

Technological innovation in Dutch cattle breeding and dairy farming, 1850–2000

by Jan Bieleman

Abstract

This article attempts to present the broad outlines of technological change in Dutch cattle breeding and dairy farming over the last 150 years. After 1850, Dutch dairy farmers and cattle breeders profited from the rapidly increasing opportunities offered by expanding foreign markets. Herd book organisations were established to meet the demand for breeding cattle from abroad. In 1904, the Dutch Herd Book Organisation was reorganised, aiming its breeding policy at three well-defined types of cattle according to the pure-line breeding principle. After 1950 aims in cattle breeding were changed, as it appeared likely that in the near future the production of cheese would become more important than that of butter. At the same time it became clear that the one-sided concentration on exterior appearance had led cattle breeding into a cul-de-sac. Consequently breeding programmes had to be developed which used new technologies in breeding, centralised milk recording and artificial insemination. At the same time, the need for a higher labour productivity encouraged the rapid spread of milking machines. To cope with the increasing number of cattle per farm, new types of stall and foddering systems were introduced and the transportation of milk from farm to factory changed fundamentally with the introduction of bulk milk tankers.

From the mid-nineteenth century onwards, Dutch agriculture entered a completely new phase in its development. Developments in transport fundamentally reshaped geographical relations inside and outside Europe. Another decisive element was the liberalisation of international trading which began to spread across Western Europe, and the new regime of free trade encouraged a fast growing supply of all kinds of agricultural products to the early industrialising countries, especially Britain.¹ G. J. Hengeveld, a Dutch authority on cattle and the author of the standard work *Het Rundvee* (*Cattle*) published in 1865, called the British export market ‘een bodemlooze

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¹ J. Bieleman, ‘Dutch agriculture 1850–1925 – Responding to changing markets’, *Jahrbuch für Wirtschaftsgeschichte*, 1996 (1996), pp. 11–25; J. Bieleman, *Geschiedenis van de landbouw in Nederland. Verscheidenheid en veranderingen* (1992), pp. 207–358; D. Pilat, *Dutch agricultural export performances (1846–1926)* (*Historia Agriculturae*, XIX, Groningen, 1989).

put die nooit gevuld kan worden ('a bottomless pit that never can be filled').² Without doubt, horticulture and livestock farming were the sectors that benefited most from these new opportunities, particularly as the demand for higher value agricultural products increased. Between 1838 and 1865 – a peak year – exports of cheese and butter cheese increased by 130 per cent and 175 per cent, respectively, most of it being sent across the North Sea. However, it was not only the quantities of butter and cheese sent for export that increased. There was also an enormous increase in the sales of different kinds of livestock. The number of cattle exported increased from less than 8000 in 1838 to more than 50,000 in 1850 and 153,000 in 1864; the numbers of exported calves increased from 2000 to 78,500. By the mid-1870s, even sheep exports had increased by more than 3000 per cent! In Noord-Holland, a province with a long-standing reputation in livestock farming, dairy prices rose by more than 100 per cent, while cattle prices increased by more than 150 per cent.³ However, it was not only the traditional dairying regions like Noord-Holland and Friesland that benefited from the increasing demand from abroad, but also the sandy districts of the interior which, from 1850 onwards, began to produce pigs and butter for export. Traditionally, dairy products had dominated agricultural exports from the Netherlands, but now exports of cattle and meat were beginning to take a comparable place. And among the exported cattle were the ancestors of the animals that about a hundred years later were to become the most popular breed of dairy cattle in the world, the Holsteins.

I

Around the middle of the nineteenth century, the Dutch cattle stock was still far from being uniform. Each region had its own breeds, adapted to the circumstances under which they were kept, although, nowadays, experts believe that most of these breeds belonged to the group of West-European Lowland breeds.⁴ However, as new, expanding overseas markets beckoned and horizons widened, livestock farmers began to wonder if the improvement of their own, traditional breeds would offer them new opportunities. So, for instance, after the 1840s, cattle breeders in the provinces of Noord-Holland and Groningen were busy experimenting with cross breeding between their own cattle and British shorthorn cattle (at that time the most fashionable breed in Europe).⁵

In the early 1870s, various groups began to discuss the desirability of establishing a Dutch herd book organisation to serve the ever-growing demand for breeding cattle from abroad. The Bohemian Herd Book, established shortly before in Prague and the Holstein Herd Book published in Massachusetts after 1872 served as exemplars. It was argued that a Dutch herd book would develop the position of Dutch cattle breeders on the international market and, at the same time, act as an incentive for the livestock-farming sector to improve its orientation

² G. J. Hengeveld, *Het rundvee, zijne verschillende soorten, rassen en veredeling* (2 vols, 1865), II, p. 114. This book offers an exhaustive overview of mid-nineteenth century cattle breeding.

³ J. L. van Zanden, *De economische ontwikkeling van de Nederlandse landbouw in de negentiende eeuw, 1800–1914* (A.A.G. Bijdragen, 25, 1985), p. 221.

⁴ As well as the book by Hengeveld, see also M. Felius, *Cattle breeds: an encyclopedia* (1995); Anno Fokkinga and Marleen Felius, *Een land vol vee. Landbouwhuisdieren van Nederland* (1995).

⁵ Felius, *Cattle breeds*, p. 129; H. M. Kroon, *De tegenwoordige richtingen in de fokkerij der landbouwhuisdieren in Nederland* (1913), pp. 122–6.

towards the international market. In 1874 the Dutch Herd Book Society, or *NRS* (*Nederlandsch Rundvee Stamboek*) was established. Shortly afterwards, in 1879, cattle breeders in the province of Friesland decided to establish their own Friesian Herd Book Organisation, the *FRS*. The founders took the view that a separate Friesian herd book was the most effective way of improving Friesian cattle, which they considered to be a separate breed. As well as these two organisations, other separate, smaller herd book societies functioned for a shorter or longer time in some regions.⁶

By the end of the century it had become clear that the changing situation in cattle breeding called for better breeding strategies and therefore for new, better-defined breeding goals. To meet these needs the Dutch Herd Book Society decided to reorganise itself. In doing so, new breeding goals were to be based on easily recognisable characteristics. Three breeding goals were accepted, and after elaborate discussion, defined and named as (i), the Black and white Friesian-Holland breed (*FH*-breed or, officially, *H*-breed); (ii), the White-faced Black Groningen breed (*G*-breed); and (iii), the Red and white Meuse-Rhine-Yssel breed (*MRIJ*-breed).⁷

Of course, these three breeds did not just appear out of the blue. The Black and white Friesian-Holland breed had grazed the pastures of the coastal provinces for centuries. It was the result of well-considered breeding strategies by local farmers, in which the typical black-and-white pattern had dominated since the eighteenth century, possibly because of the breed's high milk yields. In 1763 the Friesian publicist J. H. Knoop wrote explicitly that livestock farmers bred their cattle selectively. Cows that did not produce enough milk were slaughtered or carried off the farm as soon as possible.⁸ From late sixteenth and early seventeenth century publications, it appears that dairy cows in the province of Noord-Holland annually produced at least as much as 2000 litres annually.⁹

The Red Pied Meuse-Rhine-Yssel breed originated amongst the old, regional breeds of the easternmost parts of the country, where the soils are predominantly sandy in character. During the eighteenth century this breed had been mixed with others coming from adjacent parts of Germany. The white-faced black Groningen breed (known as *Blaarkop*) was bred not only in the province of Groningen,¹⁰ but also in parts of the province of South Holland. Their numbers were small, and in the early twentieth century this breed formed only about five per cent of the Dutch dairy cattle stock.

Implicitly connected with these newly defined goals for breeding was the fact the *NRS* had accepted the principle of pure-line breeding; that is to say breeding within three well-defined breeds. Its aim was to breed a stock of cattle that was as uniform as possible, as this should lead to the desired production qualities. This principle of using these three breeds – 'the

⁶ H. W. J. Dekker and K. P. Stapel, *100 jaar Koninklijke Vereniging Het Nederlandse Rundvee-Stamboek, 1874–1974* (1976); R. Strikwerda, *Een eeuw Fries stamboekvee* (1979); D. H. van Adrichem Boogaert, *De ontwikkeling van de Nederlandse rundveehouderij in deze eeuw. Een historisch overzicht over de periode tot 1970* ([1971]); R. Strikwerda, *Melkgew 2000* (1998).

⁷ K. P. Stapel, *Rundveefokkerij* (1988); Felius, *Cattle breeds*.

⁸ Quoted by J. M. G. van der Poel, 'Landbouw in de Noordelijke Nederlanden, 1770–1840', in *Algemene Geschiedenis der Nederland*, X, (1981), pp. 159–82.

⁹ In the nineteenth century, statistics on milk production were usually presented in litres (one litre of milk is about 1.03 kg). Bieleman, *Geschiedenis van de landbouw*, p. 65.

¹⁰ From 1930 red *Blaarkoppen* were also noticed officially in the herd book.

TABLE 1. Composition of the Dutch cattle stock according to breeds in 1975

	Number of cattle		Average milk yield (litres)
	'000 head	%	
Black and white Friesian-Holland (FH)	2954	70	4910
Red and white Meuse-Rhine-Yssel (MRIJ)	1195	28	4898
White-faced Black Groningen (G)	77	2	4664
Others	10	0	—
TOTAL	4236	100	

Source: LEI/CBS, *Landbouwcijfers*.

national three' – was maintained up to the late 1970s. Table 1 shows the balance of animals in the national herd in 1975 and reveals the continued preponderance of the Black and white Friesian-Holland breed.

II

Apart from developments in the organisational field, other important improvements also took place in Dutch livestock farming during the second half of the nineteenth century. In the first place, the cattle stock itself profited from better feeding and more care. An important part was played by the increasing use of concentrates, which has to be considered as one of the most important innovations of the time. Between 1850 and 1890 their use doubled, and after 1890 it increased further to reach a peak just before World War I.¹¹

Hardly less important were the qualitative and quantitative improvements in hay production. These were the result of an important improvement in water management in the livestock areas after steam-powered pumping stations were introduced. Consequently, better manuring of meadow land paid off, and more care was given to manure production itself. Many farms were equipped with liquid manure pits, so nutrients were no longer lost and hay yields increased.¹²

All this led to a significant improvement in milk yields. Although it is hard to obtain precise data, it is generally accepted that around the middle of the nineteenth century, milk yields from good cows in the livestock areas were as high as 2700 to 3000 litres. Of course, there were less productive cows, but at the same time there were those that gave even more, and yields of 4000 to 5000 litres were not exceptional. Five decades later, around 1900, on farms with skilful livestock keepers in the pasturing districts of the province of South-Holland, an average production of 4000 litres per cow had become quite normal. Yet, ten years earlier this had been less than 3000 litres. Dairy cows registered in the Friesian herd Book yielded as many as 4130 litres per year in the period 1896/1905 (see Figure 6). However, the last figure was the yield of

¹¹ Van Zanden, *De economische ontwikkeling*, p. 226 (Table 9.9). M. Knibbe, *Agriculture in the Netherlands*, 1851–1950 (1993), pp. 154–5.

¹² Bieleman, *Geschiedenis van de landbouw*, p. 293.

a special category of highly productive cows and should not be taken as the norm for the whole Friesian stock.¹³

Subsequently, there were other, infrastructural developments which led to important improvements in dairy farming. One was the establishment of an adequate agricultural policy by the national government at the instigation of the joint regional agricultural societies. On the initiative of this agricultural lobby, and as a part of a much more comprehensive, active agricultural policy, state agricultural advisors were appointed – one for every province – after 1890. Soon they were followed by a number of specialised dairy consultants and cattle-breeding consultants.¹⁴ In the sandy regions especially, the advisors did much to improve cattle housing, as in these areas cowsheds were mostly primitive. This was one element in a more general pursuit of better hygiene and quality, aimed at an improvement in the position of Dutch agricultural products on markets abroad. What was eventually to become an extensive administrative machinery was, in fact, part of an ambitious and comprehensive governmental programme begun in 1890 which tried to find a way to support and facilitate the dairy sector, without using tariff protection. Tariff protection was simply not an option. The Dutch (agricultural) economy was heavily dependant on exports and the government did not want to fan the fire of protection that was already smouldering in Europe.

A crucial factor in the fast changing livestock farming sector was the emergence of factory dairying – often based on co-operative enterprises. The first, steam-powered dairy factory in the Netherlands was established in the village of Warga, in the province of Friesland, in 1886. Other co-operatives were soon established. In the sandy districts (covering about 40 per cent of the country), where farms were usually much smaller and farmers had less capital at their disposal, a breakthrough was brought about by the introduction of a small-scale, cheap, hand-powered creamery. The first of these was established in 1892 and soon almost every village, no matter how small, had its own. However, as the economy boomed after 1900, they disappeared as quickly as they had arrived, as production came to be concentrated in bigger, steam-powered factories.¹⁵ Although in most cases farmers were the founders and driving force behind the establishment of these co-operatives (often assisted by local notables), the recently appointed state agricultural extension officers in the region played an important role as advisers.¹⁶

Other infrastructural innovations were taking place in livestock farming more or less simultaneously. Important innovations at the local level included the establishment of local milk-recording societies, bull societies and breeding societies. And although these organisations were begun at village level, the state agricultural advisers again played an important role in helping farmers getting them started. The first milk-recording societies were established in

¹³ J. M. G. van der Poel, 'Het Noordhollandse weidebedrijf in de 19e eeuw', *Holland, Regionaal Historisch Tijdschrift* 8 (1986), pp. 148–57. Bieleman, *Geschiedenis van de landbouw*, p. 293.

¹⁴ W. H. Vermeulen, *Den Haag en de landbouw. Keerpunten in het negentiende-eeuwse landbouwbeleid* (1966); P. J. P. Zuurbier, *De besturing en organisatie van de landbouwvoorlichtingsdienst* (1984).

¹⁵ Bieleman, *Geschiedenis van de landbouw*, pp. 294–9 and 309–12.

¹⁶ Jan Bieleman, 'The birth of factory dairying in the Northern Netherlands – in particular in the provinces of Drenthe and Friesland' (paper delivered to the CORN-Conference, 'Food production and food processing in Western Europe, 1850–1990' at Leuven on 13–16 November 2003).

Friesland, after 1894.¹⁷ They became important not only for paying farmers for the milk they delivered and as a guarantee of milk quality, but they also helped them select the best of their stock for breeding.

III

In 1906, when the Herd Book Society was reorganised by defining its three new, well-specified breeding goals, it chose a pure line breeding system in which only animals of the same variety or breed were mated. This systematic selection on the basis of an animal's exterior was strongly oriented towards model types.¹⁸ Characteristic of this approach was the way the herd book organisations introduced prefixes for individual animals with excellent breeding capacities. The Friesian Herd Book was the first to do so, when it introduced the prefix 'Preferent Sire' in 1910. The *NRS* followed six years later. In time, other prefixes followed.

However, the effect of the system of exterior inspections connected with the method of pure line breeding meant that the appearance of the cows changed quite radically over time. This was especially true in Friesland where breeders had focussed on a somewhat broader, 'deeper' and more muscular (meaty) type of beast. In doing so, they transformed the Friesian cow from a purely dairy type to a milk-meat type of cow, or a dual-purpose type. The effect was that the bigger, less muscular cow, which was still widely found in this province in the first decades of the twentieth century, gradually disappeared. However, the one-sided attention of breeders to the exterior of the animal, combined with the – still unknown – high heritability for height, led in time to smaller cows. Initially, between 1900 and 1910, the height of the shoulders of FRS cows had increased to almost 139 cm. This was maintained until 1925, but by 1960 it decreased by about 10 cm to only 129 cm. A similar trend was visible in the Red Pied *MRIJ*-cows, in the sandy districts. At about the same time it was found that many of the Black Pied *FH*-breed population had not shown any increase in productivity after World War II. Only milk fat content had increased slightly.¹⁹

Before the war, some experts had already been warning against too formal an attitude in the matter of exterior breeding and too great a concentration on milk fat content which occurred after milk recording had become widely accepted and the resulting data used to inform selection and breeding. Certainly the change from a purely dairy type of cow to a milk-meat type had, at first, been generally applauded, but it became clear that the mark had been overshot. However, as long as the official cattle inspection policy remained and Dutch breeding cattle brought high prices on export markets, no change in attitudes could be expected. Yet, by the early 1960s, it was clear that cattle breeding in the Netherlands had reached an impasse. At the same time, dairy farming was stagnating economically, and many livestock farmers turned their back on not only milk recording and artificial insemination (which was just about to spread)

¹⁷ Earlier, between 1860 and 1870 a Friesian dairy farmer had experimented with a type of cream meter, and had concluded that there were hereditary differences between cows in the quality of their milk, i.e. fat content, Van Adrichem Boogaert, *De ontwikkeling*, p. 106.

¹⁸ Dekker and Stapel, *100 jaar*, p. 102. R. D. Politiek, *Doel en streven in de rundveefokkerij* (1962), pp. 14–15.

¹⁹ J. M. Dijkstra, 'De ontwikkeling van de hoogtematen van stamboekvee in Nederland', *Veeteelt- en zuivelberichten* 7 (1964), pp. 84–92.

but the herd book organisations too. In the early 1960s, the *NRS* and *FRS* had 54,200 and 7000 members respectively (together about one third of all dairy farmers); by the mid-1970s both organisations had fewer than 33,000 members in total.²⁰ It was apparent that Dutch cattle breeding had to change direction.

In other respects too, changing circumstances made it necessary to adapt the aims of cattle breeding. Before the war, fat content had been a major selection criterion. However, in the 1950s it became clear that milk fat would be of less importance in the future whilst the importance of protein (being the raw material for cheese) would increase. It was recognised that in the coming decades butter would diminish in economic importance while cheese would become a major product as its consumption and sales increased. Indeed, whilst butter production increased until the mid-1980s, on balance it rose by 'only' 70 per cent between the 1950s and the 1990s. Over the same period, cheese production increased by more than 310 per cent, from 158,000 to 652,000 tons.²¹ The Friesian Herd Book Organisation and the joint dairy co-operatives initiated research for selecting on the protein content of milk from the 1950s.²²

As well as satisfying quantitative production characteristics, a well-bred cow was also expected to have good functional traits. One which rapidly gained in importance in the 1960s was ease of machine milking. The State Institute for Animal Husbandry Research began to research this and from 1962 onwards, ease of milking was officially a criterion for selection in cattle breeding in the Netherlands.²³

IV

Most of the breeding societies that had been established during the early twentieth century kept breeding bulls for their members' use in the same way that bull societies did elsewhere. A major problem, however, was the increasing number of instances of bovine venereal disease, which made cows infertile after having been served by one of these bulls. From around 1934, several veterinary surgeons began small-scale experiments in artificially inseminating cows. The same year saw the establishment of the first local Artificial Insemination (AI) society by a group of farmers in the Westerkwartier district, in the province of Groningen. Others quickly followed, especially in the sandy districts, where trichomoniasis was causing much damage. By 1956, the number of cases of cows with venereal disease in the whole country had been reduced to virtually nil.²⁴

The original stimulus behind the use of AI was disease control. Soon, however, it became clear that AI also had advantages for breeding, as it gave more dairy farmers access to high quality sires. This was particularly advantageous to small farmers. However, the small circle of top breeders who controlled the Dutch livestock sector were at first opposed to the use of AI. They feared that it would be a serious threat to their commercial interests. The two herd book

²⁰ Dekker and Stapel, *100 jaar*, p. 735; Strikwerda, *Een eeuw*, pp. 242–3.

²¹ LEI/CBS, *Landbouwcijfers*.

²² Bieleman, 'De georganiseerde rundveeverbetering',

p. 138.

²³ Van Adrichem Bogaert, *De ontwikkeling*, pp. 228–33.

²⁴ *Ibid.*, pp. 127 and 186.



FIGURE 1. Participation in AI and milk reporting

The number of (first) inseminations and the number of dairy cows being reported upon as a percentage of the total number of dairy cows, 1946-85.

Source: LEI/CBS, *Landbouwcijfers*; Annual reports of various organisations in the field of artificial insemination and cattle breeding.

organisations were also opposed its use.²⁵ The effect was that AI was initially taken up much more by the medium strata of Dutch livestock farming than it was amongst large farmers.

Technically, the most important step in the development of AI came with the development of techniques to freeze the semen. The first use of frozen sperm in the Netherlands was in 1955, when a local AI society in the province of Noord-Brabant used liquid air to bring the temperature down to -196°C , a method that has been used ever since. From the early 1960s the use of frozen (diluted) semen spread rapidly. By 1970 about one quarter of semen was frozen and the practice was universally employed by the end of the 1980s.²⁶

In 1946 there were roughly 40 local AI societies in the Netherlands with a membership of about 3600 dairy farmers out of a total number of about 200,000. Ten years later, in 1956, there were 146 societies and about half of all Dutch dairy farmers were members of a society. In the same year, about 61 per cent of all cows were in calf after a first insemination. After a period

²⁵ Stapel, *Rundveefokkerij*, pp. 14-15. Dekker and Stapel, *100 jaar*, pp. 252-3.

²⁶ This became possible after the British researchers Polge and Smith discovered how to freeze semen with the help of glycerine in 1955. R. Strikwerda, 'De kunstmatige inseminatie; een onmisbaar hulpmiddel in de

moderne rundveeteelt', in A. H. Nubé and R. Strikwerda (eds), *De veefokkerij in Friesland* (1961), pp. 75-81; S. W. J. van Dieten, 'Ontwikkeling in KI bij rundvee; KI technisch gezien', *Bedrijfsontwikkeling* 3 (1972), pp. 137-42.

of stagnation or even decline in the 1960s and the early 1970s, the number of (first) inseminations increased again (Figure 1). Around 1985 more than 2.1 million cows were inseminated annually, which means that AI was being used for 80 per cent of all matings.²⁷

V

The economic changes that took place after the second half of the 1950s showed clearly that far-reaching changes in breeding strategies and methods were inevitable. The response to changed conditions was the introduction of new selection methods, based on ideas then current in the field of population genetics. Eventually this led to the introduction of the *Proef-wacht-fokstieren systeem* (known in the United Kingdom as the ‘contemporary comparison system’) in the 1970s. In general terms, the crucial breakthrough was the realisation that in selecting on the basis of hereditary properties, to use female animals only was rather limiting. This was simply because most cows were retained in order to keep up stock numbers, and therefore only a limited number of heifer calves were slaughtered. A much more efficient approach would have been to select via the bulls. To do so, however, it was necessary to know in detail how the desired qualities (based on the newly formulated breeding aims) of the individual bull could be passed on.²⁸ The revolutionary thing about the whole idea was the fact that the genetic value of a breeding bull was no longer determined on the basis of the qualities of its dam and its ancestors in general, but on the basis of the qualities of its female descendants. To make this practicable, a fully computerised register of the performances of all dairy cows was established. Cows were normally reported on every three or four weeks. By the mid-1980s, about three-quarters of all Dutch cows were incorporated in a reporting scheme as appears from Figure 1 which shows the growing participation in reporting schemes after the war.²⁹

As the contemporary comparison system was implemented, the centre of gravity in dairy cattle breeding shifted from the top breeders to the regional AI centres. Again this was something the leading, established breeders found very hard to accept. Finally, the AI centres began to co-operate closely and, being internationally orientated, no longer limited themselves to the Dutch indigenous stock, but sourced sperm worldwide. This aspect of AI took on completely new dimensions as embryo-transplantation technology developed in the Anglo-Saxon countries during the 1970s. The use of this technology meant that one highly-graded cow could produce dozens of calves, instead of just one. After it became possible to freeze embryos, the first 60 frozen embryos of American Holstein-Friesian cattle arrived at Amsterdam Airport in 1983.³⁰

²⁷ Van Adrichem Bogaert, *De ontwikkeling*, pp. 128–9. LEI/CBS, *Landbouwcijfers* (1954–) and annual reports of various organisations involved with AI.

²⁸ J. de Jong, *Veehouderij* (1979), p. 211. N. J. M. van den Berg, A. T. P. Jansen and D. IJ. Kramer, *Veehouderij* (1986), pp. 155; A. F. Groen, K. de Groot, J. D. van der Ploeg and D. Roep, *Stijlvol fokken. Een oriënterende studie*

naar de relatie tussen sociaal-economische verscheidenheid en bedrijfsspecifieke fokdoeldefinitie (Bedrijfsstijlenstudie 9, Wageningen, 1993), p. 8.

²⁹ Van Adrichem Bogaert, *De ontwikkeling*, p. 113.

³⁰ Bieleman, ‘De georganiseerde rundveeverbetering’, pp. 145–6.

VI

At the end of the 1970s, Dutch livestock farming pitched into turmoil as it was invaded by a new type of dairy cow: the Holstein-Friesian. At the time, Dutch livestock was dominated by the traditional Black Pied Friesian-Holland breed, which made up 70 per cent of the national herd.

The origin of the Holstein goes back to the imports of Dutch cattle by American breeders, just after the middle of the nineteenth century.³¹ In contrast to cattle breeders in the Netherlands, who had dedicated themselves to breeding dual-purpose cattle, these American breeders concentrated on breeding purely dairy cattle, even excluding fat content as a criterion for selection (for the simple reason that it did not pay). In the 1960s, cattle breeders in some European countries began to import these Holstein breeds, and Dutch cattle breeders realised that their future market for cattle might be endangered. They soon began to wonder if the Holstein-Friesian breeds might possibly be better than their own Dutch breeds. In the autumn of 1971, a group of cattle breeders and leading figures in the cattle breeding sector went to the United States and Canada to gather information about dairy farming. They were interested to see whether it would be possible to improve the milking properties of their own breeds by using Holsteins. The idea was to improve not only the milk yield as such, but also qualities like ease of milking and fertility, as well as exterior qualities like a 'milking-machine udder'. It was concluded in 1974 that active advocacy of the American breed was not desirable. The hesitation of the leading cattle breeders was, of course, partly caused by their fear that the Holsteins would compete with their own traditional breeds and threaten their economic interests. As a result, when, compared to neighbouring countries, the rise of the Holstein in the Netherlands began relatively late, at the end of the 1970s, when, Dutch breeders and cattle experts finally became convinced of their efficacy. 'Holstein fever' broke out after 1980, and this year marks the turning point in the role of Holstein cattle in Dutch cattle breeding. Afterwards the percentage of cows with HF-blood increased rapidly.³²

All over the Netherlands the familiar Friesian-Holland breed was transformed from a dual-purpose cow to a purely dairy cow. Friesian-Holland x Holstein crossbreeds were called Holstein-Friesian (HF) or Holstein Black Pieds, and in the early 1990s, they formed the majority of the Dutch livestock (Table 2). In 1990 most of the herd book yearlings were genetically 70–75 per cent Holstein.

Breeders of Red Pieds and the white-faced black or red Groningen breed could not escape the genetic influence of the Holsteins either. Until then, these breeds had been developed as

³¹ The reason for the name 'Holstein' for a breed with an undoubted pure Holland-Friesian origin is a story in itself. Around 1860 some American cattle breeders imported a number of cows from the Netherlands. One of them, Winthrop W. Chenery, who had bought the animals in the area of the town of Purmerend and in the Beemster-polder (in the province of Noord-Holland) called them 'Dutch' when he wrote an article to be published in the annual report of the American ministry of

agriculture. However, when this was published, the editor had replaced the naming 'Dutch' in the title of the article by 'Holstein' for some reason – probably out of pure ignorance. Chenery accepted the authority of the ministry as being bigger than his own and from then on he too used the name 'Holstein' for his (Dutch) breeding cattle. Harry Hiram Wing, 'In the Beginning' in M. S. Prescott *et al* (eds), *Holstein-Friesian History. Diamond Jubilee Edition 1960* (1960), pp. 1–21.

TABLE 2. The ‘Holsteining’ of the Dutch Black Pied cattle stock. The share of Friesian-Holland and Holstein-Friesian genes in the registered cattle stock, participating in the milk recording system

	<i>Friesian-Holland (FH)</i>	<i>Holstein-Friesian (HF)</i>
1972	100.0	0.0
1977	96.6	3.3
1982	68.8	31.0
1987	34.3	65.6
1992	15.5	84.5
1997	5.4	94.6

Source: CR-Delta, Arnhem.

meat-milk types of cows. The G-breed in particular had been bred to favour meat more than milk in a ratio of 60:40.³³ Soon, these breeds lost both their dual-purpose character and their typical colour pattern. It is true that Dutch cattle remained black and white or red and white, but in other respects their appearance changed radically. Their shoulder height, for instance, increased from less than 129 cm to 145–155 cm. In the daily practice of dairy farming, it was found that the Holstein crossbreeds had indeed higher milk yields with improved utility values. The problem was, however, that their milk fat and protein contents inclined to be somewhat lower than that of the former FH-breed. There were also problems in maintaining animal fertility. When considered in retrospect, the introduction of the Holsteins into Dutch dairy farming can be seen to be a reversion to the type of dairy cow that Friesian breeders had abandoned after 1900 in favour of a dual-purpose animal. Yet, quite a number of Dutch dairy farmers, found it hard to give up their own traditional breeds, and a number of breeders of the Friesian-Holland Black Pieds established their own herd book in 1983, which was officially recognised in 1993.

Another side effect of the process of ‘Holsteining’ was that it was no longer necessary to have two different herd book organisations. At the same time, technical developments in breeding forced the adoption of a more efficient organisational structure. Therefore, and as part of a broad process of rationalisation, the Dutch Herd Book Society merged with the Central Milk Recording Service and four other organisations concerned with cattle improvement. Together with the Friesian Herd Book Organisation, they formed *Het Nederlands Rundvee Syndicaat* (the Dutch Cattle Syndicate – named so the acronym ‘NRS’ could be kept alive) in 1984.³⁴ The regional AI organisations retained their independence a little longer. However, in 1998, the large AI co-operatives merged with the NRS to form a new organisation named the *Coöperatieve Rundveeverbetering Delta* (Co-operative Cattle Improvement Delta) or CR-Delta for short.³⁵

³² Stapel, *Rundveefokkerij*, p. 53; P. Grothe, *Holstein-Friesian, een wereldras* (1993).

³³ Fokkinga and Felijs, *Een land vol vee*, p. 38.

³⁴ Th. Zwart, ‘Het Nederlands Rundvee Syndicaat opgericht’, *Bedrijfsontwikkeling* 15 (1984), pp. 122–4.

³⁵ Strikwerda, *Melkweg 2000*.

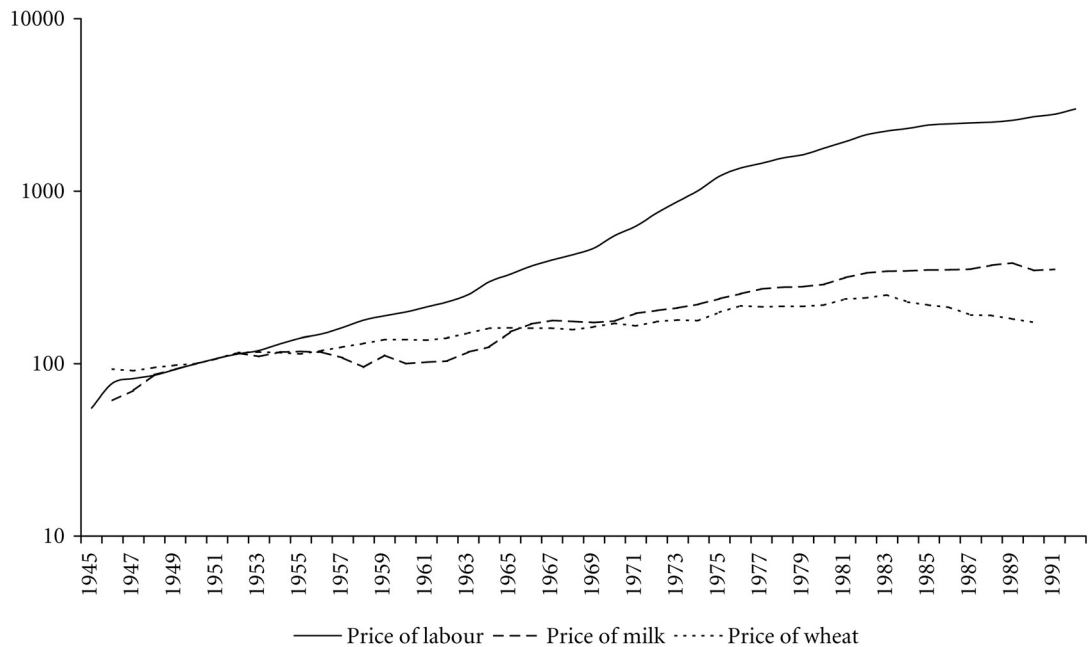


FIGURE 2. Index of the price of labour (in agriculture), wheat and milk in the Netherlands, 1945–92 (1950 = 100), logarithmic scale

Source: LEI/CBS, *Landbouwcijfers*.

VII

The revolutionary developments in the field of cattle breeding took place simultaneously with major changes in the technical realm of dairy farming itself. A process of mechanisation and rationalisation brought in milking machines, milk tanks, herringbone milking parlours, cubicle cow houses and new foddering systems.³⁶ The driving force behind this process was the inevitable need to boost labour productivity in dairy farming, as during the 1950s – and especially after 1963 – the labour costs increased at a much faster rate than the price of the farmers' products (Figure 2). By the late 1980s the cost of labour had risen more than 25 times compared with the level of 1950, while the price of milk had increased 3.6 times (and that of wheat had not quite doubled).³⁷

The technological regime that followed aimed at replacing inputs of labour with capital investment. The government explicitly supported such developments with a policy that became known as *structuurpolitiek* ('structural policy'³⁸), which aimed at a more efficient combination of inputs. Its guiding paradigm was that an efficient agriculture should form the basis for a

³⁶ This paragraph is based mainly on Priester, 'Het melkveehouderijbedrijf'.

³⁷ LEI/CBS, *Landbouwcijfers*.

³⁸ The term was chosen to emphasise the difference between it and a simultaneously pursued economic price policy.

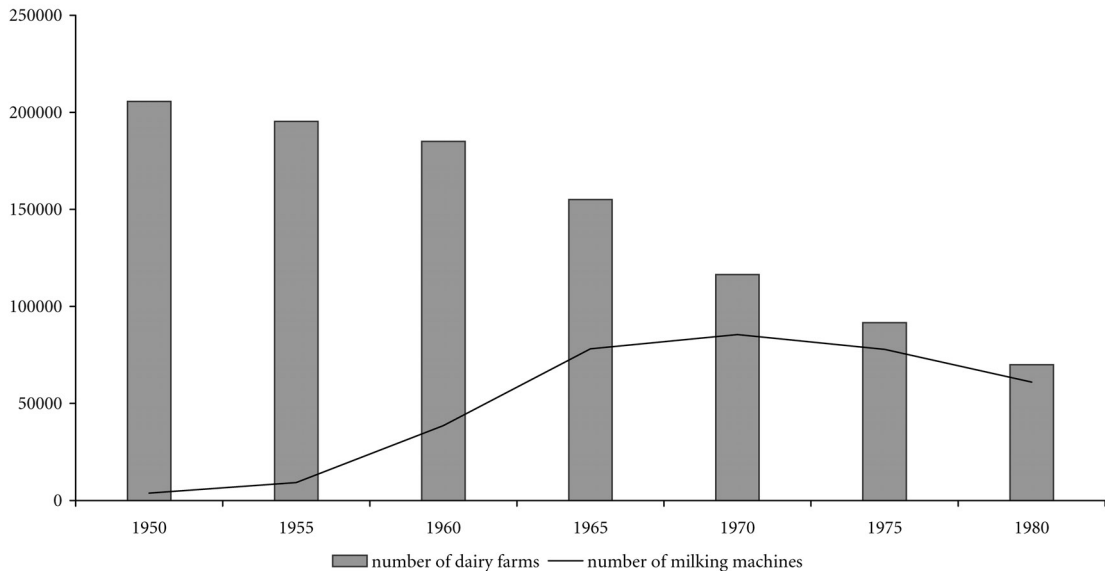


FIGURE 3. The number of dairy farms and milking machines, 1950–80

Source: LEI/CBS, *Landbouwcijfers*.

sound farming class which, in turn, was seen as the prerequisite for a sound agriculture-based rural society, and an important stabilising factor in Dutch society as a whole.

The most important innovation in dairy farming in the twentieth century was, without doubt, the milking machine. The earliest models had already been imported into the Netherlands before the First World War. In the 1920s a small growth in numbers occurred, as improved models like the Swedish-American Alfa Laval machine became available.³⁹ The quality of the machines that appeared on the market during the inter-war years was good, but they were slow to be accepted. On the one hand labour was still plentiful and on the other, there was a great deal of prejudice against machine milking which was held to be unnatural and unlikely ever to replace milking by hand. Between 1950 and 1960 the number of milking machines grew tenfold from 4000 to 39,000. During the following decade the growth slowed down somewhat, but was still phenomenal, reaching 85,000 in 1970 (Figure 3). The proportion of the national herd being milked mechanically increased from five per cent in 1950 to 90 per cent in 1970.⁴⁰

In the early 1960s it was discovered that most dairy farmers with milking machines were using them incorrectly, either inefficiently or in ways which were likely to damage the cow's udder. Moreover, the quality of the milk fell short. And because of reliance on the one man-one machine system (the so-called P1A1-system), labour efficiency was still relatively low. It appeared that the key to a higher labour performance lay in abandoning the then usual practice of 'hand stripping'. At that time, most Dutch experts were convinced that the method of mechanical stripping used in countries like New Zealand was too risky, believing it could

³⁹ J. M. G. van der Poel, *Honderd jaar landbouw-mechanisatie in Nederland* (1983), pp. 228–34.

⁴⁰ LEI/CBS, *Landbouwcijfers*.

damage the udder too easily. New Zealand farmers were readier to get rid of any of their cattle which were not able to cope with being milked mechanically. Dutch farmers had great difficulty accepting such an approach, especially those who had a stock of thoroughbred cattle. During these years, however, experiments had proved that mechanical stripping could be done without harming the cow, and thereafter attitudes changed. Although mechanical stripping required a slightly longer milking time per cow, it enabled the milker to milk more cows concurrently. Consequently, this method enabled increased labour productivity. At first, not all milking machines were able to strip cows quickly and hygienically. However, around 1970 several good machines became available and soon the technique of milking two (or more) cows simultaneously without hand stripping was accepted and spread quickly.

At about the same time it was discovered that the ability of cows to let their milk down easily was determined genetically, and that it was not difficult to select and breed according to this criterion. One could say that, from now on, milking methods were no longer adapted to the cow, but the cow was more or less adapted to the new method of milking. Moreover it was discovered that dairy cows let their milk down more easily if they were given a small ration of concentrates just before milking. Soon machines that switched off without human intervention became available, and in the early 1970s tests were carried out on milking machines that took the teat cups off automatically. This new technology was the springboard to what eventually was to lead to the introduction of the herringbone milking-parlour. On modern dairy farms equipped with these milking parlours, one man could now milk 50 to 60 cows in an hour. Twenty years earlier a hand milker in a traditional tie-up stall would have milked no more than 10 cows in the same time.

The milking machine made substantial savings on labour possible and allowed the farmer to reduce the number of cowmen he employed or to work less himself. However, he might choose to increase the size of his milk herd as this would enable him to earn back at least some of the money he had invested in the purchase of a milking machine installation and the connected equipment like milk lines and milking parlours. So, the introduction and spread of these innovations clearly had a scale-increasing effect of its own.⁴¹

One of the factors that contributed to the rapid acceptance of the milking machine in the 1950s and 1960s was that it could be used in existing farm buildings, usually equipped with the traditional tie-up stalls. Most of these buildings dated back to before the First World War. Yet, it was obvious that these stalls were very inefficient at a time when greater efficiency was being sought. For some time, state extension officers, researchers and leading farmers had been looking for new ways for replacing the traditional stalls. The first concepts that were tried in 1948–50 were not satisfactory. Milking and foddering indeed took less time than in the traditional stalls, but the daily mucking out and strawing required a lot of time and labour, and the large quantities of straw that were needed made the loose house not very attractive for the pasturing districts.

Eventually, the nearest to the ideal of a house that needed little bedding, in which the animals could walk around freely whilst staying reasonably clean was found in a British model, the cubicle stall.⁴² As in the old tie-up cow house, in the cubicle stall every cow had its own box with

⁴¹ Priester, 'Het melkveehouderijbedrijf', pp. 101–08.

⁴² *Ibid.*, pp. 108–12.

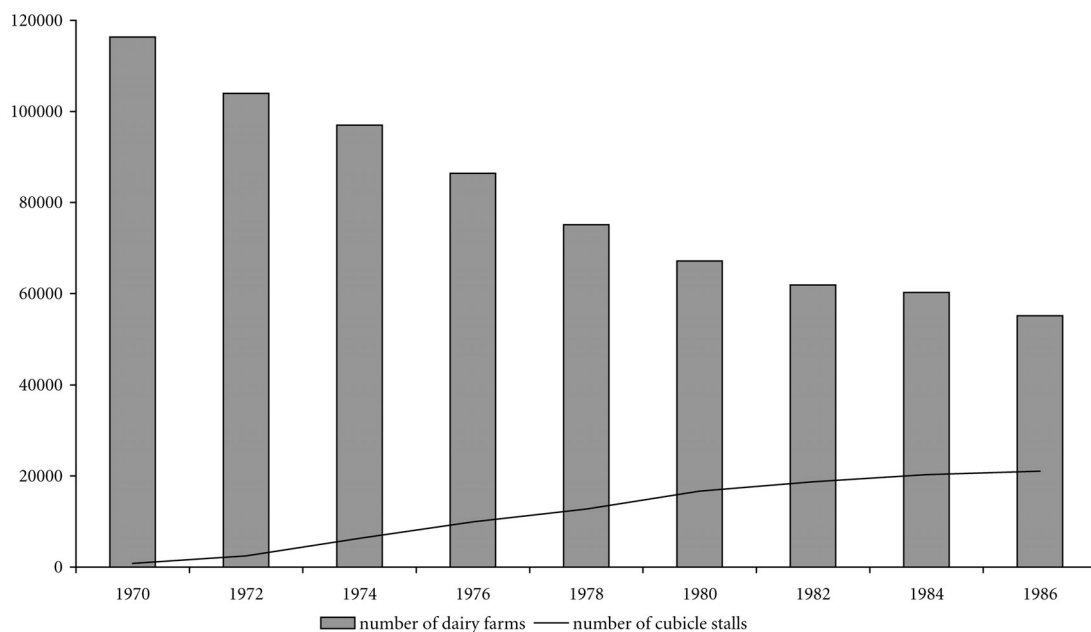


FIGURE 4. Numbers of dairy farms and cubicle stalls, 1970–86

Source: LEI/CBS, *Landbouwcijfers*.

a limited quantity of bedding. The difference was, however, that cows were not tied up, but could walk around. At first, the experts were more enthusiastic than the farmers. Even in 1970 only a few hundred dairy farmers had changed to the cubicle stall. Many were convinced that milk production, milk quality and feed consumption were not as good as in the traditional type of stall. Another factor which delayed acceptance of the cubicle stall problem was the concern that aggressive cows could quite easily injure others. The solution to this – dehorning – was not accepted in the early 1960s.

A very important stimulus to the spread of these new cubicle stalls was the subsidies that became available, especially after 1972 when the new EU directives and regulations came into effect. In that year, an interest subsidy regulation became effective in the Netherlands. It enabled livestock farmers to receive an interest subsidy on investment in cattle, machinery and cubicle stalls. Of all the new stalls built between 1972 and 1985, more than 80 per cent were built with the aid of such a subsidy. Of course, the ongoing process of specialisation also played a role in the process of accepting of the cubicle stall, particularly in the sandy regions, as former mixed farms were converted into specialised dairy farms. Anyway, the result was a spectacular increase in the number of cubicle stalls, from 800 in 1970 to 16,700 in 1980. Afterwards the growth slowed down somewhat, but by 1987 there were 23,100 (Figure 4).

As the use of cubicle cow houses spread, the use of the milk cooling tank also became more general, especially with the introduction of bulk collection. Between 1959 and 1982, a cooling tank was installed on virtually all dairy farms in the Netherlands. It replaced the traditional milk churn that had been used since the late nineteenth century for storing milk on the farm and

for transporting it to the factories. The cubicle cowhouse was not a Dutch invention, nor was the milk tank. The first milk tank, modelled on American and Swedish examples, was introduced into the Netherlands in 1959. They grew rapidly in numbers, especially after 1965: in 1970 there were 3000 and by 1980 as many as 43,000. On most of the farms, the purchase of a milk cooling tank went along with the installation of milk lines and the construction of a special milk room, the *melklokaal*, which met all kinds of high hygienic standards.

Tank milk was of a better bacteriological quality than churn milk, and it could be brought to the dairy factories more regularly, which made the processing of the milk in the factories more efficient. Transport costs were also lower and the mobile milk tanker, with its greater collecting area, allowed an increase in scale in the milk processing industry. In the 1970s many small creameries closed and milk processing became concentrated in a small number of larger ones. So, the process of scaling up not only took place on the farms, but also in the processing industry. The introduction of the bulk milk tanker led to a changing appearance of the farmyards as well. The arrival of the heavy lorries made it necessary to provide the yards with metalled surfaces.

Nevertheless, the introduction of the milk cooling tank did not take place without debate. In fact it provoked even more argument than the introduction of the milking machine and the cubicle stalls because the government used the introduction of the milk tank as an instrument in its readjustment policy which aimed at improving the overall structure of Dutch agriculture. By making the purchase of a cooling tank compulsory, farmers were forced to decide whether to abandon their farming business or to invest in it. Investment usually required them to plunge deeply into debt. The whole policy was strongly opposed and sometimes led to a furious atmosphere between milk factories (most of them co-operative!) and farmers, in what truly became a 'tank war'. Yet, their grievance against the innovation was not merely a matter of money. The simple fact that they had no choice between whether to stop or to switch hurt a lot.

The 1970s and 1980s were not only typified by the introduction of the cubicle stalls and the milk cooling tank, but also by the introduction of the earliest forms of computerisation. Process computers took over a number of the farmer's tasks, like distributing concentrates and the registration of milk yields. In the 1990s, this development culminated in the introduction of the milking robot. In 1985 about 3500 Dutch dairy farmers had such a device; five years later, in the early 1990s, there were 9000–10,000 in use.

There were also changes in the management of Dutch dairy farms, particularly in methods of fodder production as the process of scaling up occurring in Dutch dairy farming was accompanied by a much more intensive use of land. The numbers of cattle grew whilst good pasture land remained relatively scarce. Farmers therefore felt the need to increase the use of fertiliser. At the same time, traditional fodder crops quickly disappeared. The area under these crops fell from 83,000 ha. in about 1950 to only 4000 ha. in 1980. They were replaced – after some delay – by fodder maize. In 1970 only 6400 ha was under this new crop, but by 1990 this had increased to 202,000 ha, and was still expanding. Fodder maize had become the most important crop after grass.⁴³ Almost all of it was to be found in the five 'sand-provinces'. In these sandy regions,

⁴³ LEI/CBS, *Landbouwcijfers*.



FIGURE 5. Use of concentrated feeds per dairy cow, in the sandy districts of the Netherlands, 1954–1997 (kg)

Source: LEI/CBS, *Landbouwcijfers*.

as more land was put under fodder maize, the cultivation of rye, the crop *par excellence* in these regions for about ten centuries, disappeared.

Much more fundamental, however, was the enormous increase in the use of concentrates as they became cheaper. The quantity of concentrates used in cattle farming increased from about 1 million tonnes (about same level as just before the war), to 5.1 million tonnes in the mid-1980s (Figure 5).

In roughage production, silaging, introduced before 1900, was a technique that eventually completely replaced the traditional method of hay making, after the 1950s.⁴⁴ Crucial to its success was the application of PVC sheeting to cover the silos, introduced in 1956. Another stimulus came in the shape of the self-loader. This piece of machinery was demonstrated for the first time in 1960 at the agricultural show in Cologne. It was tested for silo making in Friesland in 1964–5, a new method that was later to conquer the whole Dutch dairy farming sector. In ten years the number of self-loaders had increased to more than 18,500 and the production of silage grew as well. In the mid-1960s, most of the harvested grass was still turned into hay, only about a quarter being made into silage. By 1975, however, the proportion had reached half and by 1985 three-quarters. Meanwhile, unwallied clamps (or a walled horizontal silo if it had a concrete floor and concrete walls) covered with black plastic had become a familiar feature in

⁴⁴ Priester, ‘Het melkveehouderijbedrijf’, pp. 117–24.

⁴⁵ *Ibid.*, pp. 123–4.

the yards of Dutch dairy farms. Its success was assured by its low cost, the low input of labour and the quality of the product.

More or less parallel to the shift from hay to silage was the replacement of the classic cutter bar by the rotary mower for harvesting grass. The Dutch machinery designer Zweegers succeeded in constructing a rotary mower suitable for mowing grass which came onto the market in 1965. The machine had a high capacity and could not become clogged. Grass that was too young and short or too old and lodged to be effectively cut with the cutter bar could now easily be mown. Ten years after its introduction, 44,000 had already been sold in the Netherlands as other companies developed their own versions. As grassland management became more and more intensive, the rotary mower proved its capability and was shown to be especially suitable for farmers who chose to use their grassland as intensively as possible. In this way it contributed very much to the increase in yields.⁴⁵ The result of these innovations in grassland management and fodder production was that stocking densities increased by about 75 per cent between 1950 and 1984. Some of the specialist 'sand-provinces' showed even greater advances as appears in Table 3. By 1990, after the shock of the introduction of quotas had been accommodated, stocking levels had returned to those of the 1970s.

VIII

As the result of these interlocking improvements, performances in dairy production increased enormously after the early 1960s. In the first decade of the century, the average Dutch dairy cow gave 2633 kg of milk per year. During the 1950s the annual average milk yield was as high as 3944 kg, with a fat content of 3.72 per cent. The annual average in the 1990s was as much as 6485 kg containing 4.42 per cent of fat (Figure 6). These figures imply that between the beginning of the twentieth century and the mid-1950s, milk yields of a typical Dutch cow had grown at an average rate of 26 kg per year. However, in the following four decades, a period in which innovation in dairy farming and cattle breeding was driven by the need to secure higher labour productivity, the average annual increase in milk yields amounted to 63 kg.

The striking increase in fat content that occurred after 1985 should be seen mainly as a result of the introduction of the milk quota in the preceding year. After their introduction, breeding aimed at producing cows whose milk had a higher fat content, which fetched a higher price, and thereby mitigated some of the negative effects which controls on production had had on farmers' incomes since the mid-1980s. Although protein content had been nationally and centrally registered ever since 1959, efforts to increase it were not very successful at first and not until 1970 was any real progress made. In the period 1961–5, the average protein content of Dutch milk was as high as 3.34 per cent. Thirty years later, in 1994–8, it had reached 3.47 per cent.⁴⁶

One characteristic of the rapid growth in milk yields after the 1960s was the increase in the number of so-called '100,000 kg champions', cows that produced 100,000 or more kg of milk over their productive lives. The first official production champion that managed to achieve this, was a cow called Clazina 48; she reached this milestone in August 1959. After her, the number

⁴⁶ LEI/CBS, *Landbouwcijfers*.

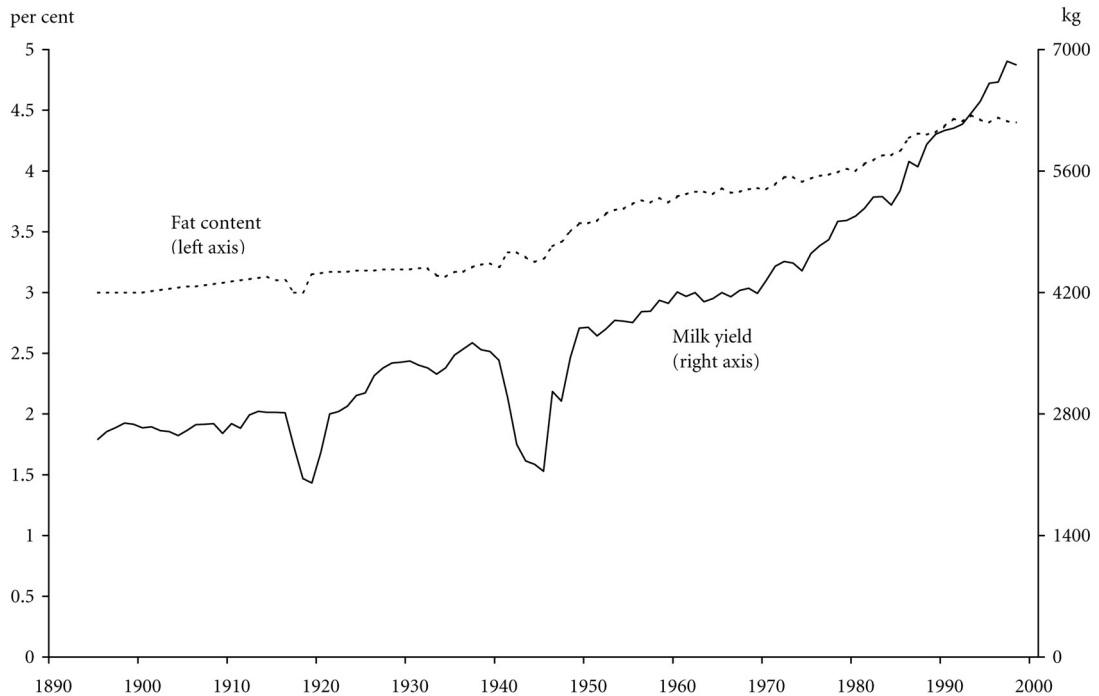


FIGURE 6. Average milk yield (in kg) from Dutch cattle, and its fat content (in %), 1895–1988

Source: *Verslag (over) van de(n) landbouw*, LEI/CBS, *Landbouwcijfers*.

of cows achieving this prize increased rapidly, especially after 1980, and by the end of 1992, the thousandth '100,000 kg champion' was honoured.⁴⁷

Productivity figures like these become even more significant if we consider how the labour requirements of dairy farming diminished drastically after 1950 as the result of a comprehensive process of mechanisation and rationalisation. The (yearly) amount of labour needed to 'manage' one dairy cow decreased from 330 man hours to about 40 man hours.⁴⁸

For a long time it had not been difficult to dispose of this rapidly growing stream of milk and dairy products. The Dutch dairy sector succeeded in increasing their exports to the Common Market countries, managing to keep ahead of its most important competitor, the Danes, who for some time were outside this market. However, rapidly increasing production led to over-production and low prices. This problem, however, was not confined to the Netherlands. On a European scale, it soon led to a milk lake – *een zee van melk* – and unsaleable quantities of butter. Therefore, in 1979, the European Commission put forward a proposal to regulate the production of milk by establishing a levy on milk in excess of a certain threshold. The

⁴⁷ R. Strikwerda, 'De onafzienbare stoet van 100,000 kg-koeien', *Veeteelt* 11 (1994), pp. 624–6.

⁴⁸ Om u te dienen, *Het landbouwtechnisch onderzoek*

in Nederland in zijn ontwikkeling (1982), p. 88. Priester, 'Het melkveehouderijbedrijf', p. 101. Bieleman, 'De georganiseerde rundveeverbetering', p. 153.

TABLE 3. Number of dairy cows per 100 ha grassland and fodder crops in the five 'sand-provinces', 1950–1990

	1950	1960	1970	1980	1984	1990
Drenthe	109	117	134	164	168	128
Overijssel	108	121	139	190	203	154
Gelderland	111	115	132	168	183	140
Noord-Brabant	117	129	138	175	201	155
Limburg	123	123	125	138	150	120
Netherlands	115	123	137	176	189	144

Source: LEI/CBS, *Landbouwcijfers*.

Note: In 1950 and 1960 still only grassland. Figures for 1984 are given as the year in which milk quotas came into effect.

regulations came into force in 1984 and for Dutch dairy farmers the threshold – the 'quota' – after which penalties were paid, was tied to their production level in the years 1981–3.

Once quotas came into effect, they did indeed lead to a striking decrease in production. In practice, the quantity of milk a farmer was allowed to deliver was now fixed, and for him to reduce his costs and maintain his income meant he had to achieve his quota with as few cows as possible. As fodder costs made up a large part of the total operating expenses, fodder conversion became an important topic. Efficiency in milk production had to be improved in this sense, which meant that breeding strategies were now concentrating on higher production, in relation to a lower weight of the cow and so a lower consumption of feed.⁴⁹

IX

The far-reaching technical changes in dairy farming we have described did not take place in isolation. They were part of a much more comprehensive process of mechanisation, intensification, scaling up, rationalisation and specialisation. The latter was especially true in the sandy regions in the southern, eastern and north-eastern parts of the country, where dairy farming had been a part of a mixed farming system producing milk alongside pork and eggs, all three products more or less equally contributing to a farmer's income. After 1965, however, dairy farming was separated from this traditional type of mixed farming, and most farms were transformed into either specialist dairy farms, or specialist poultry and pig-fattening farms. Until 1960 the centre of gravity of the Dutch livestock was still to be found in the traditional pasturing areas, but with specialisation it shifted to the east and south-eastern sandy districts. In the provinces of Noord-Brabant and Overijssel the concentration of dairy cattle increased much faster than the national average.⁵⁰ However, as the number of cattle grew and the quantities of

⁴⁹ *Ibid.*, pp. 151–2; J. K. Oldenbroek, 'De mogelijkheden van de Nederlandse rundveefokkerij', *Veeteelt* 1 (1984), pp. 366–9.

⁵⁰ J. H. M. Maas, C. J. M. Wijnen and C. J. M. Spierings, *Landbouw. Atlas van Nederland*, X (1989).

concentrates increased, the volume of manure produced also increased, although this was not seen as a problem for some time.⁵¹ It was not until the mid-1980s that the manure surplus became widely recognised as an environmental problem of the first degree. New legislation, implemented in the autumn of 1988, brought in a ban on the store of manure in the open, as a part of a complex nutrients accounting system, and forced farmers to hold it in large manure silos until the moment when it was allowed to be spread. The manure injector was now became generally adopted although it had been introduced in the mid-1970s.⁵²

It must be added, however, that since the mid-1980s, and as a direct effect of the milk quota regulations of 1984, the number of dairy cattle has decreased significantly, and in the sandy regions in particular. At this moment the number of dairy cattle in the sandy districts of the eastern and southern parts of the country has returned to its pre-1965 level.

X

These complex technological changes which were implemented from the late 1950s, also had far reaching consequences for the structure of the dairying sector and consequently for rural society as a whole. Of course, the so-called structure policy element in the government's agricultural policy was an important factor in this, as after 1963 it explicitly encouraged a reduction in the number of farms, and the growth in size of those which remained. As the number of cattle increased from around 1.5 million in the 1950s to as many as 2.5 million around the mid-1980s, the number of dairy farmers decreased. In 1910 there had been more than 190,000 farms in the Netherlands with dairy cattle, and by 1953 this number had increased to almost 203,000. Afterwards, however, numbers fell rapidly and in 1995 there were only about 37,000 dairy farms left, 18 per cent of their former number. In 1953 the average Dutch livestock farmer had about seven or eight head of dairy cattle. In 1995 this number had risen to more than 45. After World War II, the number of dairy farmers who had 50 or more dairy cows could still be counted on the fingers of one hand, but by 1995 they accounted for about 40 per cent of all dairy farms (Figure 7). It is not obvious that there is an end to this trend in sight.⁵³

XI

The history of dairy farming and cattle breeding in the Netherlands after 1850 was marked by a continuing process of technical innovation aimed at increasing the productivity of cattle and the quality and value of their products. This process never took on such dramatic dimensions as it did after the early 1960s. The rapidly increasing price of labour when compared to the much smaller increases in farm gate prices for milk was the motor driving the complex and comprehensive technological transformation that profoundly changed the face of the sector.

⁵¹ Jan Bieleman, 'Landbouw en milieu – een eeuwig spanningsveld?', in Geert Castryck and Michiel Decaluwe (eds), *De relatie tussen economie en ecologie, gisteren, vandaag en morgen, Jaarboek voor Ecologische Geschiedenis* (1998), pp. 25–35.

⁵² Jaap Frouws, *Mest en macht. Een politiek-*

sociologische studie naar belangenbehartiging en beleidsvorming inzake de mestproblematiek in Nederland vanaf 1970 (1993).

⁵³ In 2000 there were 29,467 farms with dairy cattle. Bieleman, 'De georganiseerde rundveeverbetering', p. 150; LEI/CBS, *Landbouwcijfers*.

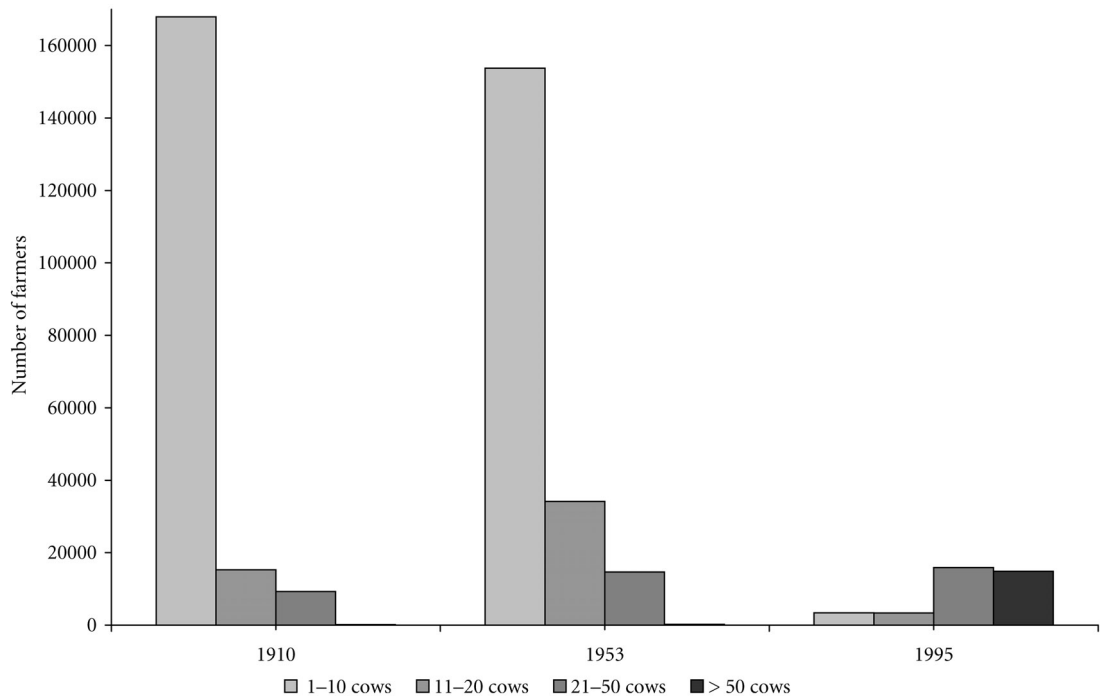


FIGURE 7. Numbers of dairy farmers according to the size of their dairy herds, in 1910, 1953 and 1995

Note: The total number of farms with dairy cows in 1910 was 192,600; 1952, 202,800; 1995, 37,500.

Source: Data bank, Rural History Group, Wageningen University and LEI/CBS, *Landbouwcijfers*.

The ruling technological regime aimed at reducing labour inputs through capital investment in labour-saving equipment. The government policy that stimulated all this was based on the assumption that a prosperous agricultural sector was necessary for the well-being of Dutch society as a whole. However, by the early 1980s, it was clear that things had gone too far, both in terms of production, and in its environmental cost. And at the end of the century it was clearer than ever that in the hunt for higher yields, a situation had arisen in dairy farming in which the cost-effectiveness of the dairy buildings and their equipment had been placed before the well-being of the cows themselves. At a time when farmers were servicing heavy debts, even the stall room given animals, which had been identified as a major cost, was under pressure. Amongst these complicated and intermeshed changes, the individual animals seemed to matter less and less.