

Oceans and Landless Farms: Linking Southern and Northern Shadow Places of Industrial Livestock (1954–1975)

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ABSTRACT

This article argues for more extensive attention by environmental historians to the role of agriculture and animals in twentieth-century industrialisation and globalisation. To contribute to this aim, this article focuses on the animal feed that enabled the rise of ‘factory farming’ and its ‘shadow places’, by analysing the history of fishmeal. The article links the story of feeding fish to pigs and chickens in one country in the global north (the Netherlands), to that of fishmeal producing countries in the global south (Peru, Chile and Angola in particular) from 1954 to 1975. Analysis of new source material about fishmeal consumption from this period shows that it saw a shift to fishmeal production in the global south rather than the global north, and a boom and bust in the global supply of fishmeal in general and its use in Dutch pigs and poultry farms in particular. Moreover, in different ways, the ocean, and production and consumption places of fishmeal functioned as shadow places of this commodity. The public health, ecological and social impacts of fishmeal – which were a consequence of its cheapness as a feed ingredient – were largely invisible on the other side of the world, until changes in the marine ecosystem of the Pacific Humboldt Current and the large fishmeal crisis of 1972–1973 suddenly changed this.

KEYWORDS

Shadow places, agriculture, livestock, industrialisation, globalisation

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INTRODUCTION

In August 1963, the Dutch veterinarian Dan (E.H.) Kampelmacher stepped on a plane to Lima, the capital of Peru. His destination: smelly factories in Lima's port city which ground up tiny anchovy fish from the Pacific Ocean into huge amounts of animal feed. Peru exported one fifth of this 'fishmeal' to the Netherlands, where farmers used it to feed their quickly rising numbers of chickens and pigs in new intensive livestock or 'factory' farms. Kampelmacher was fundamentally interested in creatures even smaller than the anchovy: *Salmonella* bacteria. Before he travelled to Peru, Kampelmacher had suspected that these germs would like the fishmeal factories, and what he saw in Peru did not reassure him (Figure 1).



Figure 1. One of Kampelmacher's pictures of pelicans at a fishmeal plant in Callao, the port town of Lima (August 1963). Kampelmacher and Mossel, 'Rapport', 9.

The fishmeal plants harboured ecosystems of their own. In the open fish pits, Kampelmacher observed, for example, 'large numbers of pelicans ... that both frequently evacuate faeces, and repeatedly vomit after satisfaction'.¹ This meant that ships leaving Peru did not just transport massive amounts of animal

1. E.H. Kampelmacher and D.A.A. Mossel, 'Rapport over een oriëntatiereis naar Peru in verband met het voorkomen van Salmonellakiemen in geïmporteerd Peruaans vismeel' (1963) 9, Archives of the *Veeartsenijkundige Dienst* 2.11.29 (hereafter vd), inv. nr. 779, Documents on (re)sterilisation of meat, bone and fishmeal (hereafter Sterilisation documents), Nationaal Archief Den Haag (hereafter NA). I have translated all Dutch quotations to English.

feed to farms in the north, but bacteria too. The ports of Lima and Rotterdam connected the ecosystems of Peruvian fishmeal plants and Dutch farms. The journey turned Kampelmacher's perspective on the problem of *Salmonella* into an ecological one.²

Kampelmacher's observations of the Peruvian fishmeal industry were exceptional in the Netherlands. Although tons of smelly 'Peru fishmeal' entered the country via the port of Rotterdam, and despite the public health danger it harboured, hardly anyone showed any interest in what the stuff was made of. Although Dutch farmers had started to refer to their new industrial poultry and pig farms as 'landless' at this point in time,³ they did not intend this phrase to mean their growing dependence on oceans rather than land. Rather, it characterised a fundamental change in livestock farming: in the postwar era farmers could increase their numbers of animals *independently* of the area of land they had for growing feed. The phrase 'landless' erased from view that these farms in fact depended on places elsewhere on the planet. Kampelmacher was the first to pay attention to 'the fish, called "anchoveta"' from the Humboldt Current ecosystem that found its way in such massive amounts to the Netherlands.⁴

Fishmeal was invisible, despite its crucial importance for two interrelated major changes in the Netherlands and the global north in general: the rise of intensive livestock farming, and the unprecedented increase in the consumption of meat and eggs.⁵ As political ecologists have pointed out, feed for livestock has become 'the central component of industrial meat production',⁶ and is highly problematic from an environmental (justice) perspective.⁷ But despite its long-term and long-distance impact, historians have neglected livestock feed.⁸ Global and environmental historians have started to write about the 'hidden' uses of the important animal feed ingredients corn and soy, but they tend to reinforce livestock feed's invisibility by focusing on the human instead of

2. Interviews, Floor Haalboom with Willem Edel (10 and 17 Apr. 2014). Accessible via: A.F. Haalboom, Thematische collectie: Onderhandelen over zoönosen in Nederland (1898-2001), DANS, 2017, <https://doi.org/10.17026/dans-2a3-bayv>
3. Erwin H.K. Karel, *De maakbare boer: Streekverbetering als instrument van het Nederlandse landbouwbeleid 1953-1970* (Groningen: Nederlands Agronomisch Instituut, 2005), 190-191..
4. Kampelmacher and Mossel, 'Rapport', 2.
5. Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (Cambridge: Cambridge University Press, 2014), pp. 304-309.
6. Mindi Schneider, 'Developing the Meat Grab', *The Journal of Peasant Studies* **41** (2014): 626.
7. Anthony Weis, *The Ecological Hoofprint: The Global Burden of Industrial Livestock* (London: Zed Books, 2013).
8. Compare: J. Donald Hughes, *An Environmental History of the World: Humankind's Changing Role in the Community of Life* (London: Routledge, 2009), pp. 189-190; K. Pomeranz, 'Advanced agriculture', in J.H. Bentley (ed.), *The Oxford Handbook of World History* (Oxford: Oxford University Press, 2011), pp. 246-266; John A. Mears, 'Agriculture', in Bentley (ed.), *The Oxford Handbook*, pp. 143-159.

the animal diet.⁹ This is part of environmental historians' more general neglect of the role of industrial agriculture – and intensive livestock keeping – in the historiography of industrialisation.¹⁰ With this paper, I join environmental historians' recent efforts to close this gap.¹¹

How did fishmeal and its environmental impacts connect industrial livestock farming in the global north to its production places in the global south, and to what extent were these impacts visible or invisible on the other side of the world? I use the concept of 'shadow places' developed by ecofeminist philosopher Val Plumwood to contribute to the environmental and global historiographical debate about distant global connections via commodity trade.¹² Shadow places are 'all those places that produce or are affected by the commodities you consume, places consumers don't know about, don't want to know about, and in a commodity regime don't ever need to know about or take responsibility for'.¹³ It is very similar to the 'ghost acres' concept used by environmental and global historians: the acres of land countries used elsewhere on the planet to relieve themselves from the constraint of lack of land. While the ghost acres concept tends to be quantitatively focused,¹⁴ the 'shadow places' concept is better suited to ask questions about the *meaning* of these

9. Arturo Warman, *Corn & Capitalism: How a Botanical Bastard Grew to Global Dominance* (Chapel Hill: University of North Carolina Press, 2003); James McCann, *Maize and Grace: Africa's Encounter with a New World Crop, 1500–2000* (Cambridge, Mass.: Harvard University Press, 2007); Ines Prodöhl, 'Versatile and cheap: A global history of soy in the first half of the twentieth century', *Journal of Global History* 8 (2013): 461–482; Ines Prodöhl, 'From dinner to dynamite: Fats and oils in wartime America', *Global Food History* 2 (2016): 31–50; Matthew Roth, *Magic Bean: The Rise of Soy in America* (Lawrence: University Press of Kansas, 2018); E. Langthaler, 'The soy paradox: The western nutrition transition revisited, 1950–2010', *Global Environment* 11 (2018): 79–104.
10. Meredith McKittrick, 'Industrial agriculture', in J.R. McNeill and Erin Stewart Mauldin (eds), *A Companion to Global Environmental History* (Wiley-Blackwell, 2012), pp. 412, 424.
11. Like the project 'Sustainable Farm Systems: Long-Term Socioecological Metabolism in Western Agriculture'.
12. Corey Ross, *Ecology and Power in the Age of Empire: Europe and the Transformation of the Tropical World* (Oxford: Oxford University Press, 2017), pp. 13–16; Dimitrios Theodoridis, Paul Warde and Astrid Kander, 'Trade and overcoming land constraints in British industrialization: An empirical assessment', *Journal of Global History* 13 (2018): 328–351; Jim Clifford, 'London's soap industry and the development of global ghost acres in the nineteenth century', *Environment and History* Fast Track (2019), <https://doi.org/10.3197/096734019X15463432086982>; Joshua MacFadyen, *Flax Americana: A History of the Fibre and Oil That Covered a Continent* (Montreal: McGill-Queen's University Press, 2018).
13. Val Plumwood, 'Shadow places and the politics of dwelling', *Australian Humanities Review* 44 (2008), <http://australianhumanitiesreview.org/2008/03/01/shadow-places-and-the-politics-of-dwelling/>
14. Kenneth Pomeranz, *The Great Divergence: China, Europe and the Making of the Modern World Economy* (Princeton: Princeton University Press, 2000), Ch. 6; Theodoridis, Warde, and Kander, 'Trade'; Clifford, 'London's soap industry'.

dependencies for human and non-human populations from an environmental justice perspective.¹⁵

Moreover, 'places' rather than 'acres' allows for the inclusion of places that are not on land, but in water. Water historians have problematised the 'blue hole' in environmental history,¹⁶ and environmental historians have started to respond with histories of the most visible inhabitants of ocean ecosystems: large ocean mammals.¹⁷ Instead, I will pay attention to less impressive ocean creatures that were nevertheless exploited on a massive scale: fish species like the Peruvian anchovy that ended up in fishmeal. I am building on Gregory T. Cushman's global ecological history of guano fertiliser, another unappetising and smelly commodity of the Pacific.¹⁸ In this key reference, Cushman analyses the rise of the Peruvian fishmeal industry as another case of what he calls 'neo-ecological imperialism': the 'Blue Revolution', in parallel to the 'Green Revolution' – to stress the connection between fishmeal production in the Pacific World and the rise of industrial livestock farming in the global north.¹⁹

This article presents a new perspective on the environmental history of fishmeal, and offers a theoretical contribution to the concept of shadow places. Plumwood in particular means shadow places 'to reflect on how nice (north) places and shadow (south) places are related, especially where north places are nice precisely because south places are not so nice'.²⁰ Existing perspectives on the history of fishmeal, Cushman's *Guano* in particular, also do not consider *how* the massive trade in fishmeal connected factories, farms and oceans, and how it created shadow places *everywhere* along its path.²¹ Using instances of sudden visibility, as in the case of a Dutch bacteriologist's interest in Peruvian fishmeal plants, I will argue that *both* production places in the global south and consumption places in the global north, *and* the oceans where the fish was

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15. Cameron Muir, 'Fifty shades of shadow places: A photographic essay', *RCC Perspectives* (2017): 107–113, 113, <https://doi.org/10.5282/rcc/7914>
 16. John R. Gillis and Franziska Torma, *Fluid Frontiers: New Currents in Marine Environmental History* (Cambridge: The White Horse Press, 2015), p. 1.
 17. E.g.: Bathsheba Demuth, *Floating Coast: An Environmental History of the Bering Strait* (New York: W.W. Norton & Company, 2019).
 18. Cushman, *Guano*.
 19. Carmel Finley, *All the Boats on the Ocean: How Government Subsidies Led to Global Overfishing* (Chicago: The University of Chicago Press, 2017), p. 4; Micah S. Muscolino, 'Fishing and whaling', in McNeill and Stewart Mauldin (eds), *A Companion*, pp. 288–289.
 20. Plumwood, 'Shadow places'.
 21. Nathan Clarke, 'Traces on the Peruvian Shore: The Environmental History of the Fishmeal Boom in Chimbote, Peru, 1940–1980' (Ph.D. Diss., University of Illinois, 2009); Kristin Wintersteen, 'Fishing for Food and Fodder: The Transnational Environmental History of Humboldt Current Fisheries in Peru and Chile since 1945' (Ph.D. Diss., Duke University, 2011); Kristin Wintersteen, 'Protein from the sea: Industrialization of Southeast Pacific fisheries, 1918–1973', *Working Paper Series DesignALdades.Net Research Network on Interdependent Inequalities in Latin America* 26 (2012): 1–31; Cushman, *Guano*.

coming from functioned as shadow places in the story of feeding fish to pigs and chickens.

To nuance our thinking about shadow places and ghost acres, my focus is on a major consumption place of fishmeal in the global north: the Netherlands, and the places where the Netherlands got its fishmeal from. I will analyse when and why fishmeal production places became shadow places in the Netherlands, and when the origin of fishmeal suddenly no longer was in shadows. The Netherlands – a ‘tiny spot on the earth’ in north-western Europe²² – is a good example of a country in the global north which has relied on the import of feeds for the maintenance of its large industrial livestock sector since the late nineteenth century. The products this sector produced were (and are) largely exported: the Netherlands became one of the biggest agricultural exporters of the world, despite its small size.²³

Fishmeal fed the twentieth-century shift to industrial livestock farming – the Netherlands was among the top three fishmeal importers internationally from 1954 to 1972.²⁴ My focus is on source material from this period, when the use of fishmeal in Dutch pig and poultry farms witnessed a boom and bust. I use sources produced by the Dutch feed sector that have not been studied before: archival documents and the annual reports of the Dutch Feed Board (*Produktschap voor Veevoeder*), which represented the interests of the feed trade and had formal policy-making responsibilities; and the annual reports of the Foundation for the quality control of cooperative livestock feeds of the main Dutch agricultural organisations (*Stichting C.L.O. controle*). Moreover, I use sources produced by Health Council (*Gezondheidsraad*) members – like Kampelmacher – who were concerned about the health dangers of fishmeal,²⁵ and the largest digitised Dutch newspaper database.²⁶ I will compare this analysis of new source material to the existing historiography on the fishmeal industries of Peru and Chile.

22. P. de Rooy, *A Tiny Spot on the Earth: The Political Culture of the Netherlands in the Nineteenth and Twentieth Century* (Amsterdam: Amsterdam University Press, 2015).

23. Jan Bieleman, *Five Centuries of Farming: A Short History of Dutch Agriculture 1500–2000* (Wageningen: Wageningen Academic Publishers, 2010); Centraal Bureau voor de Statistiek, ‘Nederland tweede landbouwexporteur ter wereld’, 6 June 2016, <https://www.cbs.nl/nl-nl/nieuws/2016/23/nederland-tweede-landbouwexporteur-ter-wereld> (accessed 19 Feb. 2020).

24. Clarke, ‘Traces’, 170, table 4.1.

25. Floor Haalboom, ‘Who owns Salmonella? The politics of infections shared by humans and livestock in the Netherlands, 1959–1965’, *BMGN - Low Countries Historical Review* 132 (2017): 83–103.

26. Koninklijke Bibliotheek, *Delpher*, <https://www.delpher.nl/>.

THE FISHMEAL BOOM

Two phases can be distinguished in the use of fishmeal in Dutch livestock feed in the period 1954–1985 (Figure 2). In the first phase, from 1954 until 1972, fishmeal constituted the main source of animal protein, and was imported and used on a massive scale. Sources of animal protein were fish in the form of fishmeal, and rendered offal from slaughtered livestock in the form of meat and bone meal.²⁷ The share of fishmeal used in poultry and pig feed increased from around sixty per cent in the 1950s to around eighty per cent in the 1960s. This fishmeal was predominantly imported. The import of meat and bone meal (predominantly from Argentina) declined from around fifty per cent between 1956 and 1959 to around five per cent between 1960 and the early 1970s.²⁸ This was the result of the rise in the availability of domestic meat and bone meal mirroring the rise in the number of livestock kept and slaughtered.

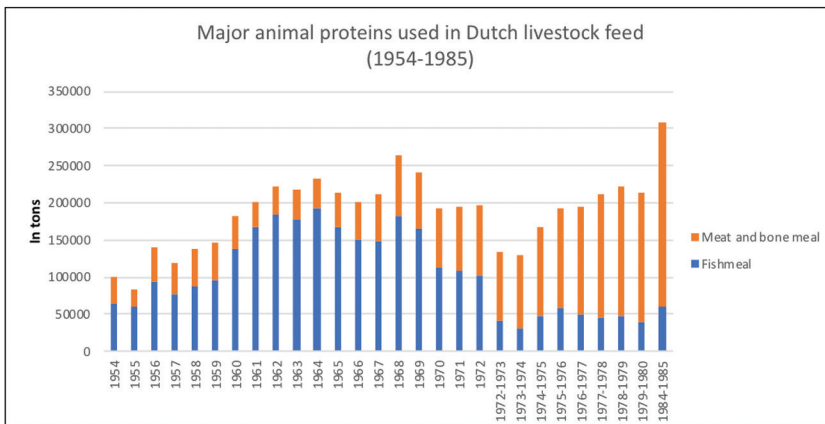


Figure 2. Major animal proteins used in Dutch compound feed for livestock (1954–1985). Sources: see notes 28 and 29.

In the second phase, after 1972, fishmeal and animal proteins in general became less important in livestock feed. The start of this shift was a spectacular bust in the global supply of fishmeal in 1972–1973, discussed in more detail below. During the 1970s and 1980s the proportion of fishmeal used in feed decreased from around fifty to around fifteen per cent. The fishmeal that was used, continued to be predominantly imported. The use of meat and bone meal increased, from around thirty up to seventy per cent. To meet this larger

27. Meat and bone meal is called ‘animal meal’ (*diermeel*) in Dutch.

28. Produktschap voor Veevoeder (hereafter PvV), *Jaarverslag 1954–1972* (‘s-Gravenhage 1955–1973).

demand, meat and bone meal was also increasingly imported again, up to half of it in 1985.²⁹

These changes were part of a larger ‘radical change’ in the way farm animals – chickens and pigs in particular – were fed in the mid-twentieth century, to enable farmers to keep them in ‘landless’ farms.³⁰ Not everything was new. Already during the late nineteenth century, Dutch farmers had shifted to livestock farming by supplementing diets on the farm with a selection of feed commodities, like cheap grains from North-America in the context of the agricultural crisis of the 1880s and waste products from the food oil industry (oil seed cakes).³¹ During the 1920s and 1930s, a specialised feed industry developed, supplied by waste products from successful Dutch food oil companies, like Unilever. This feed industry created ‘an entirely new field of science: the science of feeding livestock’, and a new kind of animal feed that was designed by experts, and produced in a factory: ‘compound feed’ (Figure 3).³² Compound feed was created from a variety of feed commodities, in order to fulfil *all* nutritional needs of pigs and chickens, enabling the shift to so-called ‘landless’ farms.³³

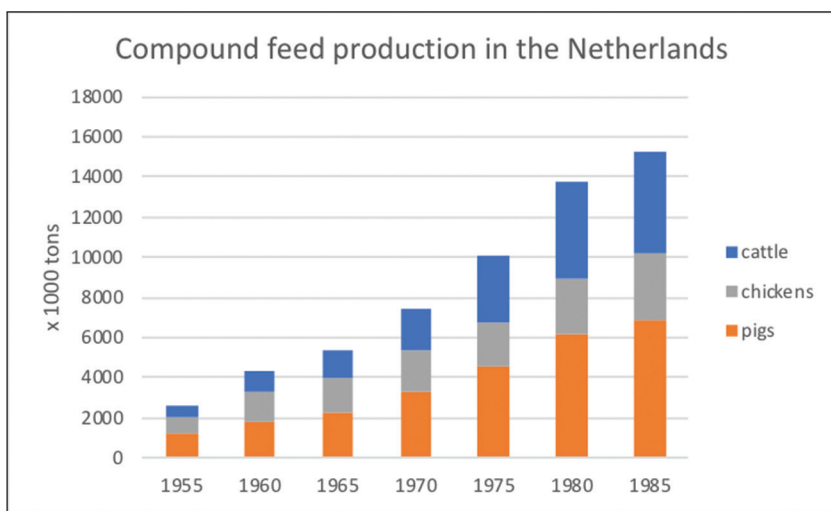


Figure 3. The production of compound feed in the Netherlands (1955–1985). Sources: see notes 28 and 29.

29. *PvV 1973–1980* ('s-Gravenhage, 1974–1981); *PvV 1985* ('s-Gravenhage, 1986).

30. Gezondheidsraad, 'Rapport inzake het salmonellose-vraagstuk', *Verslagen en Mededelingen betreffende de Volksgezondheid* (1964): 419–567, 454.

31. Bieleman, *Five Centuries*.

32. *De Nederlandse Mengvoederindustrie* ('s-Gravenhage, 1954), p. 11.

33. *De Nederlandse Mengvoederindustrie*, pp. 7–16; Gezondheidsraad, 'Rapport', 454.

Animal proteins – and fishmeal in particular – played an essential role in this shift to industrial livestock farming and the accompanying changes in western diets,³⁴ although animal proteins constituted only a small part of compound feed in absolute terms.³⁵ But for poultry and pigs, animal proteins were an ‘indispensable ingredient’ of their compound feed diet.³⁶ The Dutch livestock sector preferred animal proteins over vegetable proteins (as found in soy), and fishmeal over meat and bone meal, to obtain higher growth rates.³⁷ Animal proteins in chicken feed predominantly consisted of fishmeal, and pigs were fed fishmeal in the first months of their lives, and meat and bone meal in the months before slaughter to prevent fishy meat.³⁸

Simultaneously, the price of feed ingredients, and of animal proteins in particular, resulted in immense pressure on the livestock and feed sectors. Pig and poultry farmers’ expenditure on feed was very high. In 1958, fifty to sixty per cent of the gross pig production costs and a whopping 85 per cent of the gross egg production costs were feed costs.³⁹ Thus, there was high pressure to use ever cheaper feed ingredients. In 1962, the Feed Board warned that the fate of the feed industry depended on that of the livestock sector, and the feed industry had to ‘pay full attention to the provision of rational mixtures for prices as low as possible in order to enable [farmers] to face competition within the European Economic Community’.⁴⁰ These farmers needed fishmeal to boost the productivity of their farms, but this ingredient was also the most expensive feed ingredient compared to grains, oil seed cakes and domestically produced meat and bone meal. In these circumstances, a sudden increase in fishmeal production in the global south (discussed in more detail below) resulted in a sharp drop in the price of fishmeal during the late 1950s, and a huge increase in imports and use.

These changes in fishmeal use were similar to changes elsewhere in the global north. Internationally, fishery landings tripled in the period 1950–1973 due to the rise in fishmeal production for animal feed.⁴¹ The Dutch livestock sector ranked fourth in its consumption of this product, after West Germany, the USA and the United Kingdom.⁴² The main topics at the international fish-

34. Cushman, *Guano*, pp. 304–390; See on the ‘meatification’ and other changes in western diets: Langthaler, ‘The soy paradox’; Weis, *The Ecological Hoofprint*.

35. Constituting 10 and 6 per cent of poultry and pig feed respectively. PvV, *Jaarverslag 1957*, p. 21; Gezondheidsraad, ‘Rapport’, 491.

36. J. Boogaardt and H.J.L. Maas, ‘Vervanging van haringmeel door Peru-vismee in mestkuikenrantsoenen’, *Tijdschrift Voor Diergeneeskunde* 87 (1962): 113.

37. *Jaarverslag Stichting C.L.O.-Controle* (hereafter *Jaarverslag C.L.O.-C*) 1958–1959 (Zelhem, 1960) pp. 84–88.

38. Gezondheidsraad, ‘Rapport’, 490–2.

39. PvV, *Jaarverslag 1958*, p. 3.

40. PvV, *Jaarverslag 1962*, p. 4.

41. Wintersteen, ‘Protein’, 8.

42. Cushman, *Guano*, p. 309.

meal conference of the UN Food and Agriculture Organization in 1961 were how the use of fishmeal in the livestock sectors could be further promoted, and how the fishmeal market could be stabilised. Countries that were slower in the intensification of pig and poultry farming than the USA and north-western Europe combined starting this process with a steep rise in the use of fishmeal – southern European countries and the Soviet Union, for example. In these early years of European factory farming, European livestock consumed relatively more fishmeal than American animals, as American-grown and subsidised maize and soy dominated feeds in the USA.⁴³

The radical changes in both the Dutch feed industry and industrial livestock sectors were further promoted by protectionist agricultural policies, both in the Netherlands and in the European Economic Community. After war rationing of feedstuffs ended in 1954, the Dutch government installed tax exemptions for the compound feed industry and the trade in feed commodities to support the ‘modernisation’ of livestock farming. Meat, bone and fishmeal were exempted from trade sales tax to promote their import.⁴⁴ Moreover, formal close collaboration and staff overlap between agricultural organisations, the Ministry of Agriculture and agricultural members of parliament characterised the heyday of the ‘green front’ from the 1950s until the 1980s.⁴⁵ During the 1950s, public-private ‘statutory industrial organisations’ (*publiekrechtelijke bedrijfsorganisaties*, PBOs) were founded, in which business got formal policymaking responsibilities. These bodies were especially successful in the agricultural sector, and became central powers in agricultural policy making, the Agricultural Board (*Landbouwschap*) in particular. The Feed Board was founded in 1956, and represented different companies growing feed crops, producing waste products used for feeds, processing raw materials into feeds and trading feeds. Another feed-supporting agricultural organisation was the Foundation of the Central Agricultural Organisations for the quality control of cooperative livestock feeds (*Stichting C.L.O. controle*).

Similar developments took place in the wider and newly established European Economic Community. From the early 1960s onwards, as Peterson shows, the European Common Agricultural Policy (CAP) also exempted oil-seeds (the most important one being soy), tapioca (cassava meal) and maize gluten (a rest product of corn syrup produced in the USA) from import tariffs to support cheap feed production.⁴⁶ Fishmeal was less important in quantitative terms than these feed ingredients, and Peterson, for example, does not

43. PvV, *Jaarverslag 1961*, pp. 18–19; PvV, *Jaarverslag 1962*, p. 20; *Jaarverslag C.L.O.-C 1958–1959*, pp. 30, 87.

44. PvV, *Jaarverslag 1956*, p. 44

45. E.J. Krajenbrink, *Het Landbouwschap: ‘zelfgedragen verantwoordelijkheid’ in de land- en tuinbouw, 1945–2001* (Nieuwerkerk a/d IJssel, 2005); Rooy, *A Tiny Spot*, pp. 185–228.

46. E. Wesley F. Peterson, *A Billion Dollars a Day: The Economics and Politics of Agricultural Subsidies* (Malden, MA: Wiley-Blackwell, 2009), pp. 155, 172–173.

mention it. Nevertheless, the EEC also included fishmeal in its exemptions from import tariffs.⁴⁷ The harmonisation of import tariffs on animal proteins took a little longer than for oil seeds, and was advocated for by the Euromarket Federation of Animal Protein Importers in Hamburg. This organisation was founded in 1961 to promote the interests of the European feed industry as the ‘ideal and most suitable interlocutor for the F.E.O. (Fish Meal Exporters Organisation)’.⁴⁸

At the end of 1968, the European Commission proposed raising the price of fishmeal as part of a highly controversial plan to solve the massive surpluses of European agricultural products that were the direct result of the Common Agricultural Policy.⁴⁹ The plan became known as the ‘Mansholt plan’ after the European Commissioner for Agriculture Sicco Mansholt, the former Dutch Minister of Agriculture. Part of the Mansholt Plan was to introduce tariffs on all oil seed cakes and fishmeal (produced outside or inside the EEC), in order to use the price of compound feed as an incentive to decrease the surpluses.⁵⁰ Because the Mansholt Plan in general met with fierce criticism, it was quickly called off – to the relief of the Dutch feed industry. The Feed Board noted that diverse groups within the EEC had criticised the measure, and several third countries like the USA ‘and several developing countries ... already threaten retaliatory measures’.⁵¹

Indeed, ‘developing countries’ had come to provide Dutch livestock with fishmeal. The rise in fishmeal use and import co-occurred with a shift in the origin of the fishmeal during the late 1950s: the Netherlands no longer predominantly imported fishmeal from countries in the global north – like Norway, Denmark and Iceland – but from countries in the global south – like Peru, Angola, South Africa and Chile (Figures 4 and 5). The Netherlands bought a major share of these countries’ exports, those of Peru in particular. During the Peruvian fishmeal boom from 1958 until 1970, sixty to ninety per cent of the fishmeal imported in the Netherlands came from Peru. The livestock sector started to refer to it explicitly as ‘Peru fishmeal’, and its price determined the price of the different categories of animal proteins in the Netherlands. From 1955 until 1972, the Netherlands was continuously among the top three of countries importing Peruvian fishmeal. The Netherlands was the second-largest importer after the USA in 1955, and the largest one in 1960. From the total

47. PvV, *Jaarverslag 1968*, p. 30.

48. PvV, *Jaarverslag 1963*, p. 21.

49. Johan van Merriënboer, ‘Commissioner Sicco Mansholt and the Creation of the CAP’, in Kiran Klaus Patel (ed.), *Fertile Ground for Europe? The History of European Integration and the Common Agricultural Policy since 1945* (Baden-Baden: Nomos, 2009), pp. 181–197; Rooy, *A Tiny Spot*, p. 236.

50. PvV, *Jaarverslag 1968*, p. 30.

51. PvV, *Jaarverslag 1969*, p. 35.

Chilean fishmeal export in the 1960s, the Netherlands imported up to 37 per cent in the years from 1960 to 1966.⁵²

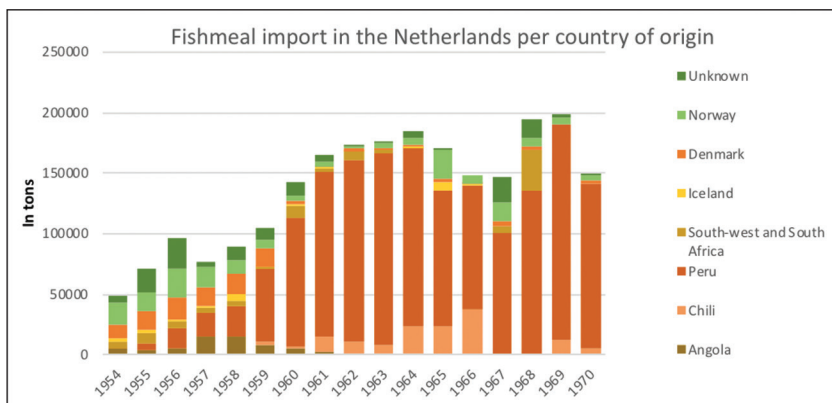


Figure 4. Source: PvV, *Jaarverslagen 1954–1970*.

According to Cushman and Wintersteen, the spectacular rise of the Peruvian fishmeal industry was the result of two geopolitical circumstances: the guano industry in Peru, and international competition for the fish of the Humboldt Current. During El Niño of 1939–1941, the Peruvian guano industry became interested in creating a fishmeal industry in order to protect the guano industry from its boom and bust cycles by exploiting the guano birds' prey – Peruvian anchovy. Simultaneously, however, the Peruvian entrepreneurial elite debated whether it was wise to create a fishmeal industry that competed directly with the guano birds. Indeed, the Peruvian fishmeal industry would overtake the guano industry in importance in the 1960s. Secondly, the South American fishmeal industry was the result of international interest in the Peruvian stocks of small fish suitable for fishmeal production, interest from the USA in particular. After the collapse of the Californian fishmeal industry shortly after the Second World War, industrial fishmeal plants in Peru were realised with American marine expertise, investments by American industrialists, subsidiaries of American companies like Cargill and Ralston Purina, and second-hand American fishmeal equipment and technology. Although multinational corporations were involved in the Peruvian fishmeal industry, national entrepreneurial elites rather than foreign ones eventually made most

52. PvV, *Jaarverslagen 1958–1970*; Clarke, 'Traces', 170, table 4.1. Exact percentages of the Dutch share in Peruvian fishmeal import differ between sources: Clarke gives higher percentages of 29.4% (1955), 31.6% (1960) and 15.1% (1965); while from the PvV sources lower percentages like 21% (1960) and 10.4% (1964) can be deduced.

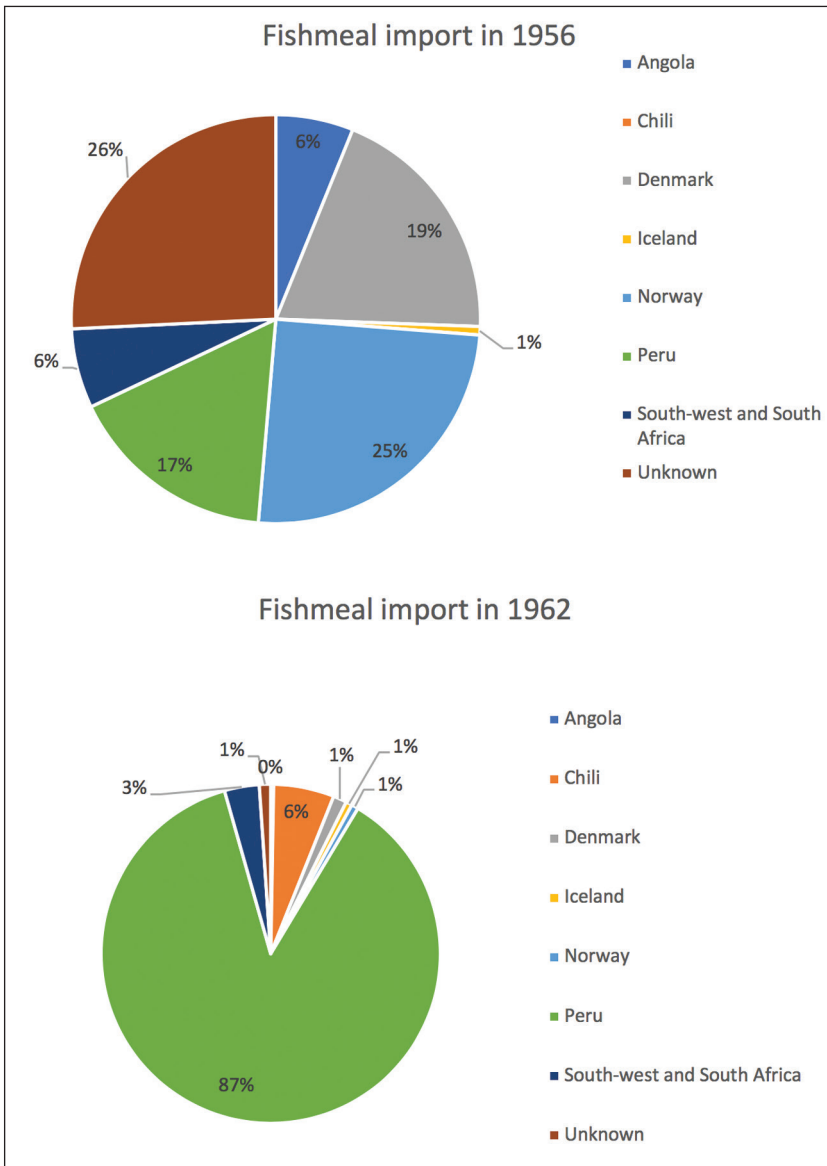


Figure 5. Origin of import fishmeal in the Netherlands in 1956 and 1962.

Source: PvV, *Jaarverslag 1956*; PvV, *Jaarverslag 1962*.

money out of it. In this way, South American fishmeal differed from other South American export commodities.⁵³

As a result, the Peruvian fishery industry changed radically during the 1950s.⁵⁴ Rather than a by-product of fish canneries, fishmeal became its core focus. Initially, anchovy fishermen depended on observing guano birds to spot schools of target fish. New industrial technologies enabled much larger quantities of anchovy to be transformed into fishmeal. Echo locators (SONAR technology) could make the anchovy schools below the ocean surface ‘visible’ independent of the guano birds, nylon drift nets were much larger and reached much deeper than the old cotton nets, and industrialists moved in entire fishmeal plants from the USA and Scandinavia. These plants could turn 5.4 tons of fish into a ton of fishmeal at the peak of the industry, burning a lot of fossil fuels in the process.⁵⁵ In 1963, Dutch scientist Kampelmacher observed ‘a quite liquid mass of fish and seawater’ being transformed into dried, ground fishmeal and fish oil – another ingredient used in animal feed (Figure 6).⁵⁶



Figure 6. One of Kampelmacher's pictures of a fishmeal plant in Callao, the port town of Lima (August 1963). Kampelmacher and Mossel, 'Rapport', 4.

53. Wintersteen, 'Protein'; Cushman, *Guano*, pp. 289–304, 313.

54. Wintersteen, 'Protein'; Cushman, *Guano*, pp. 309–311.

55. Cushman, *Guano*, p. 311.

56. Kampelmacher and Mossel, 'Rapport', 3.

FISHMEAL'S SHADOW PLACES

Cushman discusses Peru's Blue Revolution as 'an extreme form of neo-ecological imperialism' that only benefited consumers in an affluent country like the Netherlands.⁵⁷ But the Netherlands too functioned as a shadow place of the fishmeal boom in the global south. Heated fishmeal was a fire danger on board of ships, and a cause of pollution. Nitrogen and other nutrients from the fishmeal ended up in the manure of the large number of farm animals kept in the Netherlands, causing pollution of land, water and air. This 'manure problem' would turn into an environmentalist and political issue during the 1980s, and continues to be so today.⁵⁸ The fishy feed moreover affected the taste of meat and eggs.⁵⁹

The main example I want to zoom in on here, however, is the reason Kampelmacher travelled to Peruvian fishmeal plants in 1963: *Salmonella* bacteria. In the 1950s, Dutch public health experts, Kampelmacher prominently among them, joined their international colleagues in concerns that imported animal proteins for feed acted as carrier of disease. To stop the growing problem of *Salmonella* food infections ('salmonellosis'), 'it is in the first place necessary, that salmonellas are not continuously fed to the livestock'⁶⁰ – as bacteriologist Charlotte Ruys summarised the perspective of the Dutch Health Council.⁶¹ With modernisation, like the modernisation of livestock feed practices, came 'downsides of progress'.⁶² Agricultural stakeholders did not accept this problem analysis from the perspective of public health, and a fierce controversy arose. The central issue of disagreement was how contaminated animal proteins should be controlled. According to the public health camp, the state needed to impose sterilisation of imported meat, bone and fishmeal as soon as these commodities arrived in the port of Rotterdam. Concerned about the feed price impact of such policy, the agricultural camp contested the central importance of feed in *Salmonella* ecology, and argued that the feed sector should self-regulate any *Salmonella* control measures of imported animal proteins for

57. Cushman, *Guano*, p. 305.

58. Jaap Frouws, 'Mest en macht: Een politiek-sociologische studie naar belangenbehartiging en beleidsvorming inzake de mestproblematiek in Nederland vanaf 1970' (Ph.D. Diss., Landbouwwuniversiteit Wageningen, 1994); Rooy, *A Tiny Spot*, p. 255.

59. *Jaarverslag C.L.O.-C 1959–1960* (Zelhem, 1961), p. 32; PvV, *Jaarverslag 1960*, pp. 23–24; 'Schip in brand bij de Hoek', *de Volkskrant*, 12 Feb. 1966, 1; 'Verwijderen van stookolie wordt dure zaak', *Algemeen Handelsblad*, 4 Apr. 1966, 4; Wina Born, 'Nederland heeft geen eigen traditionele kerstgerechten', *Leeuwarder Courant*, 21 Dec. 1968, 33; Mary Schuurman, 'Koken voor de pret', *De Telegraaf*, 18 July 1970, 17.

60. A. Charlotte Ruys, 'De Salmonella-epidemie van deze zomer', *Nederlands Tijdschrift voor Geneeskunde* 103 (1959): 2399–2401, 2401.

61. Gezondheidsraad, 'Rapport'.

62. Anna Charlotte Ruys, *Keerzijden van vooruitgang* (Haarlem: Bohn, 1959); Minutes of the Salmonellosis Committee, 7 Dec. 1960, 15, Archives of the Gezondheidsraad, 2.15.36, inv. nr. 2266, NA.

feed. In 1965, a compromise in the *Salmonella* controversy was reached: obligatory sterilisation of imported meat and bone meal was prescribed with the *Salmonella* Bill in 1965. Fishmeal, constituting around eighty per cent of the animal proteins used in pig and chicken feed, was exempted from this measure and left to the feed industry's self-regulation.⁶³ In other words: the feed industry was allowed to self-regulate the bulk of the imported animal proteins, and the 'green front' was the winner of the controversy.⁶⁴

However, the role of fishmeal in the *Salmonella* problem became increasingly controversial too. Actors referred to this as the 'fishmeal dilemma'. The Health Council noticed the stark difference between Dutch Feed Board and German figures on the percentage of *Salmonella* contamination of similar fishmeal imported in both countries via the port of Rotterdam: German figures showed higher *Salmonella* contamination than Dutch figures. In 1963, the State Institute for Public Health concluded that 26–31 per cent of imported fishmeal was very likely contaminated with *Salmonella* bacteria, against claims of the Feed Board that fishmeal contamination was sporadic.⁶⁵

Nevertheless, unhygienic production circumstances – in which *Salmonella* bacteria were likely to thrive – were a fundamental characteristic of cheap industrial fishmeal production for livestock feed during the second half of the twentieth century. Wintersteen has argued that the possibility to ignore hygiene and sanitation was a major reason why the Peruvian and Chilean fishmeal industries focused on processing fish for animal feed rather than human food. Fishmeal was more profitable, because the 'unrefrigerated anchovies and sardines' 'were often processed rotten' into fishmeal 'with rudimentary technology', 'thus reducing costs on land'.⁶⁶ Hardy also gives evidence that industrially produced fishmeal was problematic from a bacteriological point of view. She quotes the American Centre of Disease Control microbiologist Philip Edwards, who considered *Salmonella*-contamination of fishmeal produced in the USA to be 'entirely a problem of plant sanitation, which I understand is really horrible'.⁶⁷

This issue of 'modern' fishmeal industry hygiene was the reason why Kampelmacher travelled to several fishmeal factories on the Peruvian coast in

63. Simultaneously, the ca. 15% of meat and bone meal used for feed was increasingly domestically produced: the import share declined from ca. 50% in the late 1950s to 2% in 1965. PvV, *Jaarverslag 1956–1965*.

64. Anne Hardy, *Salmonella Infections, Networks of Knowledge, and Public Health in Britain, 1880–1975* (Oxford: Oxford University Press, 2015), Chs. 7 and 8. See on the Dutch controversy: Haalboom, 'Who owns Salmonella?'

65. E.H. Kampelmacher, 'Onderzoekingen over het voorkomen van Salmonellakiemen in geïmporteerd vismeel', April 1963, report 73/63, Archives RIVM Bilthoven; Van Beukering to Van den Born, 12 July 1963, vD, inv. nr. 779, Sterilisation documents, NA. See for an overview: K.C. Winkler et al., 'Het *Salmonella*-probleem bij vismeel: rapport van de werkgroep ad hoc', Mar. 1967, vD, inv. nr. 570, Feed regulation changes, NA.

66. Wintersteen, 'Protein', 16.

67. Hardy, *Salmonella*, p. 165.

the summer of 1963. His involvement was arranged by Chief Veterinary Officer Jacques van den Born, another prominent member of the public health camp. Van den Born wanted to ensure that a member of the public health camp accompanied another expert who was more affiliated to industry, D.A.A. Mossel, and presented Kampelmacher as the representative of the Dutch government to the Peruvian authorities. Kampelmacher and Mossel reported that industrial fishmeal production in Peru occurred in ecological circumstances that were likely to contaminate the product, and assessed Peruvian bacteriological research as 'at the moment still very inadequate', and the export certificates issued by Peruvian authorities as being 'without any value'.⁶⁸ However, after the research trip, Kampelmacher and Mossel concluded different things from what they had seen. Mossel supported the agricultural camp's argument that solutions should not be sought within the Netherlands: 'Peru is entirely willing to improve the production of fishmeal in the shortest possible term.'⁶⁹ In his work for the State Institute for Public Health, on the other hand, Kampelmacher stressed that his findings on *Salmonella* in Peruvian fishmeal underlined the importance of sterilising the meal in the Netherlands.⁷⁰

Eventually, the 'green front' successfully gained control over 'the fishmeal dilemma' according to its preferences and interests. After the *Salmonella* Bill of 1965 had left the fishmeal dilemma unresolved, the Ministries of Agriculture and Social Affairs installed a mutual 'ad hoc' expert advice committee to solve it. This 'Winkler committee' ignored the Health Council's advice, and did not invite key figures from the public health camp. Members were medical microbiologists with no history in the salmonellosis debate and agricultural scientists. The Winkler committee depoliticised the fishmeal dilemma in the sense that it provided the government with a single scientific advice in 1967.⁷¹ It concluded that sterilisation of imported fishmeal was unnecessary, and that the feed trade's self-regulation was sufficient. The Feed Board continued to be in charge of *Salmonella* control, and self-regulation by the industry continued to be the norm. This left the public health camp with a sense of defeat for decades to come.⁷²

The Netherlands functioned as a *shadow* place with regard to these public health consequences of the fishmeal trade, because this impact remained largely invisible in South America. Although the issue and the trade interests involved did lead to concerns of Peruvian authorities behind the scenes,⁷³ it

68. Kampelmacher and Mossel, 'Rapport', 11.

69. PvV, 'Verslag van de bespreking over het Salmonella-vraagstuk', 5 Nov. 1963, vd, inv. nr. 779, Sterilisation documents, NA.

70. vd, inv. nr. 779, Sterilisation documents, NA.

71. Winkler et al., 'Het *Salmonella*-probleem'.

72. J. Huisman, *Advies inzake het salmonellosevraagstuk* (Den Haag: Gezondheidsraad, 1978), p. 2; interviews, Floor Haalboom with Joop Huisman, 4 and 28 Mar. 2014. Accessible via: Haalboom, Thematische collectie.

73. vd, inv. nr. 779, Sterilisation documents, NA.

remained relatively invisible. None of the environmental historians who have worked on the Peruvian and Chilean fishmeal industries mentions the issue.⁷⁴ As we will see, this did not mean that the *Salmonella* controversy in the global north had no impact on fishmeal production places in the global south.

The argument that imported feed components like fishmeal constituted a public health danger in the global north included an element of colonial othering, especially regarding Africa, and is repeated in existing historiography. Dutch public health experts were particularly concerned that animal proteins *from the global south* carried exotic *Salmonella* bacteria they had never encountered before. The Health Council argued in 1964: ‘*The past seclusion of the farm yard has given way to contact with all continents.*’⁷⁵ In 1971, the Dutch epidemiologist Joop Huisman wrote that imported feed brought ‘the tropics to the farm, with all the associated risks.’⁷⁶ Experts elsewhere in the global north shared these concerns, and the Angolan fishmeal industry in particular suffered from associations with *Salmonella* contamination. After the Second World War, Angola became one of the first major exporters of fishmeal globally. However, this industry, according to Cushman, ‘almost closed down when bacteriologists discovered that air-dried Angolan fishmeal harboured an astounding diversity of *Salmonella* strains’.⁷⁷ Medical historian Anne Hardy relates how European and American microbiologists concluded in the 1950s and 1960s that subtypes of *Salmonella* bacteria that had initially been designated as American, were actually *African* in origin. The German bacteriologist Fritz Kauffmann wrote in 1969: ‘the Angolan product is terrible, it is the greatest reservoir of *Salmonella* types in the world.’⁷⁸ Hardy concludes from this that fishmeal trade from Africa to America had ‘promoted the export and global voyaging of a host of microbial parasites’.⁷⁹

It is undeniable that *Salmonella* bacteria travelled to new places as a result of intensified global trade in animal proteins. However, by focusing on African fishmeal, both Cushman and Hardy strengthen the image that fishmeal from Africa was more dangerous than fishmeal from elsewhere – an image that livestock feed industries in the global north actively tried to promote in order to protect their interests. In the Dutch controversy, the livestock feed sector linked the *Salmonella* problem to poor nations with ‘less rationally operating companies’ – especially in Angola – and tried to disassociate it from countries with modern ‘new factories’ after US examples.⁸⁰ In 1961, the Dutch Feed

74. Clarke, ‘Traces’; Wintersteen, ‘Fishing’; Cushman, *Guano*, Ch. 9.

75. Gezondheidsraad, ‘Rapport’, 454, 520. Emphasis in the original.

76. Joop Huisman, “‘Andere Salmonellosen’ te Rotterdam’, *Nederlands Tijdschrift voor Geneeskunde* 115 (1971): 1062–1064, 1063.

77. Cushman, *Guano*, pp. 314–315.

78. Hardy, *Salmonella*, p. 164.

79. *Ibid.*, p. 165.

80. PvV, *Jaarverslag 1962*, p. 20.

Board's 'exemption committee' created a 'White List' of fishmeal brands that did not need to be tested for *Salmonella*, and gave preferential treatment to the Scandinavian fishmeal industry. Its self-regulation activities focused on the banning of Angolan sun-dried fishmeal from the fishmeal import, and the industry sent batches of Angolan fishmeal to get sterilised as a standard procedure. As a consequence, traders started to avoid Angolan fishmeal in 1960, and the Feed Board prohibited its import altogether in 1961. Simultaneously, the Feed Board stressed that its policy worked 'educationally' on the fishmeal production places that provided Dutch feed factories with almost all fishmeal at this point in time – Peruvian fishmeal plants.⁸¹

But this argument erased from view an essential characteristic of cheap fishmeal production that Kampelmacher observed in 1963: its insanitary production practices. The ability to produce feed ingredients in insanitary conditions was at the heart of the fishmeal industry's choice to prioritise animal feed over human food production in the 1950s and 1960s, despite UN Food and Agriculture Organization and UN Development Programme attempts to use fishmeal in human food in low income countries to combat malnutrition.⁸² The production of fishmeal for animal feed was cheaper, and the US Food and Drug Administration closed off the American market by concluding that fish protein concentrate was unfit for human consumption in 1962. Neither did the Peruvian industry opt for the option to produce canned fish for human consumption, because this required more machinery, more labour and higher sanitation standards. This was the dynamic almost everywhere in the global south where a fishery industry was promoted: Peru, Chile, Angola, Indonesia, Polynesia, Malaysia and the Philippines. During the years in which Peru became the biggest fishmeal exporter, the fish consumption of its population actually *declined*. Although campaigns to use fishmeal as human food attracted some positive attention in Dutch socialist and social-democratic media,⁸³ no-one associated malnutrition in the global south with feeding livestock in the Netherlands during the 1950s and 1960s.

Left-wing governments in Peru and Chile of the early 1970s tried to change this focus on animal feed instead of human food production.⁸⁴ In Peru, this co-occurred with a radical political change: the centre-left military dictatorship in power from 1968 until 1980 cut back the fishmeal industry, and stimulated fishing for human consumption rather than feed production. In the long term it was successful in stimulating Peruvian fish consumption. In the early 1970s, this change had major consequences for the Peruvian fishmeal industry. The rise in fishmeal prices as a consequence of this change in Peruvian policy is visible as

81. PvV, *Jaarverslag 1960*, pp. 21–23; PvV, *Jaarverslag 1961*, pp. 20–21.

82. Wintersteen, 'Protein'; Cushman, *Guano*, pp. 313–317.

83. 'Chemicus maakt vismeel tot menselijk voedsel', *Het Vrije Volk: Democratisch-Socialistisch Dagblad*, 13 Apr. 1954, 1; 'Vismeebroodjes', *De Volkskrant*, 14 Sept. 1954, 7.

84. Clarke, 'Traces', Ch. 5; Wintersteen, 'Fishing', Ch. 4; Cushman, *Guano*, p. 326.

a decline in the use of fishmeal in the Netherlands from 1970 onwards (Figure 2). The Dutch Feed Board noted a larger demand for soy rather than fishmeal as a consequence.⁸⁵ In Chile, the left-wing democratic government of Salvador Allende (1970–1973) started a collaboration with Soviet Union trawlers that caught fish for human consumption in exchange for Chilean fishmeal.

These Peruvian and Chilean policies in the early 1970s were exceptional and short-lived. More often, non-democratic political circumstances in the global south supported rather than hampered cheap fishmeal production for livestock in the global north. Angola exported fishmeal under Portuguese colonial rule (until 1975), and South Africa exported fishmeal during Apartheid (until 1994). In Chile the neoliberal dictatorship of general Augusto Pinochet (1973–1990) gave fishmeal industrialists free rein again from 1973 onwards, and Chile had replaced Peru as the major fishmeal exporter by 1980.⁸⁶

Social inequality was exacerbated in these political circumstances. Fishmeal industrialists made enormous amounts of money, and stock exchanges in the global north enabled speculation on fishmeal. Simultaneously, workers in the fishmeal plants were poorly paid and lived in slums with no paved roads, running water or electricity, unhealthy conditions and polluted air. Fishmeal's volatile market resulted in labour unrest during the 1960s in Peru, and during the 1980s in Chile. The smaller group of fishermen providing anchovies to the Peruvian plants had a more powerful economic position, and earned large amounts of money during the fishmeal industry's boom years. Meanwhile, the rise of the fishmeal industry and demise of the guano industry resulted in rural crisis in South America, as regional producers had difficulty accessing fishmeal for domestic livestock feed, and farmers no longer had access to cheap fertiliser.⁸⁷

The fishmeal industry moreover was smelly and polluted its surroundings. While fishmeal pollution from the Dutch port of Rotterdam attracted some attention in the Netherlands in the early 1970s, South American fishmeal pollution remained invisible. Most Peruvian fishmeal plants were located around the cities of Callao (the port of Lima) and Chimbote on the northern coast of Peru. Elite concerns about fishmeal pollution in the capital city of Lima, led to public health regulations. Many factories were moved to less-regulated places along the coast, taking the air pollution and resulting public health problems with them. One of these places was the city of Chimbote, which quickly grew into the largest fishmeal city of Peru, and became 'one of the nation's ... most polluted cities'.⁸⁸ When Kampelmacher visited Peru, Chimbote's industrial focus had shifted from steel and fish canneries to fishmeal production.

85. PvV, *Jaarverslag 1970*, p. 20.

86. Wintersteen, 'Fishing', Ch. 4.

87. Clarke, 'Traces', Ch. 6; Wintersteen, 'Fishing', 206–208, Ch. 4; Wintersteen, 'Protein'; Cushman, *Guano*, pp. 322, 325.

88. Clarke, 'Traces', 2.

Chimbote provided indigenous migrants from rural areas with work, but also with bad working and living conditions in its sprawling slums amidst the fishmeal plants, and severely polluted air and water. In only a few decades, the city had mushroomed out of a drained wetland into what international social scientists would call a 'non-place' and 'the worst urban environment we have seen since leaving India' in 1972.⁸⁹ These conditions attracted the attention of Peruvian intellectuals and political activists from the late 1960s onwards.⁹⁰

One place impacted by the feeding of fish to farm animals was in particular in shadows: the marine ecosystems from which the tiny fish were taken, like the Pacific Humboldt Current along the coast of Peru and Chile. According to Cushman, the unprecedented scale of turning Peruvian anchovy fish into livestock feed in the early 1960s 'doomed Peru's marine environment to ecological catastrophe'.⁹¹ Three issues were at the core of this catastrophe.

The first issue concerned pollution of the ocean with rotting organic waste from the fishmeal plants. In the fishing season of 1970, 'an estimated 4,200 tons of untreated stickwater entered the ocean *every hour*' on the Peruvian coast.⁹² As a result, the bays of fishmeal towns like Chimbote and Calloa were turned into eutrophic death zones. Although this meant that non-industrial, artisan fishermen could no longer fish in the water of the bay, this issue did not inspire a counter movement in Peru, as the fishmeal smell had in Lima in the early 1960s. Nor did it receive any attention in the Netherlands. Even Kampelmacher, who was so preoccupied with sanitary conditions in the fishmeal plants, did not comment in any way about the consequences of the huge amounts of organic waste for the ocean.⁹³

The second issue concerned the impact on fish populations. The shift from global north to global south production of fishmeal during the late 1950s meant a major shift in the marine ecosystems being sourced and the fish species used for the production of fishmeal. Formerly, fishmeal for European animal feed had been produced as a side product of the herring fishery in Norway, Denmark and Iceland. During the 1950s, fishmeal was increasingly produced from tiny fish species at the base of marine food webs. These fish were hardly used as human food, and had little economic value as a result – making them particularly attractive to the livestock feed sector. The Angolan and South African fishmeal industries mainly landed a kind of sardine: Southern African pilchards (*Sardinops ocellatus*). Peruvian fishmeal was mainly manufactured from the abundant Peruvian anchovy (*Engraulis ringens*) in the nutrient-rich Humboldt Current along the western coast of South America. Peruvian anchovy also ended up in fishmeal from Chile, together with other abundant fish

89. Quoted in: Wintersteen, 'Fishing', 196–97.

90. Clarke, 'Traces', Ch. 3; Wintersteen, 'Fishing', Ch. 3; Cushman, *Guano*, pp. 311–312.

91. Cushman, *Guano*, p. 304.

92. Cushman, *Guano*, p. 312.

93. Kampelmacher and Mossel, 'Rapport'; Clarke, 'Traces', Ch. 3; Cushman, *Guano*, p. 313.

species with high oil content, like Spanish sardines (*Sardinops sagax*) and jack mackerel (*Trachurus murphyi*).⁹⁴

Industrial fishmeal production had a major impact on the stocks of these fish. The Californian fishmeal industry collapsed in the late 1940s when stocks of sardine were depleted. Peruvian fish experts started to warn of the impact of free-reined fishing on Peruvian anchovy stocks in the mid-1960s, and the Peruvian government started to introduce an anchovy production quota. In these circumstances, the fishmeal industry denied its impact on the anchovy population, arguing that it was resilient and only followed climate cycles. It is likely that the stocks of anchovy fish were not just impacted by the massive fish landings for the production of fishmeal. But that the production of fishmeal on an industrial scale also had an impact on the stocks is clear.⁹⁵

For the different species of birds that provided the Peruvian guano industry with its commodity, these developments had even higher impact: the third issue. Species of marine birds that were affected included the pelicans Kampelmacher had observed in such large numbers in 1963, Peruvian cormorants (*Phalacrocorax bougainvillii*), blue-footed and Peruvian boobies (*Sula nebouxii* and *S. variegata*) and different species of terns. These birds competed directly with the fishmeal industry – and thus with northern pigs and chickens – for the anchovy fish. Combined with the climatic impact on bird populations of the 1965–1966 El Niño, this resulted in longer term depleted populations of guano birds. Cushman recounts how starving birds showed up in urban markets in search of food, and concludes: ‘Peru’s world-famous guano industry died in full public view.’⁹⁶ The fishmeal industry welcomed this demise of its main competitor for anchovy stocks. It used the occasion to argue for the replacement of the Peruvian guano industry with a chemical fertiliser industry. Indeed, Peru ‘allowed the guano industry to pass into oblivion’ – an economic development that was entangled with ecological changes.⁹⁷

The ocean ecosystems in the global south exploited to feed the industrial livestock sector in the north remained largely invisible. Dutch sources only mention by name fish species used to produce fishmeal from countries in the global north, like herring from Scandinavian countries or menhaden from the United States – even though the latter was hardly used in the Netherlands. Fishmeal from countries in the global south was initially discussed with the generic term ‘fishmeal’, without reference to the species making up this product. This was even the case for a scientific article that asked whether ‘Peru

94. Gunnar Saetersdal, Gabriella Bianchi and Tore Strømme, ‘The Dr. Fridtjof Nansen Programme 1975–1993: Investigations of Fishery Resources in Developing Regions: History of the Programme and Review of the Results’, FAO Fisheries Technical Paper (Rome: FAO, Institute of Marine Research Bergen, 1999), 267–268; Wintersteen, ‘Protein’, 12; Muscolino, ‘Fishing and whaling’, p. 288.

95. Wintersteen, ‘Fishing’, 5, 219; Wintersteen, ‘Protein’; Cushman, *Guano*, pp. 321–324.

96. Cushman, *Guano*, p. 321.

97. Cushman, Ch. 6, pp. 302, 321–324, 321 (quote).

fishmeal' could completely substitute 'Norwegian herringmeal', 'because the composition is not entirely the same.'⁹⁸ Nowhere did these sources mention what actually constituted fishmeal from countries in South America and Africa. And although Kampelmacher discussed pelicans as a sanitary problem in his report on the Peruvian fishmeal industry, he did not mention any relation between the fishmeal industry and the decline in the numbers of guano birds.⁹⁹

THE PROTEIN CRISIS MOVES NORTH

Environmental historians of the fishmeal industry have pointed out that the marine ecosystem could no longer be ignored in the early 1970s: it had such dramatic influence on the fishmeal trade that it created shadow places of its own. In 1972–1973, the Peruvian anchovy population in the Humboldt Current dramatically collapsed, and the fishmeal industry with it. The preceding years of industrial-scale fishing had depleted the population. The strong El Niño of 1972–1973 resulted in the cool waters of the Humboldt Current warming up, and the remaining anchoveta schools relocating to cooler, deeper waters – away from the fishing nets.¹⁰⁰ This event had major impact on the entangled fishmeal and livestock industries.

The Peruvian fishmeal industry changed dramatically. The Peruvian military government responded to the social problems created by the collapsing fishmeal industry by expropriating the entire industry in May 1973. It created the national fishmeal company Pesca Perú. The focus shifted to canned fish, as the Peruvian anchovy was replaced by a species of sardine that could be canned as a human food, and the Peruvian government stimulated canneries. The market for fishmeal was largely taken over by Chile under the neoliberal dictatorship of Pinochet, and the Peruvian equipment was moved to South Africa. Despite these changes, (illegal) fishmeal production continued in Peru, because it continued to be more profitable than canned fish.¹⁰¹

The disappearance of the Peruvian anchoveta also made the 'protein crisis' move north. The Dutch livestock sector referred to the 'true emergency situation' of the Peruvian fishmeal crisis as the 'protein crisis' (*'de eiwit-crisis'*).¹⁰² This term did not refer to human malnutrition problems in the global south or contemporary concerns about how to feed a burgeoning global population, but to 'a somewhat slower growth and higher feed conversion' of pigs and chickens

98. Boogaardt and Maas, 'Vervanging', 113.

99. *Jaarverslag C.L.O.-C 1959–1960*, p. 33; PvV, *Jaarverslag 1962*, pp. 19, 50; Kampelmacher and Mossel, 'Rapport'; Boogaardt and Maas, 'Vervanging'.

100. Wintersteen, 'Protein'.

101. Clarke, 'Traces', Ch. 5; Wintersteen, 'Fishing', 215–231; Finley, *All the Boats*, p. 5.

102. CLO-Instituut voor de Veevoeding De Schothorst (hereafter: CLO-Instituut Schothorst), *Jaarverslag 1972–1973* (s.l., 1974) pp. 13–14.

in Dutch industrial farms due to a shortage of proteins.¹⁰³ Thus, according to Wintersteen, the crisis 'was not primarily humanitarian but political-economic in nature, as Northern farmers faced a shortage of fishmeal and thus a rise in prices of chickens, eggs, and pigs'.¹⁰⁴ The price of fishmeal skyrocketed in 1973, by 246 per cent in comparison to 1970.¹⁰⁵ The high price led to a sharp decrease in the import of fishmeal in the Netherlands: by 42 per cent in 1973.¹⁰⁶

These events suddenly moved fishmeal production places in the global south out of the shadows in the Netherlands. After years of ignoring the fish behind 'Peru fishmeal', the Feed Board started to refer to 'the schools' of fish that were disappearing in 1972, and when the fish had not reappeared in 1973, it used the name anchovy for the first time to explain why the price of fishmeal was 'unprecedentedly high'. In 1977, the social-democratic newspaper *Vrije Volk* elaborately introduced its readers to the Peruvian anchovy and its habitat in its weekend supplement, including a drawing of the fish and a map of Peru. The newspaper pointed out that although readers knew the anchovy as 'the tiny animal that usually garnishes a Wiener schnitzel', the fish had in fact been essential for the production of that Wiener schnitzel before its dramatic disappearance.¹⁰⁷

Also, the growing Dutch environmental movement had a role in making fishmeal's shadow places visible, as the fishmeal crisis co-occurred with a wider surge in environmental consciousness. Environmentally concerned newspaper writers started to include fishmeal in the argument that meat production was a waste of scarce proteins and exacerbated 'the world food problem'.¹⁰⁸ These scientists, journalists and vegetarians argued that feeding the proteins in grains and fish to livestock to produce far less protein was a waste and morally problematic, and that people in rich countries like the Netherlands would do better to lower their meat consumption. International environmentalism inspired this argument. In particular, warnings from the Club of Rome, individual scientists like Norwegian-American professor Georg Borgström and writers like Frances Moore Lappé were influential in this debate. Dutch readers bought half of the worldwide number of copies of the Club of Rome's 1972 *Limits to Growth* re-

103. Ibid., p. 14.

104. Wintersteen, 'Protein', 17.

105. Clarke, 'Traces', 123, table 3.7.

106. *PvV* 1973.

107. *PvV* 1972, p. 60; *PvV* 1973, p. 59; 'Ansjovisramp treft Peru', *Het Vrije Volk*, 13 Aug. 1977, 18.

108. Rob Foppema, 'De honger is toch dichterbij', *Trouw*, 7 Mar. 1972, 5; Hans Bouma, 'Uitbuiting van dieren en mensen', *Trouw*, 26 June 1973, 2; "'Vis bestemd voor de mens, niet voor het dier'", *Trouw*, 26 Mar. 1974, 13; R. Boeringa, 'Vlees kan geheel uit ons menu', *NRC Handelsblad*, 1 Jan. 1975, 4; H. Surendonk, 'Angstige dromen over de toekomst van oceanen', *NRC Handelsblad*, 30 Oct. 1976, 3; Hans Schmit, 'Weer méér zeehonden gedood', *Trouw*, 2 Apr. 1977, 5; Wouter van Dieren, 'Zoute stoerheid en ecologisch drama', *NRC Handelsblad*, 3 Feb. 1979, 6.

port, and the 1974 Dutch edited translation of Lappé's *Diet for a Small Planet* would be followed by many other editions.¹⁰⁹

The agricultural sector thus faced growing environmentalist criticism of their argument that importing feed ingredients like fishmeal was efficient, and the Peruvian fishmeal crisis seriously endangered the promise that this system would produce *cheap* food.¹¹⁰ These circumstances required extraordinary measures to find a cheap substitute for fishmeal, which all proved far from perfect for the livestock sector and meat consumers in the Netherlands, and came with new shadow places of their own.

The first strategy was to use more domestically produced meat and bone meal (Figure 2). This product made out of slaughter offal of the burgeoning livestock sector was cheaper than fishmeal, but its price nevertheless rose in response to the fishmeal price. Another major disadvantage of meat and bone meal in comparison to fishmeal was that its nutritional composition was variable instead of constant.¹¹¹

The second strategy was to shift to soy as a vegetable source of protein – an impact of the fishmeal crisis that historical sociologists have not recognised in their work on food regimes.¹¹² Soy was the best source of vegetable proteins, because of its complete composition of amino acids for animals. In the long run, after the Peruvian fishmeal crisis of 1972, soybean cake became more important as source of protein in the diets of pigs and poultry. This turned out to be unproblematic when other missing nutrients were added. A real problem was how the Peruvian fishmeal bust exacerbated the enormous rise in the price of soy from the United States. The fishmeal crisis happened to occur simultaneously with the opening up of the Soviet market for American livestock feed commodities like grain and soy. The increased demand for these commodities in the early 1970s was exacerbated by the fishmeal crisis: all factory farms in northern America, Europe and the Soviet Union suddenly relied on American soy. As a consequence, its supply was far from enough to meet this sudden demand, although the US saw a record harvest of soybeans in 1972. The Nixon government even decided in July 1973 to impose an export stop on soy to prevent US meat prices from rising any further. Prices of other products containing soy, such as margarine, also rose significantly as a consequence.

109. Dirk-Jan Verdonk, *Het dierloze gerecht: Een vegetarische geschiedenis van Nederland* (Amsterdam: Boom, 2009); Sjoerd Keulen, *Monumenten van beleid: De wisselwerking tussen Nederlands rijksoverheidsbeleid, sociale wetenschappen en politieke cultuur, 1945–2002* (Hilversum: Verloren, 2014), p. 193.

110. Jan van Capel, 'Bezuiniging op veevoeder geen oplossing honger', *De Volkskrant*, 12 Dec. 1974, 2; 'Kans op goedkoper voedsel', *NRC Handelsblad*, 6 Mar. 1974, 1.

111. CLO-Instituut Schothorst, *Jaarverslag 1970–1971* (s.l., 1972) pp. 101–109.

112. Harriet Friedmann and Philip McMichael, 'Agriculture and the State System: The Rise and Decline of National Agricultures, 1870 to the Present', *Sociologia Ruralis* 29 (1989): 93–117; Harriet Friedmann, 'Distance and Durability: Shaky Foundations of the World Food Economy', *Third World Quarterly* 13 (1992): 371–383.

For developing soy production countries such as Brazil, this was an important window of opportunity.¹¹³

The American soy crisis of 1972–1973 strongly exacerbated the Dutch livestock sector's 'protein crisis', and inspired a third emergency strategy: feeding animals fewer proteins. This meant they grew less quickly, but in the circumstances, according to the agricultural organisations' feed control foundation, 'this was the most economical solution for the poultry and pig farmers'.¹¹⁴ The catholic newspaper *De Volkskrant* summarised the situation in the headline: 'Hunger threatens the livestock'.¹¹⁵

The fourth strategy was to intensify research into 'the protein provision of our animals', which had been 'hardly interesting' during the years of abundant Peruvian fishmeal.¹¹⁶ The 1960s attempts to create protein for feed from fossil fuels got a particular boost: in the early 1970s, the livestock industry was imagined to be fuelled by oil in a very literal sense. During the early 1970s, the crisis in feed proteins was a new incentive for oil companies like Shell and British Petroleum to invest in research and development of feed protein derived from fossil fuels. Dutch agricultural and food research institutes researched the safety and nutritional value of these fossil proteins, concluding that nothing was wrong with them. In 1974, the agricultural organisations' feed control foundation argued in favour of synthetic feed protein because of the double Peruvian fishmeal / American soy 'protein crisis', and 'as an effective measure to mitigate the world food problem'.¹¹⁷

As a consequence of the 'protein crisis', fishmeal and animal proteins became less important in Dutch animal feeds in the long-run (Figures 2 and 3). After the crisis, the Netherlands was only a minor importer of Peruvian fishmeal, just like the USA. This was very different from one other western country that had also been in the top three of Peruvian fishmeal imports: the Federal Republic of Germany. West Germany even increased its share in Peruvian fishmeal export after the crisis: to 33 per cent in 1980. During the Cold War détente, in which Eastern European countries and the Soviet Union increased trade relations with the west, the Federal Republic of Germany was a 'key facilitator' of such trade.¹¹⁸ Selling fishmeal to the Soviet bloc was lucrative,

113. H.P. Stappers, G.J. Borggreve and A.H.M. Grimbergen, 'Vervanging van vismeel door sojaschroot [...]', in: CLO-Instituut Schothorst, *Jaarverslag 1973–1974* (s.l., 1975) pp. 134–142; *PvV* 1976, p. 61; Friedmann, 'Distance'; Langthaler, 'The soy paradox'.

114. CLO-Instituut Schothorst, *Jaarverslag 1972–1973*, p. 14.

115. Jan van Capel, 'Honger bedreigt vee', *De Volkskrant*, 12 July 1973, 2.

116. CLO-Instituut Schothorst, *Jaarverslag 1972–1973*, p. 14.

117. 'Wereldprimeur: Staatsmijnen entameren produktie van lycine', *Algemeen Handelsblad*, 24 May 1963, 4; 'Shell haalt eiwit uit aardgas', *De Volkskrant*, 10 Oct. 1974, 2; 'BP vervaardigt meer eiwit uit aardolie', *Nederlands Dagblad*, 6 May 1975, 6; CLO-Instituut Schothorst, *Jaarverslag 1973–1974*, p. 12 (quote).

118. Dunja Krempin, 'Rise of Western Siberia and the Soviet–West German energy relationship during the 1970s', in Jeronim Perović (ed.), *Cold War Energy: A Transnational History of*

as the Soviet Union had started feeding factory farms with fishmeal (and imported grains) in order to increase meat consumption. As the Peruvian military regime did not discriminate between selling to East or West in its attempt to be independent from extreme right or left (exceptional in Latin America in this period), several communist countries also got a larger share of Peruvian fishmeal, like Cuba and Yugoslavia.¹¹⁹

CONCLUSION

To contribute to the historiography on the role of agriculture and animals in twentieth-century industrialisation and globalisation, this article focuses on the shadow places of animal feed that enabled the rise of 'factory farming'. Both the concepts of 'ghost acreage' and Plumwood's 'shadow places' have been used to better understand how western industrialisation relied on 'overseas' places, and have in effect strengthened the image of rich, western countries as centre, and poor, southern countries as periphery. This article provides a conceptual contribution to this debate by understanding shadow places as being created *anywhere* in the story of feeding fish to pigs and chickens. Following the journey of Dutch bacteriologist Dan Kampelmacher from Dutch farms to Peruvian fishmeal plants, it argues that *both* production places in the global south and consumption places in the global north, *and* the oceans where the fish came from functioned as shadow places. From the beginning, fishmeal carried 'downsides of progress' to the Netherlands, and very vividly in the shape of *Salmonella* bacteria. These turned the Netherlands into a shadow place of cheap fishmeal production, for vulnerable patients in particular. Feed contamination was occasion for a major *Salmonella* controversy in the Netherlands. Kampelmacher was a major defendant of the public health view in this controversy, but lost against the better organised agricultural camp which successfully resisted far-reaching control measures. The underlying issue was that this problem was bound to cheap feed: unhygienic production circumstances were a central characteristic of cheap fishmeal production. Making the fishmeal more hygienic clashed with the push for cheap feed ingredients. While this issue got a lot of attention in the Netherlands, it remained invisible in South America.

But Kampelmacher's interest in the Peruvian fishmeal industry remained narrowly focused on the problem of *Salmonella* bacteria. Simultaneously, the surroundings of the fishmeal plants in the global south also functioned as shadow places of livestock production in the global north. While Peruvian fishmeal industrialists and fishermen made a lot of money from the fishmeal boom, the industry and the volatile market of fishmeal also went hand in hand

Soviet Oil and Gas (Cham: Springer International Publishing, 2017), p. 254.

119. Clarke, 'Traces', 170; Cushman, *Guano*, p. 309.

with exacerbating inequality, lower fish consumption, and environmental pollution among the Peruvian poor. The Angolan fishmeal industry was victim of the northern *Salmonella* controversy: it was successfully framed as the major contamination danger from a poor and backward African country, and went bust as a result. These impacts were not discussed in the Netherlands.

Thirdly, the Humboldt Current marine ecosystem along the coast of Peru and Chile functioned as a shadow place from both Dutch and South American perspectives, albeit slightly more visible from the latter. The impacts of massive fishing on the anchovy population and the guano bird populations attracted interest in Peru because of their economic value. But the sea water pollution and trophic impacts on other parts of the marine ecosystem remained largely 'opaque', as is often the case for oceans.

But in 1972–1973 the Humboldt Current marine ecosystem created its own shadow places in both the north and the south. The extraordinary strong El Niño led to the sudden disappearance of the anchovy population, and to the collapse of the global fishmeal market. The shock was tremendous in both production and consumption places of fishmeal, although on different scales. The event came with large social and political changes in Peru, and Dutch farmers perceived it as a 'protein crisis' – or a crisis of cheap feed. This shock suddenly put the Peruvian fishmeal industry in the spotlight in the Netherlands. The livestock sector became interested in the Peruvian anchovy and how it could be replaced, and the growing environmental movement started to include the 'wasteful' feeding of fishmeal to animals in its critical discussion of meat production and the 'global food issue'. The dependence on fishmeal of the livestock sector was all of a sudden turned into a problem when the huge supplies disappeared and the stuff was cheap no longer. The sector frantically searched for solutions for the entangled fishmeal-soy crisis: feeding animals fewer proteins, shift to feeding more meat and bone meal, and a growing reliance on artificially created feed proteins, including proteins from fossil fuels.

The story of fishmeal is only a small part of the broader history of the impact of livestock farming during the twentieth century. The bulk of feed commodities has grown larger rather than smaller. Dutch livestock continues to rely on imported feed: the Netherlands is the largest importer of soy of the European Union, and this soy predominantly comes from the global south.¹²⁰ Today, forty per cent of global arable land is used to feed animals rather than people.¹²¹ The shadow places of this practice are everywhere: the unequal distribution of the high-quality foods of animal origin, environmental pollution at the sites of feed production and animal production, and the climate impacts as a result of forest destruction and livestock numbers.

120. Tamara Mohr, 'Soja Barometer 2014' (Nederlandse Sojacoalitie, 2014).

121. Anne Mottet et al., 'Livestock: On our plates or eating at our table? A new analysis of the feed/food debate', *Global Food Security* 14 (2017): 5.

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