Plants, Catalogues and Credit: Agriculture Transitions in Proprietary Regimes in Greece, 1920-2020

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Abstract

The emergence and transformation of intellectual property in Greece has attracted little scholarly attention, and there is an understandable tendency in legal scholarship to focus exclusively on formal intellectual property rules. This article offers an original approach. First, it examines proprietary, attributional and other regulatory norms in plant breeding in Greece from the 1920s to the present day. Specifically, it traces how the management of knowledge, the distribution of credit, and the establishment of regimes dealing with ownership and productivity claims have evolved over that period. Until the early 1980s, there was no intellectual property (IP) in the narrow (that is, purely doctrinal) sense, but this does not mean that IP *sensu lato* was entirely absent. State institutions managed credit through publications and catalogues, and in so doing, socially legitimized their role as the creators of new

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improved varieties, publicly made productivity claims for the new varieties, and at the same time regulated the practices of agronomists and farmers. This more expansive construction of 'IP' provides a secondary claim to this article's originality. The 1981 accession to the European Economic Community, however, reoriented Greek agriculture towards market liberalization, alongside the institutionalization of legal plant breeders' rights, albeit not domestically, and national seed catalogues. As this article shows, though, this much more proprietarian and exclusionary trend is being challenged in Greece, as it is elsewhere in the world, by an emerging grassroots innovation movement.

Introduction

Current work on the history and sociology of science and technology has examined the role of establishing intellectual property (IP) rights in driving agricultural transitions, the transformation of farming practices, and social change in rural areas.[2] In addition, the agricultural sectors of various regions and countries, and, in fact, the whole food chain at a global or country level, have become dominated by a small group of large and powerful conglomerates, mainly located in North America and in Europe, who depend on formal *legal* intellectual property rights to achieve and defend

[2] Biagioli, M. (2006), 'Patent Republic: Specifying Inventions, Constructing Authors and Rights', *Social Research*, 73,1129-1172; Charnley, B. (2012), "Agricultural Science and the Emergence of a Mendelian System in Britain 1880-1930". Unpublished PhD thesis. University of Leeds; Charnley, B., Radick, G. (2013), "Intellectual Property, Plant Breeding and the Making of Mendelian Genetics", *Studies in the History and Philosophy of Science: Part A*. 44:2, 222-233; Charnley, B. (2013) "Seeds Without Patents: Science and Morality in British Plant Breeding in the Long Nineteenth-Century", *Revue Economique*, 64: 69-88; Charnley, B., Radick, G. (2008), '*Plant Breeding and Intellectual Property Before and After the Rise of Mendelism: The Case of Britain',* presented at the Living Properties Workshop, MPIWG; Kevles, D.J. (2007), 'Patents, Protections, and Privileges: The Establishment of Intellectual Property in Animals and Plants', *Isis*, 98:323-331.

their dominant positions.[3] However, recent scholarship in the history of science and technology also stresses the importance of going *beyond* an understanding of intellectual property as a genre of legislation, and calls for a broader conception of 'intellectual property'. MacLeod and Radick introduce the distinction between 'Intellectual Property Narrow' (IP narrow) and 'Intellectual Property Broad' (IP broad).[4] The first denotes the formal legal instruments to regulate and enable control over the management, circulation and exploitation of valuable knowledge and innovations. Yet, as they have argued, history shows us that intellectual property rules emerge also through practices of standardization, as well as through productivity claims and norms for apportioning credit and monetary gain. The IP broad approach is particularly helpful in those technoscientific fields that functioned without patents or other legal IP rights, but where attributional claims and rewards were still possible through other means, including the acquisition of symbolic capital that was vital to the construction and control of the market.[5]

In this context the present article examines the transition of plant breeding practices in Greece from the 1920s to the present day. The period in question covers almost ninety years of tumultuous history: it involved two world wars, two dictatorships and many governments of various political hues, ranging from conservative to social democratic. We reconstruct the history of plant breeding practices by focusing on proprietary regimes in plant breeding and examining two key periods of breeding. The first period covers the years from 1920 to the early 1980s,

[3]Kranakis, E. (2007), 'Patents and Power: European Patent-System Integration in the Context of Globalization', *Technology and Culture*, 48:4, 689-728.
[4]MacLeod, C. and Radick, G. (2013), 'Claiming ownership in the technosciences: Patents, priority and productivity', *Studies in the History and Philosophy of Science*, Part A, 44: 2, 188-201.
[5]Arapostathis, S. and Gooday, G. (2013), 'Electrical technoscience and physics in transition, 1880-1920', *Studies in the History and Philosophy of Science* Part A, 44: 2, 202–211; Hopwood-Lewis**,** J. and MacLeod, C. (2013), 'Patents, publicity and priority: The Aeronautical Society of Great Britain, 1897–1919', *Studies in the History and Philosophy of Science,* Part A, 44**:**2, 212-221.

and the second, from the early 1980s to the first two decades of the 21st century. These two periods allow us to examine the changing role of the state in the plant breeding industry and in the management of knowledge, and thus also the changing relations between the industry's major actors. We show that there was little homogeneity between these periods; governmental policies and agriculture politics were co-produced with politically and ideologically different governance regimes. We draw on existing literature in relation to the co-production of political regimes (democratic or totalitarian) and techno-sciences.[6] We show how plant breeding and knowledge and innovation management were influenced by the priorities and ideological predilections of different governments. Furthermore, we show how the techno-scientific and agricultural practices in plant breeding reproduced power relations. In the sixty years that mark the first period of plant breeding, as we examine, the state played a prominent role in the funding and control of plant breeding; whereas in the second period, liberal policies that promoted market-led political economies of productive activities like agriculture called for a reduction of the role of the state. In this latter period the state transformed from a controller and producer of the plant industry to its regulator. The transition of the roles of the state and the public sector in the agricultural economy went hand in hand with changing proprietary regimes in seed production. We argue that during the period of state-led governance of plant breeding, emphasis on productivity claims was connected to the

[6] Law scholar and leading social scientist Sheila Jasanoff has introduced the "co-production idiom" as an approach to the social study and analysis of science and technology. Jasanoff argues that we need to study and reconstruct the dynamics of the making of institutions, social representations, social identities and discourses in order to unravel the interplay and the co-shaping of nature and social organization. Jasanoff stresses that by focusing the social studies of science and technology on the four instruments (institutions, representations, identities and discourses) we understand and unravel their role in shaping what we know about nature, how we know it, for what reason, for whom and on whose behalf. In this way the co-production of natural and social order emerges, showing how knowledge and politics are strongly related and depended the one on the other, see Jasanoff, S. (2004), "Ordering Knowledge, Ordering Society," in Jasanoff, S., ed., *States of Knowledge*, (Routledge: London and New York), 13-45.

institutional and social legitimization of research centres and state funded institutes. On the other hand, in the final decades of the twentieth century, new legislation aimed at harmonizing Greece's policies with those of European law stressed the standardization of seeds and seed production. New institutions and relevant bureaucratic tools like the national catalogue of plants, along with the institutionalization of breeders' rights, shaped the new proprietary regime. Admittedly, such institutionalization did not go so far as to entail Greece joining UPOV, which is the international organization that oversees the only treaty that both requires and standardizes intellectual property protection for new plant varieties (see below). Javier Lezaun's distinction between 'delimitation' and 'demarcation' has been of value in understanding this transition. For Lezaun, 'delimitation' refers to the construction of regulatory objects in the law and through the law. On the other hand, 'demarcation' describes 'the administrative practices and technical instruments through which such objects are made bureaucratically unambiguous and analytically distinct'.[7] Therefore, in this article we examine the instruments and the materialities used by actors in the agricultural industry to secure and strengthen proprietary regimes when the law had either made no such provision, or simply produced 'soft' versions of intellectual property.

Intellectual Property Transitions in Greece from the 1920s

The period between the 1920s and the end of the century was marked by continual pressures from intellectual property developments elsewhere in Europe that were

[7] Lezaun, J. (2006), 'Creating a new object of government: making genetically modified organisms traceable', *Social Studies of Science* 36(4): 499-531, 504.

associated with the rhetoric of national 'progress' and 'growth'.[8] The first patent law in Greece was adopted in 1920. Prior to this date patents were equated with privileges and had been awarded by the Greek Kingdom through means of special parliamentary acts.[9] By linking patenting with the ideology as well as the rhetoric of 'progress' and 'development', industrial elites and technocrats were pressing for the establishment of a regime of strong proprietary rights.[10] By securing a more formalized system of patent awards that would bypass the intricacies, contingencies and politics of "special" parliamentary acts, was considered by the industrial elites as a step towards the necessary institutionalization of processes to promote local inventions and inventors. Greek engineers and inventors aimed to secure their technocratic role in the Greek state and Greek economy, which was undergoing reconstruction following the First World War. As mentioned, the first patent law, the 2527 Law, came into force in 1920. The new legislation was embedded within an era of broad political, institutional and cultural change promoted by the bourgeois classes.[11] The new law established patenting as a right and the inventor as an individual with rights over ideas and innovations. Yet the 2527 Law specified territorial boundaries over novelties and inventions, since inventiveness was defined in terms of national boundaries (i.e. local novelty). The new patent law functioned in that period's dominant ideological domain

[8]Arapostathis, S. (2015), 'Intellectual Property Law and Politics in 20th century Greece' in Bottis, M., Alexandropoulou, E., Iglezakis, I.(eds), *Lifting barriers to empower the future of Information Law and Ethics*, Proceedings of the 6th International Conference of Information Law and Ethics (University of Macedonia Press, Thessaloniki), 422-430; Arapostathis, S., (2020), 'Industrial "Property", Law and the Politics of Invention in Greece 1900-1940', in *Patent Cultures: Diversity and Harmonization in Historical Perspective*, Graeme Gooday and Steven Wilf (ed.) (Cambridge University Press, 2020),166-183.

[9] Clark A.M. and Clark, W. (1884), *Patents, Designs and Trade Marks' Act, 1883, and the Patent Laws of All Foreign Countries and British Colonies* (London).

[10] Zaharias, P., 1912, "On the protection of inventions", *Archimedes (1910–1912, IA-IE)*, no. 4 (August 1912): 42–7 (in Greek).

[11] Alevizatos, N., "Eleftherios Venizelos and the constitutional reform of the country", *Venizelos and Civic Modernization*, ed. by G. Mavrogordatos and C. Hatziiosif (Crete: Crete University Press), 33–43 (in Greek); Arapostathis (2020)*op cit.;* Mavrogordatos, M., 1988, "Venizelos and Civic Modernization" in *Venizelos and Civic Modernization*, ed. by G. Mavrogordatos and C. Hatziiosif (Crete: Crete University Press), 9–19

by promoting the liberal values and ideals of individual rights. At the same time, it defined a technology transfer policy based on foreign patents while permitting imitation activities.[12] Imitation was introduced implicitly in the 2527 Law and while it contradicted the emerging liberal values underpinning individual rights, it was influenced and determined by a political realism characteristic of the political and industrial elites of the period. The issue at stake was to introduce incentives and mechanisms for the implementation of technological change in interwar Greece. The legal context for industrial property remained along the lines set by the law of 1920 until the mid-1980s when things changed.

By 1987, a new patent law was designed and ratified for the 'Technology Transfer, Inventions and Technological Innovations' (1733/1987). This came a year after the European Patent Convention (1607/1986) was ratified. The new legislation was the outcome of years of pressure on Greek governments by the World Intellectual Property Organization (WIPO) and the European Patent Office (EPO). The integration of Greece into the European Community provided further impetus for passing the new 1987 legislation which brought to Greece the criterion of 'global novelty' and provided for the establishment of a functional national patent office.[13] Specifically, the 1733/1987 Law was framed by innovators, inventors and policy makers as a necessary move towards harmonization with the rest of the European Community and a 'modernization' that would boost national 'growth', regional

[12]Arapostatis, 2015, 2020 *op cit.*

[13]Arapostathis, S. (2010), 'Academic Entrepreneurship, Innovation Policies and Politics in Greece', *Industry and Higher Education*, Vol 24, No 3, June 2010, pp. 165–176; Arapostathis, 2015 *op cit.*; Deniozos, D. (1993), 'Technology Policy', in Giannitsis, T., Deniozos, D., Caloghirou, Y, Liberaki, A., Travlos, S., (1993) *Industrial and Technology Policy in Greece*, Athens, 209–261(in Greek); Diakogiannis, J.E. (1980), 'Technological dependence and the control of the Greek economy from the West', *Oikonomikos Taxidromos*, No 1386, 27 November, p 24 (in Greek); Diamandouros, N.P. (1997), 'Greek politics and society in the 1990s', in Allison, G.T., and Nicolaidis, K., eds., *The Greek Paradox: Promise vs Performance*, MIT Press, Cambridge, MA, 23–37

'development' and establish a more organized national innovation system.[14] The pressures towards harmonisation continued and further increased with the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property (TRIPS). Greece was a founder member of the WTO in 1995. The aim of TRIPS was to establish global intellectual property standards agreed through multilateral negotiations, enhancing support for the effective enforcement of property rights in technological productions, branded goods, cultural works, and names used for locally-specific goods.[15]

The 1987 law made, for the first time, a clear statement relevant to patenting in the context of crop improvement and agricultural produce, introducing a clear exclusion from patentability of agricultural and horticultural processes. While private companies and those with industrial interests in agrochemical and seed production were interested in expanding notions of property, associations of farmers, agronomists and food science researchers reacted, and successfully managed to achieve the exclusion.

Greece has not signed the UPOV Convention that aims to settle a common legislative framework for the Members States in order to secure the exclusive rights

[14]Arapostathis, 2010; Diamandouros, 1997, *op cit.*; Featherstone, K. (1988), *Socialist Parties and European Integration: A Comparative History*, Manchester University Press, Manchester; Featherstone, K. (2005), 'Introduction: ''Modernisation'' and the structural constraints of Greek politics', *West European Politics*, Vol 28 No 2, 223–241; Lekkas, Th. (2013), 'Software Piracy: Not necessarily evil or its role in software development in Greece', in *Knowledge Management and Intellectual Property: Concepts, Actors and Practices from the Past to the Present*, Stathis Arapostathis and Graham Dutfield (eds) (Edward Elgar: Cheltenham), 85-106; Lekkas, Th. (2014), 'Legal Pirates Ltd.: Home Computing Cultures in Early 1980s Greece', in *Hacking Europe: From Computer Cultures to Demoscenes*, Gerard Alberts and Ruth Oldenziel (eds) (Springer: London and NY), 73-105.

[15]Aoki, K. (2008), *Seed Wars, Cases and Materials on Intellectual Property and Plant Genetic Resources*, (Carolina Academic Press), 280-1; Kranakis, E. (2013), 'Business TRIPS: American corporations and patents head to the global South, 1950–2010' in *Knowledge Management and Intellectual Property: Concepts, Actors and Practices from the Past to the Present*, Stathis Arapostathis and Graham Dutfield (eds), (Edward Elgar: Cheltenham), 85-106; Tyfield, D. (2014), *The Economics of Science: A Critical Realist Overview*, v.2 (Ontological Explorations), Palgrave: London, 100.

of plant breeders on newly-developed plant varieties.[16] While the expansive breeder's exemptions have existed since the early days of the Convention (1961), the more constrained farmers' privilege that has existed since the 1978 Act but is somewhat narrowed down in scope with the 1991 Act.

It is true that the reduction of state funding and patronage for research and development and the gradual decline of the state research institutes, restrained the state-led plant breeding regime while increasing the integration of foreign and native private companies and the use of foreign plant varieties. And yet, governments of all political inclinations were forced to defend the rights and interests of Greek farmers due to their powerful and effective lobbying and a culture of political clientelism.[17] This led Greek authorities to opt not to sign the UPOV Convention. On the other hand, due to pressures from the EEC and later from EU for regulations and laws that would secure a single European market for goods, the Greek governments appropriated the EU seed catalogues as a tool to establish an idiosyncratic proprietary regime that would secure the creation, the institutionalization and the function of a market of propagation materials (see following sections).

State Policy, Plant Varieties and Organized Plant Breeding: Governing Agriculture Transitions and Productivity Claims

[16] Adcock, M. and Llewelyn, M (2001), 'Legal Protection of Biological Material: Globalization Versus State Freedom', *Journal of Intellectual Property Rights*, v.6, 361-368; Llewelyn, M., and Adcock, M. (2006), *European Plant Intellectual Property*, (Hart Publishing: Oxford and Portland); Di Fonzo, A. , Nardone, V., Fathinejad, N. , Russo, C. (2019), 'The Impact of Plant Variety Protection Regulations on the Governance of Agri-Food Value Chains', *Social Sciences*, *8*, 91, doi:10.3390/socsci8030091; R. Silva Repetto, R. and Cavalcanti, M. (2000),'IV. Agreement on trade-related aspects of intellectual property rights (TRIPS)' in *Multilateral Trade Negotiations on Agriculture: A Resource Manual*, (FAO: Rome) http://www.fao.org/3/x7355e/X7355e05.htm#TopOfPage (last accessed 20/07/2020).

[17] Collins, N. and Louloudis, L. (1995), "Protecting the protected: the Greek agricultural policy network", *Journal of European Public Policy*, 2(1), 95-114; Iliopoulos, C. and Valentinov, V. (2012), "Opportunism in Agricultural Cooperatives in Greece", *Outlook in Agriculture*, 41(1), 15-19; Louloudis, L. and Maraveyas, N. (1997), "Farmers and agricultural policy in Greece since the accession to the European Union", *Sociologia Ruralis*, 37(2), 270-286.

The Interwar Period

The development in Greece of plant breeding as a systematic and science-based practice in the early years of the twentieth century is related to the initiatives of agronomist Ioannis Papadakis (1903-1997), a key figure in the emergence of systematized plant breeding. Papadakis studied to be an Agronome-Ingenieur in Gembloux, Belgium. Between the years 1927 and 1946 he was the conceptualizer and key force behind the foundation of the Institute of Cereals in Thessaloniki.[18] Papadakis began experimenting with plant breeding in 1923 when he established the experimental seed production unit and station in Larissa in the prefecture of Thessaly. In 1928, under his initiative, large-scale seed imports for local seed production were introduced into Greek agricultural practice. Various seed varieties were imported from Italy (Mentana), Australia (Canberra), and Germany (Hard Federation and Cologne). Papadakis also initiated a programme of extensive experimentation with trials in many places around Greece. The establishment of the Institute of Plant Varieties and Improvement in Thessaloniki in 1931 lent a credibility to his initiatives since he was the head of the Institute from the outset.[19] In the interwar period, and again after WWII, the Institute became a centre of scientific and systematized plant breeding.[20] Hybridization experiments conducted by Papadakis resulted in the

[18]Papadakis, I.S (1983), *The Greek Economic and Agriculture Miracle* (*Το Ελληνικό Οικονομικό και Αγροτικό Θαύμα: Διδάγματα για τους ξένους και για μας*), Athens Academy, Athens; Zoiopoulos, P (2014), *Two Blades of Grass* (Δύο Λεπίδες Χλόη), Athens.

[19]Papadakis, I.S. (1929), *The Greek Plant Varieties of Wheat* (Οι Ελληνικοί τύποι σίτου), Thessaloniki; 45 Years of State Seed Production (45 Χρόνια Σποροπαραγωγής) (1974), Ministry of Agriculture, Athens: 7-8; Plant Catalogue: What Wheat should we plant (Κατάλογος Φυτών: Τι στάρια πρέπει να σπέρνουμε), 1934, Institute of Plant Improvements, Thessaloniki; Zoiopoulos, *op cit*.: 145-157, 194-196; Mazower M. (2002), *Greece and the Inter-War Economic Crisis*, Oxford University Press, Oxford; Kribas, C. (2004), 'Science, Technology and the Environment', in *Greece in the Twentieth Century*, Th. Couloumbis, Th. Kariotis, F. Bellou eds. (Frank Cass: London and NY).

[20]Nouaros-Mihailides, I. (1983), 'Forward to 'The Greek Economic and Agriculture Miracle'', Academy of Athens, 556-557; Dianelis, Th. (1983), 'Forward to 'The Greek Economic and Agriculture Miracle'', Academy of Athens, 557-562.

development of three wheat hybrids: 3213 (Florence x Federation), 5237 (Federation x Ardito), and 5471 (Florence x Ardito).[21] His efforts complemented an emerging ideology supporting rationalization of public affairs and the economy by means of science and technology, and specifically through the agency of scientists and engineers who started to claim authority in solving societal and state problems relevant to research, innovations and technological innovations. Although critics questioned his emphasis on improved varieties, Papadakis countered as follows: (a) improved seed varieties would result in higher productivity than local and traditional seeds; and (b) there was no scientific proof that improved varieties would be detrimental to the environment or the soil where they were sown.[22] Furthermore, he argued that improved varieties increased the quality of the flour and thus contributed to the improvement of the food chain in interwar Greece. Food security was at stake, claimed Papadakis, but he also offered a solution. Papadakis advocated for the introduction of improved plant varieties alongside the establishment of an agriculture paradigm that prioritized monoculture as an asset to the national economy in order to pre-empt concerns about food security.[23]

Papadakis' emphasis on employing a scientific approach to tackle agricultural problems is a prime example of the emerging technocratic ideology that stressed the importance of scientists and engineers in state affairs and state policies in Greece during the early twentieth century.[24] In Greece, a reductionist and determinist ideology emerged that regarded science and technology as the foundations of society.

[21]Talellis, D. (1952), *The Increase of Agriculture Production and the Institute of Plant Improvement* (Η γεωργική παραγωγή και το Ινστιτούτο Καλλιτέρευσης Φυτών), Thessaloniki.
[22]Pamphlet of Station of Seed Production, 1930; Talellis *op cit.*; Papadakis, 1983*op cit.:* 563-565; Ioannides, A. (1996), *The evolution of wheat cultivation: 1919-1995* (Η εξέλιξη της καλλιέργειας των σιτηρών: 1919-1995), Θεσσαλονίκη.
[23]Talellis, *op cit.*; Papadakis, *op cit.*
[24]Antoniou Y., Assimakopoulos, M., Chatzis, K. (2007), 'The National Identify of Interwar Greek Engineers: Elitism, Rationalization, Technocracy and Reactionary Modernism', *History and Technology*, 23:3, 241-261; Arapostathis 2015*op cit*.

This ideology legitimized the activities of scientists and engineers and created a new role for them as agents of rational state formation who were also critical to the organization of the economy. It was an ideology that resonated well with the social and governmental priorities of the interwar period and particularly with Eleftherios Venizelos' 'bourgeois modernization of the state'. Yet during Metaxas's dictatorial regime (1936-41), the prevailing fascist ideology espoused techno-scientific nationalism and exhibited features of the reactionary modernism that was characteristic of ideological regimes in Europe and in Greece at the time.[25] The ideology expressed by Metaxas's dictatorial regime emphasized national autarky, involving state organization and control. In this context, scientists and engineers tried to legitimize their new roles by promoting techno-sciences as a rational way to achieve the establishment of a nation-state that was both robust, technologically independent, capable to use and exploit its natural sources and self-sufficient in relation to nutrition.[26]

In 1937, Metaxas's dictatorial government introduced the 825/1937 Law on Plant Breeding and Seed Production.[27] This was a legislative change that introduced institutional infrastructures and a legal framework for state policies concerning the control of agriculture and seed production. The Central Committee of seed production

[25]Bogiatzis, V. (Μπογιατζής, Β.) (2012), *Suspended Modernization* (*Μετέωρος Μοντερνισμός*), Athens; Bogiatzis, V. (2013) 'Politics, Science Ideology and Technology in the Public Sphere in the Greek Interwar Years' ('Πολιτική, Ιδεολογία επιστήμης και τεχνολογία στον Δημόσιο Λόγο του Ελληνικού Μεσοπολέμου'), in *Επιστήμη και Τεχνολογία: Ιστορικές και Ιστοριογραφικές Μελέτες*, Mergoupi-Savaidou E., Merianos G., Papanelopoulou F., Christopoulou Ch. (Athens); Bogiatzis, V. (2015), 'The Longing for a "Conservative Revolution": German Influences over the Greek Inter-war Politicization of Technology and Science', in Fernando Clara, Cláudia Ninhos (eds), *Nazi Germany and Southern Europe, 1933-45: Science, Culture and Politics*, Palgrave Macmillan, 105-119; Mazower, 2002*op cit.*; Vergopoulos, K. (1993), *Nationalism and Economic Development* (Εθνισμός και Οικονομική Ανάπτυξη), Athens; Dafnis, G. (1997), *Interwar Greece* (Η Ελλάδα μεταξύ δύο πολέμων), Athens; Kyrtsis, A. (1996), *Sociological Thought and Modernization Ideology in the Greek Interwar Period* (Κοινωνιολογική σκέψη και εκσυγχρονιστικές ιδεολογίες στον ελληνικό μεσοπόλεμο), Athens.

[26] Bogiatzis, 2015*op cit.*; 2013*op cit*; Antoniou Y, Bogiatzis, V. (2010), 'Technology and Totalitarian Ideas in Interwar Greece', *HoST: journal of History of Science and Technology*, v.4 http://johost.eu/vol4_fall_2010/vol4_ya.htm.

[27]Government Gazette, 1 September 1937, ref. 343.

was established by the Ministry of Agriculture and instituted an annual control, assessment and approval of plant varieties, both imported and native. The new law enabled the Bank of Agriculture (Art.3) to financially manage the state's plant breeding programme and oversee the quality control of the bred varieties. It stated that the Bank would financially support the distribution and acquisition of any mechanical appliances necessary for quality plant breeding. Aiming to further boost the introduction and use of plant varieties, the law also introduced price control mechanisms for improved breeds as well as for the plant varieties that had been imported into Greece. The law provided the general directions for an organized state funded plant breeding programme and also instituted institutional infrastructure and protocols that led to an effective and efficient state intervention in plant breeding, and centralized governmental policies. The 825/1937 Law instituted the Registry («Μητρώον») of Greek plant varieties of cereals and plants for livestock farming. Furthermore, the research institutes were established as the research centres for improved plant varieties, as centres for the better mode of their introduction in farming and the control of new plant varieties as well as the plant breeding farms. They became the 'boundary' institutions that conducted science-based plant breeding. They owned the appropriate technical tools for plant breeding, became the owners of the infrastructure for the storage of plant varieties, assumed responsibility for the quality control of the breeds, and guaranteed that the seeds would not become blended during the production process. These agricultural research institutes became the institutions that monitored and controlled plant breeding, plant breeders and the delivery and distribution of breeds. Finally, they functioned as education and training centres for agronomists and farmers across the country.[28]

[28] Government Gazette, 1 September 1937, ref. 343; 45 Years of State Seed Production, 1974.

The Post War Agriculture Paradigm and State Planning

The Metaxas Law (825/1937) set the legislative and regulatory setting for organized plant breeding while at the same time contributing to the shaping of a scientifically-based agricultural system operating on an industrial scale. Following WWII, the state remained highly interventionist: it prioritized the science-based paradigm in agriculture transitions, diffusing the use of improved plant varieties both in large-and small-scale farming. The ideology of state-led agriculture transitions based on science and technology became stronger in the aftermath of WWII, as part of a techno-scientific nationalism that emerged during that period and influenced public discourse about technological innovation. Emphasis was placed on the policies concerning agricultural productivity that were directed by scientific rationalization. Yet while agronomists commonly supported science-based plant breeding, there were intense differences among left-leaning scientists about the scale and type of farming that should be employed in Greece. For example, Sakantanis, a left-wing agronomist and engineer wrote an article in *Antaios* (a leftist periodical) in 1945 that supported the introduction of new and better methods of cultivation in Greece through the use of improved plant varieties by hybridization or a selection of any of the 'new' scientific methods.[29] He argued that this approach would result in an intensification of agricultural production that corresponded with the use of Taylorist ideas in farming. Though Sakantanis argued in favour of public expenditure on relevant infrastructures for plant breeding, he equally stressed that any rationalization of cultivation through new labour practices and the introduction of new varieties had to be relevant and

[29]Sakantanis, K.B. (1945), 'The problem of agriculture production' ('Το πρόβλημα της παραγωγικής γης', *Antaios* (*Ανταίος)*, τ.Ι, 32-38, 65-70.

pertinent to local needs and conditions.[30] While this approach existed among left-wing scientists, the dominant ideology prioritized by those engaged in agriculture on an industrial scale involved the extensive use of fertilizers, pesticides, mechanization and the use of improved plant varieties as was the case elsewhere. Indeed, the Green Revolution that transformed agriculture in certain parts of the developing world, was both informed by and helped to perpetuate this ideology.[31] Between 1950 and 1980 the ideals of economies of scale prevailed, while mid- and large-sized farming rapidly emerged in Greece. The use of irrigation in farming increased from 13.3% in 1961 to 36% by 1993. In the same period, the number of tractors used in farming increased from 30,000 to 200,000. There was an increase in public and private investments, too. Public expenditure between 1953 and 1973 was approximately 22%-26% of the GDP, but between 1974 and 1985 this percentage decreased by about 10%.[32]

In this context, in the 1950s and 1960s, plant breeding efforts and investments were intensified and new plants like rice and maize were introduced to the state plant breeding programme. By 1954, lucerne and clover had been introduced; as had potatoes by 1962, and peas in 1968. By the mid-1970s, new agricultural research institutes had been established. These included the Institutes of Viticulture; Floriculture, and Vegetable crops; they were responsible for breeding and seed production of the relevant plant varieties. 44 new centres of seed production had been

[30]Ibid: 68

[31]Mann, C.C. (2018), *The Wizard and the Prophet: Two Groundbreaking Scientists and their Conflicting Visions of the Future of Our Planet*, New York: Alfred A. Knopf; Perkins, J.H. (1997), *Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War*, New York: Oxford University Press.

[32]Damianakos, S. (1997), 'The ongoing quest for a model of Greek Agriculture', *Sociologia Ruralis*, 37: 2, 190-208; Mergos G, Karagiannis G. (1997), 'Sources of productivity change under temporary equilibrium and application to Greek agriculture', *Journal of Agricultural Economics*, 48, 313-329; Fousekis, P. and Pantzios, C. (2000), 'Output price risk and productivity growth in Greek agriculture', *Spoudai*, 50:3, 106-124; Mamatzakis, E.C. (2003), 'Public infrastructure and productivity growth in Greek agriculture', *Agricultural Economics*, 29, 169-180.

introduced by 1973.[33] The Colonel's regime (Junta, 1967-1974) urged farmers to use improved plant varieties. The regime argued that autarky in wheat and bread could not be tackled by cultivating unstandardized seeds, as these could not guarantee high productivity. In 1971, they decided that all bean seeds should be substituted by improved seeds produced in the scientific research centres. Standardization was identified as the key characteristic of productivity and thus as key metric for the securitization of productivity and the self-sufficiency and autarky.[34] With the restoration of democracy, Karamanlis's government maintained a similar policy that promoted the use of genetically improved seeds and developed a programme for subsidising them.[35]

Proprietary Claims as Productivity Claims: Improved Varieties and Standardization

In the article thus far, we have shown that the state was the key actor in the governance of seed production. Emphasis has been given to the institutionalization of mechanisms that simultaneously increased state intervention and established a national agricultural ideology grounded in science-based agriculture and the improvement of plant varieties. In this context, the state institutes of agricultural research functioned as gatekeepers of state policies and also attempted to socially legitimize their role in the development of public policies relevant to agriculture. In this context agronomists and agriculture scientists self-fashioned the role of both gatekeepers for food policies and agents of nation-building. Leading agronomists played a key role in guiding state agricultural policy as they headed the relevant

[33]45 Years of State Seed Production, 1974.
[34]Macedonia, 5/3/1972, p.9; 4/2/1971, p.3; 11/4/1970, p.9; 11/6/1972, p.19; 15/10/1971, p.5; 26/4/1970, p.17; 21/2/1968, p.6; Eleftheria, 6/11/1967, p.8.
[35]Macedonia, 1/2/1976. p.19; 10/11/1978, p.6.

research institutes. Through those institutions, they insisted there was a causal relation between scientific intervention and the improvement of plant varieties, and productivity and performance. Following WWII and the Civil War, the agricultural sector was severely crippled due to a drastic decrease in production and the compulsory deportation of Greece's rural population due to fighting. Thus, in subsequent years, the priority of agricultural public policy became the security of nutritional adequacy through the increased use of improved plant varieties and, most importantly, through the wider use of cereals.[36]

In 1942, the Institute of Cereals under the scientific leadership of Papadakis developed the so-called 'Number', a plant variety of soft wheat Efkarpia 3 (known as Γ-38290). Its development initially began in 1934 with experiments on the hybridization of Rieti and Quality, two foreign varieties that were imported from Italy.[37] By 1957, Greece was self-sufficient in wheat production due to the extended use of 'Number'.[38] For more than twenty years, this plant variety was used in 70% of the country's cultivated fields.[39] Between 1961 and 1969, the research team in the Institute experimented with the variety 'Victory' («Νίκη»), a hybrid of Wiebulls-Karn and Yaktana 54B (see image 1). At the end of the experimentation period, Bountonas, the then-head of the Institute, suggested the substitution of 'Number' with the new breed 'Victory', which had proven itself to be equally productive in regions with

[36]Moisidis, A (1986), *Agriculture Society and Modern Greece* (Η Αγροτική Κοινωνία στην Σύγχρονη Ελλάδα), Athens; Moisides, A (2010), 'The agriculture issue in the 20th century' ('Το αγροτικό ζήτημα κατά τον 20ο αιώνα', in *Greece in the 19th and 20th century* (*Η Ελλάδα στον 19ο και 20ο αιώνα)*, Moisidis, A., Sakelaropoulos, S., (eds) 289-312, 298; Petmezas, S. (2006), 'Agriculture and Economic Growth in Greece', paper presented in the IEHC Conference, Helsinki, 1-20: 3-5.

[37]Tallelis, 1952: 8-9; Kokolios, V. (1958), *The Improved varieties of Cereals* (Αι βελτιωμέναι ποικιλίαι σίτου, κρίθης, βρώμης, αραβόσιτου, ορύζης και ο πολλαπλασιασμός αυτών από το 1931-1957), Thessaloniki; Papadakis, 1983: 567-568; Zoiopoulos, 2014.

[38]Zoiopoulos, 2014: 145-157, 194-196.

[39]Kokolios, V. (1959), *The plant varieties of wheat in Greece* (Αι Καλλιεργούμεναι, Ποικιλίες Σίτου στην Ελλάδα), Thessaloniki:6-8; Kokolios, V. (1960), *The plant varieties of strong and soft wheat in Greece* (Οι εν Ελλάδι σκληροί και μαλακοί σίτοι), Thessaloniki; , S. (1969), *The state seed production* (Η κρατική σποροπαραγωγή), Athens; Ioannides, 1996.

intensive patterns of farming as well as those of extensive agriculture, stronger against disease, and resulting in better quality flour. 'Victory' was introduced as a native plant variety that could compete with the imported variety of soft wheat Generoso which, since 1960, had been used in the most fertile soils and plains of Greece.[40]

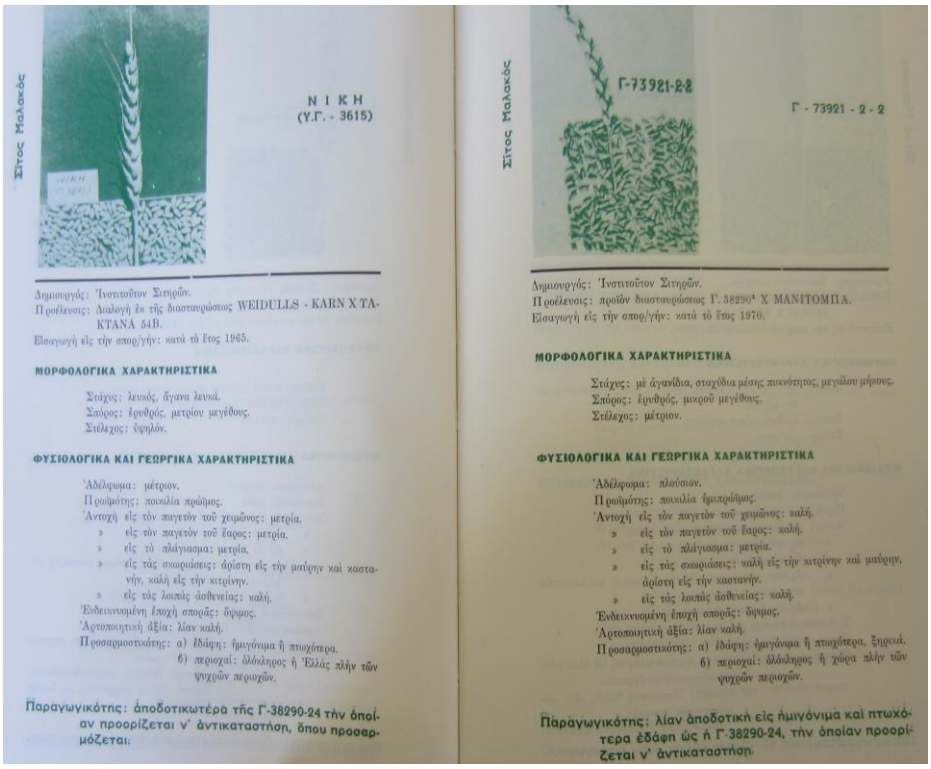
In the early years of systematized plant breeding, while there had been no formal IP rights for seeds and plants, an 'informal proprietary regime' was secured, firstly through the publication of the catalogues of the Institutes, and secondly, through the institutionalization of standardization processes. The two modes of enacting an informal proprietary regime were interrelated because they furthered the standardization of agriculture practices, particularly the standardization of the practices of the emerging community of agricultural scientists. From their earliest days of operation, the seed production institutes compiled and published annual catalogues of plant varieties where they registered all new varieties and described and standardized the 'optimal' practices for seed production. The catalogues of plant varieties functioned both as literary technologies for the distribution of credit and as technologies of standardization. The name of the variety was registered along with the name of its creator if it was imported, or the name of the institute in which it had been created if it was a hybrid produced within Greece. This was a statement that secured the distribution of credit and its attribution to the creators. For the institutes, this was particularly important because any association of the improved varieties with enhanced productivity and efficiency would increase the symbolic capital of the institution. In turn, increased symbolic capital would guarantee state funding and the state's patronage of the research conducted in the laboratories and the institutional fields. For instance, the publications of the Institute of Cereals aimed to promote the

[40]Bountonas, G. (1969), 'The Plant Variety of Soft Wheat, 'Victory'' (Η Ποικιλία Μαλακού Σίτου 'Νίκη'), Thessaloniki.

institute's work and legitimize its existence and role in the national economy, and in the political and institutional life of Greece. In the Institute's publication of 1969, Stylianos Farmakis, the agronomist and institute's line manager of seed production, provided analytical descriptions of old and new breeds, and also outlined the standardized processes and stages of seed production.[41] Such was the perceived importance and value of productivity claims in the absence of formal IP rights. For the foreign seed varieties, inclusion in the catalogues was necessary for adoption by Greek agronomists and farmers; in other words their registration in the catalogues meant their use in the nationally controlled process of seed production. Publication in a catalogue by one of the specialist agricultural institutes was functionally equivalent to a certification for their use.

Furthermore, with the publications including provision of the varieties' technical characteristics, performance qualities, soil requirements for optimal use, as well as the appropriate fertilization methods and relevant farming practices, the catalogues guaranteed purity and quality for the farmers and their agronomist advisors. This genre of publication functioned to facilitate the education and diffusion of important information to those agronomists in the rural areas. These publications helped standardize farming through the social legitimization of improved plant varieties and the promotion of a science-based agriculture. They made clear statements about the authority and productivity claims of the research results of the institutes. Since the seed production remained a state-funded, controlled and administrated process, the pattern remained substantially similar until the late 1970s. But – as we will see - the governance of seed production changed drastically in the 1980s with new institutional and legislative reforms.

[41]Farmakis *op cit.:* 10-11.



Σίτος Μαλακός

ΝΙΚΗ
(Υ.Γ. - 3615)

Δημιουργός: Ἰνστιτοῦτον Σιτηρῶν.
Προέλευσις: Διαλογή ἐκ τῆς διασταυρώσεως WEIDULLS - KARN X TAKTANA 54B.
Εἰσαγωγή εἰς τὴν σπορ/γίαν: κατὰ τὸ ἔτος 1965.

ΜΟΡΦΟΛΟΓΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ

Στάχυς: λευκός, ἄγανα λευκά.
Σπόρος: ἐρυθρός, μετρίου μεγέθους.
Στέλεχος: ὑψηλόν.

ΦΥΣΙΟΛΟΓΙΚΑ ΚΑΙ ΓΕΩΡΓΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ

Ἀδέλφωμα: μέτριον.
Πρωϊμότης: ποικιλία πρώϊμος.
Ἀντοχὴ εἰς τὸν παγετὸν τοῦ χειμῶνος: μετρία.
» εἰς τὸν παγετὸν τοῦ ἔαρος: μετρία.
» εἰς τὸ πλάγιασμα: μετρία.
» εἰς τὰς σκωριάσεις: ἀρίστη εἰς τὴν μαύρην καὶ καστανήν, καλὴ εἰς τὴν κιτρίνην.
» εἰς τὰς λοιπὰς ἀσθενείας: καλή.
Ἐνδεικνυομένη ἐποχὴ σπορᾶς: ὄψιμος.
Ἀρτοποιητικὴ ἀξία: λίαν καλή.
Προσαρμοστικότης: α) ἐδάφη: ἡμιγόνιμα ἢ πτωχότερα.
β) περιοχαί: ὁλόκληρος ἡ Ἑλλὰς πλὴν τῶν ψυχρῶν περιοχῶν.

Παραγωγικότης: ἀποδοτικωτέρα τῆς Γ-38290-24 τὴν ὁποίαν προορίζεται ν' ἀντικαταστήσῃ, ὅπου προσαρμόζεται.

Σίτος Μαλακός

Γ-73921-2-2

Γ - 73921 - 2 - 2

Δημιουργός: Ἰνστιτοῦτον Σιτηρῶν.
Προέλευσις: προϊὸν διασταυρώσεως Γ. 38290[4] Χ MANITOMΠΑ.
Εἰσαγωγὴ εἰς τὴν σπορ/γίαν: κατὰ τὸ ἔτος 1970.

ΜΟΡΦΟΛΟΓΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ

Στάχυς: μὲ ἀγανίδια, σταχύδια μέσης πυκνότητος, μεγάλου μήκους.
Σπόρος: ἐρυθρός, μικροῦ μεγέθους.
Στέλεχος: μέτριον.

ΦΥΣΙΟΛΟΓΙΚΑ ΚΑΙ ΓΕΩΡΓΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ

Ἀδέλφωμα: πλούσιον.
Πρωϊμότης: ποικιλία ἡμιπρώϊμος.
Ἀντοχὴ εἰς τὸν παγετὸν τοῦ χειμῶνος: καλή.
» εἰς τὸν παγετὸν τοῦ ἔαρος: καλή.
» εἰς τὸ πλάγιασμα: μετρία.
» εἰς τὰς σκωριάσεις: καλὴ εἰς τὴν κιτρίνην καὶ μαύρην, ἀρίστη εἰς τὴν καστανήν.
» εἰς τὰς λοιπὰς ἀσθενείας: καλή.
Ἐνδεικνυομένη ἐποχὴ σπορᾶς: ὄψιμος.
Ἀρτοποιητικὴ ἀξία: λίαν καλή.
Προσαρμοστικότης: α) ἐδάφη: ἡμιγόνιμα ἢ πτωχότερα, ξηρικά.
β) περιοχαί: ὁλόκληρος ἡ χώρα πλὴν τῶν ψυχρῶν περιοχῶν.

Παραγωγικότης: λίαν ἀποδοτικὴ εἰς ἡμιγόνιμα καὶ πτωχότερα ἐδάφη ὡς ἡ Γ-38290-24, τὴν ὁποίαν προορίζεται ν' ἀντικαταστήσῃ.

Image 1: Sample of the Catalogue of Improved Varieties of Cereals, Ministry of Agriculture, 1971-1972, p.18-19. Left: 'Victory' a hybrid by Weidulls-Karn X Yaktana 54B developed by the Cereals Institute and introduced in seed production in 1965. Right: Γ-73921-2-2 hybrid from Γ 38920 X Manitoba developed by the Cereals Institute and introduced in seed production in 1970. Courtesy of the Institute of Plant Breeding and Genetic Resources (IPBGR), Hellenic Agricultural Organization (HAO)-Demeter (formerly known as National Agricultural Research Foundation- NAGREF)

Europeanization, Regulation and Standardization from the 1980s onwards: Rights and Technologies of Market Construction

The accession of Greece into the European Economy Community was a turning point in its agriculture policies.[42] Furthermore, it introduced serious changes in the governance of intellectual property in agriculture, instituted the plant breeders' rights

[42]Damianakos, 1997 *op cit*; Louloudis, L. and Maraveyias, N., 'Farmers and Agricultural Policy in Greece since the Accession to the European Union', *Sociologia Ruralis*, 37, 271-286; Damianos, D. and Hassapoyannes, K. (1997), 'Greece and the Enlargement of the European Union', *Sociologia Ruralis*, 37:2, 303-312; Rutz, C., Dwyer, J., and Schramek, J. 2013, 'More New Wine in the Same Old Bottles? The Evolving Nature of the CAP Reform Debate in Europe, and Prospects for the Future', *Sociologia Ruralis*, 54:3, 266-284; Tosun, J. 2014, 'Agricultural Biotechnology in Central and Eastern Europe', *Sociologia Ruralis*, 54:3, 362-381.

IP system, and legitimized a different political economy underlying the legal treatment of propagation material. The latter resulted from external pressure toward a legislative harmonization within the European framework that came into being with the 1564 Law of 1985[43] on the "Organization of Production and Marketing of Propagating Material of Plant Species". The law made important provisions that defined a new proprietary regime. Article 8, for instance, defined the creator and her rights with respect to a variety of plant species that were produced naturally or by means of engineering and that were certified to be 'new, original, homogeneous and stable' by the relevant committee of the Ministry of Agriculture. The certificate of plant creation was valid for fifteen years with the exception of grapevines, fruit trees and ornamental trees, for which a period of eighteen years was granted. It established exclusive rights of production and trade for the certified varieties.[44] It was a legislative innovation introduced in order to establish a formal intellectual property regime and a market culture in the plant breeding industry in a period where economic liberalization including an enhance role of the private sector emerged as the dominant paradigm. It is important to stress that Article 8 of the law, which provided for breeder's rights, was not actually put into legal effect in Greece. In order to be activated, presidential decrees should have been signed, but this never occurred in order to appease concerns over the farmers' rights and ability to use protected varieties to their fields reiterating existing and well embedded practices of using harvested seeds for propagation purposes. Today the situation remains much the same in that those who aspire to apply for exclusive rights must make their application to the European Office of Plant Varieties which provides for a unitary EU-wide right.[45]

[43]Government Gazette, 164/A/26-09-1985.
[44]Government Gazette, 164/A/26-09-1985.
[45]As provided under Regulation 2100/94on Community Plant Variety Rights.

A further tool in the market-oriented regime of governance has been the National Catalogue of Cultivated Plants that was instituted by virtue of Article 6 of the law of 1985.[46] According to this law, in order to be legitimate for cultivation and trade, varieties (conventional or genetically modified) must be registered in the Catalogue. The Catalogue has been a key bureaucratic device for enabling a liberalized market, since it underpinned the configuration of a certified plant variety. Furthermore, it functions as the institution that guarantees the smooth function and regulation of the market. It is the 'obligatory passage point'[47], as we explain below. At the same time, it functions as the bureaucratic tool for securing the state's role in regulating and controlling plant breeding and seed production without investing directly in state-funded seed production. In the 1980s and 1990s, there was a drastic decline in the creation of new policies concerning plant breeding and seed production in Greece. The specialized institutes remained key actors in plant breeding, but their emphasis shifted from national agendas towards boosting market-oriented management of plant varieties. While the 1980s was characterized by the emergence and consolidation of the power of the Panhellenic Socialist Movement (PASOK), a party that ideologically stressed the importance of the role of the state in social and economic affairs, the integration of Greece into the EEC shaped a governance pathway that reserved a regulatory role for the state and shaped the legislative context for market creation. As mentioned, the National Catalogue has been an 'obligatory passage point' for agricultural institutes or companies that develop new varieties and,

[46]Government Gazette, 164/A/26-09-1985.

[47]Callon, M. (1986), 'Elements of a sociology of translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay', in John Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge?*, London, Routledge: 196-233; Law, J. and Callon, M. (1994), 'The life and death of an aircraft: A network analysis of technical change'. In Wiebe E. Bijker and John Law (eds), *Shaping technology/building society: Studies in sociotechnical change*, Cambridge, Massachusetts: MIT Press, 21-52; Star, S. L. (1995), *Ecologies of knowledge: Work and politics in science and technology*, State University of New York Press.

through registration, aim to commodify them and integrate them into farming practices, and, in the case of the market actors, including foreign ones, to claim a position in the Greek market in plant breeding. Publication and thus registration in the Catalogue secure validity for 10 years for plants of large-scale farming and for 30 years for vines.

The registration of a variety in the Catalogue has been a bureaucratic and complex science-based process involving evaluation of the propagation material based on existing standards of quality, purity and germination. Accordingly, new organizational entities were instituted under the jurisdiction of the Ministry of Agriculture which was responsible for the control and supervision of seed production. The National Technical Committee of Propagating Material (transformed ten years later with the 2325/1995 Law) and the National Organization of Propagating Material were instituted under Articles 20 and 21, respectively (Government Gazette, 64/A/26-09-1985). The former was the committee responsible for the evaluation and the technical protocols for the registration process in the National Catalogues. It was the institution that set the qualitative standards for the evaluation of the propagating material, the standards for seed production, and the distribution of the propagating material in specially sealed bags that bore the breeders' trademarks and brand names. The latter was instituted as a state-owned company that would coordinate and finance research on new plant varieties conducted in the research centres. It was responsible for the conservation of existing varieties, and for assisting farming communities working with the new propagating material and securing the standardization of the seed production processes.

The post-1985 period is notable as being when Greece harmonized its practices with the legislative restrictions and the bureaucratic processes of the

European Union. Throughout this period, the national legislation, procedures and protocols for all of Greece's cultivated plants have complied with the European legislation and have followed the general and specific European technical protocols under the European directives 2002/53 (70/457)[48] and 2002/55 (70/458).[49] By April 2000, the technical protocols of the national technical catalogues of potatoes, sugar beets, cereals, and legumes were harmonized with the European technical catalogues, following the European directive of 1970 concerning the common European technical catalogue. In turn, separate National Catalogues have been published for each of the following types of cultivated species: intensive crop farming (large-scale cultivation plants), vines, vegetables and trees.[50]

Registration in the National Catalogues involves an evaluation on distinctiveness, uniformity and stability (known as DUS test) of the plant varieties after application of the variety creator or maintainer. The Variety Research Institute of Cultivated Plants (VRICP) that is located in the village of Sindos, on the outskirts of Thessaloniki in Northern Greece, has been the main institute carrying out the control and assessment of new and existing plant varieties in Greece since 1981 (915/81 Presidential Decree). The VRICP conducted experiments and DUS tests for a period of two years for the registration and extension of existing registered varieties. The standards that are followed by the experts in VRICP are those which have been agreed to by the International Union for the Protection of New Varieties (UPOV), which is the organization that provides a multilateral treaty that unites, all parties, including the

[48] Council Directive 70/457/EEC of 29 September 1970 on the common catalogue of varieties of agricultural plant species.
[49]COUNCIL DIRECTIVE 2002/55/EC of 13 June 2002, "On the marketing of vegetable seeds" https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2002L0055:20090704:EN:PDF
[50]http://www.minagric.gr/index.php/el/home-2/553-greek-content/fitikisparagwgis/polaplasiastikoyliko/nomothesia-polyliko/cat-poik-polyliko/3047-enthnikoi-katalogoi-poikilion.

state, under a unified system for intellectual property rights for plant varieties. The national criteria are replicated from the technical protocols (Protocols for tests on distinctness, uniformity and stability) of the Community Plant Variety Office (CPVO).[51] According to UPOV protocols (Article 7 of the 1991 Act), a "variety shall be deemed to be distinct if it is clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of the filing of the application".[52] VRICP has followed the UPOV conventions and standards for uniformity, which make clear that:

> Where all the plants of a variety are very similar, and in particular for vegetatively propagated and self-pollinated varieties, it is possible to assess uniformity by the number of obviously different plants – "off-types" – that occur. However, where the range of variation within a variety is larger, because of the features of its propagation, and in particular for cross-pollinated, including synthetic, varieties, the plants are not all very similar and it is not possible to visualize which plants should be considered as atypical or "off-types." In this case the uniformity can be assessed by considering the overall range of variation, observed across all the individual plants, to determine whether it is similar to comparable varieties.[53]

The new plant varieties are also tested for their stability. Practically, this means that the characteristics should remain unchanged after repeated propagation or until the

[51] http://www.cpvo.europa.eu/main/en/home/technical-examinations/technical-protocols/tp-agricultural-species.
[52] https://www.upov.int/edocs/pubdocs/en/upov_pub_221.pdf (last accessed 7 September 2020)
[53] Document TGP/10/1 Draft 5, p.4-5. https://www.upov.int/edocs/mdocs/upov/en/tc_edc/2007/tgp_10_1_draft_5.pdf (last accessed 7 September 2020)

end of each propagation cycle. The DUS tests that form part of the evaluation process for the registration of new varieties are the same as the qualifying criteria for plant breeders' rights protection. Developing such varieties is a technologically advanced, labour and resource intensive procedure, and of considerable duration. Through these standard evaluations, the Greek regulatory regime implements an idiosyncratic proprietary regime for private companies, as well as public funded scientific institutes that invest in agronomical, chemical and engineering expertise to create and secure the maintenance and preservation of plant varieties. An exception can be identified in the case of the National Catalogues of vines, as these are formed mostly by traditional, local landraces with no known plant breeder.[54]

The registration protocols and standards were used by private companies and state institutes as ways to enforce 'broad' proprietary claims and to structure the market on the basis of the 'rights' and the restrictions that the registration provided to the plant breeder or the maintainer. Propertizing knowledge and propagation material of this sort resonated with the Greek emphasis on intensive agriculture based on regulated, standardized, controlled, uniform and stable varieties. The registration secures the commodification of plant varieties by guaranteeing the exchangeability and use-value of the registered varieties. This latter value is linked strongly to the standardization of the biological material. NGOs that promoted paradigms alternative to the dominant one have argued that the criteria and processes of registration are complex in order to privilege only those private concerns and interests that could bear the financial cost and the investment in human capital that the processes would

[54]Governmental Gazette 684 B/ 24.11.92.

involve.[55] The associated cost and the complexity of the requisite bureaucratic procedures have functioned as serious entry barriers to registering local and traditional landraces in the National Catalogue, despite a provision for their registration that was made in the 2009 Act.[56]

Farming Commons: Traditional Landraces and Networks of Trust

The dominant paradigm is characterized by the management of propagation material through its commodification that inseparably linked plant varieties and market structure. Yet there were reactions to the dominant practices and ideology that linked industrialized agriculture with proprietary regimes and the quest for productivity and growth. A community of farmers called Peliti was established in the northern county of Drama, in 1995, as a free community that promoted organic agriculture and the conservation of tradition local plant seeds. Within 20 years, it was transformed into an NGO that promoted the values of grassroots innovations, collective management of propagation material and community values in farming. The Peliti network is comprised of 18 local communities/groups of farmers who have been conducting plant breeding of traditional landraces, while since 2014 it has established relations and networks with communities abroad (Bulgaria and USA) and since 2017 it has organized events and seed festivals beyond the Greek borders (Turkey).[57] Panagiotis Saitanoudis, the founder of the network, was working in organic farming when he realized that local farmers were conducting their own plant breeding of traditional plant varieties that researchers in the research institutes did not know about. At the

[55] Such views have been expressed by Greek NGOs like the 'World's Agronomists' ('Γεωπόνοι του Κόσμου', http://worldagronomists.blogspot.gr)) as well as the Kokopelli Association.
[56]Governmental Gazette, 2038, B', 21/09/2009; Governmental Gazette 194, B, 11-02-2011; Governmental Gazette, 1099, B', 11/06/2015.
[57] https://peliti.gr/categories/διεθνείς-δράσεις/το-πελίτι-στην-τουρκία/ (last accessed 27/07/2020).

same time, traditional landraces and their breeders risked extinction either through misappropriation by private companies that would “re-invent” them through proprietary rights and registration in the Catalogue, or by neglect due to the ideologically driven agriculture policies that prioritize science based, engineered varieties. Lately, these farmers have organized a unit to monitor international relations and legislation developments on issues relevant to IP rights and genetically-modified organisms.[58]

The network prioritizes the maintenance of seed banks of traditional local plant varieties, as well as the promotion of organic farming and the free movement of seeds. From 1995 to 2015, the community conserved and distributed 4,000 traditional plant varieties of vegetables, cereals etc. among 120,000 amateur and professional farmers. The catalogue "*κατάτόπους αγροκτήματα...*" (‘The local farms’) is the main document in which Peliti registers its farmers and the varieties they produce and use. It promotes the free diffusion and distribution of traditional landraces, even if after cultivation in new places the outcome is the production and harvesting of something new and altered from the traditional landrace. They support this genetic evolution and adaptability as substantial qualities in the climate change era. They argue that this process fits neatly with the quest, noticeable in other parts of the world, to reinvigorate traditional agriculture and their attendant regulatory norms that seek to revive endemic co-evolution between varieties, environmental and ecological circumstances, and local societal needs (e.g. in Peru).[59] Peliti emphasizes agro-biodiversity and the conservation of local traditional breeds as part of the inherent character and culture of regions and localities. It promotes an alternative paradigm of

[58]http://www.peliti.gr/index.php?option=com_content&view=article&id=618%3Anevrokopi2015&catid=136%3A20xronia&Itemid=130&lang=el (last accessed 27/07/2020).
[59]*See* Asociación Andes (2016), ‘Resilient Farming Systems in Times of Uncertainty: Biocultural Innovations in the Potato Park, Peru’. IIED, London.

agriculture and socio-technical order. The material, biological and cultural factors are considered as inseparable. The plant varieties, the social practices of cultivation, the modes of life and consumption, and the social relations of the communities constitute a whole and a continuum. Peliti attempts to establish an alternative economy of goods and services. Traditional landraces have been conceived of as forms of cultural and social, rather than purely economic, capital. A moral economy of gift-giving has been re-established where landraces are exchanged as a means for their conservation and wider adoption. They are opposed to any formal intellectual property restrictions since such rights have been linked to paradigms of industrialized agriculture, capitalist monopolies over plant varieties, and corporate control over global food production and supply. Thus, Peliti raises concerns and reacts like other actors of political activism in their attempts to counter the homogenization and unification of intellectual property and trade laws and agreements like the aborted Transatlantic Trade and Investment Partnership between the United States and the EU.[60]

Furthermore, in the case of the registered varieties in the National Catalogue, members of Peliti demand that those varieties that have been patented but whose patents have expired should remain in the registry, instead of being withdrawn as had previously been the practice of the private companies. The reason for their withdrawal was to restrain their use so as to promote the new patented varieties intended to replace them. Peliti argues that the old varieties should remain in the registry so that the farmers can conduct their own plant breeding with them, legally cultivate the varieties they have developed themselves, and trade the seeds. According to the founding and leading members of the community, decentralized ownership and knowledge in relation to plant breeding should be considered as a requirement for the

[60] Interview with Vasso Kanelopoulou, International Relations Coordinator of Peliti, March 2015.

democratization of seed and food production. Decentralization is viewed as the cornerstone of an alternative political economy of seeds, and a requirement for the deconstruction of the control of food by a small number of private interests. Agriculture has been viewed as a practice that integrates open source technologies pertinent to small-scale farming that takes on board local agronomic and geomorphological specificities. Through its emphasis on the openness of the innovation system in agriculture, the Peliti community promotes agricultural innovations that will secure autarky and food sovereignty by other means: without state funding, based on grassroots innovation, and without resort to the formal intellectual property regulatory regime. Such innovations are characteristic of practices that are already embedded in the culture and tradition of regions and the local populace.[61] The members of the community did not share the public view that unregulated and unstandardized seeds are dangerous for the health of the public. They insist that this argument is highly politicized and aims to promote industrialized, science-based agriculture rather than having any genuine interest in public health. They think it is indicative that monitoring and over regulation is conducted to test seed germination rather than in order to secure public health. Peliti believes in a different genre of standardization that is achieved through the devolution of trust to the local people and plant breeders. Quality and purification control is achieved through these networks of trust. Their aim is to create a registry of traditional landraces so, in this respect, the community functions as a registry of farmers and the seed packets bear and circulate the name of the plant breeder. The network is based on and bound by existing relations of trust. Accordingly, Peliti offers an alternative bundle of practices and norms that challenges the conventional view that farmers

[61]Ibid.

should grow varieties that are new, genetically uniform and stable, so they can contribute more effectively to national productivity, and the health and well-being of the public. Peliti's norms clearly reject IP narrow proprietary regimes but nonetheless contribute to the full IP spectrum existing in Greek agriculture once we envisage IP as being a broader set of practices concerned with how the ownership rights are designated and applied.

Concluding Remarks

We have argued that alternative regimes of political economy managed the credit and rights of the propagation of plant materials in different ways. Before and after WWII, when the Greek state exercised power as a regulator, owner and producer of propagation material, all proprietary claims functioned within an 'intellectual property broad' (IP broad) dimension. The link between the creator and the plant variety was established for both symbolic and economic reasons. While symbolic credit for the creation of new plant varieties was not attributed to individual researchers, it was attributed to their research institutions. This attribution of symbolic credit was important for the economic viability and sustainability of the state funded institution, as well as its social legitimization as a contributor to national agriculture policy and the economy. We have stressed the common characteristics of the regime of patents as privileges, in which any attribution of credit was based on the practical validity of inventions that were locally determined and negotiated.[62] In a similar way, the credit attributed to the research institute and its research teams was for the development of

[62]Biagioli, 2006, *op cit.*

plant varieties that were proved efficient and appropriate to specific geographic, climatic and morphological conditions, and thus to specific locales and regions.

State funded research created an ecology of knowledge where the economy of credit linked institutional existence to the potential contribution an institution's research might make to increase the performance of farming in Greece. Furthermore, the attribution of credit through the distribution of the catalogues functioned as a guarantee of the quality and effectiveness of the seed, and the practical standardization of farming. The latter was effective because the technical information and details in relation to each plant variety directed the practices of the practitioners and particularly the agronomists, who acted predominantly in the fields and had the task of controlling the activities of the farmers. The circulation of catalogues as material objects replete with "literary technologies" of attribution and cultivation was not only crucial in establishing an economy of credit where the Greek state had a monopoly on the research and development of new plant varieties and in seed production. Catalogues and their circulation also served as a mechanism through which institutes reaffirmed their role as indispensable to the national research policy regime. In the state planned agricultural economy, there was a strong relation of dependence[63] between different actors and we have tracked fragments of a gift-giving economy that characterized their relations. By attending to scientific publications and the institutional catalogues of plant varieties, we argue that researchers benefited society and the state. Their research was promoted as central to the government's efforts to implement agricultural policies that benefited society at large. In return, these researchers were given their own gift in the form of secure, state-funded employment.

[63]Lapavitsas, C., 2012, 'Commodities and Gifts: Why Commodities Represent more than Market Relations', *Science and Society*, 68:1, 33-56; Gregory, C. (1982), *Gifts and Commodities*, London: 12.

Since the liberalization of the market in the early 1980s, the National Catalogue of propagating material has been the critical institution securing the proprietary regime in plant breeding within Greek agriculture. While no strong patent rights or breeder's rights have been enforced in Greece, an idiosyncratic proprietary regime has been established through the registration of the improved plant varieties contained/published in the National Catalogue, and adherence to European Union law providing EU-wide plant breeders' rights that are thus far not domestic *per se*. The publication of the Catalogue sparked the creation of the market of seeds and plant varieties in Greek agriculture and the securitization of the partial attribution of credit to the creator. Despite the lack of a domestic formal property regime, registration in the Catalogue became the administrative procedure through which one could secure the trading rights for seeds and the commodification of research on plant improvements. In a context of legal nominalism, the registered varieties do not possess a proprietary status but their place in the National Catalogues contributes to the development of a regime of ownership as a precondition for their commodification. The registration secures the credit to the registrant, and both the exchangeability and the value of use of the varieties. The value of the use of the varieties is linked directly to the dominant paradigm of agriculture intensification which has promoted stability, homogeneity and standardization as key characteristics of biological material.

Reactions and opposition to the dominant idiosyncratic proprietary regime came from marginal initiatives enacted through grassroots innovation and an alternative agriculture paradigm, one that emphasizes the use and preservation of traditional landraces and the borderless circulation of seeds. For those affiliated with these grassroots initiatives, agriculture is understood to be a practice that is based on

open sourced, commonly owned plant varieties. Interactions and transactions have been embedded in a gift economy and in relations of trust among farmers. In that non-authoritarian ecology, any technology like the plant variety listings functioned as a registry for securing conservation and cooperative maintenance of traditional varieties, and not for capital intensification. Traditional knowledge communities are producing raw material and 'common' goods that are distributed freely within a moral economy that excludes aggressive appropriators and free riders.

We argue that since improved varieties have been based on traditional landraces and their core biological characteristics can be traced in landraces, intellectual property rights on plant genetic resources should be conceived as socially, politically and morally questionable. This is especially so where rights are asserted against the farmers who maintain these landraces through use and continue to breed their own varieties that are then freely circulated. This socio-material order supports a different agriculture paradigm and conceptualization and management of commons that are not only marginal, but also do not pose any threat to the existence of the dominant regime. Still, the alternative ecologies of the management of commons, the lack of a direct and complete IP narrow regime in Greece, as well as the past hybrid system of partial commodification and the dissemination of credit mostly through a regime of privileges, demonstrate alternative modes of knowledge management that can introduce configurations of the 'public domain' different from the existing one.[64] At stake are the related questions of whom the 'public domain' is for, and who will serve it in such a way as to secure a socio-material order that reduces inequality.

[64]Aoki, K. (2008), *Seed Wars, Cases and Materials on Intellectual Property and Plant Genetic Resources*, Carolina Academic Press; Chander, A. and Sunder, M. (2004), 'The Romance of the public domain', *California Law Review*, 92, 1331-1374; Sunder, M. (2007), 'The invention of traditional knowledge', *Law and Contemporary Problems*, 70:2, 97-124.

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