

The chicken, the factory farm and the supermarket: the emergence of the modern poultry industry in Britain

by
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Poultry Industry in Britain¹*

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“Rationing and price control of feeding stuffs ends on August 1st”, declared the lead article of the British trade journal, *Poultry Farmer*, on March 14th, 1953. A revolution in modern British agriculture was to follow, with the poultry industry utterly transformed through intensive rearing and factory farming. The resulting cheap chicken meat led to a revolution in the British diet. In 1950 British households consumed only around 1 million chickens. But by the mid-1960s, like many other things in the country, meat-eating habits were transformed. Over 150 million chickens were sold for consumption in 1965, over 200 million by 1967. If the postwar decades of the 1950s and 1960s saw a transformation in British society, its revolutionaries sustained themselves with mouthfuls of roast chicken.

This article describes how the modern poultry industry emerged in Britain principally through initiatives from food retailers. It is this that distinguishes the British case from parallel developments in U.S., where there was also a great expansion in poultry production and consumption. As in the U.S., entrepreneurial poultry farmers collaborated with pharmaceutical and animal feeds companies, with food retailers and refrigeration unit manufacturers, and together they conducted a wholly novel experiment in the organisation of agriculture. But at the forefront of the emergence of modern poultry farming in the U.S. was the active and interventionist hand of government through the United States Department of Agriculture. In Britain the role of innovator and co-ordinator fell to a small group of entrepreneurial poultry farmers

and a handful of highly innovative food retailers, with one, J. Sainsbury, leading the way.

I. The American Origins of the Broiler Chicken Industry

Chicken meat had long been eaten throughout most of the world, but never as a staple.

In the 1920s chicken was code for an enticing luxury in America, with Herbert Hoover's 1928 electoral slogan, "A chicken in every pot" victoriously aimed at aspirational voters at the end of the Roaring Twenties. But it was there that the transition from occasional luxury to everyday staple occurred first.

Initially only one section of America's heterogeneous population saw chicken as a staple, America's Jews. New York City, with almost three-quarters of America's first and second generation immigrant Jews, was the largest Jewish city in the world. It represented the largest and most concentrated urban demand for chicken meat anywhere in the early twentieth century.²

Kashrut restrictions on slaughtering methods meant that Jewish demand was for live chickens, and from the mid-1920s these were increasingly reared in the Delmarva peninsula, between the Chesapeake Bay and the Atlantic Ocean.³ While chicken production there in the 1930s grew, the industry remained small overall. It wasn't until Jewish demand could be met with pre-slaughtered chicken that the scale of chicken production was transformed; the first processing stations opening in Delmarva in the late 1930s and early 1940s. Production capacity then mushroomed, so prices fell and producers began targeting the Gentile market. With its longstanding

preference for the American method of dry frying, or broiling, this gave the emerging industry its name.⁴ A massive increase in demand followed, first during the war and then especially afterwards. Per capita consumption of chicken in the United States increased from 5lb in 1945 to over 28lbs in 1961. The American broiler chicken industry emerged as the first modern “agribusiness”.⁵

Despite its parochial ethnic origins in serving the specialist needs of the Jewish community, the industry’s transformation was no accident. First, in the 1920s chemists at the University of Wisconsin realized that supplementing chicken feed with synthetic Vitamin D enabled poultry flocks to be better managed and the laying season extended.⁶ This coincided with a United States Department of Agriculture initiative (in conjunction with its Co-operative Extension Service, attached to the Land Grant colleges) to encourage those farmers badly hit by disease in the 1920s to switch to broilers.⁷ Research at the Land Grant colleges further focused on mineral and vitamin feed supplements to boost growth, although the next chemical breakthroughs came from the leading pharmaceuticals companies like Merck.⁸ By the early 1950s U.S. feedstuffs producers were supplementing with a melee of vitamins, coccidiostats and antibiotics their maize, soya bean and feather meal high-energy feed, with the result that poultry growth rates jumped.⁹

Some breeds of chicken grew quicker than others. Poultry farmers rapidly converged on one strain, the White Cornish stock developed by Charles Vantress growing from 12 per cent to 76 per cent of the Delmarva commercial broiler population from 1953 to 1957, for instance.¹⁰ As the conditions for the mass production of chicken meat were increasingly ripe, Americans increasingly ate a single, standardized chicken

product. Within a decade – from the late 1940s to the late 1950s -- the American broiler chicken industry had expanded enormously and begun to move away from its Delmarva peninsula heartland, with former tobacco and cotton farmers elsewhere turning to poultry production. Arkansas quickly developed into a major centre of production. But such rapid growth in the industry led to overproduction, price falls and industry reorganisation. Poultry farmers with anything less than deep pockets were forced to withdraw, or to become contract farmers working for the big feedstuffs companies (like Ralston Purina) or hatcheries (like Perdue in the Delmarva peninsula) that integrated forwards into chicken rearing, or for the distributors, like Tyson, that integrated backwards from trucking in Arkansas.¹¹ During the 1950s, in other words, American poultry farming was evolving into a major industry, applying the latest technology in production, processing and distribution.

II. Innovation and Growth in British Poultry Farming

British poultry farming began the 1950s far, far behind the U.S. industry in techniques, efficiency and scale, partly, as the *Poultry Farmer* headline indicated, because of restrictive Government practices. Yet – unusually for British industry – the poultry sector rapidly caught up with, and even overtook, American practice in the second half of the 1950s, to a large extent because the different institutional structure in British poultry farming encouraged better co-ordination between the principal parties during the industry's formative years.¹²

Before the war Britain's 50 million or so poultry flock was reared for their egg production.¹³ Eggs had become a staple in the British diet before 1914, most

obviously in their derivative form in cakes and biscuits, confectionary and drinks, but some were also eaten fresh.¹⁴ Most were imported from Ireland, Denmark, France and Austria, as well as Poland, Russia and even Egypt. Frozen and dried eggs came increasingly from as far afield as China.¹⁵ But the British poultry population expanded during the 1930s as demand for fresh eggs grew. The flocks were small, typically only around 200-400 birds, and were fed off farmyard scraps. The eggs were collected by one of Britain's 616 approved local packing stations, where they were boxed up and sent on.¹⁶ It was a seasonal activity, with hens laying in the lighter summer months, and so could only ever be a sideline to the main farm business. Egg laying was mostly managed by the farmers' wives, with its significance deprecated as merely her "pocket money" activity.¹⁷

Significant or not, an egg-producing industry needed chickens, for a hen's productive life lasted around two years. And while there were some small commercial hatcheries, most egg-laying flocks reproduced themselves. This inevitably led to the production of surplus cockerel chicks all around the country. It was these young cockerel chicks (males) that supplied the early demand for small "roasters". The older "spent", or redundant, layers were mostly only fit for the pot.¹⁸ Apart from some imports from chicken farms in Hungary, Lithuania and Russia, the chicken supplied to British households in the 1940s was overwhelmingly a by-product of these egg-laying flocks.¹⁹ They were mostly sold in local markets or through small, independent egg and poultry retailers. But demand was growing in the 1940s and 1950s. For one thing, chicken was left off the postwar British rationing system, and so a genuine market emerged. A few regional grocery chains that had sold poultry before the war also

involved themselves in the poultry trade. Some went on to become instrumental in its transition

III. The Co-ordination Problem and the Development of the British Poultry Industry.

The very early entrepreneurial poultry farmers were attempting to introduce techniques already developed in the United States. Whether it was increasing flock size in ever larger sheds, augmenting feed with evermore sophisticated supplements, or improved processing methods, knowledge flowed eastwards across the Atlantic.²⁰ But the British environment was different to the United States in two critical ways.

First the role of Government differed. The United States Department of Agriculture had long established its preference for direct intervention into the U.S. agricultural sector. With successive British Governments embarking on a path of economic planning and control after the war, agricultural activities in Britain were also severely impinged by regulation. The more entrepreneurial of the poultry farmers became intensely frustrated at official restrictions on their growing businesses. Under the 1950 Diseases of Animals Act Vantress chickens could not be imported, for example, so ensuring British chicken farmers were less productive than American. To compound matters, official attempts to improve the domestic broiler stock were too slow. Entrepreneurs resorted to smuggling in fertilised Cornish Rock eggs from the U.S. Antony Fisher, the founder of the leading producer Buxted Chickens, brought two dozen back in his hand luggage disguised as Easter Eggs. But an additional impact of the Act was to bar imports of cheap American chicken meat, and so to offer protection to the infant British poultry industry.²¹ This encapsulates the difference in

the two Governments' approaches to intervention. The USDA took responsibility for re-organising the U.S. agricultural sector, commissioning research and disseminating information on new feed innovations, farming practices, and on how the industry should be structured. The British Government had no truck with such prescriptive practices. Rather its philosophy was to control the market (through veterinary regulation, price-controls or import restrictions), but otherwise not intruding on actual farming practices.

Secondly, British food retailing, and poultry retailing in particular, was seemingly far more concentrated than the United States, enabling a few leading retailers to exert more control over the emerging industry than was the case in the U.S. This needs some explanation, for while there were many thousands of small, independent poultry stores in Britain in the 1930s, the trade "disappeared" during the war.²² By the early 1950s only a dozen or so chains dominated the re-emerging trade. The Unilever subsidiary MacFisheries and the regional grocer J. Sainsbury were the most important by far.²³ With the continued uncertainty over import restrictions in the postwar years, and the expected growth in consumer demand for chicken, these leading retailers wanted to encourage greater quantity and better quality from domestic suppliers. Sainsbury's had already invested in its British supply lines with a longstanding trading relationship with Lloyd Maunder, a meat supplier based in Tiverton, Devon, and had even established its own poultry farm and processing plants in East Anglia. Sainsbury wanted to extend such collaborative supply arrangements to other leading poultry producers.²⁴

It wasn't that American food retailers ignored chicken producers. Horowitz mentions the East Coast retailer A&P as one retailer that was involved with the Delmarva producers, for example.²⁵ But the leading retailers in Britain were able to exercise far more influence over their supply lines because they handled proportionately a much greater share of the total poultry trade. Sainsbury's, the market leader, reckoned on having around fifteen percent of the total market. With far more stores than Sainsbury's, MacFisheries could not have been far behind. Add in several of the other strong regional grocers, and the nascent poultry industry was dominated by perhaps less than a dozen retailers.²⁶

Retailers were therefore able to exert far more control over the industry than in the United States, and it was these retailers, not the Ministry of Agriculture (the British equivalent of the USDA), who pressed British poultry farmers to follow American methods, exploit economies of scale and so drive down the price of chicken. The net result was that British retailers not only possessed more market power than their American counterparts, but they did not have to compete with an assertive state agency in efforts to restructure and co-ordinate poultry production. They nevertheless shared a similar goal to the USDA, wanting to create a mass market for chicken. In Britain this proved problematic, for despite its privileged position off the meat ration, chicken in Britain was firmly identified as a luxury in the mid-1950s, and it came with a price to match.

IV. Self-service-inspired retailer intervention in British Poultry production

The consensus view in the early 1950s was that chicken remained too expensive in Britain to compete effectively with alternative meats. The price had to fall before a significant market could emerge. Retailers took the initiative and introduced the principal pricing innovations in the early years of the industry's development. Most obviously they insisted on smaller birds that cost less to rear, so they could be priced more attractively. Price was far more important than size, as Max Justice, Sainsbury's manager of the Poultry, Game and Rabbit Department, explained in his keynote speech to the inaugural broiler industry conference in October 1955, saying that a "very substantial market for broilers can be developed if it is possible continuously to offer a bird of about 3lb cleaned, plucked weight for 10s [\$1.40] retail".²⁷

Retailers then began to reduce their range of offerings to just three grades of chicken: small chickens (very young birds at 1lb to 1½lb weight), roasters (up to 3lb and selling at the 10s price point) and boilers.²⁸ "Standardization is long overdue", claimed *Poultry Farmer* in late 1954 "and until we have got some common basis on which to compare one bird with another, the whole business of buying table poultry is quite a hazard." Retailers pressed for far more uniformity, especially in the popular 3lb category.²⁹

As retailers began to influence both the size and permitted rearing costs, so pressure was increasingly brought to bear on the palatability and presentation of the chicken meat. Alan Sainsbury (Executive Director and Chairman of the family firm) insisted on buying white-fleshed birds, claiming that (and in contrast to prevailing tastes in the U.S.) "yellow-fleshed birds are not popular" with consumers. "Put yellow and white-fleshed birds side by side and you can be sure the yellow will be left to the last."

Sainsbury also became active in breed selection, collaborating with commercial hatcheries and sponsoring the competitions in the first official broiler tests in 1959.³⁰ Retailers also dropped the word “broiler”. It had been imported from the United States along with the industry, but British cooking habits didn’t include broiling. The term merely confused British shoppers; it was too close to the word “boiler”, the lower quality fowls.³¹

These few retailers were so interventionist because it was they who were at the forefront of adopting the self-service format during these years, and none more so than Sainsbury. From the second half of the 1950s onwards, Sainsbury was aggressively moving away from its traditional counter service format and incorporating a self-service format with greater shelf and refrigerator space than its peers. Before the war Sainsbury had sold a huge variety of poultry and game in large quantities, and senior management wanted to continue with this trade. But the new format could no longer tolerate such a range and variety of products. Increased standardization from its suppliers was now paramount, prompting the retailer to become far more instrumental in managing its supply chain.

Sainsbury was already active in communicating novel farming techniques to its suppliers. Sainsbury’s Max Justice told John Maunder (who had taken on the poultry business in the family firm) of advanced U.S. techniques in 1956, for instance, a conversation which ultimately precipitated a total transformation of rearing methods in Devon.³² But the introduction of self-service was to take the rate of retailer-led change in the organisation of the industry to a new level.

Self-service was, of course, another American invention being introduced somewhat haphazardly and experimentally into the UK by several pioneers.³³ It was understood partly to be a solution to the growing difficulty in recruiting skilled labour for the grocer's traditional counter service functions. Self service's real benefit, however, was the format's impact on the productivity of scarce retail space. Sales per square foot could potentially increase, as backroom preparation and storage space was converted into selling space. For most of the early experiments with the self-service format this meant following more or less exactly the American model of restricting the number of lines available in supermarkets to non-perishable packaged goods.³⁴

Unlike Tesco, Fine Fare and other self-service pioneers, Sainsbury was already committed to perishables, especially poultry. But poultry presented something of a dilemma for a nascent self-service operator. It required both specific skills for preparation (drawing and trussing) and refrigerated storage space. Poultry was, in fact, so difficult to handle that butchers did not even sell it, preferring instead to concentrate on red meats, which required both less cold-storage and could cope with more robust handling than poultry.³⁵ Harold Temperton, Director of the National Institute of Poultry Husbandry at Harper Adams agricultural college, castigated butchers' conventional approach to poultry. "Undoubtedly the good work of the poultry farmer was frequently spoiled by crude methods of dressing, evisceration and presentation of many butchers."³⁶

Poultry was, in fact, an ideal product for a labour-intensive, high-service quality retail format like Sainsbury's traditional counter service operation. But Sainsbury had committed itself to pursue expansion in self-service. It was because, uniquely among

British food retailers, it wanted both to continue serving its large existing market for poultry and to incorporate more self-service features in its stores that it became the driving force behind the transformation of intensive rearing and factory processing of poultry in Britain. As Giles Emerson summarises in his recent history of the company, “Sainsbury’s was once again pioneers [sic]... [in the] product innovation stimulated by self service... the introduction of “ready-to-cook” frozen chickens.”³⁷

Frozen chickens sold in self-service supermarkets differed in one crucial respect from their forebears sold in the traditional counter-service stores. Without either the space for preparation or even the skills among branch staff, evisceration had to take place at the packing station rather than in the store. This was to have enormous implications for the processing side of the industry, because chicken meat deteriorated very rapidly after evisceration unless it was kept under refrigerated conditions.

Even before adding evisceration to processing operations, pressure from retailers had begun to transform Britain’s packing stations. The retailers’ demand for standardization of chicken sizes in the mid-1950s had a dramatic impact on the most labour intensive element of the poultry industry, slaughtering and processing. Standardizing bird sizes encouraged introduction of specialized machinery and allowed , “packing stations [to]... get busy on the conveyor belt system and process at low cost.”³⁸

Packing stations that wanted to supply supermarkets with eviscerated chicken from the late 1950s onwards had to go further and completely refigure their production methods in order to address the greater perishability of eviscerated chicken. They

especially had to make substantial new investment in refrigeration and hygiene. For companies like Buxted, able to make the additional investment, the gains were soon apparent. Writing his annual survey in *Poultry Farmer and Packer*, Tony Pendry, Buxted's Managing Director (and Antony Fisher's right-hand man), emphasised that "1959 has seen the opening of two or three very large broiler packing stations." Over half of the entire trade now went through just four processing stations.³⁹ One of those large packing stations was Buxted's new Aldershot "poultry factory", "with 80 people turning 30,000 pre-packed and frozen oven-ready birds a week", and planning to reach a throughput of 150,000 birds a week by 1961. With its conveyor-driven, automated processing system and quick-freezing plant in four enormous blast tunnels capable of freezing 1,800 birds an hour, semi-automatic packaging machinery and shrink-wrapping, this new factory cost £250,000. It was probably the most advanced processing plant in the world, seemingly ahead of practice in the U.S. poultry industry.⁴⁰ The company was appealing for producers capable of producing batches of not less than 5,000 birds at a time. It was a far cry from traditional poultry farming and those flocks of 200 to 400 birds.⁴¹

The self-service imperative for off-site evisceration inevitably therefore led to increased capital intensity, specifically in refrigeration. And not just in processing stations. All the way along the supply chain from slaughtering to sale, eviscerated poultry needed to be kept cold. "The temperature... must be reduced quickly to below zero Fahrenheit and held at this until a few hours before the bird is put into the oven. This means some formidable problems for distribution and the expense of such distribution must be charged to the product. Much so-called quick frozen poultry is badly trussed, low frozen and just pushed into a cellulose film bag, and after a few

days' handling the bag bursts and the bird then begins to develop freezer burn, which means the flavour is lost" explained *Poultry Farmer* in 1958.⁴²

The demand for refrigeration units in trucks and vans grew, with Imperial Chemical Industries emerging as the country's leading supplier.⁴³ The need for refrigeration at the point of sale of course became paramount, and so an unintended consequence of the self-service format's imperative need to push non-display activities up the supply chain was to give those retailers with large existing investments in expensive refrigeration units a strong competitive advantage in selling chicken.⁴⁴ Indeed, even among the supermarket pioneers only Sainsbury's, MacFisheries and the much smaller Waitrose had made the necessary investments. By the mid-1950s Sainsbury typically installed up to two dozen refrigerators in each of its new self-service stores. Its Chief Electrical Engineer reported that, "Some idea of the load required at Lewisham can be given by the fact that it is practically double that required by the Lewisham Gaumont Cinema and had our building not been well advanced, the [electricity] supply company would have insisted on the construction of a sub-station to take this load." MacFisheries was also rolling out refrigeration-intensive, self-service format stores across the north of England.⁴⁵

Other grocers, even those developing self-service formats, like the Allied Suppliers group (the Unilever subsidiary incorporating the Liptons, Home and Colonial and other brands), the Co-operative Retail Service (CRS), Fine Fare and Tesco, lay far behind the leaders in refrigeration capacity, preferring instead in their self-service experiments to follow the US self service archetype more exactly and focus on building up sales of non-perishables.⁴⁶ Of course the U.S. self service model was also

changing, and by the late-1950s chicken was increasingly distributed via self-service stores. In 1959 Denby Wilkinson claimed that “help-yourself stores handle 60%” of American poultry output. But the chicken retailed in the U.S. differed crucially from the British product, distributed chilled not frozen and wrapped by the retailers in their central warehouses, not at the packing stations. By 1960 the British and American consumers were buying different products, with important consequences for the two industry structures.⁴⁷

V. Retailer as Industry Co-ordinator

The net effect of continual innovation in the British poultry industry in the ten years after the decontrol of feedstuffs was of a technological revolution in intensive rearing methods among farmers, the adoption of factory processing at packing stations and the creation of a market for a slightly different product than in the U.S. – the frozen chicken. These retailer-led influences were to have a dramatic impact on the speed with which the poultry industry developed in Britain and the organisational structure it adopted. The reduction in the size of the bird from a 4½lb to 5lb bird to a 3lb bird reduced the growing cycle from 12 to 10 weeks (and with later improvements in feedstuffs to nine weeks), meaning farmers were able to move from three harvests per year to four, and then to five. The productivity of farm space rocketed.⁴⁸

But it was the remarkable increase in the capital intensity in processing that forced the leading firms to invest heavily or lose out. Processors increasingly contracted out chicken rearing itself. Despite such precipitate change in firms like Buxted Chickens

and Lloyd Maunder, investments followed a careful sequence of discussion and agreement with the leading retailers.

While retailers were eager to consult with producers on product quality and price, they were quickly dragged into the industry's re-organisation because of one important consequence of the drive to expand rearing. As the economies of scale began to be exploited and flock sizes rose from the hundreds to the thousands, so retailers became increasingly agitated over fluctuations in supply. In the United States as the industry spread, it was plagued by periods of glut, before price falls subsequently led to producers exiting and so to undersupply. Such volatility hampered the industry's ability to market the product.⁴⁹ But the much smaller number of retailers in Britain exerted far more control over the supply chain than was possible in the United States to co-ordinate production cycles. They needed to, because they depended on "regularity in supplies,... steady prices to the consumer... [and] consistency in quality", claimed Sainsbury's Max Justice in his keynote to the inaugural broiler conference.⁵⁰

However, volatility in supply was difficult to eradicate because of the increase in batch size as chicken flocks grew. With the early producers rearing a flock of, say, 1,000 or more chickens over a 10 to 12 week season, the aim was to slaughter and distribute the entire flock of chickens as soon as they reached the target weight. The costs of two or three additional days of feeding could eliminate the farmers' profit margin. As flock sizes increased into the tens of thousands, the risks multiplied. So the leading growers began to contract directly with supermarket retailers in advance of the chickens even hatching, in order to reduce the risk of too many flocks being

brought to market simultaneously.⁵¹ In 1958 according to *Poultry Farmer and Packer*, “the chief development... has been the rise of the ‘group system’”, where farmers had fixed contracts with packing stations, which in turn had fixed contracts with retailers, enabling the market to be co-ordinated.⁵²

Leading retailers precipitated the development of the contract raising system, in particular Sainsbury. Alan Sainsbury had been very involved in the wartime controls of food production and distribution, which revolved around the zoning of supply, eliminating competition, but enforcing co-operative behaviour. They sought to adapt wartime practices for the fully competitive markets of the mid-1950s. John Maunder recalled being summoned to Max Justice’s office in London in 1956 along with a few other pioneer poultry processors, and told by the Sainsbury representative that

“we’re going to organise the country into sectors. And Maunder, you can have the West Country, and Antony Fisher you can have the South-east,... And we just sat there and took this as our marching orders. We were basically told, and ‘Go home and organise it.’ We had nothing more than that to go on. We literally had to go back and organise it.”⁵³

Maunder, Buxted and the others then recruited farmers to supply them, and they in turn then had the processors as guaranteed outlets. It was not straightforward, but the “group system” spread.

John Maunder later recollected that “you had to go out and literally persuade farmers to invest in chicken houses, at a time when it was a relatively unknown and unproven thing. It gathered momentum, of course, in a matter of a strikingly short period of

time – only a couple of years. Farmers talked amongst themselves and we virtually had to do very little selling of the idea because it was an attractive commercial proposition at that time. In those early stages it was very novel. And to get a farmer to actually understand the fact that he had to put these day-old chicks in when we wanted them put in, because it had to be on a programmed output.”⁵⁴

The system guaranteed revenues to its privileged insiders, which in turn facilitated their commitment to a very high level of capital expenditure in what were still quite small firms. Buxted worked very closely with Sainsbury’s as it embarked on its major expansion of processing facilities, for example. Perhaps unsurprisingly, “Sainsbury’s became by far their biggest and best customer.”⁵⁵ The lead-suppliers collaborated among themselves, facing little incentive to compete once inside the Sainsbury “sector system”, sharing knowledge about how to obtain the best supplies.⁵⁶ It was a system that constrained competitive forces, and so indeed privileged insiders, but at the enormous benefit of increasing the returns to investment in new facilities, in what was inevitably a highly volatile trade.⁵⁷ It was a form of collaboration that echoes contemporaneous developments in the U.S., but which remained significantly different. For there it was farmers and feed companies, prompted by the USDA, that integrated forwards. Retailers, and initially processors, were omitted from the standard integrated U.S. poultry business. Processors indeed continued to buy their meat at auctions until recently, prompting incredulity from their British colleagues.⁵⁸

In Britain, as the scale of rearing and processing increased, and as the quality or product was increasingly assured, so did incentives to firms to incorporate multiple stages of poultry production. A few processors with close relationships to the

dominant retailers initiated this process. By the early 1960s the leading processors had integrated backwards beyond rearing and into commercial hatcheries, and then developed close ties with feedstuffs producers. Buxted, for instance, sold a ten percent block of shares to Spillers (a leading British feed manufacturer) in October 1961. After its flotation in 1963, a controlling stake was subsequently acquired by Nitrovit, the Yorkshire-based feedstuffs company, in February 1964, which also then sought to create a wholly integrated business, “from a day old chick to the shop counter.”⁵⁹

In 1963, after only ten years of development, Geoffrey Sykes was able to characterise the British poultry industry as being composed of a handful of large, fully integrated units, where minimum efficient scale of output was 5 million broilers per annum. “From the stage of hatching-egg production to processing, the cost of this chain of enterprises exceeds £1½ million. The organisation behind the achievement of putting a chicken weighing 2½ lb ready-to-cook in the shops at 7/6d to 10/-.”⁶⁰

Well before then, by the end of 1958, the British poultry industry was claiming to have reached the American industry at the technological frontier of poultry production, in terms of both the rate of growth and the efficiency of processing.⁶¹ Maunder and his fellow integrated processors would “all... make fairly regular trips to the States. The realization that we all came to was that in fact the only benefit that they [the U.S. producers] brought to this whole scene was the genetic benefit. We rapidly overtook them in almost every other sphere, and we would go there and we would say ‘Yes, very interesting, but...’ In most areas they were behind us... So we were always interested in what they we doing, but if we were interested in anything at all, it was the genetic progress that they were making with the stock.”⁶²

The growth in the poultry industry in the decade or so after the decontrol of feedstuffs was truly impressive. Total commercial broiler chicken production grew from a near insignificant one million in 1950, to five million by 1953, or perhaps one-eighth of the egg-laying population. But after the summer of 1953 growth was truly remarkable, the table poultry population rising to ten million shortly after 1956, and 100 million by 1961, and well over 150 million by 1965-6. By 1967 the total number of birds produced for table poultry in Britain was 202 million, compared with only 52 million egg-layers.⁶³ This explosive growth in the size of the chicken industry was associated with no less a dramatic concentration, with, by 1963, 90 percent of the entire chicken production “in the hands of only 1,000 growers”, each either owned by, or contracting with only a few dozen processors.⁶⁴ At the top of the industry were Sainsbury’s and MacFisheries in retailing, and Buxted and Lloyd Maunder in production and processing. Together these firms had captured around one third of the total market during the late 1950s and early 1960s, albeit at different stages.⁶⁵

Such concentration had yielded tremendous gains in efficiency, which allowed the price to fall.⁶⁶ In 1954 Sainsbury’s were selling their roasters for 4s per lb or more, which for a 4lb bird placed a chicken firmly in the luxury price category.⁶⁷ Hall and Clark show how chicken prices fell by 30 per cent from 1955 to 1965, compared with pork and lamb prices rising by between 20 to 30 percent, and beef prices by over 40 percent over the same period.⁶⁸ And as prices fell, so demand for chicken soared. British meat consumption overall was broadly static after 1953. So the share going to poultry rose from only one percent in 1955 to ten percent by 1965. Once the idea of chicken consumption gained credence with the British public, they switched to

poultry in ever greater numbers. Poultry consumption represented almost a quarter of all meat consumption by 1990.⁶⁹

VI. Conclusion

Within ten years of the *Poultry Farmer* heralding the decontrol of feedstuffs, the British poultry industry had been transformed from an agricultural backwater into one of the most dynamic sectors of the British economy. In 1964 Buxted was processing over 500,000 birds *per week* at its three processing plants.⁷⁰ This transformation was dependent upon a series of critical innovations: in poultry breed selection and reproduction techniques at commercial hatcheries; in nutrition, growth management and disease control, especially through exploiting developments in pharmaceutical technologies; in the accommodation of ever larger flocks, their feeding, ventilating, and in the control of their behaviour; in their slaughtering and processing, with the enormous investments in refrigeration throughout the distribution channels, and the ever more widespread use of antibiotics; in retailing, where the emergence of supermarkets and the self-service format prompted so many of these changes in the supply chain; and finally in cooking, where families by the million took first to roasting chickens with greater regularity, and then frying, baking, and grilling in their experimentation with new culinary tastes.

Yet all of these innovations originated in the United States, where all of the advantages of scale and access to investment finance in the 1950s lay. Even self-service techniques originated there, and were widely adopted by retailers of chicken. Despite this, British producers were able to catch up and even, in many areas,

overtake the American producers by the mid-1960s. To a very large extent this was because the institutional structure of the British industry differed significantly from that in the U.S.

It was the co-ordinating role played by a few leading food retailers that enabled efficiency levels to rise so quickly in the British industry. Sainsbury was committed to introducing self-service techniques into its chain of stores from the late 1950s, while still retaining its traditional commitment to poultry. It was only after realizing the possibilities that arose from introducing American methods in processing that Sainsbury's then organised the industry by allocating regional sectors to its privileged suppliers, who then had to go ensure supplies came from their local farmers. This, the "group system", was an echo of wartime practice and yet it was superbly successful in peacetime competitive markets because it allowed the British industry to avoid the volatility associated with the U.S. model. The lack of co-ordination there meant that the market for chicken initially oscillated between periods of glut and scarcity before consolidation occurred. Instead, in Britain, the market was created for frozen, not fresh, chicken, so perishability was reduced. Co-ordination around this frozen chicken enabled a stable market to be created very early. Revenues then became far more predictable, so prompting higher rates of investment in advanced mechanisation, and, with the guaranteed sales, high rates of utilisation across all new capital equipment from the outset. It provided an institutional structure that enabled scarce investment to be used very efficiently, and so encouraged rapid growth.

The British model was based on collaborative relationships along the supply chain instigated and controlled by retailers. This was absent in the U.S. The American

preference for “arm’s length” contracts even to the 1980s bemused John Maunder. In a sector where quality assurance was of paramount importance in guaranteeing product quality to the consumers, the British model was to opt for the organisation closest to consumers, the leading retailers, to be the principal co-ordinator. The American model largely left such co-ordination to the relevant Government department and the firms with the deepest pockets, best able to survive the industry’s periodic downturns and drive consolidation through. In Britain, instead of the proactive role of the USDA, the Government was essentially broadly protectionist, but uninterested in pursuing any interventionist policies that might have helped to encourage modernization of poultry production. Indeed, their protectionist measures hindered innovation in the closely related egg sector, permitting archaic production and distribution methods to continue unchallenged.

The British model eventually changed, and became somewhat less integrated, although food retailers still carry far more influence there today than in the United States. But the significance of the remarkable British poultry industry experiment was to have important repercussions for the country’s leading food retailers for many years afterwards. Of all the supermarket pioneers, Sainsbury’s emerged as the market leader in the early 1960s and increased its dominance during the 1980s because of the importance of learning how to innovate using such strongly collaborative relationships with its supply chain.

¹ This article is forthcoming in Warren Belasco and Roger Horowitz eds, *Food Chains* (University of Pennsylvania Press, Philadelphia PA, 2008 forthcoming). It has benefited from both the generous funding of the Museum of English Rural Life, University of Reading, and privileged access to the wealth of MERL's archival collections. We have also received generous assistance from the Sainsbury Archive. Our thanks go to both organisations.

² For an overview of the Jewish immigrant population in New York see Andrew C. Godley, *Jewish Immigrant Entrepreneurship in London and New York: Enterprise and Culture* (Basingstoke and New York: Palgrave Macmillan, 2001), chapter 4.

³ Roger Horowitz, *Putting Meat on the American Table: Taste, Technology, Transformation* (Baltimore: Johns Hopkins University Press, 2006), chapter 5. Delmarva is an acronym for the three states of Delaware, Maryland and Virginia, across which borders the peninsula carries.

⁴ Horowitz, *Meat*, 105 on broiling, and 102-116, and Ross Talbot, *The Chicken War: An International Trade Conflict between the United States and the EEC, 1961-1964* (Des Moines: Iowa State University Press, 1978), 2-5 on Delmarva origins. Denby Wilkinson was Secretary of the official British National Broiler Tests, on breed selection, from 1959 onwards. His correspondence is held at the archive of the Museum of English Rural Life, and contains copious notes on the origins of the American industry (reference MERL DW/ AD8/4).

⁵ Talbot, *Chicken War*, 3; Geoffrey Sykes, *Poultry – A Modern Agribusiness* (London: Sykes, Crosby, Lockwood and Sons, 1963), chapter 5.

⁶ Talbot, *Chicken War*, 4.

⁷ Horowitz, *Meat*, 111.

⁸ Lou Galambos, *Networks of Innovation: Vaccine Development at Merck, Sharp & Dohme, and Mulford, 1895-1995* (Cambridge: Cambridge University Press, 1999), 126-32 on poultry medicines; Talbot, *Chicken War*, 5 on the importance of Merck's discovery of synthetic vitamin B₁₂ for poultry rearing.

⁹ Talbot, *Chicken Wars*, 5; Sykes *Poultry*, 7. Partly because US maize growers were unable to reach their export markets after 1942, they switched to supplying the poultry feedstuffs producers, thus boosting the industry's productivity.

¹⁰ They were also known as Cornish Rocks. Horowitz, *Meat*, 113, the figures refer to sales of Vantress birds at auction, which accounted for the overwhelming majority of transactions in the U.S. Denby Wilkinson on the Vantress hatchery in Georgia (MERL DW AD8/4).

¹¹ Sykes, *Poultry*, 74, 77-8; Talbot, *Chicken Wars* 5-8; Horowitz, *Meat*, 118-20; and Denby Wilkinson (DW AD8/4) on the development of the US system.

¹² The best source for a comparative analysis of British and US manufacturing is S.N. Broadberry, *The Productivity Race* (Cambridge: Cambridge University Press, 1997).

¹³ B. R. Mitchell, *Abstract of British Historical Statistics* (Cambridge: Cambridge University Press, 1962), 83, shows poultry numbers rose from 49m to 73m from 1927 to 1935 before falling to 64m by 1939.

¹⁴ P. Mathias, *Retailing Revolution: A History of Multiple Retailing in the Food trades based upon the Allied Suppliers Group of Companies* (Longmans, London, 1967), 16-34, esp. 25-8 on middle class family consumption of 20 to 30 fresh eggs per week, poor family consumption of less than 12 eggs per week.

¹⁵ Mathias, *Retailing Revolution*, pp. 27-28, says over 3 billion out of an annual British egg consumption of 3.9 billion (or around three-quarters) were imported before 1914. Bridget Williams, *The Best Butter in the World: A History of*

Sainsbury's (Ebury Press, London, 1994), 35-6, 93 (imports) on eggs. James B. Jefferys, *The Distribution of Consumer Goods* (Cambridge: Cambridge University Press, Cambridge, 1950), Chart I. On eggs from China and Russia, see, Ning Jennifer Chang, 'Vertical Integration and, Business Diversification, and Firm Architecture: The case of the China Egg Produce Company in Shanghai, 1923-1950', *Enterprise and Society* 6 (2005); and Stuart Thompstone, "'Bab'ye Khozyaystvo": Poultry-Keeping and its Contribution to Peasant Income in pre-1914 Russia', *Agricultural History Review* 40, (1992), 52-63.

¹⁶ *Poultry Farmer* March 28th, 1953, 'Packing Stations'. The packing station network was expanded as a mechanism for wartime food distribution.

¹⁷ Williams, *Best Butter*, 50 on seasonality; Sykes, *Poultry*, 7 on 'sideline'. Lady Denman's report, *The practical education of women for rural life: Report of a sub-committee of the inter-departmental committee of the Ministry of Agriculture and Board of Education* (London: HMSO, 1928), for her endorsement of the 'pocket money' activity.

¹⁸ Henry Clarke and Hilary Binding, *The History of Lloyd Maunder, 1898-1998, a West Country Family Business* (Halsgrove: Tiverton, 1998), 85 on slaughtering 'spent' hens.

¹⁹ *Poultry Farmer* January 16th, 1954. This was the poultry industry's trade journal and reflected the transition from an egg- to a meat-producing industry with its title change to *Poultry Farmer and Packer* in 1959 (hereafter *PF* and *PF&P*).

Thompstone, 'Poultry-Keeping in Russia'; and Brian Short, "'The Art and Craft of Chicken Cramming" Poultry in the Weald of Sussex 1850-1950', *Agricultural History Review* 30 (1982), 17-30, on imports.

²⁰ One exception to this direction is photographic evidence of a Japanese firm exhibiting its plucking machinery at Agricultural Shows in Britain in 1950. See the outstanding *Farmer's Weekly* photographic archive at Museum for English Rural Life.

²¹ Frost, *Fisher*, 49; Sykes, *Poultry*, 7. It was not until 1959 that the first National Broiler (Random Sample) tests were instigated at the Ministry of Agriculture's test ground near Godalming, Surrey. US producers tried hard to get access to the British market, repeatedly disparaging the Government's 'so-called protective health measures', PF July 2nd, 1955, 1. Talbot, *Chicken War*, 10-12, on the enormous exports of chicken meat from the US to Germany from 1960, thwarting the development of any poultry industry there, which suggests that the protection offered to British farmers was in fact genuine.

²² National Farmer's Union, 'Report on Marketing', February 6th, 1957, 6, 'During the war... table poultry disappeared from the market.' (NFU Archive, Ref. 6340 P.63: 381, at the Museum of English Rural Life).

²³ Williams, *Best Butter*, 135; and 'Mr Alan discusses', *JS Journal* I:2 (April 1947), 13. Giles Emerson, *Sainsbury's: The Record Years, 1950-1992* (London: Haggerston Press, 2006), 49-50. MacFisheries began as a personal indulgence of Lord Leverhulme, but was amalgamated into Unilever after his death. Its history is nevertheless a neglected part of that empire. See Charles Wilson, *The History of Unilever* (London: Cassell, 1954, 2 volumes), 261-3, vol. 1. Despite its initial embarrassment to the parent company, with 360 stores it went on to become an important source of profits for Unilever (311). In Wilson, *Unilever 1945-1965: Challenge and Response in the Post-War Industrial Revolution* (London: Cassell, 1968), gives a very occasional reference to postwar developments. J. B. Jeffreys, *Retail Trading in Britain, 1850-1950* (Cambridge: Cambridge University Press,

1954), 244-52, esp. 248 on MacFisheries; and Jeffreys, *Consumer Goods*, 179-89 (there were over 50,000 independents in the egg and poultry trade in 1938, 188). For its late 1950s development see *PF&P* September 19th, 1959, 19, on MacFisheries' new Manchester store.

²⁴ Clarke and Binding, *Lloyd Maunder*, 43, 46-7, 52 on Frank Sainsbury's turkey farm; also see Williams, *Best Butter*, 35-7; and Emerson, *Sainsbury's*, 49-50 on the company's egg collecting operations that preceded its forays into poultry farming. Jeffreys, *Retail Trade*, 195 confirms Sainsbury's closeness with suppliers differentiated it from other British provisions merchants.

²⁵ Horowitz, *Meat*, 103 and 111. Richard Tedlow, *New and Improved: The story of mass marketing in America* (New York: Basic Books, 1990), chapter 4 covers the history of A&P, but without referring to any role in the poultry industry.

²⁶ Jim Woods, Sainsbury's Merchandising and Marketing Manager, claimed that Sainsbury did 12%-15% of all available trade in the regions where their shops were present, which mapped onto those locations where poultry demand was disproportionately high (London and the Home Counties). Given that Sainsbury was particularly competitive in poultry, it seems not unreasonable to assume that their share of the nascent broiler chicken market was around this figure. (See letter from Jim Woods to Anthony Tennant of Mather & Crowther advertising agency, 20th January, 1960, Sainsbury Archive.) For the other regional grocers see Emerson, *Sainsbury's*, 66 and 156; and *PF* October 2nd, 1954 for David Greig, another leading regional grocer. Sykes *Poultry*, 30, states that with '8 to 12 [chains] dominating Britain's food retailing', it was far more concentrated than the US.

²⁷ *PF* September 10th, 1955, 5.

²⁸ *PF* September 10th, 1954 on Sainsbury; *PF*, September 18th, 1954 on equivalent attempts at grading in the Midlands and Scotland, and *PF* October 2nd, 1954, on grading attempts at David Greig.

²⁹ *PF* October 30th, 1954. Also see Sykes' comment in *PF* October 27th, 1956, on how 'retailers are finding that the nation's demand is for a smaller bird (3lb to 3¼lb)'

³⁰ *PF* November 22nd, 1958, 21, for Alan Sainsbury. And contrast with Horowitz, *Meat*, 120 on Perdue's attempts to market yellow-fleshed chickens that attracted a price premium in the US. Sainsbury's buyers were also used for grading at the tests. The company sponsored two of the cups awarded annually for poultry production, the only retailer to participate in this way (MERL DW AD2/6).

³¹ *PF* January 16th, 1954, and *PF* September 11th, 1954 on Sainsbury dropping the term, and *PF* October 2nd, 1954 for similar moves at Greig. It retained some currency although was never again the prevailing descriptor.

³² See Clarke and Binding, *Lloyd Maunder*, 85. John Maunder interview with Andrew Godley and Bridget Williams, August 30th, 2006.

³³ Emerson, *Sainsbury's*, 43-57; Williams, *Best butter*, 124-217; Clarke and Binding, *Lloyd Maunder*, 79 and 85. Horowitz, *Meat*, chapter 6, discusses the slow progress of self-service in American meat retailing.

³⁴ Ralph G. Towsey, *Self-service Retailing, its profitable application to all trades* (London: Iliffe Books, 1964), 84. On US practice see Tedlow, *New and Improved*, chapter 4.

³⁵ See Sykes in *PF* November 14th, 1953, and Sykes, *Poultry*, 197. The Vestey retail empire did not retail chicken, for example. See Richard Perren, *Taste, Trade and*

Technology: the Development of the International Meat Industry since 1840 (Ashgate, Aldershot, 2006), esp. 205-8.

³⁶ Speaking at the inaugural National Association of Poultry Packers' Annual Conference, reported in *PF* May 15th, 1954.

³⁷ Emerson, *Sainsbury's*, 49-50.

³⁸ *PF* October 16th, 1954 reporting a speech by Hugh Finn, chairman of Stonegate Poultry of Canterbury.

³⁹ Pendry in *PF* October 31st, 1959, 30. Also *PF* November 21st, 1959, '56% of all eviscerate poultry is packed in just four stations'.

⁴⁰ Horowitz, *Meat*, 114-5, cites examples of processing plants in the US with a much lower capacity. Adding evisceration increased labor demands, and new equipment needs were minimal. The adoption of new wrapping materials that replaced cellophane (pioneered by the Cryovac company) were beginning in the red meat industry, Horowitz, *Meat*, chapter 6. Our thanks go to Roger Horowitz for drawing this important observation.

⁴¹ *Poultry Farmer* September 19th, 1958, 9; *PF* September 19th, 1959, and *PF* September 12th, 1959, 19 on shrink-wrapping, and extensive discussion *passim*. Factory evisceration 'still had its problems', and was still labor intensive, Pendry in *PF* October 31st, 1959.

⁴² *PF* October 25th, 1958.

⁴³ Buxted, for example, was using refrigerated vehicles to deliver frozen chickens to Sainsbury's London depot five years before the company began to operate similar vehicles out of its new Basingstoke depot in 1964, *JS Journal* (April/May 1964), 11-15.

⁴⁴ *PF&P* October 25th 1958. In consequence, Hugh Finn (of Stonegate Poultry) castigated retailers, hotels and restaurants with insufficient refrigeration capacity, ‘the wastage of birds going through their hands was appalling’, *PF* October 16th, 1954, 1. Also see *PF* article on equipment manufacturers at the Northern Poultry Show, November 29th, 1959, 19, where prices ranged from £369 to ‘approx £500’. Towsey, *Self-service Retailing*, 84, ‘the cost of refrigerators can vary as much as from £30 to £110 per foot run’.

⁴⁵ *JS Journal* (January 1956), on engineering at Lewisham, Alan Rickman (Sainsbury’s engineer) discusses 24 refrigerated wall cabinets in total in the store. Also see *JS Journal* (December 1955), interview with F. G. Fry – the electrical engineer responsible for development of Sainsbury’s refrigerated cabinets.

⁴⁶ Mathias, *Retail Revolution*, on Allied.

⁴⁷ MERL DW A/8/4. Sykes *Poultry*, 12, emphasised that overall UK self-service was behind that in the US.

⁴⁸ Sykes in *PF* April 10th, 1954 on 3 per annum; Sykes *Poultry*, 103 on 5 per annum. And then *PF&P* July 17th, 1963 on 10 week season (with a 2-3 week resting in between crops for disease control).

⁴⁹ Talbot, *Chicken War*, 9; Sykes, *Poultry*, 74.

⁵⁰ Speech reported in *PF* September 10th, 1955, 5.

⁵¹ One leading poultry entrepreneur claimed in his speech at the inaugural broiler industry conference that ‘it was useless to produce on a speculative basis. It was also necessary... to co-operate fully with the chick supplier, feed merchant, and final market.’ *PF* September 10th, 1955, 5.

⁵² *PF&P* October 25th, 1958, 21.

⁵³ Maunder interview. Alan Sainsbury was Chairman of the Ministry of Food's import committees for the supply and distribution of poultry and rabbits and also chief representative of the multiple grocers on the Ministry of Food's retail advisory committees during the war. See James Boswell (ed.), *JS 100* (London, J. Sainsbury Ltd., 1969), 54-55.

⁵⁴ Maunder interview.

⁵⁵ *JS Journal* 'Ready to Cook', (September 1957), 10-13. Citation Frost, *Fisher*, 50. Also see Emerson, *Sainsbury's*, 49-50.

⁵⁶ Maunder interview.

⁵⁷ Sykes, *Poultry*, 12, on retailer incentives for collaboration and 30-4 on the rise of long term contracts and co-ordination. Sykes contrasts the role of retailers driving up quality with Marketing Boards, 34 (in direct contrast to his earlier view that the Fatstock Marketing Board ought to regulate prices in the chicken industry, see *PF* July 30th, 1955).

⁵⁸ Ed Covell interviewed by Roger Horowitz, 1st February, 1995. We thank Roger Horowitz for making a transcript of the interview available to us. Maunder interview on the 'arms-length contracts' and US processors buying meat at auction.

⁵⁹ Citation from *Economist*, Feb 15th, 1964, also see Feb 22nd, 1964 (copies held at National Union of Agricultural Workers' archives, held at the MERL). Frost mentions that Allied Foods then took over the business (*Fisher* 55-8). Buxted was acquired by Ross, which in turn was acquired by David Thompson's and Harry Solomon's Hillside Holdings. This was eventually acquired by Hicks Muse, the American private equity group (now renamed Lion Capital), in 1999, whereupon the original poultry businesses were all shut down. Lloyd Maunder acquired its own feed producing capacity and has remained privately controlled and independent.

⁶⁰ Sykes, *Poultry*, 47, and see his chart for the breakdown.

⁶¹ *PF* October 25th, 1958, 21, reporting data from growth trials in both countries. On US processing see Talbot, *Chicken War* for 1963 data, showing US plants processed 6.5m to 7.0m chickens per year. The Buxted and Maunder processing plants easily equalled such throughput.

⁶² Maunder interview.

⁶³ Sykes commenting in *PF* October 29th, 1956 on 1m in 1950, and 10m in 1956 and forecasting 100m by 1960. National Union of Agricultural Workers Union leaflet on the broiler industry dated c. 1961, stated that the 1953 total was 5m, rising to 100m by 1960 (The NAUW archive is at the Museum of English Rural Life). National Farmer's Union, 'Report on Marketing', February 6th, 1957, 6 on 1955 and 1961 forecast 100m. Hunt and Clark, *Poultry and Eggs in Britain, 1966-1967* (The Agricultural Economics Research Institute, University of Oxford, 1967), 34, lists British Hatchery chick placings for table poultry 1964-5 to 1966-7.

⁶⁴ Hunt and Clark, *Poultry and Eggs*, 7.

⁶⁵ Sainsbury's sales were 4.7 million birds in 1957-8 (out of a total demand of say 20m -- see note 63), rising to 11.9 million in 1959, and 13.4m in 1960 (out of a total market rapidly approaching 100m -- note 63). See J. Sainsbury, 'Financial Reviews', 1960 and 1961 (Sainsbury Archive). The Poultry department was the lead performer at that time 'Once again a large part of the additional trade was due to the poultry department', *ibid.*, 1960. Fisher and Pendry had captured almost one-fifth of the total British broiler market for Buxted. Frost, *Fisher*, 51, states the company output was around 25m per annum in 1964, when total output can be inferred from Hunt and Clark, *Poultry and Eggs*, chick placings, 34. This lists 157m chicks placed with table poultry farms in 1964-5, rising to 182m and then 202m in 1965-6 and 1966-7

respectively. Backwards extrapolation would imply perhaps 130m-135m broilers reared in 1963-4.

⁶⁶ Hunt and Clark, *Poultry and Eggs*, 7, the industry was 'very efficient' by 1963.

⁶⁷ *PF* September 11th, 1954.

⁶⁸ Hall and Clark, *Poultry and Eggs*, 83. Also see *PF&P* October 31st, 1959.

⁶⁹ See Andrew C. Godley and Bridget Williams 'Democratizing Luxury and the Contentious "Invention of the Technological Chicken" in Britain', *University of Reading Discussion Paper in Management and Economics* 2007.

⁷⁰ Frost, *Fisher*, 51.