevant social group of researchers, who bring along yet again new artifacts. For example, the INV plays a participative role in research, even lending its high tech equipment to the benefit of wine producers[20]. Also, INTA and universities play a much more central role in the developments in the vineyard. Special influence can be seen from modern biochemistry, which introduced enology to polyphenols[21] and the question of volatile qualities[22], as will be further discussed in section four.

All these relevant social groups, their objectives and interests and the artifacts they introduced have had major consequences for the face of viticulture. As the object has become to produce small, thick-skinned, concentrated grapes through a careful control of the plant[23], many different artifacts became central to the vineyard. For instance, distinctions are made between vines of low and high enological quality, each of the many varieties having distinct sensorial characteristics and different needs for tending. The interest in producing distinct tastes and smells also influences the techniques and artifacts involved in planting, maintenance and harvesting. Farming now concerns managing the balance between plant stress and competition. An ideal planting system favors small plants with low distance and a limited number of branchings and bunches per vine, achieved through pruning[24]. Also, inferior bunches are taken away to let the best grapes grow optimally, while maximum sunlight is obtained by partly de-leaving the vines[25]. The ideal support system is the "trellis", which guides the plant's branchings and also allows for the use of machines for many

[20] In the Quantity Framework, the INV played the role of policeman, trying to catch winemakers in the act of possible wrong doings. Now, because of the advanced materials they now have to their disposition, control can be ad-hoc, which means the INV can work on preventive policy (through cooperation with the winemakers). Also, winemakers have an interest in the INV's knowledge, while the INV wants the sector to comply with the international trade regulations they negotiate on. Source: interviews INV.

[21] Polyphenols are a group of chemical substances in plants that have more than one (poly) phenol-groups per molecule. They are claimed to have anti-oxidant properties, meaning their intake is healthy. Tannins are a well known example of polyphenols found in grape skins and seeds, and therefore especially in red wine. Tannins have the chemical function of binding proteins, with the characteristic of adding astringency and a bitter taste. In the same way, many other polyphenols are responsible for other sensations.

[22] The term volatile refers to all those chemical substances that are sensitive to heat meaning that the incorrect treatment of the plant containing them implies their loss or destruction. In wine the concern is mainly about flavor and aroma substances volatiles.

[23] This is because the more a plant is controlled, the more intense its grapes become.

[24] E.g. the 'double guyot' a system in which each plant has two branchings on each side.

[25] Before bunches fully start to ripe, the lesser ones are taken away so the plant can dedicate its energy to the best grapes. Leaves are taken in order to allow for a maximum of sun to reach the grapes without burning them.

different chores. Maintenance systems further act in function of this stress control, e.g. measured irrigation[26]. This is why a lot of research is done on drip irrigation, a system found in other desert areas like Israel. Finally, the indicators for harvesting include much more than alcohol-inducing sugars: the ripening of an array of polyphenols has become the important factor.

Besides all the techniques implied in vineyard management, the place where the vines are planted has become an issue, as many of the treasured biochemical substances are believed to enter by the roots and to be fed and bred by the climate. "Terroir" and "microclimate" thus form important issues. Where the readily accessible and cheap (inland) Eastern region of Mendoza was inherent to the quantity frame, the "quality" technological frame includes the higher mountain areas like the Valle de Uco. In all, the quality frame implies a completely different meaning of grapevines, with an 'ideal vineyard' not only tended differently, but which may find itself in completely different locations, with new relevant social groups and a multitude of new artifacts interacting with it.

2.3. Two frames: any problems?

The previous analysis demonstrates that different social groups are related to different meanings of grapes and how they are to be farmed. In consequence, very different techniques and artifacts are involved. Table 1 summarizes the differences between the two frames analyzed. The image portrayed up till now seems to imply that the production of quality wine started only recently. However, when reading up on the history of Argentine wine (e.g. Vidal Buzzi, 2002; Lacoste, 2003) it becomes clear that the 'quest for quality' and many of the farming methods involved in it have existed for a long time. For example, the varieties, planting distances, support methods and branching and pruning techniques now favored by many are considered to be traditional of Lujan de Cuyo, the oldest wine region. A DOC has even been called to life to protect them. But who introduced or established these 'traditional ways'?

Another problem would be that it seems implied that the quantity frame is history, or is at least rapidly being replaced by the quality frame. However, figures indicate that 65% of the market is still dedicated to the production of table wine. Though many state that in this sector also marked differences in quality have taken place, one should wonder whether it can be categorized under one or the other technological frame. The number of vineyards tending low-quality "rosado" varieties like the Criolla is still in the majority[27]. And even if one technological frame would take over another completely, how does this work? For sure it implies changes for at least part of the relevant social groups involved. For example, though the general demand for wine-grapes is rising, many independent producers are currently left out of work. Finally, it remains to be understood how grapes came to be interpreted as the origin of taste

[26] Because of the desert climate at the foot of the Argentine Andes, irrigation has always been necessary to grow anything. The careful administration of water is a powerful means to maintaining the plant just under its stress level. Modern drip irrigation systems, now even computer controlled, maximize the possibilities for control and are found more and more in the Argentine vineyard.

[27] In 2004 the harvest of red varieties was 6.7 million quintales, while for the rosado varieties it was 7.2 million. A 'quintal' is 46kg. Data INV.

and smell, instead of as a mere commodity. Though some aspects were mentioned that could make the shift possible, it remains unclear why or how the people involved could shift their way of thinking - or how certain social groups (dis)appeared on / off stage. The following sections will try to give some insight in these questions.

	Quantity Frame	Quality Frame
Relevant Social Groups	Independent and cooperative grape producers; "trasladistas" and table wine wineries; immigrant-related population; transporters and distributors.	Exporting wineries, wine-consultants, investors; agronomists, enologists; research institutions; international consumers, critics, magazines.
Definition of The Grapevine	Production device for supplying the commodity ingredient of (table) wine	Tool for creating the characteristic elements of taste and smell for a wine
Constituents of Grape Quality	Size: big Characteristics: thin skin, maximum juice Maturity: enough Brix for 13º	Size: small Characteristics: thick skin, concentrated juice, grape variety. Maturity: high ºBrix and full polyphenol development
Technologies for grape farming	High plant distance; low plant density; flood irrigation.	Low plant distance; high plant density; drip irrigation; pruning; de-leaving; pest control; fertilization control; soil research; etc.
Artifacts in grape farming	Cheap, high-yield plants; arbor; water channels; unskilled laborers.	Plants of identified varieties; trellis; irrigation pipes; tractors; skilled laborers; anti-hail nettings, etc etc

Table 1. Two frames in the production of wine grapes

RELEVANT SOCIAL GROUPS AND THE QUEST FOR QUALITY

This section will take a look at another group of 'quality pioneers' in the history of Argentine viticulture. While important parallels are observed with the previously described 'quest for quality', a close analysis of the relevant social groups and the grape qualities they relate to also reveals fundamental differences. This demonstrates once again how different technological frames imply different farming techniques.

In the second half of the 19th and early 20th century large amounts of varieties like Malbec and Cabernet were imported from Europe. Apparently importing such varieties was preferred over slipping the unidentified breeds locally available at the time[28]. As early as the 1850's a 'quest for quality' can be distinguished. The Mendoza government contracted the French agronomist Michel Pouget to help improve the produce of their region, who imported many French varieties. Later, Tiburcio Benegas did groundbreaking work for improving his Trapiche wines[29]. He was convinced that varieties should be pure and therefore bred separately, a very uncommon practice in his days. His recommendations for planting – dated 1885 – approximate ideals found in the current quality frame. Benegas' son continued his work, doing more

[28] This is why in the 70's there w 50.000ha of Malbec that could be eradicated in the first place. Data: INV.
[29] For example, one of his accomplices did extensive research for him on the French methods for viticulture and enological practices.

research and introducing new plant varieties. He also set the trend for offering different qualities of wine. Besides the typical table wine, labels with more pretentious fantasy names were supposed to refer to a distinctive, higher-quality content. (Vidal Buzzi, 2002).

Most of the founders of Argentine wineries at the turn of the century were immigrants from traditional wine regions like Italy, Spain and France who more or less took over the existing wine industry[30]. By 1910, almost 70% of the wineries and 83% of the wine production was in hands of European immigrants. They had brought with them not only their customs of drinking – which allowed for a quickly expanding market[31] - but also their preference for certain wines, namely those from back home. Grape stalks were imported and planting techniques and winery practices were imaged on what was customary 'back there'. (Lacoste, 2003; Vidal Buzzi, 2002).

On a superficial reading many similarities can be found between these changes and the current ones. Relevant social groups included quality conscious wineries, enologists, agronomists, and a government concerned with improving the region's name. Foreigners were important agents of change, as were travels to other wine regions. The old ways of wine production had to make way for new ways, in which more concern for quality was displayed. New grape varieties formed an important artifact for this goal. It seems then that the current technological frame of quality was foreseen by at least some visionaries.

Lacoste's work (2003), however, sheds more light on how to interpret the relationship of those historic relevant social groups and the wines they produced. The general goal was to make wines that copied those from back in Europe or at least that referred to these places of nostalgia. Central artifacts were the labels and the names of the wines. The elaborating methods aimed especially at approaching the results of European (French) wines, not as much the practice[32]. This lead to the need for distinguishing grape varieties, though for the same reason - in most of the literature of the time - higher quality grape varieties are simply referred to as "French" as opposed to "Criolla". (Lacoste 2003; Vidal Buzzi 2002).

This is all very different from the quality frame described in §2.2. Though superficially a similarity may be seen in the so-called quest for quality, the meaning of the term "quality" has changed. Relevant social groups might respond to the same name, but are composed of very different people, embedded in very different societies, cultural backgrounds and related to distinct professional, scientific or technological knowledge. While certain methods have been coming and going for a long time, they have not simply run into oblivion during certain periods of time. Rather, their meaning – and thus the reasons for their importance – has changed with new relevant social groups involved.

[30] In the Mendoza region wine production started almost as early as the first colonists, in the 1500's.
[31] Over the second half of the 19th century Argentina's population quintuplicated due to mostly European immigrants. (Lacoste, 2003)
[32] See for example the recipes published by Don Tiburcio in 1885 for ways to imitate Bordeaux or Bourgogne. (Vidal Buzzi, 2002, p. 58-60)

4. HOW RELEVANT SOCIAL GROUPS AND TECHNOLOGICAL FRAMES CHANGE GRAPE QUALITY

Section 2 showed that the dependency of vineyards on wineries changed from a purely financial relationship to an active involvement of wineries in the way that grapevines are managed year round. The question was later posed whether this was really the case for all wineries, and if so why. This section wants to understand how different relevant social groups started looking at the field in a different way, in order to create a better understanding for the differences in meaning found. As an example it is illustrated how one profession – enology - has changed over the years, and how this could affect both the artifacts and relevant social groups related to that profession.

4.1. A history of enology

Enology has gone through important changes over the century. This section briefly describes the most recent ones. In the 70's the enologist was predominantly considered an expert who could prevent problems and whose efforts were dedicated to creating wines to the best of his own insights, guiding consumers with his superior taste. As vinification techniques, for example the adding of yeasts, were believed to be the most crucial element in defining taste and quality, the enologist was the central figure in the wine making process. While many facets of this enology are still central, in the 90's the sensitive aspects of wine making started taking centre stage, which implied an interest in independently defined sensations as opposed to enologist-dependent ones. This change is intricately connected to the incorporation of biochemical research[33] and new equipment like the spectrometer, which opened up fields of research on the causes of specific sensations. Polyphenols appeared in its many forms and their actions and characteristics have been studied since. (Sources: interviews with enologists, INTA and INV)

The accent now put on polyphenols – some of which are volatile, or temperature sensitive – goes hand in hand with radically different artifacts[34]. For example, as grapes are responsible for producing polyphenols, the vine and its vineyard become crucial to the enologist, thus introducing new problems and solutions and as a consequence, producing new artifacts. The work in the winery changed from the art of turning grapes into wine, into preserving and developing the specific grape characteristics brought into the winery in the best possible fashion. Under the hot Andean sun this would mean, for example, that technology for temperature control became vital. (Foster, 1995)

Another major change associated with sensitive enology is that the enologist thinks *from* instead of *for* the consumer, using his knowledge to elaborate all those sensations that consumer-groups might be looking for. The enologist now has to understand all these different groups and types of sensations, and know how to make each of them within the (financial) limits put to him. As most wineries (try to) export their produce, this means that vast knowledge is needed of wines and consumer

[33] Unfortunately, the scope of this research does not allow for examining how this relationship came to be.
[34] It remains to be seen how exactly this relationship was constructed; one could say that research on polyphenols allowed for a new definition of quality, or that changing visions allowed for polyphenols to enter the stage, or both.

demands throughout the world. This is why enologists now cooperate closely with marketing and also why international wine consultants and 'flying winemakers' have become popular. (Source: interviews; Foster, 1995).

What this example shows is how a professional group can change and how such changes imply other people becoming part of the relevant social group of wine makers, like consultants or marketeers. As the constituent artifacts of quality change, this may affect the composition of the whole technological frame. When the enologist was a 'genius' responsible for the superior quality of wine, little demands were put on grape producer's methods. The conception of quality as "sensations" for "different groups of consumers", combined with new artifacts like polyphenols, soil constituents et cetera, not only gave grapevines a much more central place in the winery, but also put new demands on the people farming them. The next section describes how the relationships between enologists and agronomists changed in consequence.

4.2. Enologists and agronomists: how a new technological frame redefines professions

For many years a separation was and in places can still be found between enologists and agronomists. In a way this seems remarkable, as at the main faculty for enology in Argentina, Don Bosco, students study fruit farming with a specialization in viniculture, while agronomists at the Universidad de Cuyo (UNCU) are also educated as authorized enologists (Source: interviews UNCU and Don Bosco). Nevertheless, the cultural differences between - Mendocino - enologists and agronomists show clearly, for example when examining the way they gather and exchange information. Apparently, not only the courses taken form the characteristics of a profession.

Enologists are generally described by colleagues as closed individuals: they tend not to exchange information with their fellows. The job of enologist is perceived as secretive due to the chemical nature of the work, maintaining alive as it were the feeling of the old alchemists. (Source: interviews agronomists) While some enologists partly deny this image, as they do have contacts with other wineries and especially with the enological departments from INTA, INV etc, others cannot admit to the importance of exchanging information with local colleagues outside the winery. (Source: interviews enologists)

Nowadays for enologists of exporting wineries the most important information regards the developments on the international scene, both of vinification techniques and of consumer demands. To this end they tend to travel to congresses and other wine regions. They also try to maintain contact with traveling wine-makers, international consultants and their international clients, all in order to create a better feeling for changing possibilities and demands. Finally, enologists keep up to date by reading professional literature and gathering general data on climate, grapes, etc. There is also a centre for enologists, but its efforts are focused on the capacitation of only the younger generation and on the promotion of Argentine wine. (Source: interviews enologists, CLEIFRA)

Quite the contrary, agronomists seem a mingling and talkative bunch. They all know each other and meet up for lunch during important fieldwork seasons to discuss

problems they run into. Winery agronomists keep in touch with their supplying producers, visiting them several times a year and exchanging tips and information with them. On a more institutionalized basis, many agronomists of prime wineries are united in the regional exponent of the national "Consorcio Regional de Experimentación Agrícola" (CREA). They come together at each other's properties monthly to discuss the specific problems of that vineyard and to think up solutions for their colleague. Later the effects of these solutions are discussed again. Other contacts are with the UNCU faculty and with INTA agronomists. They all visit the same congresses and events and read professional literature and magazines. (Source: interviews agronomists, CREA).

Regardless of their cultural differences, enologists and agronomists in the quality frame share much more common ground and influence in each other's decisions than when the quantity frame was dominant. This implies they not only need to understand what the other is talking about, but also to communicate with each other actively. An important point of exchange between them is the tasting session[35]. Agronomists have to know about wines to be able to decide on how to manage their grapes[36]. To test the many qualities aside from sugar content[37] and to understand how these might influence the wine, grape tasting has also become an indispensable part of the agronomist's job (source: interviews agronomists, UNCU). As the enologist has to set the direction for the grapes to take with regard to the wine in mind, he now also walks through the vineyards, tasting grapes and taking part in the decisions (source: interviews enologists, Don Bosco). Thus, both the agronomist and the enologist enter each other's 'territory'. The enologist brings along an interest in polyphenols and volatiles, substances that the agronomist has to understand. But in his turn, enologists need to understand the agricultural technicalities and the specifics of the many vineyard artifacts, in order to understand the agronomist's possibilities and problems.

4.3. Grape producers and agronomists: how relevant social groups change

While the previous section explained how professions have changed according to a new (dominant) technological frame, this section describes how the professionalization of grape production reshaped and/or displaced relevant social groups. Historically in Argentina there have been three different kinds of actors that (could) belong to the relevant social group of grape producers. Independent producers ("viñateros") sell their grapes and sometimes rent capacity to make their own table wines in low volumes. Resellers ("trasladistas"), on the other hand, produce their own grapes or buy them on the market, and generally own a winery, but also buy elaborated wine from smaller producers. They do not, however, commercialize wine,

[35] Not only are the own wines tasted and discussed constantly, also the competition is sampled against their own products through blind sessions - preferably with fixed panels of bodega colleagues and sometimes a few outsiders. Sources: interviews agronomist of medium sized premium bodega; owner/agronomist of large bodega.
[36] To give an example of the lack of habit in this area, students at the agronomy faculty of the UNCU always elaborated wine from their grapes, but never used to taste it throughout the process.
[37] Sugar content – degrees Brix – is easily measured by a small device that is pierced into the grape.

as all produce is sold to bottle or fraction companies. Finally, integrated wineries produce and / or buy grapes, elaborate wine and sell or commercialize it.

The incorporation of new characteristics for defining the quality of grapes and the complicated technologies that are involved in this redefinition, have led to the professionalization of grape production. Wineries have started integrating more vineyards in order to increase their control on the material for (premium) wines (Source: INV). Also, they have introduced extensive quality control of the produce bought on the market, even putting demands on the management of the grape's entire life cycle when it concerns up-market products (Source: interviews winery managers, grape producers). On the one hand, this means wineries have had to incorporate knowledge on farming. They increasingly employ agronomists and other specialists to supervise supplying producers and / or to manage their own vineyards. Some wineries take their agronomical research to the limit of a scientific exercise[38]. On the other hand, the changing view on grape quality intensified the relationships between wineries and their suppliers. This means that producers who want to sell to quality wineries need expert staff, (re)education or at least the will and possibility to follow the new demands. (Source: interviews grape producers).

However, this does not mean the "quantity frame" and its relevant social groups are no longer present in Mendoza. Though quality wines are on the rise, 65% of Argentine wine production is still dedicated to table wine in Tetra-Brick (carton). Table wines (in carton and bottle) up to AR$3.30 even make up for almost 89% of the market's volume and 76% of the market's value (Fondo vitivinícola, 2005). Though changes might have been made in the winery, grapes for these wines are bought purely on a price basis. Though the market for table wines has fallen, putting many before the question whether to change or not, the total production is still enormous. As long as the relationships in the quantity frame hold strong, it seems to make sense that many of the relevant social groups involved are not easily incorporated in the quality frame. The question now is how further developments might affect those relationships and what will happen then to these groups and their artifacts.

The national government program "Cambio Rural" was started by INTA in Mendoza in 1992 to help small, independent farmers[39]. The idea of the program was that the participating producers would take over the necessary investments to continue the change process after a couple of years. This part generally failed however, as only a few actually did invest their own money. (Source: INTA) Several experts claim that a mind-switch is still lacking among most of the independent producers, especially those without technical education (source: interviews with association representatives, agronomist managers). Among the schooled field workers and technicians supposedly a difference is noted between those above or below age 40, as profound curriculum

[38] At Bodegas Arizu, for example, the owner and head agronomist Alberto Arizu works together with a team of different specialists that not only performs detailed studies but also presents them at scientific congresses. The most recent project has been to chart an entire vineyard into small patches, specifying values Brix (sugar content) of each patch, in order to decide the order for harvesting such that the grape quality will be more uniform. Later, also fertilization will be applied in function of these maps. Even though it calls for very intensive work, Arizu intends to draw such maps for all his vineyards, not only the premium ones. Source: interview Arizu.

[39] The program offered subsidies and technical support in order to help independent grape producers make a switch to higher quality farming. An INTA technician would act as point of reference to a group of producers to discuss the problems they encounter and help elaborate solutions, which would then be up for subsidy. Source: INTA

changes took place about 20 years ago (source: INTA, agronomist managers). This would help explain why many (older) producers are being left out of the new developments: even if they wanted to, they would lack means for understanding the quality frame.

5. CONCLUSIONS: THE MEANING OF GRAPEVINES AND TECHNOLOGICAL CHANGE

This paper describes the grape vine on the one hand as a production device for commodity grapes that supplies juice for wine, on the other hand as a tool for creating characteristic elements of taste and smell for wine. This not only helps explain the differences already observed by most of the participants in the field, but also why certain social groups do not come together in one technological frame. They cannot, because to them grape farming is simply a different matter. For example, people who have based the moment of harvest on certain information all of their lives – like sugar content - do not change their insights simply because they are told to take into account things which they have never heard of before and that therefore never existed to them - like 'volatile polyphenols'. To them a grape vine is a completely different artifact, implying different ways of care taking. The division between old and young producers now comes to make sense, as about 20 years ago the school curricula started incorporating biochemistry, which helped to weave these students into the biochemistry-minded technological frame of quality.

The analysis also showed that, though quality may have been an issue for over a century, even among relevant social groups that occupied themselves with producing 'quality wines', there are very different conceptions of what this quality should be. As relevant social groups and artifacts change, so does the meaning of grape quality. In relation to immigrants the emphasis was on imitating the taste of specific wines from another region (specifically, Bordeaux and Bourgogne). In the current technological frame however, emphasis is on bringing out tastes considered specific to a certain grape variety, and preferably achieving results that stand out in comparison to wines from other parts. This puts methods of grape farming central, which are compared to many internationally recognized wine regions. These different meanings imply different artifacts and technologies in the process of grape production.

Finally, the analysis has illustrated the work that lies behind technological change: it is not a question of 'transferring' new techniques or instruments to a group of people. Professionals need to be formed, a need for artifacts has to arise and those artifacts need to be made part of the work practice in some way. The coming and going of technologies and artifacts can tell the story of the struggles between and the creation of new technological frames. With regard to the history described here, the complexity of such a process means that a 'new way' does not simply take over an 'old way', certainly not in all respects. Rather, new relevant social groups have taken center stage in new types of wine production at different times, (partly) displacing others. Other relevant social groups find themselves in other technological frames, which may have been dominated or changed, but in any case need to be recognized and analyzed if it is desired that the people involved in them remain a part of Mendocino wine production in the long run.

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INTERVIEWS

Altavista	Ing. Juan Argerich, chief agronomist	07 april 2006
Arizu – Luigi Bosca	Ing. Alberto Arizu, owner / chief agronomist	23 may 2006
Asociación de Cooperativas Vitivinícolas de Mendoza (ACOVI) y Federación de Cooperaciones Vitivinícolas Argentinas (FeCoVitA)	Ing. Eduardo Sancho, president	23 nov. 2006
Asociación de Viñateros de Mendoza	Francisco Lopez, general manager	01 nov. 2006
Asociación de Viveros Vitícolas Arg.	Carlos Corvalan, president	02 nov. 2006
Bodegas Argentinas	Juan Carlos Pina, general manager	04 april 2006
Bodegas Argentinas	Esteban Onofri, consultant	22 may 2006
Bodega Carlos Pulenta	Carlos Pulenta, owner / manager	06 april 2006
Cámara de Mosto	Sergio Colombo, manager	07 april 2006
Chandon	Angel Vespa, manager publicity	07 april 2006
Centro de Licenciados en Enología e Industria Frutícola Argentina (CLEIFRA)	Alejandra Lozano, president	31 oct. 2006
Clos de los 7	Carlos Tizio, general manager	23 may 2006
COVIAR	Javier Vitale, assistant	04 april 2006
Departamento de Irrigación	Alejandro Genari, secretary general	31 oct. 2006
Domaine St. Diego, ex Trapiche	Angel Menoza, enologist	06 dec. 2006
Don Bosco, fac de enología	Gladis Ranuglia, dean	23 may 2006
Escorihuela (Grupo Catena)	Ricardo Gonzalez Villanueva, chief agronomist	22 may 2006
ElGourmet.com	Elisabeth Checa, editing chief	28 march 2006
Grupo Q media	Fabricio Portelli, journalist / sommelier	29 march 2006
IDITS		01 nov. 2006
INTA	Alberto Alcalde, department of viticulture	02 nov. 2006
INTA	Carlos Catania, chief - department of enology	06 april 2006 05 dec. 2006

INTA	Anibal Catania, department of extension	05 dec. 2006
INTA	Raúl del Monte, department of enology	23 may 2006
INTA	Jorge Perez Peña, chief - department of irrigation	06 april 2006 02 nov. 2006
INTA, ex COVIAR	Ana María Ruiz	07 dec. 2006
INTA	Salvarredi, chief - department of extensión	02 nov. 2006
INTA	Sari, department of enology	02 nov. 2006
INTA	Hernan Vila, department of viticulture	23 may 2006
INV	Cristina Pandolfi, international affairs	07 april 2006
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INV	Claudia Quini, fiscal investigation	07 april 2006
INV	Monica Barrera Oro, legal affairs	04 april 2006
INV	Carlos Anzorena, courses	04 april 2006
INV Buenos Aires	Luis Fontana, enologist	21 march 2006
Salentein Bodegas	Raul Pierro, industrial manager	05 april 2006
Salentein Bodegas	Mauricio Fogliatti, inologist	05 april 2006
Salentein Bodegas	Ronald Benning, general manager	05 april 2006
UNCU, Fac. de Agronomía	Ing. José Rodríguez, dean	06 april 2006
UNCU, Fac. de Agronomía	Ing. Juan Carlos Formento, profesor	06 april 2006