

# **THE RUSSIAN STEPPES: AN ENVIRONMENTAL HISTORY, 1700-1914**

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## 1. INTRODUCTION

The main theme of my research is the interaction between the agricultural settlers and the environment of the steppe region from the eighteenth to the early twentieth centuries, as ever larger areas of grassland were ploughed up and turned over to grain cultivation. Environmental history - the history of the interaction between humans and the natural world and their attempts to understand that world - is one of the fastest growing areas of historical research. Humans have come to understand their relationship with, and impact on, natural environments most readily when they have found themselves in unfamiliar conditions. Over the eighteenth and nineteenth centuries, the steppes of the Russian Empire were settled by farmers who came from quite different environmental conditions. Many originated from the forested, fairly infertile, but humid heartland of Russia or from the more fertile land of what is now northern Ukraine. The settlers also included migrants from German lands who responded to invitations from Catherine the Great.<sup>1</sup> On moving onto the steppes, these Russian, Ukrainian and German settlers encountered a vast grassland, often described as a 'sea of grass', with very fertile black soil, the famed *chernozem*, but low and unreliable rainfall, and few trees. They had to adapt and alter their ways of life, changing their agricultural methods and using new building materials, for example, while seeking to understand this unfamiliar environment and their relationship with it.<sup>2</sup>

The prominent environmental historian John McNeill has pointed out that 'the sweep of Russian frontier expansion' is 'cry[ing] out ... for the attention of environmental historians.'<sup>3</sup> My research goes some way towards addressing this need by analysing the settlement of Russia's steppe frontier. It will also make a significant contribution to the relatively small, but growing, body of work on the environmental history of Russia as a whole.<sup>4</sup> By focusing on the interaction between humans and the natural environment, moreover, my research serves as a useful counterbalance to the overemphasis on 'environmental determinist' interpretations of Russia's history.<sup>5</sup>

My research makes a contribution to another aspect of Russian history that has attracted much interest in recent years: the study of Russia as a empire.<sup>6</sup> An important aspect of much of this work has been a focus on the periphery rather than the centre.<sup>7</sup> Indeed, the steppe region and its inhabitants have been the subject of a number of books in recent years. Michael Khodarkovsky<sup>8</sup> and Willard Sunderland<sup>9</sup> have paid particular attention to empire building and the interaction between ethnic groups across the steppe region as a whole. A number of monographs have considered particular ethnic groups or regions on the steppes, for example: Thomas M. Barrett<sup>10</sup> and Shane O'Rourke<sup>11</sup> on the cossacks; Khodarkovsky on the Kalmyk nomads;<sup>12</sup> and John R. Staples on a region of southern Ukraine inhabited by German and Slav settlers as well as Nogai nomads.<sup>13</sup> Several of these books, for example those by Barrett, O'Rourke and Staples, included discussion of

environmental issues. What will be original about this proposed monograph is that environmental history will be placed at the heart of the story of the interaction between the population as a whole and the environment across the entire steppe region.

A further feature of my research is the comparative framework and global perspective. The Russian experience on the steppes was part of a broader encounter between farmers, mostly of European origins, and grasslands around the globe. The environment of the steppes is the direct counterpart of the prairies and Great Plains of North America, the pampas of Argentina and similar regions in Australasia. The steppes can, to some extent, be considered as an addition to Alfred Crosby's 'neo-Europes': regions in temperate parts of the globe that were settled by Europeans, who transformed them into lands with productive European-style agriculture.<sup>14</sup> In all these regions, the indigenous populations were displaced, together with the native flora and fauna, and the fertile grasslands were ploughed up to grow grain, increasingly wheat, to feed the expanding urban populations of the industrialising cities of Europe and North America. Historians have compared the development of agriculture on the grasslands of North and South America.<sup>15</sup> I have written elsewhere about comparisons and connections between the steppes and the Great Plains.<sup>16</sup>

The main focus, however, is on Russia. As well as considering the relationship between humans and the steppe environment, my research also sheds light on other questions. The Russian encounter with the steppes raises questions about Russian identity: the forested heartland of Russia has in many ways been integral to Russia's sense of identity. The expansion of the empire and settlement of regions with very different landscapes changed the way Russians thought about and represented their native land.<sup>17</sup> Since the steppe region straddles the ancient (the river Don) and the modern (the Ural mountains and Ural river) borders between 'Europe' and 'Asia', the incorporation of the steppes was one of the factors that prompted Russians to consider their place in the world: was Russia European, Asiatic, or did it have distinct identity of its own? This recurring theme in Russian intellectual and cultural life has attracted attention from historians of Russian imperialism and culture as well as geographers,<sup>18</sup> and merits further attention from the perspective of environmental history.

The Russian steppes form part of the vast semi-arid grassland that stretches from Hungary to Mongolia. The Russian steppes extend as far south as the Black and Caspian Seas and the Caucasus mountains. The time period covered needs explanation: the main focus will be on the period between around 1700 and the early twentieth century. The start date approximates to Peter the Great's foundation of the Russian Empire. This was formally proclaimed after the defeat of Sweden on the Baltic in 1721, but a crucial antecedent was Peter's conquest in 1696 of the Turkish fortress of Azov, near the delta of the river Don, one of the major rivers flowing through the steppes.

Although Azov changed hands again before its final transfer from Ottoman to Romanov rule, its conquest was key to the Russian annexation of the rest of the steppe region over the eighteenth century. The end to the main period covered by this book will be the Empire's demise during the First World War. By 1914, all but the most arid parts of the steppe region had been settled, ploughed up and cultivated, marking the completion of the process that took off in the early eighteenth century. Land in the steppe region was owned by the state, nobles, cossacks, peasants, and the remnants of the indigenous nomadic population. From the mid-nineteenth century, a growing amount of land was leased to commercial farmers, who used hired labour, machinery, often imported from the United States, and grew grain for the lucrative export market. Russian scientists had taken great steps forward in understanding the ecology of the region, and in devising more sustainable ways of using the land, but the existence of private property and limited resources and lack of sufficient will by the tsarist state meant there was little prospect for a wholesale intervention in the region by a state advised by scientists. The revolution of 1917 and the foundation of the new Soviet regime marked a fundamental change. Private property was abolished, and the new regime was committed to change, intervention and transformation, based on an ethos of conquering nature, including the fertile steppe region.

## 2. THE STEPPE ENVIRONMENT

In order to understand the interaction between humans and the environment, it is necessary to understand the 'natural environment' of the steppes on the eve of Russian agricultural settlement. This can be done in a number of ways on the basis of a variety of sources: contemporary descriptions of the environment, looking back to Herodotus, but focusing on such works as that of Cornelius Cruys in 1699,<sup>19</sup> who surveyed the Don valley on the orders of Peter the Great in the wake of his conquest of Azov, by the Russian Academy of Sciences expeditions in the 1760s-70s;<sup>20</sup> and the work of later scientists, who analysed surviving samples of uncultivated steppe, including those preserved in nature reserves (*zapovedniki*).<sup>21</sup>

The vast plain, in places rolling, elsewhere unnervingly flat, was dominated by big skies; the monotony broken up by the rivers, such as the Dniepr, Don, Volga, Ural and their tributaries, that cut valleys through the steppes and, characteristically, had high, or hilly, right banks and low, or meadow, left banks. The climate throughout the region was continental – short, hot summers and long, cold winters – and semi-arid. Precipitation was below 400 mm a year on average throughout the steppes, and was unreliable, leaving the region prone to periodic droughts, which had catastrophic consequences for agriculture and agriculturalists. The severity of the climate was increased by hot, dry winds from the east, from Asia. Before agricultural settlement, the vegetation of much of the region consisted of grasses, characteristically feathergrass, herbs, wildflowers and shrubs. Trees were few, and confined mostly to river valleys and ravines. It was the shortages of trees

and water that were the most striking features of the environment to the migrants from the wooded and more humid lands of central Russia and northern Ukraine as well as central Europe.

The climate, flora and fauna had interacted with the surface of the land over long periods of time to create the soil cover. The grasses rotted down and intermingled with the weathered parent rock to form the black earth (*chernozem*), rich in nutrients and organic matter, and the less rich chestnut soils in the more arid southeast of the steppes. These soils were ideal for growing grain. In studying the black earth as part of the environment in which it had formed, Russian scientists, most prominently Vasilii Dokuchaev (1846-1903), devised modern soil science. The scientific significance of this achievement was on a par with the work of their more famous compatriot, Mendeleev, in devising the periodic table of elements. Russian soil scientists' work revealed the central paradox of the steppe soils: the very fertility that gave such bumper harvests in good years, when the rains came, was largely a consequence of the low rainfall that, in years of drought, led to harvest failures and famine. The low rainfall meant that the minerals which made the soil so fertile had not been leached out and created conditions ideal for the accumulation of organic matter.<sup>22</sup>

For millennia prior to the eighteenth century, the main form of land use on the steppes had been nomadic pastoralism. The nomads, moreover, had played a role in the creation of the treeless environment, raising questions about how far it was 'natural'. They burned the steppe to promote the growth of grass for their livestock, in the process destroying trees. Their grazing animals then prevented saplings from growing. The role of the nomads in creating the treeless environment was the subject of much debate in the nineteenth and early twentieth centuries, but was later confirmed by analysis of samples of fossil pollen.<sup>23</sup>

### 3. SETTLEMENT AND POPULATION

The steppe nomads, mostly Turkic and Mongol peoples, pushed settled agriculturalists, mainly Slavs and Finnic peoples, deeper into the forested regions to the north and west. The Russian state turned the tide, however, and gradually conquered and settled the steppes, beginning in the mid-sixteenth century with Ivan the Terrible's defeat of the Tatar Khanates of Kazan' and Astrakhan', successor states of the Mongol Empire, on the river Volga. The settlement of the steppe region will be the subject of a concise second chapter that will draw on data in censuses and provincial sources. The pioneers of Slav settlement of the steppes were the cossacks, who for a long time eschewed arable farming, which they associated with peasants and serfdom, in favour of livestock husbandry, raiding, piracy, and acting as irregular frontier guards, which were more suited to their free and masculine way of life. Only in the nineteenth century did crop cultivation come to play a large role in the cossack economy.<sup>24</sup> Large-scale agricultural settlement, by

Russian and Ukrainian peasants and some Germans, took off in the mid-eighteenth century. The population of the region increased dramatically from under four hundred thousand in the early eighteenth century to almost fifteen million by the end of the nineteenth century.<sup>25</sup>

#### 4. LAND USE

Parallel to the enormous increase in the population was the equally dramatic change in prevailing patterns of land use. A primarily pastoral, and partly nomadic, economy was replaced over time by settled arable farming. The waves of settlers ploughed up the fertile, virgin black earth and planted cereals, converting pasture, meadow and 'natural' steppe to arable fields. The chapter will explore attempts that have been made to compute figures on land use to show changes over time, taking account of definitions of land use, which were imported from central Russia and may not have been applicable to the long-fallow agriculture practised on the steppes. Available data suggest that there was a 500 percent increase in the area of arable land in the steppe region between 1725 and 1887, an increase which continued at a greater pace in the late nineteenth and early twentieth centuries. The rapid pace of loss of unploughed steppe prompted scientists such as Dokuchaev to urge the preservation of samples for scientific research, on which much knowledge of the environment of the historic steppes is based.<sup>26</sup>

#### 5. HUMAN IMPACT ON THE STEPPE ENVIRONMENT

Almost from the start of the settlement and cultivation of the steppes, contemporaries commented on changes in the environment, and debated the extent to which they were a result of human activity. Contemporaries paid a great deal of attention to the destruction of the small areas of woodland as the settlers, most of whom came from forested environments, continued to use wood for many purposes, from construction to fuel, without regard for the scarcity of trees on the steppes. This was part of a growing concern throughout the nineteenth century, which was world wide, that forests performed a vital role in the environment, and that their destruction led, amongst other things, to soil erosion and climate change. The steppes were indeed prone to soil erosion and gulleying, which many writers argued had increased after the land had been ploughed up and the original vegetation removed.<sup>27</sup> The problem was worst in the more arid southeastern parts of the steppes and in years of drought, when the steppes suffered from dust storms every bit as alarming as the 'dust bowl' on the southern plains of the United States of America in the 1930s. A colleague of Dokuchaev described the dust storms on the southern steppes in 1892 in dramatic terms, recording that 'everyone' expected 'the end of the world'. Dust storms also occurred in the late eighteenth century, prior to the wholesale ploughing up of the steppes, suggesting that the connection with human activity may not have been as clear cut. Russian studies in the late 1880s and early 1890s by



Dokuchaev suggested that the soil erosion and gulleying were causing the land to dry out and ground water levels to fall. Anxiety about the impact of human activity on the steppe environment reached a peak during the catastrophic drought, crop failure and famine of 1891-2.<sup>28</sup>

## 6. STEPPE AGRICULTURE: THE STRUGGLE WITH DROUGHT

Seeking ways to make crop cultivation sustainable in a region with very fertile soil but low and unreliable rainfall was one of the central tasks for farmers, agricultural scientists and the Russian government. The early settlers practised extensive farming, using long-fallow crop rotations. An area of steppe was cleared of its native grasses, often by burning, ploughed up, and sown with grain. In the following years, rudimentary rotations of grains were sown until the initial bumper yields in the virgin soil started to fall. At this point, the land was fallowed. The native grasses reoccupied the land and animals were grazed on it. The land was left fallow for ten, twelve, fifteen years as there was plenty of new land to be brought into cultivation. This very extensive form of land use on the steppes lasted for several generations.<sup>29</sup> It began to change only in the late nineteenth century as population density increased and there was a growing awareness of the waste and harm of such methods. Some farmers and government agencies, drawing on their own experience and encouraged by agricultural scientists, began to use new, more 'rational' systems. The fallow period was reduced and more systematic crop rotations introduced. The German settlers pioneered four-field rotations and sought to preserve moisture by keeping the fallow field 'black', free of vegetation.<sup>30</sup> The Peasant Land Bank, that was established in the 1880s to acquire land for sale to peasants, introduced new crop rotations on this land, and encouraged sowing fodder grasses in the fallow field.<sup>31</sup> The crucial issue was retaining scarce moisture in the soil to allow crops to grow. Agricultural societies and scientists as well as farmers expended great efforts to work out the best ways to achieve this. They pioneered methods that later, in North America, became known as 'dry farming'.<sup>32</sup>

Other ideas were put forward to deal with the environmental constraints on the further development of arable farming on the steppes. For settlers from more humid, forested lands the obvious solution was to increase the amounts of water and trees on the steppes. There were many plans for planting trees on the steppes, and genuine progress was made in developing steppe forestry. Again, German settlers were among the pioneers, and their work was taken further by foresters on state plantations later in the nineteenth century.<sup>33</sup> Many proposals were also made for irrigation schemes. There was even a plan by an American engineer in the 1880s to raise the level of the Caspian Sea to flood the southeastern steppes and change the climate of the steppe region as a whole.<sup>34</sup> A few, more modest, irrigation schemes were carried out, especially in the wake of the disaster of 1891-2. Overall, however, studies in the late nineteenth century showed that irrigation was not economically viable, given the level of technology, the topography of the

steppe region, and the volume of water in the region's rivers.<sup>35</sup> In 1892, Dokuchaev devised a detailed plan to make agriculture on the steppes more sustainable by regulating and damming rivers, planting trees, including shelter belts to protect fields from the wind, and finding ways of farming the land that were in keeping with the 'natural' environment. Much scientifically valuable research was done, but the plan was not carried out in full, partly for financial reasons, and partly because it would have infringed on private property rights.<sup>36</sup>

## CONCLUSION

Between the early eighteenth and early twentieth centuries, the steppe region of the Russian Empire was transformed from a grassland inhabited by relatively small numbers of nomadic pastoralists into a much more heavily populated region where the inhabitants engaged in settled agriculture, devoting more resources to growing crops than raising livestock. The environmental history of the steppes under the tsars can be compared and contrasted with developments under Soviet power. The Soviet regime sought to conquer nature and transform it in the service of its self-appointed task of creating an urban, industrial, socialist society. Large-scale collective and state farms were established on the steppes, in the face of resistance from sections of the local population. Agriculture on the steppes underwent mechanization and, in time, chemicalization. State intervention changed tack alarmingly. Stalin enforced a distorted version of Dokuchaev's ideas in his 1948 plan to transform nature by planting massive shelter belts of trees and damming the major rivers; Khrushchev reverted to extensive development in his Virgin Lands Campaign of the 1950s. There were elements of continuity. The scientists who advised the Soviet government were the 'academic children' and 'grandchildren' of Dokuchaev's generation, and some sought to moderate the impact of the schemes on the ground.<sup>37</sup> The underlying aim was similar: exploit the rich, fertile soil to produce grain. At the start of the twentieth century, the steppes had been the major agricultural region of an overwhelmingly rural empire that was one of the major suppliers of grain to the global market, albeit subject to periodic crises caused by droughts. By the late twentieth century, the steppe region, now part of a predominantly urban society, was no longer able to produce enough grain for domestic consumption and scientists were becoming increasingly concerned about the depletion of the fertility of its once rich, black earth.<sup>38</sup>



## Notes

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<sup>1</sup> See Roger P. Bartlett, *Human Capital: The Settlement of Foreigners in Russia, 1762-1804* (Cambridge: Cambridge UP, 1979).

<sup>2</sup> See D. Mun [Moon], 'Predstavleniya o vozdeistvii khlebopashestva na prirodu stepei yugo-vostoka Evropeiskoi chasti Rossii, 1850-1900', *Izvestiya Vysshikh Uchebnykh Zavedenii. Severo-Kavkazskii region. Yubileinyi vypusk* (2002), pp.30-8; D. Moon, 'Agriculture and the Environment on the Steppes in the Nineteenth Century' in N. Breyfogle, A. Schrader, W. Sunderland (eds), *Peopling the Russian Periphery: Borderland Colonization in Eurasian History* (Abingdon and New York: Routledge, 2007), pp.81-85.

<sup>3</sup> J.R. McNeill, 'Observations on the Nature and Culture of Environmental History', *History and Theory*, vol.40 (2003), 30, 41-2.

<sup>4</sup> See Andy Bruno, 'Russian Environmental History: Directions and Potentials', *Kritika: Explorations in Russian and Eurasian History* vol.8 (2007), pp.635-650. For a pioneering study, see A. V. Dulov, *Geograficheskaya sreda i istoriya Rossii: konets XV-seredina XIX v.* (Moscow: Nauka, 1983).

<sup>5</sup> See, for example, Richard Pipes, *Russia under the Old Regime*, 2nd ed. (London: Penguin, 1995), pp.1-24. For the author's views on such interpretations, see David Moon, review of L.V. Milov, *Velikorusskii pakhar' i osobennosti rossiiskogo istoricheskogo protsessa* (Moscow: ROSSPEN, 1998), *Kritika: Explorations in Russian and Eurasian History*, vol.3 (2002), pp.537-45 and id., review of Grigory Ioffe, Tatyana Nefedova and Ilya Zaslavsky, *The End of Peasantry? The Disintegration of Rural Russia* (Pittsburgh, PA: University of Pittsburgh Press, 2006), *Europe-Asia Studies*, vol.59 (2007), pp.1456-7. See also D. Moon, 'Land and Environment' in S. Dixon (ed.), *The [Oxford] Handbook of Modern Russian History* (Oxford: OUP, forthcoming).

<sup>6</sup> See, for example, Andreas Kappeler, *Russland als Vielvoelkerreich: Entstehung, Geschichte, Zerfall* (Munich, 1992) (*The Russian Empire: A Multiethnic History*, translated by Alfred Clayton [Harlow: Longman, 2001]); Jane Burbank and David L. Ransel, eds., *Imperial Russia: New Histories for the Empire* (Bloomington, IN: Indiana UP, 1998).

<sup>7</sup> See, for example, Nicholas Breyfogle, Abby Schrader, Willard Sunderland (eds), *Peopling the Russian Periphery: Borderland Colonization in Eurasian History* (Abingdon and New York: Routledge, 2007); Mark Bassin, *Imperial Visions: Nationalist Imagination and Geographical Expansion in the Russian Far East, 1840-1865* (Cambridge: Cambridge UP, 1999).

<sup>8</sup> Michael Khodarkovsky, *Russia's Steppe Frontier: The Making of a Colonial Empire, 1500-1800* (Bloomington: Indiana UP, 2002).

<sup>9</sup> Willard Sunderland, *Taming the Wild Field: Colonization and Empire on the Russian Steppe* (Ithaca, NY: Cornell UP, 2004).

<sup>10</sup> Thomas M. Barrett, *At the Edge of Empire: The Terek Cossacks and the North Caucasus Frontier, 1700-1860* (Boulder, CO: Westview Press, 1999).

<sup>11</sup> Shane O'Rourke, *Warriors and Peasants: The Don Cossacks in Late Imperial Russia* (New York: St Martin's, 2000). See also id., *The Cossacks* (Manchester: Manchester UP, 2007)

<sup>12</sup> Michael Khodarkovsky., *Where Two Worlds Met: The Russian State and the Kalmyk Nomads, 1600-1771* (Ithaca, NY: Cornell UP, 1992).

<sup>13</sup> John R. Staples, *Cross-Cultural Encounters on the Ukrainian Steppe: Settling the Molochna Basin, 1783-1861* (Toronto: University of Toronto Press, 2003).

<sup>14</sup> Alfred J. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (Cambridge: Cambridge UP, 1986).

<sup>15</sup> C. E. Solberg, *The Prairies and the Pampas: Agrarian Policy in Canada and Argentina, 1880-1930* (Stanford, CA: Stanford UP, 1987); Jeremy Adelman, *Frontier Development: Land, Labour, and Capital on the Wheatlands of Argentina and Canada, 1890-1914* (Oxford: Oxford UP, 1994).

<sup>16</sup> D. Moon, 'In the Russians' Steppes: The Introduction of Russian Wheat on the Great Plains of the United States of America', *Journal of Global History*, vol. 3, no. 2 (2008), pp.203-225

<sup>17</sup> See, for example, Christopher Ely, *This Meagre Nature: Landscape and National Identity in Imperial Russia* (DeKalb, IL: Northern Illinois UP, 2002); Arja Rosenholm and Sari Autio-Saraso (eds), *Understanding Russian Nature: Representations, Values and Concepts Aleksanteri Papers 4* (Helsinki: University of Helsinki 2005.).

<sup>18</sup> See Nicholas Riasanovsky, *Russian Identities: A Historical Survey* (Oxford: Oxford UP, 2005); David Schimmelpenninck van der Oye, *Toward the Rising Sun: Russian Ideologies of Empire and the Path to War with Japan* (DeKalb, IL: Northern Illinois UP, 2001); Christopher Ely, *This Meagre Nature: Landscape and National Identity in Imperial Russia* (DeKalb, IL: Northern Illinois UP, 2002); Mark Bassin, 'Russia between Europe and Asia: The Ideological Construction of Geographical Space', *Slavic Review*, vol.50, no.1 (1991), pp.1-17.

<sup>19</sup> [Cornelius Cruys], 'Rozyskaniya o Done, Azovskom more, Voronezhe i Azove', *Otechestvennye zapiski*, 1824, pp.46-73; id., 'O npravakh i

obyknoveniyakh Donskikh Kazakov, v kontse XVII veka' [trans from Dutch], *Severnyi arkhiv*, chast' 11 (1824), pp.283-96.

<sup>20</sup> See, for example, Samuel Georg Gmelin, *Puteshestvie po Rossii dlya issledovaniya trekh tsarstv estestva, perevedena s nemetskogo*, 2 parts (Spb.: Imperatorskaya Akademiya Nauk, 1771-7); Johann Anton Guldenstadt, *Reisen durch Russland und im Caucasischen Geburge*, 2 vols (Spb., 1787-91); Peter Simon Pallas, *Puteshestvie po raznym provintsiyam Rossiiskoi Imperii*, 3 parts (Spb: Imp. Akademiya nauk, 1773-88).

<sup>21</sup> See Feliks Shtilmark, *The History of Russian Zapovedniks, 1895-1995*, translated by G. H. Harper (Edinburgh: Russian Nature Press, 2003); M.N. Stroganova et al (eds), *Zapovedniki evropeiskoi chasti RSFSR: II* (Moscow: Mysl', 1989).

<sup>22</sup> See D. Moon, 'The Environmental History of the Russian Steppes: Vasilii Dokuchaev and the Harvest Failure of 1891', *Transactions of the Royal Historical Society*, 6th series, 15 (2005), pp.149-174.

<sup>23</sup> Stroganov, *Zapovedniki evropeiskoi chasti RSFSR: II*, pp.26-7.

<sup>24</sup> See Shane O'Rourke *The Cossacks* (Manchester: Manchester UP, 2007).

<sup>25</sup> See D. Moon, 'Agriculture and Land Use on the Russian Steppes since ca.1800', *The Environmental Histories of Europe and Japan* (Nagoya, Japan, 2008), pp.77-90.

<sup>26</sup> *ibid.*

<sup>27</sup> Contemporary concerns in the Don Cossack region can be traced in books published over the nineteenth and early twentieth centuries, e.g. [V.D. Sukhorukov], *Statisticheskoe opisanie zemli Donskikh kazakov, sostavlennoe v 1822-1832 godakh* (Novocherkassk: Oblastnaya voiska Donskogo tipografiya, 1891); S.Nomikosov, *Statisticheskoe opisanie Oblasti voiska Donskogo* (Novocherkassk: Oblastnoi voiska Donskogo tip., 1884); V.V. Bogachev, *Ocherki geografii Vsevelikogo Voiska Donskogo* (Novocherkassk, 1919).

<sup>28</sup> See Moon, 'The Environmental History of the Russian Steppes'.

<sup>29</sup> See A.S. Ermolov, *Organizatsiya polevogo khozyaistva: Sistemy zemledeliya i sevooboroty*, 5th edn (Spb: Devrien, 1914).

<sup>30</sup> See John R. Staples, *Cross-Cultural Encounters on the Ukrainian Steppe: Settling the Molochna Basin, 1783-1861* (Toronto: University of Toronto Press, 2003).

<sup>31</sup> See Gosudarstvennyi Arkhiv Samarskoi oblasti (GASO), fond.149 Krest'yanskii Pozemel'nyi Bank, delo 184.

<sup>32</sup> See N. Tulaikov, "'Sukhoe" zemledelie (sistema Kembel'ya)', *Polnaya entsiklopediya russkogo sel'skogo khozyaistva i soprikasayushchikhsya s nimi nauk*, 12 vols (Spb: Devrien, 1900-1910), vol.XII, pp.1262-1267.

<sup>33</sup> See G.N. Vysotskii, 'Stepnoe lesorazvedenie', *Polnaya entsiklopediya russkogo sel'skogo khozyaistva i soprikasayushchikhsya s nimi nauk*, 12 vols (Spb: Devrien, 1900-1912), vol.9 (1905), pp.443-99.

<sup>34</sup> Henry C. Spalding, 'The Black Sea and the Caspian', *Van Nostrand's Eclectic Engineering Magazine*, 15, 92 (August 1876), pp.122-7.

<sup>35</sup> See, for example, I.I. Zhilinskii, *Ocherk rabot ekspeditsii po orosheniyu na yuge Rossii i Kavkaze* (Spb: tip. V. Bezobrazova, 1892).

<sup>36</sup> V.V. Dokuchaev, *Nashi Step'i prezhde i teper'* (Spb,1892).

<sup>37</sup> S. V. Zonn, A. N. Eroshkina, 'Ucheniki i nasledovateli V. V. Dokuchaeva', *Pochvovedenie* (1996), no.2, pp.124-38.

<sup>38</sup> See, for example, V.A. Kovda and E.M. Samoilova (eds), *Russkii chernozem: 100 let posle Dokuchaeva* (Moscow: Nauka, 1983); Anatoly Greshnevikov, *Ukhodit pochva iz-pod nog* (Moscow and Rybinsk, 2002).