CHAPTER

2

The 20th century: winds of change (1900–45)

OUTLINE

Food and Society
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Along with the above, and for the benefit of background, the next few sections focus on certain of these dynamics such as: politics and governance; health and nutrition; science and technology; and a smattering of social awakening to tell the story of food's growing public and political importance. This is important from the stance of food and society, as it tells the story of the beginnings of so many governmental and nongovernmental issues and initiatives, the advancement of society, food science, and several attempts at global governance. The same story also describes the successes and failures while at the same time introducing key prominent people, events, and innovations along the way.

By the 20th century, things were beginning to move quite rapidly. For instance, steam, diesel, gasoline, and electric power were becoming more widely accessible. On top of this, improvements in transportation infrastructures including those of roads, canals, ships, and of course rail improved the lot for agriculturalists, empowering farmers and allowing for greater freedom. Such improvements also meant that supplies existing far away from markets (and those closer of course) could now conceivably be sown, harvested, and brought to market in a timelier fashion. Thus, in essence, the period known as the industrial revolution can be characterized in many ways, in particular three ways might best surmise the period: that of the energy source used (fossil fuels), the greater use of artificial fertilizers and pesticides, and lastly, the improvement and implementation of targeted scientific agricultural research. Coinciding with this was the increased abundance of refrigeration, mechanization leading to increased yields, and labor productivity. This period also saw the introduction of extensive irrigation, significant increased animal husbandry, and the greater

application of antibiotics and hormones. Concomitantly, a decline in family-based farming and the simultaneous growth of agribusiness's (large-scale food production and processing industries) helped create greater employment in new start-up industries in new areas of agriculture, such as the agricultural chemical sector and the biotechnology sectors along with a few others, etc. (UOR, 2009). Consequently, such was the influence of the agricultural and the industrial revolutions, which profound changes in the way agri-business was conducted, combined, they allowed for the extensive, long-distance transportation of food and commodities facilitating commodity imports and exports. Thus, efficiently expanding markets and in due course ushered in an era of agricultural globalization. In turn, this new agricultural paradigm was unequivocally instrumental of the foundation of world trade realignment. By extension large production and less lead time from farm to market saw the lowering of the costs all round especially in production: furthermore, commodity prices too saw great benefits in the form of cheaper market prices, more accessible to the laymen.

2.1 The agricultural landscape

From around the late 19th century to the turn of the 20th century, agriculture was facing a mixed bag of challenges (some good, some not so). From stagnating yields and national interventionist policies, which hindered rather than helped, and from agricultural specialization and the industrialization of agriculture combined to alter the landscape of the contemporary agricultural model. All this coincided with an extended period of stagnation in terms of lowered farm salaries particularly within the United States (Gardner, 2002). This also coincided with a spurt of rapid increase in population size and yet in spite of previously mentioned advances in both the agricultural and industrial sectors it appeared as if a commodity yield increases plateaued. Consequently, it came to be seen that technology alone could not arrest the tide of stagnating crop yields. In fact, the situation, not surprisingly, drew great attention to agricultures' potential limitations in providing for the increasing rate of population growth (see Malthus, carrying capacity 13.2 & 13.3).

As an aside, further negativity was also being fostered about international trade too. One of the biggest concerns at the time was the seemingly overreliance on this new international trading platform in general. However, the same phenomenon was also noted in the agricultural and general food chain arena's too (Michie and Smith, 2000). The concern suggested some was that trading food internationally threatened to increase overdependence while simultaneously exposing large net importing/exporting nations to massive "trade" or "economic" shocks. This was because, fundamentally speaking, while keeping up with current economic concepts of the time—net imports appeared to be, more often than not, as a negative "pull" on the national balance sheets, especially among the foreign earnings balance. In doing so, this was seen as some suggested to large "trade gaps" (Michie and Smith, 2000). By contrast, increasing net exports were thought to improve a nations overall wealth (Michie and Smith, 2000) (see also balance of payments in the appendices).

At about this time too much lip service was being paid to increasing national self-sufficiency in agricultural production. The voices were heard and this shepherded a time of much needed improvement. The United States is a good case in point. Up to this point,

the United States relied quite heavily on the United Kingdom for the knowledge transfer especially in the areas of technology and agriculture (seed and animal husbandry). As a consequence, society's opinions and expectations began to increase and after a lengthy period of government lobbying. The end result was the creation of dedicated government agencies of agriculture. And it was successful. Once created, with new-found government intervention, US farmers began to invest in the new technologies and innovations in the form of new land and equipment. A similar phenomenon too swept across Britain and some parts of Europe as they too set up specialist dedicated agricultural agencies. Furthermore, accompanying these increasing agencies came greater responsibility and accountability. Legislative instruments of late 19th to early 20th centuries emphasized production and the protection of agricultural goods in the form of mechanisms such as greater tariffs through both export and import taxes. Globally, this opened the door to the creation of the international organization whose sole responsibility was agricultural trade and other issues—International Institute of Agriculture (IIA) founded by a merchant of Polish-American origin in 1905 called David Lubin. The IIA operated more like a global clearing agency among other things. Having said that, the institute's greatest legacy, among other things, was to raise the profile on an international level of the need for increased worldwide awareness of a more formalized agricultural profile from production to legislation (Britannica, 2009).

However, there were many casualties of both agricultural and industrial revolutions and their associated policies as well as the resultant fledgling, fast-growing international trading platform. In particular, the extensive dislocation of time-honored trading partners did not go unnoticed. Such displacement came to be, in part, due to the adoption of more efficient use of existing resources and through specialization. Alas food commodities' increased mobility together with fairer trade barriers observed a sort of geo-displacement among many customary agrarian suppliers (Michie and Smith, 2000). By way of illustration, as grain became less profitable for, say Europe-based agriculturalists, so the North Americans and Australians filled the vacuum by providing alternate cheap and reliable substitutes. Out of this and other opportune circumstances, numerous European farmers responded by specializing too. Many turned their attention to dairying, cheesemaking, and other globally competitive products (Clayton and Black, 1943). Consequently, with increasing global demand, supply (raw materials) and specialization increased or was further developed, thus herein laying the foundation of the worldwide realignment of not only the agrarian sector but also world trade in general.

With this, in terms of policy, in particular agricultural policy, the main aim of agricultural policy-makers in the industrialized world was to expend a good deal of effort, came through in the form of protectionism of sorts whereby legislation provided sufficient agricultural/provisions for not only their own countries but also of their close trading partners as well, and of course for their valuable allies.

2.1.1 Agricultural productivity

By way of supplementary information, before the period mentioned above, improvements in agricultural productivity, more frequently than not, was attained by way of land acquisition and/or reclamation and greater use of fertilization. This helped in the drive for greater

cultivatable land and total increased in harvest per acre. Furthermore, before grain yields could markedly increase, one other barrier had to be navigated: that of productivity. Presently, labor-intensive agriculture still relied on heavy manpower per acreage, particularly during harvest time. In fact, agricultural methods had not changed much from about the 14th century to the late 19th and early 20th centuries. Time advances in technology, particularly in America and the United Kingdom, were such that while growth through land expansion or reclamation was slowly decreasing subsequent yields were increasing (Johnson, 2000; Gardner, 2002). Also, as has been touched on, the increased intensification and industrialization of agriculture meant the resultant productivity gains allowed more farm and ancillary workers to pursue nonagricultural employment in both the manufacturing/industry and the service sectors. Not surprisingly too, such migration out of agricultural employment further fueled urbanized living, which, in circular logic, additionally reinforced the needs of the industrialization process and which subsequently also contributed to the increase in prosperity of countries or states (Johnson 1997, 2000; Weisdorf, 2005). No wonder, with such increases in food productivity and better, faster to market commodity, coupled with commodity mobility, that population figures markedly increased (Cohen, 1995; Zhang, 2008). Such increases were also responsible for noticeable changes in the dynamics and makeup in society. That is to say, from a long history of farm-centric work and life, reduced labor, due to mechanization (in both production and harvesting) and the overall industrialization process, societal changes meant there were more people moving to urban areas in the hope of finding work in alternative trades, many of which had never existed before this period. This had a knock-on effect in terms of the creation of national wealth (Watson 1974, 1983).

Concurrently, as the populace amplified due in large part to more than favourable conditions mentioned previously, certain individuals previously concerned about population numbers vis-a-vis the Earth and its potential to supply mankind's needs resurfaced with a vengeance (see Section 13.3).

2.2 Health and diet: the final link

Meanwhile while others were concentrating on runaway population numbers, during the early part of the century, independent caloric studies conducted around the world, as Chittenden writes, many seemed to back up the requirement of 3000 calories per day which was advised by Voit some 20 years or so previously (Chittenden 1906, 1907). That being said, there were still many other studies that showed that no universal consensus leaving Chittenden to lament over what he believed was a general lack of "scientific" evidence in many trials. He also bemoaned certain "apparent" scientific studies where one man's habit or craving vis-à-vis food requirements did not signify sufficient methodical approach to warrant any serious consideration (Chittenden 1904, 1906, 1907; Carpenter et al., 1997). Chittenden further contemplated just how such studies passed muster and truly reflected the reality on the ground (Gibson, 2016). Supporting this argument, Chittenden cites his own predictive studies which revealed a person's physiologic requirements would easily be catered for with fewer calories compared with a growing body of 3000 kcal proffered by many other studies (Chittenden, 1904; Carpenter et al., 1997). Even Lusk, a student of

TABLE 2.1 Early daily nutritional values as offered by Lusk and Chittenden.

Date/Authority	Load (default man)	Protein	Fat	Carbo-hydrate	Calories
1904–07 Russell Chittenden					
Russel Chittenden's research determined that balance for the so-called "brain worker" (slightly more active than the sedentary man) was sustainable on fewer than the often-raised daily figure of 3000 calories. For Chittenden, as he saw himself as fully sedentary, he considered 2000 calories sufficient for his own needs					
		>50 g			2500–2600 calories
1906 Graham Lusk					
					2488–2562 calories

Source: Hutchinson (1916); Chittenden (1904, 1906, 1907); Lusk (1906).

Voit and somebody who did more to raise the profile in the field of nutrition than almost any other during this period, like Chittenden similarly viewed the generally accepted 3000 daily calories as being just a tad excessive. Chittenden and Lusk's recommendations are outlined in Table 2.1.

2.3 Technology and biotechnology close the gap

In the field of technology around the beginning of the 20th century, things were moving very fast. It was not uncommon for what was the previous few months' technical or scientific innovation to become policy in the next few months. Such was the rate of scientific/technical/or industrial development, especially in areas of steam, diesel, and electric power, that there was quick and wide uptake of these new technologies. This facilitated improved transport, infrastructure, and other advances like refrigeration. In fact, improved methods of preservation and procedures effectively permitted prior, far-from-market suppliers, easier access to trade globally.

Biotechnology (although the term had not been coined as of yet) represented the notion that some materials or products could be made with the help of live organisms (Fári and Kralovánszky, 2006). As a result, industries were now using the latest biotechnologies to help in such issues as deficiencies of food and other societal needs. Besides the food component, biotechnologies were also used for manufacturing substances such as acetone, butanol, and glycerol. Indeed, the technology was especially welcomed in Germany where plant produced acetone was employed to produce paint solvents or more dangerously to make bombs. Furthermore, in both Germany and Britain, community wastewater was decontaminated or purification plants, founded on bacteriological yeast action, and were used in overcrowded cities where major outbreaks of disease occurred (Bud, 1993). In addition, groundbreaking scientific investigation by Max Delbrück and team opened up the possibility to use excess brewer's yeast as a food supplement in animal husbandry. Later this became extremely advantageous for Germany, especially during the First World War as they successfully substituted nearly half of their imported animal feed protein requirements with eukaryotic, single-celled microorganism (aka brewer's yeast) (Ugaldea and Castrillob, 2002). There were other major breakthroughs during this early period too (Table 2.2).

TABLE 2.2 Key early dates in biotechnology.

Date	Advancements made in the early 20th century
1900	Mendel's work on genetics had stagnated for a few years until they were rediscovered by Hugo DeVries, Erich Von Tschermak, and Carl Correns reexamined Mendel's work.
1901	In 1901, Beijerinck discovers oxygen-dependent (aerobic) nitrogen fixers.
1902	In this year "immunology" is first used.
1902	Walter Stanborough Sutton suggested that Mendel's so-called "factors" (genes) were transported via chromosomes and tentatively suggested they might also transport heredity from one generation to the next. A few years later, Sutton gave Mendel's "factors" the more familiar name used today "genes."
1902	Archibald Garrod further strengthened the link made between Mendel's genetic heredity and the biochemical pathways of reproduction systems in organisms.
1903	Both Walter Sutton and Theodor Boveri both postulated that every egg or sperm cell comprised one chromosome pairs (one of each). And in doing so joined or enhanced Mendel's gene heredity pathways and with it the fertilization of the egg and by extension heredity.
1905	Two other scientists, Edmund Wilson and Nellie Stevens, postulated that both X and Y chromosomes together determined the gender of an organism.
1906	While used in descriptive above, the actual term "genetics" was first introduced into the scientific world.
1907	In this year, the first in vivo culture of animal cells commenced.
1909	Further work on genes discovered that genes were also associated with hereditary disorders.
1909	Adding to the relatively new field of biotechnologies terminology, Wilhelm Johannsen coined the words "gene," the transporter of heredity, and "genotype" to determine the composition (genetically wise) of flora and fauna, while "phenotype" was given to mean the organism itself.
1912	In the evolution or maturation of X-ray technology, Lawrence Bragg was able to research the structures of modest crystalline materials at the molecular level, thus paving the way to the growth of X-ray crystallography.
1915	Phages also known as "bacterial viruses" were unearthed.
1917	In the field of terminology, "biotechnology" finally came of age to earn its own respective field and title created by Károly (Karl) Ereky, a Hungarian agricultural engineer.
1918	Using acetone produced by plants, the German army used it to make bombs.

Compiled from multiple Sources: Bud (1993); Thackray (1998); Fári et al. (2001); Fári and Kralovánszky (2006); BioTech Institute (2010).

2.3.1 Plant hybridization

Biotechnology can also be applied to the selective breeding of plants and livestock. In fact, for millennia unbeknownst to practitioners aided in the production and betterment of both livestock and crops. Before about 1910, for instance, selective breeding gave agriculturists an ability to select the best examples of the harvest, which was then utilized as seedlings in the round of planting. Having said that, the downside of this particular method (based on the visual aspect alone) had its limitations—this was biotechnology in use. This, however, changed when a trio of geneticists—George Shull, Edward East, and East's student Donald Jones, independently began working on corn genetics. Selective breeding by

planting the previous year's best corn, for example, was flawed. Instead, Shull, Edward, East, and East's student not only showed that although hybridization (the cross-breeding of corn offspring) was a more effective guarantee of the next crop quality but also noted that the crop often surpassed the original corn plants. Unfortunately, however, celebrations were short-lived as further experiments exhibited a certain amount of deterioration of superiority in the hybrid's subsequent first-generation examples. Consequently, it was found that in assurance of continuous increasing and better yielding harvests, it seemed one solution was to revert back to the original lineage—the unique parental combination. This notion meant that if farmers were to continue down the hybridization of crops, they would now be tied to seed companies for their higher yielding quality product on an annual basis. However, this new reliance on seed companies was weighed against the potential benefits farmers climbed on board.

2.4 Governance and early food production

Before the "Great" or First World War, Britain's existing food chain (see Food Chain, Chapter 9, Section 9.2) was largely stable. Indeed, it was not uncommon for Britain to routinely be fairly self-sufficient growing about 20% of the required wheat and about 50% of required beef, mutton, and bacon, etc. However, Britain still needed to import foods to the tune of approximately 13 million tons annually. For this bounty, Britain relied heavily on the United States and Canadian markets for what amounted to close to 65%–70% of total nutritional requirements (Pollen, 1917; Pinchot, 1918). Such a situation, however, led Britain (up to half-way through the Great War) to adopt a "let it be" policy. This lackadaisical attitude toward policies concerning nutritional issues was counterproductive at best and foolish beyond that. Granted though, Britain was not suffering to the same extent of food shortages as Europe was at this time—but Europe at this time did not readily benefit a great deal from the same "special" relationship with America and others that Britain shared (Starling, 1919a; Dewey, 1989). Then, around the middle- to late 1916, a general, less than stellar, crop yield in Britain and a progressively successful U-boat campaign by the Germans topped off with reducing allied harvests, so even Britain had to eventually adapt and change. In fact, by this time food shortages had already begun to disrupt Britain's everyday routine, which was further made difficult by profiteers and hoarding food.

Then came the First World War, and British and American governments were, by this time (end of the 19th century), involved in the regulatory policies concerning nutrition and health requirements. However, since the beginning of the century, such policies reflected a light hand, with no real teeth to them. Up to now, it appeared that required food supply was left largely to existing trade routes satisfying supply and demand with limited input from regulatory policies. In fact, things only really changed with the actual onset of the Great War (Beardsworth and Keil, 1997).

Furthermore, up to now, focus was on quantity of food rather than the quality of the diet itself (Beardsworth and Keil, 1997). Moreover, Starling (a well-known physiologist of his time) noted in 1919 that to leave the nations nourishment to market forces (especially during war periods) was simply too much of a gamble (Starling, 1919a). Indeed, it was during this

period that governments came to realize the immense complications of adequately feeding nations while ensuring sufficient quality. Starling's rationale was predicated or based on the notion that while many of history's previous skirmishes/wars or the like usually seemed only to affect small regional areas and populations, however, despite the size of the skirmishes, there was always seemed to be continuous lingering issues of hunger and disease. Not surprisingly, Starling also inferred that by ramping up these small wars as was the likes of World War One, when once every suitable man was enlisted so the major proportion of the remaining population were fully immersed in industries supporting the war effort, governments quickly realized the hugely damaging possibilities of doing nothing, especially in the area of food production and supply, etc. (Starling, 1919a).

Consequently, the arrival of agricultural specialization together with the commencement of the First World War provided both problems and opportunities in the areas of food production, supply, security, and incomes. One foreseeable problem though and one which was largely ignored was that as able-bodied farmers were diverted to war duties, farm equipment and soil suffered. That is to say that the remaining agricultural equipment was left improperly or at worst badly maintained while fertilizers became scarce due to lower levels of production. In continental Europe, fertilizer production was especially low (up to between 60% and 70%) reduction in some areas (Pollen, 1917; Pinchot, 1918; Dewey, 1989).

During this period, across the pond in America, however, the American agricultural sector prospered and again found itself in the position of global purveyors of food, especially for the nations at war (Encyclopedia, 2006). Momentum for America's success in this area came from interventionism in the free market; free trade was effectively suspended as the government bought up majority of agricultural grain futures, effectively gaining control over the whole sector. This allowed for a fixed supply of grain at steady prices (Santos, 2006). This was great news for the allied forces.

2.4.1 Interventionism: rationing

Back in Britain in 1914, the Defense of the Realm Act (DORA) passed into law. Originally put in place as a way of reducing the worst excesses logistical security, however, it was an act that saw the government effectively taking control of key industry logistics, particularly in the supply of goods and materials. DORA also came to play a significant role in the area of food supply. This fit snugly with the then Prime Minister Herbert Asquith and the coalition government of 1915, which also favored more proactive interventionist food policies. In the coalitions view, more land was to be reserved for cultivation and putting in price supports as extra incentives. However, it became clear that DORA was failing. However, according to Dewey, these and other measures were not fully implemented until the appointment of the new Prime Minister Lloyd George in 1916. It was then that the full measures of interventionism with a slew of policies to kick-start or stimulate existing production, through mechanisms like guaranteeing prices and, if needed, compulsory powers to enforce cultivation, came into full force (Clynes, 1920; Dewey, 1989). Indeed, in response to the failing DORA, the Government in 1917 formed the Food Ministry (Clynes, 1920) with the laudable goal of not only regulating the production of the local food supply but also consumption. In the United States, similar controls were implemented under the Lever

Food Control Act of 1917, whereby the Department of Agriculture retained control of all on-farm activities while market organization and pricing became the preserve of the Food Administration (Clayton and Black, 1943). Britain and America were not alone in this predicament either, as many other countries in the continents of Europe and Africa were also being hard hit in this new war of attrition (Lysaght et al., 1917; Starling, 1919a; Cary, 1920; Bennett, 1949). Indeed, many other countries, including Germany itself, suffered widespread disease and famine. Whether people died from policy failure, disease, war, or famine itself is difficult to determine as many people died from opportunistic diseases such as tuberculosis, rickets, influenza, dysentery, scurvy, keratomalacia, and hunger. Indeed, there were even reports of exhumed bodies being cannibalized (Lysaght et al., 1917; Starling, 1919a; Cary, 1920; Bennett, 1949). Directly as a result of such experiences, it has been observed that, particularly during wartime, food and agriculture has come to be seen as an industry of strategic economic and social importance (Tanner, 2004).

Even so, knowing this, Britain and other countries were still slow in taking the initiative. Primarily, the UK government organized the Royal Sugar Commission in August 1914, and this was followed in October 1916 by the Royal Commission on Wheat Supplies and in December 1916 by the Ministry of Food (Table 2.3). Nonetheless, it was not until the appointment of Lord Rhondda in 1917 as Food Controller did scientific principles of food and nutrition take their proper place in the determination of policy. Yet, in spite of all this interventionist effort, it was still not enough, and eventually it became necessary, toward the end of the war, to, at first, introduce a voluntary rationing scheme, but which was then later made compulsory in January 1918 (Starling, 1919a,b; Howard, 2002; National Archives, 2011). The United States also could not avoid a similar fate, especially after feeding their servicemen and honoring their export commitment to the allied forces. As a result, even Americans were eventually advised of the timely need of maintaining balance and moderation in their diets (Armour, 1917; Lusk, 1918).

In fact, it can be seen from Table 2.3 this was a busy period full of advancement in many areas especially in the political and scientific arenas.

2.5 Nutrition grows up

Around this time, vitamin and other nutrient research allowed researchers to state that a person's health itself was related to the food one ate. This was supported by the fact that science was tentatively showing that child development was distinctively correlated child's consumption of food. In 1921, building on this, a report originating from the Minister of Health in Britain drew attention to a notion of a balanced diet, i.e., in addition to the main sources of energy, an assortment of vitamins and minerals was also required for the continuing health of the population. It was also noted that fruit, vegetables, and milk were especially rich in nutrients and the recommendation was that they should be made more accessible to the population. It was reports like these in both England and the United States that safeguarded the continuance of good practices such as national milk distribution programs and school feeding and other such programs up to the 1930s. Many such programs' impetus came from active organisations like the Children's Minimum Council

TABLE 2.3 Key dates of the period: early 20th century.

Key dates of the period	
1905 Education Act (The Provision of Meals)	The UK Education Act (otherwise known as the "Provision of Meals act") was the culmination of the work of 365 private, charitable organizations that came together in an effort to improve child nutrition.
1908 International Institute of Agriculture **(IIA)**	David Lubin's (an agricultural reformer) political efforts led to the inception of the "International Institute of Agriculture" (IIA). Its role was to enrich the settings of rural life while also acting as a world clearing-house on information for crops, prices, and cross-border trade.
1909 The Haber–Bosch Process	Developed and first utilized industrially in 1913 the Fritz Haber and Carl Bosch[1] process of making fertilizer took synthesized ammonia, which was directly made from hydrogen gas and atmospheric nitrogen. As said, originally intended to be employed in the manufacture of fertilizer[2]. It was later adapted by the German government into a process of bomb making during WW1.
1914 The UK Defense of the Realm Act (DORA)	The Defense of the Realm Act or DORA as it was known was introduced in 1914. Its mission was to disseminate information on everything people were not allowed to do in times of war—firstly in terms of security and secondly to prevent food shortages. As WW1 progressed, DORA was seen to be failing. With a healthy black market and panic buying together distorted the equitable distribution of food. Consequently, DORA was modified. In a bold move the government took over several million acres of farm land to provide food for the nation. Like others, this initiative also failed and in a desperate measure introduced rationing through the Ministry of Food in 1918 and as a result, no one starved.
1914 Royal Society's War Committee	Formed in 1914 to forge a plan to blockade Germany's food provisions the Royal Society's Physiological War Committee was born. Slightly later, in 1916, a sub-committee, the "Food (War) Committee" was introduced in an effort to advise the government on matters of food and nutrition.
1916 Ministry of Food	Founded by a Royal Charter in 1793 as the "Board or Society for the Encouragement of Agriculture and Internal Improvement" lasted until it was finally dissolved in 1822. Whereupon in 1889, the Board of Agriculture Act led to the creation of the Board of Agriculture (later the Ministry of Agriculture, Fisheries and Food (MAFF)). However, by 1916, this too was further superseded by the Ministry of Food whose main aim was to regulate the consumption and supply of food while also to encourage the overall production of food (Starling, 1919a,b).
1916 US Federal Farm Loan Act	The Federal Farm Loan System was the USA's first massive intervention policy in the United States Agriculture industry.
1917 The Lever Food Act	Founded in 1793 by Royal Charter the "Board or Society for the Encouragement of Agriculture and Internal Improvement" (the Board of Agriculture Act) lasted until it 1822 whereupon it was finally dissolved. By 1889, the same Act led to the creation of the Board of Agriculture, (later the Ministry of Agriculture, Fisheries and Food (MAFF)). However, by 1916, this too was further superseded by the Ministry of Food whose main aim was to regulate the consumption and supply of food while also encouraging the overall production of food.

(*Continued*)

TABLE 2.3 Key dates of the period: early 20th century.—cont'd

Key dates of the period	
1917 Inter-allied Scientific Food Commission	The members of Inter-allied Scientific Food Commission from Great Britain, United States, Italy, and France were given the task to examine the scientific aspect of the inter-allied food problem and to recommend any suitable measures that might improve the dire situation (Starling, 1919a).
1917 Biotechnology	Even though biotechnology was already established as a discipline, the term was finally coined by a Hungarian agricultural engineer named Károly (Karl) Ereky in 1917. The word was found in two publications: "Food production and agriculture" and "large-scale development of pig fattening" (Rao, 2008; Fári and Kralovánszky, 2006).

[1]*Haber–Bosch process was also the work of great insight. Playing with the method of mixing nitrogen from the atmosphere with hydrogen and enormous amounts of heat, the mixture was then burned leaving behind a nitrogen–hydrogen mixture. Furthermore, this was then compressed and heated to between 200 and 700°C in the presence of a catalyst (metal oxide) with the end result being ammonia for further use in making fertilizers.*

[2]*Fertilizers—plants rely on certain nutrients for healthy development; these include but are not limited to nitrogen, phosphates, and other minute amounts of trace elements. Furthermore, plants can only uptake nitrogen in its nitrate form. This means that nitrogen in the atmosphere is not an option for plants. Instead, plants utilize microorganisms which convert atmospheric nitrogen into nitrate (that plants can use) within the soil. Therefore, soil pH (acidity or alkalinity) must be carefully monitored and adjusted to ensure the optimal growing conditions for each particular crop. Fertilizers then are very useful as they contain the right nutrients in the right quantities for the budding plant. This is why one of the major developments of the Green Revolution was the use of chemical fertilizers, not only to adjust soil pH balances but also to achieve the right levels of all the important trace elements and compounds such as nitrates and phosphates.*

Compiled from Baldwin (1907); Kates (1912); Starling (1919a,b); Gunderson (2003); Moore (2008); Smith (2009).

(later the Children's Nutrition Council) and the Committee Against Malnutrition whose collective aims were to improve the nation's overall nutrition, particularly so when it came to children (BMJ, 1938; Lloyd and Shore, 1938; BMJ, 1954; Acheson, 1986).

Further research in this area continued to give scientists more insight into the various nutrients and their respective roles within the diet. As understanding grew, the methodologies of data gathering also improved. For example, evidence for "requirement" needs was modified from predominantly observational research of so-called healthy people to tentative studies whereby nutrient intakes were varied to determine minimum needs (Beaton, 1992). It was this period that the United Kingdom really shone, stood out, and was at the forefront of global nutritional understanding. In fact, Britain, at this time, was definitely at the forefront of a global, ad hoc nutritional movement (Ruxin, 1996).

2.5.1 Metabolic studies

Aligned with nutrition, studies on BMR (basal metabolic rates), i.e., is the rate at which the body absorbs and utilizes the various energy giving nutrients while at rest to keep vital functions working, for instance, breathing and keeping warm. While calorimetry thus far had been the method of choice for researchers to date, two men in particular, Arthur Harris and Francis Benedict together with the Carnegie Institute (CI), were to change all this. Joining forces with the Carnegie Institute of Washington to work together on the analyses of particular biometric measurements to do with BMR, Harris, Benedict, and the CI established a predictive formula for BMR rates without the need for calorimetry. Their subsequent paper published in 1918 still stands up today, after 100 years, and is still employed in some areas around the world even now. Harris and Benedict's extensive statistical

analysis of the data for over 100 men and women each, together with 94 newborn babies, was such that they firmly establish a link between the surface area of the whole body, a person's height, and also their weight. The formula, using multiple regression equations, presented BMR values equal to (Equation 2.1):

Equation 2.1 Predictive BMR formula

$$\text{For men, BMR} = 66.4730 + 13.7516\,w + 5.0033\,s - 6.7550\,a$$

$$\text{For women, BMR} = 655.0955 + 9.5634\,w + 1.8496\,s - 4.6756\,a$$

where BMR = total heat production per 24 h, w = weight in kilograms, s = stature in centimeters, and a = age in years (Harris and Benedict, 1918).

Source : Harris, Benedict and the CI.

This research was groundbreaking, and shortly afterward among ongoing concerns over the malnourishment of the people, the Royal Society (of Britain) founded the Physiological War Committee whose main goal was to counsel the then government on questions of nutrition (Table 2.3) (Royal Society, 1917). After much advice, the president of the Board of Trade asked the Royal Society to draw up recommendations for Minimum Dietary Requirements (MDR). As a result, in 1916, a subcommittee of the Royal Society's War Committee—The Food Committee—was inaugurated (Starling, 1919a,b; Beardsworth and Keil, 1997; Moore, 2008). And following advice and research of its own, the committee determined that

> … [We] are convinced that the dietary requirements of a nation engaged on active work cannot 'be satisfactorily met on a less supply … than 100 grams protein, 100 grams fat, 500 grams carbohydrate, equal approximately to 3,400 calories per "man" per day. ***Royal Society (1917)***, ***{Table 2.4}***.

However, and once again for an average woman doing an average days' work, less calories were recommended as the Society allotted a total of 2400 calories for women (Starling, 1919a,b).

From this point on, in Britain at least, the impetus for national dietary standards was formed, humanitarianism notwithstanding (Beaton, 1992). Nutritional standards gained further inertia when it was decided in 1917 that all allied nations would pool their nutritional supplies to achieve a comprehensive unity of nutritional supplies (Starling, 1919a,b). Indeed, to this end, an inter-allied conference at Versailles in November 1917 created the Scientific

TABLE 2.4 The Royal Society's daily recommended food provision.

Date/ Authority	Load (default man)	Protein (g)	Fat	Carbohydrate	Calories
1917/18 Royal Society of London The Royal Society noted that approximately 3–3400 calories per man based on modified Atwater's figures were sufficient to maintain energy equilibrium on a daily basis					
		100	100	500	3000–3400

Compiled from Royal Society (1917); Starling (1919a,b); DuBois (1940).

Food Commission, in which their task was to study, among other things, the nutritional requirements of allied country's with the objective of planning and controlling food shipments from North America to Europe (Starling, 1919a,b; Beaton, 1992; Iacobbo, 2004; Gibson, 2016). From this point, in Paris 1918, the Inter-Allied Scientific Food Commission gathered to further the abovementioned objectives. In doing so, the committee drew largely on previous work of the Royal Society and implemented many of their food requirement recommendations. However, it was not an easy task at all. The first challenge the committee foresaw was just how to gauge the nutritional needs of apparent heterogeneous populations, especially where energy needs varied greatly inter alia, age, gender, occupation, and size. Aided by the US representatives of the Commission, Chittenden and Lusk (G.R.C. 1944), the answer was to tackle the problem from two perspectives—firstly by employing an average person's BMR as a baseline and then adding further requirements based on the type of work that was to be undertaken. The commission calculated an average person's baseline BMR requirement to be in the region of 1687 calories per day. Then considering an average days' work for the average male and the requirements amounted to just over 3000–3136.8 calories to be precise. However, an important caveat here is that this final calculation did not factor in the variable occupations of people. The following Table 2.5 is from the commission's recommendations.

At about this time, two fledgling movements, the bio-dynamic and organic movements, owed their existence to the popular ideas of Rudolf Steiner.

TABLE 2.5 Daily calorie requirements as proposed by the Inter-Allied Scientific Food Commissions.

Group and work levels	Calories	
	Gross intake (allowing for waste)	Net
Male		
- Sedentary	2750	2500
- Heavy	3500–5500	3200–5000
- Soldier		3700–3800
Average male	3300–3400	3000
Female		
- Laundress		3291
- Typewriter	2100	1900
Average female	2650	2400
Children		
0–6	1650	1500
6–10	2100	2310
10–13	2500	2750
14 and above	As average adults	

Source: Adapted from Starling's 'The Feeding of Nations' (London, Longmans, Green & Co., 1919).

2.6 Bio-dynamics and organic farming

(See also Organic Farming, Chapter 8)

As an aside, for as long as early civilized man ceased hunting and gathering and began cultivating his own food, organic agriculture was the norm. This lasted millennia but then was abruptly altered from about 1845 onward. This was because of the agricultural and chemical revolutions, fronted by Liebig and others. The revolutions advocated a whole new industrial approach to the agri-business industry. In fact, a few of the more prevailing approaches advocated the intensification, the industrialization of agricultural output on an unprecedented scale. Not surprisingly, the new approach relied heavily on the use of mechanization of difficult or routine tasks, also with the increased usage of synthetic or chemical pesticides, herbicides, and fertilizers. However, regarding the use of industrial pesticides, fertilizers and the like had its downsides. This led some in the 1920s, particularly the European farmers, to begin to turn away from such products, disillusioned with what they viewed as reduced seed vitality of crops and a general decline in animal health; there was also the issues of pests as well as, to some, a general loss of flavor.

Addressing the problem, a group of land owners sought council from Dr. Rudolf Steiner, an Austrian responsible for the Steiner schools' movement. Steiner immediately embraced the challenge and a short time later, he delivered a series of eight lectures in which the fundamentals of a new agricultural method called "*bio-dynamics*" was put forth as one of the several solutions. Steiner's unique point of view embraced a holistic spiritual, almost ethereal approach to agriculture fully embraced in the natural cycle of life. Thus, in Steiner's view, by treating the Earth as a single organism, the regeneration of life through agriculture was a simple process of aligning the multifarious components of increasing industrialization/chemical usage congruently with the elements of nature. Perhaps a more telling proposition was delivered in his fifth speech in which he suggests

> Spiritual Science always tries to look into the effects of living things on a large scale … the wide circumference of Nature's workings — that is the talk of Spiritual Science. But we must first know how to penetrate into these wider workings of Nature. ***Steiner (1958)***.

Thus, as can be seen, even from the birth of Steiner's biodynamic viewpoint, he, at once, advocated an holistic practice of both agricultural needs and an understanding of the complexities of the interrelated relationships at work in nature (Steiner, 1958; Bradshaw, 2003).

In the field of politics though, especially around the time of the First World War, things were rather bumpy.

2.7 Socio-political tectonics

Following the aftermath of the First World War, socio-political and economic environments had to change and adapt. This resulted in the changing of long-established monarchies, feudalism, and other outdated forms of governance, especially within Europe. This left a vacuum which was quickly replaced with a gamut of emergent communist, fascist as well as democratic, autocratic and other successor states. Political borders were also

being negotiated and redrawn resulting in a number of smaller states, especially as a result of the newly dispersed German, Austro-Hungarian, and Ottoman empires. In Russia too, under the pressure of widespread economic disruption throughout the country because of the war effort, it too saw its own revolutions in the 1917 Russian and subsequent Bolshevik uprisings.

An aside to all this, one direct consequence of the cost of war, particularly in Europe (which devastated many country's internal infrastructures), an economic weaker Europe emerged. While in America, economic opportunities to help rebuild and renegotiate the terms of trade with European authorities led the way for the United States to emerge as the economic superpower of the day. Also, in the area of politics and governance of food, the cessation of World War One hostilities proved to be a busy time in the new emerging "food for all" notion. With the advent of WW1, food, unwittingly took on greater importance due to shortages in many areas. In this sense the war almost became a war of attrition. Consequently, in the end, it was quickly noted that post-war reconstruction of local economies and general infrastructure was not the only challenge ahead for many developed countries. Rather, existing and exacerbated economic and social issues (including food) had to be tackled on an unparalleled worldwide platform. It was about this time too that another area—the pressure of population control—also resurfaced and began receiving more and more interest. After fading attention in the optimum carrying capacity of populations possibly due to the preoccupation of war, the end of hostilities together with predictions of ongoing food deficiencies, outside of the United States, awoke public debate regarding carrying capacity of earths inhabitants and the food supply (Ostrolenk, 1930; Mukerjee, 1933; Wolfe, 1934; Gibson, 2016).

Out of the ashes of post–World War 1 it was recognized that there was a great need in the affairs of the world as a whole. This took the form of global governance, and the outcome was the creation of a new, far-reaching organization or institution called the League of Nations. This new body aimed solely at equipping and encouraging international collaboration on the many political and social fronts that WW1 had raised.

2.7.1 The League of Nations

This was not a new concept either. For several years before the end of the war, discussions among the allied parties came to the conclusion that an international organization was needed to help maintain global peace and security (Hitchcock, 1919; League of Nations, 1919; Northedge, 1986). As mentioned, over the previous few years, while an institutional framework had been loosely modeled, it was only properly fleshed out under the "Treaty of Versailles" (the official document marking the end of the "Great" war). The main aim was an institutional body that could help maintain global peace and security. Thus, created during the 1919 Paris Peace Conference the new body was officially named the League of Nations. To date, the League of Nations was the most ambitious attempt at global governance concerning matters of peace and security. However, despite this mini victory of international standing, one major economic and political power, the United States failed to sign the accord. The Americans it seemed, were nervous of what was seen as the creation of a global political power that could effectively restrict America's freedom of action. More importantly, it was felt that the United States would very well be subject to control of what was potentially seen as a super-state or supra-national authority. On top of this, it was also considered that the United States might be forced or coerced into fighting wars not of their choosing

and on sides not of their control (White, 1919). However, despite America's lack of involvement, the League of Nations operated surprisingly well. In conjunction with the creation of the "League," several other institutions were also created; these included the International Labor Organization; the Permanent Court of International Justice; and the Health Organization.

Through the mandated Covenant of the League of Nations (the Leagues Operational Charter) two overriding goals were paramount. The first was to encourage international cooperation within economic and social fields. And the second, was the creation of a multilateral instrument whereby world nations could seek refuge from cross-border political disagreements or tensions through discourse without recourse to conflict—effectively, a place to secure or preserve peace through dialogue, arbitration, and conciliation (Hitchcock, 1919; League of Nations, 1919; Kohn, 1924; Pipkin, 1933). It was not just about political issues either. Indeed, while just a fledgling body, the League was the first major international organization whereby issues of international economic and social standing could be addressed; it was in these areas that the League really left its lasting legacy. In fact, one of its founding principles, that of "multilateral dialogue" served as a blueprint for its later, successor organization, the United Nations (discussed later).

In the meantime, the league was busy paving the way for many new initiatives, especially in the area of economic and social issues. One such social milestone was initiated by the renown British social reformer Eglantyne Jebb, who, after the creation of the "Save the Children's fund" in 1919, turned to another matter close to her heart - the notion of children's rights. Indeed, in 1923, in an effort to pursue her goals, Eglantyne headed all the way to Geneva, to the International Union. Equipped with a modest but well-defined ideologue attesting to the inherent rights of children Eglantyne witnessed the fruition of her dream, the "Declaration of the Rights of the Child," or the Declaration of Geneva as it became known. The accord was well received and even taken up a year later by the League of Nations itself under the banner of the "World Child Welfare Charter" (UNICEF, 2009). Groundbreaking by standards of the day, the Charter effectively meant that children were agreed to have rights to such things as food, shelter, and health care, protected from exploitation among others to generally ensure a fully rounded package of welfare.

Meanwhile, Western agricultural policies of initial optimism resulting from the allied victory as well as increasing highly integrated and industrialization of agriculture became somewhat subdued as surpluses and then depression swept in.

2.7.2 Surpluses and depression

As a direct consequence of the First World War effort and concomitant increasing demand for agricultural produce as well as into the post-war reconstruction period, rising demand seemed to buoy the agricultural industry. Indeed, numerous Western government policies from price support, interventionism, and protectionism simultaneously increased output while controlling overall costs for the better. However, so good was the bounty that in America profiteering, despite legislation ensuring middle men sold goods at cost plus, a small token of profit for themselves was insufficient to keep the more unscrupulous of merchants under control. This created universal complaint and much ill feeling from the American consumer (Crutchfield, 1919), in spite of numerous antiregulation sentiments from the masses. However, one commentator of the time, Crutchfield, was in favor of a

post-war reconstruction world where the role of American industry, especially agriculture, maintained the duality of regulated pricing and controlled demand. This, Crutchfield cites, would help stabilize prices and supply at a time when the:

> …the whole world is looking to the American market for an undue share of our supplies… *Crutchfield (1919)*.

Nonetheless, whether primarily through the "inelasticity" of the agricultural sector or whether through Western policies, growth in agricultural output at the back end of the war and into the next few years increased markedly (Holmes, 1924; Ostrolenk, 1930; Michie and Smith, 2000). Elsewhere though, especially in Eastern Europe and much of the rest of the developing world, it could not be further polarized—poverty and depression continued as agricultural deficits became commonplace. Yet it was not all doom and gloom as the West still provided for many of the undernourished, equating to millions of tons of food aid being shipped to Eastern Europe and other needy countries on a regular basis (Shaw, 2007). This was during 1919–26 AD. This was generally greeted as mixed news, principally for the American agricultural industries, as the continued gains and resultant yield increases from the industrialization of agriculture meant there was plenty to sell. However, a tipping point was reached, which ultimately led to the "West's" first real glut of agricultural surpluses (Ostrolenk, 1930). At the time this glut was seen both as a hindrance and an opportunity. A hindrance as it meant a reduction of farm incomes and an opportunity for producers with the potential of increasing entries into major new export markets (Mayne, 1947). Inevitably perhaps, with the richer getting richer and the poorer getting poorer, the result was the increasing emergence of economic disparity between developed and the underdeveloped nations while an ever-widening trade gap grew (Durand, 1922; Taylor, 1926).

More seriously, lurking around the corner in Russia was full-scale famine. This arose several years after the uprising of 1917 and the succeeding civil war in which wheat and other food crops were decimated. The situation was exacerbated with the onset of drought, in which wholesale crop failure combined to cause widespread hunger and death. Further adding to the death toll was the fact that Lenin refused to acknowledge the famine and as a result no aid was sent. Resulting from the confluence of events it has been estimated that upward or 4 million people died of famine during this particular period (Chamberlin, 1934; Gantt, 1936; Bennett, 1949). Luckily, it did not last long as a quick recovery took place over the next few years before fully recovering to pre-war levels by about 1927/28. However, it seems that few lessons were learned through all of this as over the next few years famine once again reared its head.

This was also a period of innovation when it came to the governance of food and food-related issues including forward-looking health, political, and scientific issues of the day as can be seen in Table 2.6.

2.7.3 The Great Depression

As mentioned above, harking back to the period shortly after the end of the Great War, the 1920s witnessed a steady global recovery in trade in nearly all but the agricultural sectors of

TABLE 2.6 Key dates of the period: 1918 to 30.

Key dates of the period	
1918/19 Influenza Epidemic	During the period between 1918 and 1919, the influenza pandemic spread like wildfire and killed in the region of 20–40 million people worldwide.
1919 The International Labor Organization **(ILO)**	By 1919, the League of Nations established an agency for matters concerning the reconstruction and the protection of labor unions. The ILO ran for a while; however, after the demise of the League, the ILO became a specialized agency under the umbrella of the UN in 1946 (ILO, 2010).
1919 The International Federation of Red Cross and Red Crescent Societies **(IFRC)**	During this time, the Red Cross widened its international activities to include support to emergencies that fell outside of war (IFRC, 2009).
1919 Save the Children	The Save the Children foundation was created to combat intense civilian suffering caused by the continued a blockade against Germany and Austrian-Hungary (Save the Children, 2009).
1919 League of Nations (**LoN**)	Creation of the first international multilateral organization with the mandate for peace and cooperation (League of Nations, 1919).
1920 Save the Children International Union (**SCIU**) (L'Union Internationale de Secours aux Enfants)	In 1920, Eglantyne Jebb and sister Dorothy Buxton founded the "Save the Children" campaign in the United Kingdom (UNICEF, 2005).
1924 World Child Welfare Charter	In 1924, the League of Nations adopted the "Save the Children" (SCIU's) values of the declaration of the rights of the child (UNICEF, 2005).
1927 The (**LoN**) International Economic Conference (Geneva)	In 1927, the League of Nations Assembly's held its first International Economic Conference. It had two main objectives, which were to strengthen international trade laws (arresting widespread adoption of tariff increases) and in the second, to address certain commercial, industrial, and agricultural challenges (UNOG, 2010).
1929 US Agricultural Marketing Act	In 1929, the US Agricultural Marketing Act created a new body, the Federal Farm Board US, which in an attempt to stabilize the agricultural market was allowed to directly intervene to influence price stabilization, crop surpluses, and export prices (Markham, 2002).
1929 The International Association of Agricultural Economists (**IAAE**)	Established in 1929 by 11 countries, the International Association of Agricultural Economists was created to regularly host conferences to share knowledge and to address challenges throughout the world (IAAE, 2008).
1929 British Colonial Development Act	The British Colonial Development Act aimed to provide agricultural and economic development in their many colonies with a view to stimulate both domestic investments while also advancing Britain's own commerce and trade (Garside, 2002).
1930 Wheat Meetings	Between 1930 and 31, there were 16 international meetings held for international wheat importers and exporters to foster agreement of agricultural products; however, while no agreement was reached, the meetings did eventually lead to the first wheat conference in 1931 (IAAE, 2008; IGC, 2009a).

(*Continued*)

TABLE 2.6 Key dates of the period: 1918 to 30.—cont'd

Key dates of the period	
1930–34 US Grain Stabilization Corporation (**GSC**)	The United States Federal Farm Board's (FFB) set up the Grain Stabilization Corporation to buy up grain and other commodities to stabilize prices of key crops (Markham, 2002).
1930 US Agriculture Marketing Act established the Foreign Agricultural Service Division (**FASD**)	The US FASD was created to help maintain and expand international export opportunities. However, the FASD was eventually superseded by the Foreign Agricultural Service in 1953 (National Archives 1995; Otto, 1999; Swanson, 2003).

Source: Compiled from multiple sources League of Nations (1919); National Archives (1995); Otto (1999); Garside (2002); Markham (2002); Swanson (2003); UNICEF (2005); IAAE (2008); IFRC (2009); IGC (2009a); ILO (2010); UNOG (2010).

industry (Kindleberger, 1986; Michie and Smith, 2000). However, in economic terms, from about the mid 1920s till the end of the decade (1929) the steady recovery became a boom. However, this was short-lived and, due either in part, to the reparations and war debts (Keynesian), or to the poor adherence to the international Gold Standard (Monetarism) (depending on which one you side with) the world fell into what became known as the "Great Depression" (Kindleberger, 1986). This accentuated the already problematic global economic trade markets and furthermore, the Great Depression also had the effect of further depressing agricultural markets by additionally contributing to widespread unemployment (Ostrolenk, 1930). Not surprising, from increasing global governmental interventionist policies, one had to find a way of tackling an overheated economic market further exacerbated by overproduction in the agricultural sectors. In the United States, one attempt to pass a bill (the McNary-Haugen Bill) which would see excess agricultural products off-loaded in foreign countries, while concurrently raising prices in the domestic market failed. Failing this, in 1929 the US government then introduced the Federal Farm Board (FFB). The FFB while claiming some victory over agricultural excesses, ultimately it too, failed in its remit to address the virtually annual problem of "over productivity." Following on from this, the AAA or Agricultural Adjustment Act was passed in 1933 with the ambitious aim of reducing cultivatable acreage while compensating farmers for nonproduction/trade. Another method also used by the AAA was the environmental-based policy that united reduction in commodities while encouraging environmental protectionism via payments to farmers for shifting soil-depleting crops like wheat and corn etc. to soil-conserving plants such as legumes and grasses (Hardin, 1943).

2.8 Continued hybridization

Following on from previous agricultural attempts at increasing yields and thus raising productivity per hectare so, the big breakthrough came with the first commercially available hybrid corn. Progression in this field can best be shared by two people, George S. Carter (1921) and Henry Wallace (1923). Commonly quoted as the first person attributed with

such advances was Henry Wallace who in 1913 became interested in the methods that Shull and East had pioneered. Eventually, through the help from the American government. Wallace established one of the first commercial hybrid corns in 1923 (Berlan and Lewontin, 1986). Carter in 1921 meanwhile, also building on the work of Shull, East and others, created the first double-crossed method of hybridization (Cook, 1937). Consequently, by 1923 this new method of breeding, whether cross-breeding or hybridization became profitable for both farmers and industry too (Morrison, 1947; Sprague, 1962; Smith et al., 2004). Furthermore, by the mid 1920s, simultaneous trials on wheat also permitted commercially available hybrids (APS, 2010). The acceptance of these new hybrids, especially in America by the 1930s, was immediate and production expanded to such a degree that grain yields increased significantly, further adding to problem of overproduction mentioned in previous sections.

Meanwhile, in the arena of health, this period carried mixed blessings.

2.9 The health organization of the League of Nations

Following the near end of the Great War (1918/19), influenza cut a swathe of devastation across the world by killing between an estimated 15 and 20 million people. In addition to this, approximately 2 million cases of typhus placed extraordinary burden on the Office International d'Hygiène Publique (OIHP). Separately, in early 1920, a proposal by the League of Nations (LoN) for a permanent international health organization called the "Health Organization of the League of Nations" (HOLN) was accepted. Not long afterward, another proposal saw the LoN proposing to combine the duties of both the League's Health Organization with those of the OIHP, in doing so creating a single international health organization. However, the reality was problematic in that, while the United States was a member of the OIHP and not the League, the proposal meant that any collaboration or joining of forces required that the United States become a member of the League. Sadly, the United States made it clear that this was counter to US interests and so for this and other reasons talks broke down leaving in its wake two separate international health organizations (WHO, 2010). As it turned out, the OIHP's main sphere of activity continued to be focused on the supervision and development of international quarantine measures, while the HOLN among other things continued to collect, collate, and disseminate information on the status of epidemiological diseases of importance. Initially, the HOLN almost exclusively dealt with health issues in the United States and Europe, its remit eventually expanded to encompass surveys taking on board global nutritional standards. Progress was slow, however, causing one commentator Ruxin (1996) to comment:

> …prevalence of nutritional disorders in the developing world principally remained a scientific point of ignorance. ***Ruxin (1996)***.

This situation quickly righted itself as the HOLN went on to collaborate with many of the top nutritionists of the time, shaping both understanding and eventually policy. However, before the HOLN moved into full gear, independent studies and events were moving along at a fast pace advancing nutritional understanding.

2.9.1 Dietary energy research

During this period (into the 1920s), the debate as to nutritional requirements continued with Britain and America at the forefront.

2.9.1.1 Britain

While many studies showed disagreement and divergence when it came to nutritional consensus, there was growing convergence in the dietary makeup of a balanced diet. It is worth noting too that contemporary studies still relied on calorimetry in many methodologies, yet one noteworthy exception was Miss E. M. Bedale. Importantly, while many clinical trials vis-à-vis basal metabolic rate (BMR) still used calorimetry as mentioned above, the first real study using BMR to evaluate human energy (macronutrient) requirements was Bedale's. Indeed, in her 1923 publication of school-age children's energy needs, Bedale explored various children and their activities and determined energy expenditure in relation to their calorie intakes for each grouping using BMR. However, while these studies were of great pioneering effort, they were largely ignored by the wider nutritional community, owing it seems to her gender and ergo her credibility (Bedale, 1923; McNaughton and Cahn, 1970; Henry, 2005).

Meanwhile too, Chittenden's previous skeptical views regarding the nutritional communities over reliance on general nutritional recommendations was much criticized and was not universally accepted (Carpenter et al., 1997). Yet Chittenden's misgivings continued to echo in the early work of Henry Sherman who in 1920 published a sort of metaanalysis of over 100 (109) previous scientists' experiments and found protein recommendations varying a great deal ranging from 21 to 65 g for an average 70 kg man. This equated to an average requirement of 0.635 g of protein per kilogram of body weight equal to 44.4 g per day for an average 70 kg per man appearing to echo Chittenden's views. As such Sherman suggested that:

> Many of the published experiments which were designed to test the amounts of protein required in normal nutrition are now seen to have given misleadingly high results… ***Sherman (1920, p. 98)***.

2.9.1.2 America

During the same period in the United States, the United States Department of Agriculture's (USDA) nutritionist Hazel Stiebling promoted nutritional research. Indeed, regarding her work at the Sherman laboratory, Stiebling proposed the first comprehensive dietary standards taking into account vitamin and mineral needs too (Harper, 1985). Table 2.7 highlights the original values even though she later partnered with Esther Phipard, further increasing recommendations to include both thiamine and riboflavin.

Importantly, this signified an ideological break from previous attempts to promote values that aimed to prevent starvation to one of inclusivity, taking into account overall optimum requirements for health, nutrition, and well-being (see also appendix Table 29.1 & 29.2 Macro- and Micro-Nutrient Guidelines of the EU, USA and WHO for Adult Men and Women - Parts One and Two) (Harper, 1985).

In the field of population pressures, amid global economic depression and agricultural uncertainty, the perennial argument of population growth and even overcrowding as well as the world's natural resources was brought once again brought to the fore (Holmes, 1924; Merritt-Hawkes, 1928).

TABLE 2.7 USDA recommended daily requirements by Hazel Stiebling (1933).

USDA Recommended daily requirements by Hazel Stiebling 1933	Energy	Protein	Calcium g	Phosphorous g	Iron g	Vitamin A units	Vitamin C units
Child under 4	1200	45	1	1	0.006 −0.009	3000	75
Boy 4−6; girl 4−7	1500	55	1	1	0.008 −0.011	3000	80
Boy 7−8; girl 8−10	2100	65	1	1	0.011 −0.015	3500	85
Boy 9−10; girl 11−13	2400	75	1	1.2	0.012 −0.015	3500	90
Moderately active woman or boy over 11−12, girl over 13	2500	75	0.88	1.2	0.013 −0.015	4000	95
Very active woman or boy 13−15	3000	75	0.88	1.32	0.015	4000	100
Active boy 15+	3−4000	75		1.32	0.015	4000	100
Moderately active man	3000	67	0.68	1.32	0.015	4000	100
Very active man	4500	67	0.68	1.32	0.015	4000	100

Source: Recreated from Stiebling's Food Budgets for Nutrition and Production Programs. (US Department of Agriculture, USDA, 1933).

2.10 Population pressure resurfaces: the First World Population Conference

Under the auspices of the League of nations, a population conference was held in Geneva in 1927. Importantly, this was the first real multilateral attempt to collate information and viewpoints with regard to the population problem (Carr-Saunders, 1927). The World Population Conference was also perhaps the first real international forum to consider the question of *optimum* population capacity of food and other resources, among other things (De Gans, 2002). Professor Raymond Pearl from Johns Hopkins University, one of the key scientists at the conference, utilized previous empirical studies of the US population, together with his work with rats, fruit flies, and yeast cells, extrapolated his findings of a potential burgeoning population to the present-day familiar growth curve that resembles a flattened "S" or "logistic growth" curve as it has become known (Pearl, 1927; De Gans, 2002).

Pearl further hypothesized that this growth was primarily due to fertility and mortality and only secondarily from economic and social factors (Pearl, 1927; De Gans, 2002). Pearl's work also signaled a departure from numerous previous trends predicated on historic growth rates. Instead he asserted the notion of future alternative conditional predictions based on combinations of single or multiple alignments of inter alia socioeconomic variables (Pearl, 1927).

Yet despite such innovation, Pearl's work was received as being divisive and polarizing, although many individuals, including the Secretary General of the League of Nations Sir Eric Drummond, considered it a great success (Carr-Saunders, 1927; Merritt-Hawkes, 1928; Connelly, 2006). Indeed, it was also, according to birth control pioneer and sponsor of the conference Margaret Sanger (1927), the first time that sociologists and biologists collaborated on a project with the sole purpose of using scientific analysis of social problems in a search for solutions to economic dilemmas (Sanger, 1927). Yet, despite this renewed drive in population matters, there was still little broad-ranging consensus over limiting factors that might determine population ceilings.

Shortly after in 1930, another high profiler of population pressures Hiller explored several previous studies that collectively cited limited factors of population growth ranging from temperature, light, air, and nutrition to humidity among others (Hiller, 1930). However, Hiller swiftly dismissed such studies as

> …invalidated by methods used in their construction … [that contain] … logical inadequacies. ***Hiller (1930, p. 524)***.

Furthermore, he also fully dismissed the notion of population pressures or predictions as generally untenable suggesting instead that previously used variables such as technological, social and cultural influences that had been used as determinants of population ceilings less than useful as, in his words:

> …any attempt to predict long time population cycles will probably go as far astray as did the forecasts of Malthus. ***Hiller (1930, p. 550)***.

Such concerns caused ripples in the field and were outed by many including Speier and Kähler who countered in their book "The War of Our Time" (1939) when it was noted that:

> …interdependently social and economic conditions influence population development. … A study of the world-wide implications of population trends gives us only further proof that it is necessary to build up an international system of social and economic co-operation if we are to prevent the starvation of millions of human beings… ***Staudinger (1939)***.

2.11 The gold standard

On the economic front, the pre-1930s global trading platform was based on "relative" free trade backed by a hitherto strong gold standard. However, with the advent of competitive currency devaluations by certain nations topped with strategic manipulation of trade policy, the standard finally collapsed. There were some who came to consider this failing of classical economic paradigms, as paving the road for the new "Keynesian" revolution, which focused more on national or domestic fiscal and monetary policies (Goodrich, 1947). Not long after the collapse of the standard, the spectra of surpluses once again raised its head. Attempting to head off the worst of the economic fallout, the United Kingdom alongside the major wheat exporting countries of the time combined forces in an attempt to address the need to control and dispose of the unbelievably voluminous wheat surpluses (double the wheat exports of all

countries in 1938–39). The answer came in the realization of the need to reduce production-altering trade barriers and other production, stock, or quota controls to stabilize supplies and by extension prices (Thompson, 1943).

2.12 Biotechnological advances

The late 20s and early 1930s saw great developmental leaps in the fields of microbiology and fermentation technologies (Zymotechnology). And, while a fuller, more complete understanding of chemical functions of post-war molecular biology was still to come, the early 1930s was nevertheless an exciting time. One such development and perhaps the most important discovery around this time was penicillin, discovered by Alexander Fleming in 1928 (derived from the Penicillium mold); this was undoubtedly a seminal moment in the field of bioscience. Another breakthrough saw the manipulation of certain microorganisms in which they could now be mutated through physical and chemical manipulation to become faster growing and more tolerant of less oxygen. It was this new hybridization that further promoted the development of new technologies, especially in food fermentation—zymotechnology (Shurtleff and Aoyagi, 2007; Gibson, 2016). Such developments led to the subsequent expansion of large-scale fermentation production, principally in the pharmaceutical industry. This propagated a rapid upsurge in interest in life sciences' research, which in turn also saw the eventual generation and the creation of new antibiotics in addition to increasing the range of enzymes and vitamins available (AU/ICE, 1997). Other notable moments in the biotechnology sciences are delineated in the following Table 2.8.

2.13 Green shoots of agricultural evolution

In the field of agriculture, little else has achieved more in the way of increasing crop production than the humble fertilizer. Fertilizers were not new at this time, rather it was the economical industrial synthesis of ammonia (Smil, 2001) that made all the difference.

TABLE 2.8 Key dates: Biotechnology 1919 to 38.

Date	Notable dates in the biotechnology sciences
1921	The first marketable hybrid corn is developed.
1925	Consuming more than 10% of the USDA total budget in 1921, Congress had to cut the decades-old free Seed Distribution Program.
1926	Hermann Muller revealed X-rays encouraged genetic mutations providing researchers a way to induce transformations. Henry Agard Wallace founded a hybrid-corn seed company called "Hi-Bred" known today as Pioneer Hi-Bred International, Inc.
1928	Alexander Fleming discovers Penicillin.
1934	Desmond Bernal illustrated that molecules of protein could be studied using X-ray crystallography. Martin Schlesinger purified bacteriophage and in doing so found equal amounts of DNA and protein.
1938	The term "molecular biology" was first coined.

Source: Compiled from: NHM (1989/90); BioTech Institute (2010).

However, up until about the turn of the century, obtaining commercial fertilizer for agricultural use was not very easy. It was about the same time when global crop yields started to wane and stagnate. Indeed in the United States, crop production, particularly wheat grain, was achieving only about 1.7% increase in 1909 than practically the whole of the previous decade (Webb et al., 2008). Consequently, it was arguable that actual, natural crops physiological limits were being reached.

Accordingly, it was felt, more than understood, that any substantive increase in yields would have to be driven by agricultural technologies—technologies such as fertilizers and the like. Unfortunately, what was holding progress back was "on-the-ground farmers" shortage of nitrogen for fertilizers[1] Indeed, in the first two decades of the 1900s, it was common for farmers in the United States and Europe to lack sufficient credit and purchasing power for the acquisition of nitrates to make these fertilizers. This occurred despite nitrates being one of the top three commodities (by volume), globally shipped. As far as synthesizing artificial nitrogen compounds in the laboratory went, the goal was to make it plentiful and cheaper for the end user. And indeed, a process had previously been developed by two Germans Fritz Haber and Carl Bosch[2] in 1909 that could directly synthesize ammonia from atmospheric nitrogen and hydrogen gas, which could in turn be used in the production of fertilizer. The process was then first used industrially by BASF Limburgerhof agricultural research center in 1913 and then by the government of Germany. Yet during the War, the German government shifted focus and instead of using ammonia for peaceful agricultural purposes they channeled the conversion of ammonia away from fertilizer to the production of high explosives instead. Incidentally, a side note saw both chemists later winning the Nobel Prize for their work in chemistry—Fritz Haber in 1918 and Carl Bosch in 1931. This fixing of nitrogen became known as the Haber–Bosch process and was at first a closely guarded German secret. That was until after the war when a clause of the treaty of Versailles ensured that BASF was obliged to share the knowledge, albeit under license, to a new, purpose-built unit in France. Industrial plants then began to pop up everywhere across the globe taking advantage of this "marvelous" new industrialized technology, which, in turn, opened up plentiful possibilities in the global agricultural sector (Smil, 1999).

Thus, the preindustrialization of fertilizers and their constituent components, which were globally traded among growing financial speculation, crop failures, and trade constraints,

[1]Fertilizers—plants rely on certain nutrients for healthy development; these include but are not limited to nitrogen, phosphates, and other minute amounts of trace elements. Furthermore, plants can only uptake nitrogen in its nitrate form. This means that nitrogen in the atmosphere is not an option for plants. Instead, plants utilize microorganisms which convert atmospheric nitrogen into nitrate (that plants can use) within the soil. Therefore, soil pH (acidity or alkalinity) must be carefully monitored and adjusted to ensure the optimal growing conditions for each particular crop. Fertilizers then are very useful as they contain the right nutrients in the right quantities for the budding plant. This is why one of the major developments of the Green Revolution was the use of chemical fertilizers, not only to adjust soil pH balances but also to achieve the right levels of all the important trace elements and compounds such as nitrates and phosphates.

[2]Haber–Bosch process was also the work of great insight. Playing with the method of mixing nitrogen from the atmosphere with hydrogen and enormous amounts of heat, the mixture was then burned leaving behind a nitrogen–hydrogen mixture. Furthermore, this was then compressed and heated to between 200 and 700°C in the presence of a catalyst (metal oxide) with the end result being ammonia for further use in making fertilizers.

were readily translated into higher food costs and by extension food prices. All this changed with the advent of industrialized fertilizers.

2.14 Health and nutrition studies foster acrimony and collaboration

Back in the field of health and institutional collaboration, it was a mixed bag of pluses and minuses.

2.14.1 Cross-border nutritional collaboration

On a wide-reaching mission, the League of Nations (LoN) and others looked closely at the health and well-being of children first before concentrating on the wider populace. Indeed, in the writings of Périssé (1981), the international community shocked by the overwhelming impact the Great Depression had on people's overall health and living conditions, people and institutions began to take serious interest in the situation and started to make sweeping decisive moves to arrest and prevent further undernourishment (Périssé, 1981). In this endeavor, collective multinational institutional collaboration first began in 1925 with the Health Organization of the LoN, the International Institute of Agriculture (IIA), and the International Labor Organization (ILO). Together they researched nutrition in, vis-à-vis agriculture, social, and economic problems (League of Nations, 1936a,b; Mayne, 1947). This paid dividends and by the 1930s many foreign governments began refining children's nutrition with the establishment of free or subsidized milk as well as school meals. From these small beginnings, one could feel a palpable momentum growing. However, it was not until the consolidation of so many strands of study by the League and others that the LoN finally made real international progress (Carpenter, 2007). It began with the recognition that what was needed was a set of common nutritional requirement standards that could be used as guidance and comparison across regions and nations.

At the same time by 1931, based in Switzerland, the LoN's Health Secretariat's Nutrition Division recruited Wallace Aykroyd as what was perhaps the first ever nutritionist explicitly tasked with international nutritional guidance and responsibility (Carpenter, 2007). Then in 1932, the League organized two conferences of expert: one in Rome and the other in Berlin. Their goal was to assess the fundamentals of acceptable diets while assessing the role of nutrition inter alia the economic crisis (League of Nations, 1936a; Périssé, 1981; Carpenter et al., 1997). This and others acted as forerunners to the League's 1935 Expert Commission on Nutrition Conference, London (see Chapter 2.14.4) (Medical Science, 1936).

2.14.2 The Burnet and Aykroyd report

Meanwhile, on the Yugoslav representative of the HOLN suggestion, information was collected on the food situation in a sample of representative countries. Overseen by the Director, Dr. Frank G. Boudreau, the result was the Burnet–Aykroyd report: "Nutrition and Public Health." The report, drawing on the works of John Boyd Orr (UK) and Hazel K. Stiebling (US), showed that despite plentiful or excessive food production, the poorest of people were still suffering from hunger and deprivation. Furthermore, perhaps of

overriding inference, was the fact that the report formally acknowledged that at the center of the issue was the underconsumption of food as a direct result of low purchasing power. This brought poverty into the mix (more below) (Burnet and Aykroyd, 1935; League of Nations, 1936a; Harper, 1985). The report focused on three main points: firstly, nutritional needs; secondly, the resources required to fulfill such needs; and thirdly just how best to employ these resources for the betterment of the general population (Burnet and Aykroyd, 1935; League of Nations, 1936a,b). The report was submitted at the 16th full assembly of the League of Nations in 1935. It was a key piece of work that not only acknowledged the previous ideas of John Boyd Orr (later the first Director-General of the FAO) but was also timely. Timely, in that it brought another level of understanding to an international forum amid a period when other important discoveries were being made in the field of diet and nutrition. In fact, the report was very significant in that it recognized that health had indeed become a problem of social and economic importance and by way of addressing the situation proposed a marriage of health and agriculture (Gibson, 2016).

2.14.3 Joint memorandum of the BMA and MoH

Domestically, in the Britain at the time, regarding dietary recommendations disharmony came about with the publication of the British Medical Association's 1933 report stating that for the average person, a daily health and maintenance regime should comprise 3400 calories. While, previous work by the Ministry of Health (MoH) advocated only 3000 calories (BMJ, 1933; BMJ, 1934), the tabloids picked up on this indiscretion in a heartbeat and implied that the cost of the BMA's recommendations for sufficient basic food for good health could not even be covered with limited income from unemployment pay. Not surprisingly a political furor erupted. Equally not surprising was that the MoH was enraged and the report led to an acrimonious confrontation among the two bodies. Eventually, good sense prevailed and all agreed that the margin had to somehow be decreased. To this end, a conference between the Nutrition committees of both the MoH was held in 1934 to address the bodies various areas of contention. While tense, the meeting nevertheless reached an eventual agreement in the form of a joint memorandum. This memorandum proposed a set of increasing caloric requirements (Table 2.9) based on age sex and activity level. For the purpose of general aggregation, an average calorie consumption of 3000 calories per person was also agreed (BMJ, 1934; Smith, 2003).

Incidentally, Beardsworth and Keil (1997) writes that despite reservations by both parties and although malnutrition was still widespread throughout the United Kingdom, the interwar years actually saw Britain's general dietary health improve quite markedly (Beardsworth and Keil, 1997). Meanwhile in a more global arena, the League of Nations and others were also active in the role of nutrition for the betterment of children and the masses. Further key dates of this period can be found in the following Table 2.10.

Back to the Burnet–Aykroyd report and its many forward-thinking objectives brought renewed enthusiasm to the table.

2.14.4 The Mixed Commission of the LoN

The Burnet–Aykroyd report was of such consequence that it could not be ignored and great discourse among the various parties ensued. Deliberated in detail at the LoN's general

TABLE 2.9 Agreed daily requirements by the BMA and MoH.

Group	Calories
Male	
- Light work	2600–3000
- Medium work	3000–3400
- Heavy work	3400–4000
Female	
- Active	2800–3000
- Housewife	2600–2800
Children	
Boy 14–18	3000–3400
Girl 14–18	2800–3000
Children	
12–14	2800–3000
10–12	2300–2800
8–10	2000–2300
6–8	1700–2000
3–6	1400–1700
2–3	1100–1400
1–2	900–1200
Adult average	3000

Source: Recreated from The Nutrition Question. British Medical Journal 1(3828): 900–901, 1934.

assembly, it stirred up many emotive topics. One of the people enthused by the Burnet–Aykroyd report was the former Australian Prime Minister Stanley Bruce. Bruce, stimulated by the report, addressed the LoN and firmly backed up the notion of a merging agriculture and health responsibilities (FAO, 1970). Consequently, in direct response to the meeting, several initiatives were put in place. Firstly, a technical committee was selected to review the report's physiological foundations of nutrition, while secondly another committee, the Mixed Committee, was inaugurated and tasked with looking into the report vis-à-vis the full wide-ranging issues of nutrition in regard to health and economics (Campbell, 1938). The new Mixed Committee was to be chaired by Lord Astor who was to oversee the nutrition work of the HOLN, the International Institute of Agriculture, and the ILO (Royal Statistical Society, 1936).

The mixed committee produced two reports: an interim and final reports. The interim report titled "Problem of Nutrition" comprised four volumes: An Interim Report of the Mixed

TABLE 2.10 Key dates of the period: 1931 to 34.

Key dates of the period	
1931 International Wheat Conferences	The first few International Wheat Conferences between exporters and importers (Rome, London) failed to reach an agreement; it did, however, eventually lead to the first successful agreement among its cohorts (IGC, 2009a).
1931 The International Relief Association **(IRA)**	Created to aid the adversaries of Hitler and the Nazis movement, the International Relief Association was suspended in 1933 (Montgomery, 2008).
1933 International Rescue Committee **(IRC)**	Despite the cessation of the International relief Association, an American branch of the IRA was actually created the behest of Albert Einstein to continue the previously good work of the IRA (IRC, 2009).
1933 First International Wheat Agreement—Wheat Advisory Committee	After extensive negotiations, the third International Wheat Conference was a good chance for both the importing and exporting countries to sign the first International Wheat Agreement. On top of this, the Wheat Advisory Committee (later to become the IWC in 1942) was born. However, sadly the first International Wheat Agreement failed in the first year (League of Nations, 1933; Meerhaeghe, 1998; IGC, 2009a,b).
1933 US Agricultural Adjustment Act (**AAA**)	Under the auspices of the US Agricultural Adjustment Act (**AAA**) (PL. 73–10), the United States intervened in the market mechanism to restrict US agricultural production and by extension surpluses. They did this by paying farmers to reduce the cropping area they cultivated and thus reduce and stock, thus raising the value of the actual crops that were grown (Fite, 1962; NAL, 2010).
1933 Kwashiorkor	Inadequate protein consumption in infants usually induced by poor breastfeeding (the sickness of weaning) was given the name "kwashiorkor" in 1933 by a British nurse Cecily Williams working in the Gold Coast. Originally, the term was taken from the GA language of coastal Ghana.
1933 US Commodity Credit Corporation (**CCC**)	The United States Commodity Credit Corporation (**CCC**) became the preferred body for managing food stocks and surpluses while protecting farm income and market prices. The corporation formed the foundation of the first food aid and became part of USDA in 1939 (FSA, 2008).
1934 US Export & Import Bank	US Export & Import Bank was created to promote US exports through the use of concessional loans.

Source: Compiled from multiple reports and committees League of Nations (1933); Fite (1962); Meerhaeghe (1998); FSA (2008); Montgomery (2008); IGC (2009a,b); IRC (2009); NAL (2010).

Committee on the Problem of Nutrition; the report on the Physiological Basis of Nutrition; Nutrition in various countries; and lastly, Statistics of Food Production, Consumption and Price (League of Nations, 1936a,b; Royal Statistical Society, 1936). Collectively, recommendations were made encouraging to both governments in general and the LoN to, inter alia, setup of national nutritional committees to fully promote up to date nutritional policies (Mcdougall, 1940). The report was further revised which eventually led to the Final Report of the Mixed Commission of the League of Nations on the Relation of Nutrition to Health, Agriculture and

Economic Policy (League of Nations, 1937). The report expressly noted the failure of mankind to satisfy normal nutritional requirements (League of Nations, 1937). The report further elaborated on whether it was not the sole duty of public authorities to assume the responsibilities inherent in a nutrition policy, or whether wider stakeholders, including the public, should take up some of the responsibility (League of Nations, 1937).

The Final Report of the Mixed Committee was a remarkable document, which contemporarily was the most detailed and authoritative analysis of nutrition and the broader notions of social economic and agricultural issues ever undertaken to date. The report even became a best seller voted by the New York Times as the most important and influential book of the year (Mcdougall, 1940). While the report and its supplementary technical papers set forth the LoN recommended nutritional requirements albeit without supporting scientific justification, nevertheless, it did propose a blueprint calling for dietary standards: the dietary recommendations for special groups; nutritional surveillance; and global nutritional education (Périssé, 1981; Harper, 1985; Carpenter et al., 1997). Caloric recommendations for the general population were given for adults with various workloads, infants, and children (Table 2.11). Indeed, the guidelines further promoted the notion of optimal nutritional needs rather than minimum nutrition which had been practice for so long (League of Nations, 1936a; League of Nations, 1937; Périssé, 1981).

Moreover, while the report was more focused on industrialized nations, it did, however, look at the developing world too—although in some eyes, not enough. Among the many conclusions and recommendations, some of which are described previously, the report went on to acknowledge the fact that in many countries, grave malnutrition was rife; furthermore, it was also understood that the means and ware withal to address such issues already existed. The report was further decisive on the notion that while ignorance was a big problem in the exacerbation of malnutrition, poverty was undeniably an important central component that needed to be tackled. This further reinforced the idea that optimum health and well-being was not solely the provision of energy through food intake but rather seeing diet as a holistic notion that involved numerous other factors, not least of which was poverty (League of Nations, 1937; Hanekamp and Bast, 2007).

The period between the two wars was very productive in its nutrition and health research and policies. Great momentum was also garnered in terms of social responsibility and scientific understanding. While, in the early 1920s, protein standards appeared to be more predicated on opinion than fact, by the end of the 1930s, experimental nutritional research laid more solid foundations for energy requirements and better health (Hwalla and Koleilat, 2004). Furthermore, despite an ongoing lack of general universal consensus, continued nutritional research nevertheless flourished and increasing convergence began to develop (Table 2.12). It was also understood at about this time that provision of food in adequate quantities and quality would profoundly affect a nation's health more than any other single reform (McDougall, 1943).

In the world of governance during the 30 s, a growing awareness of food and nutrition as well as the consequences of an inadequate diet were beginning to loom large in many countries policy priorities.

TABLE 2.11 The League of Nations nutritional recommendations.

Age	Calories	Protein gm/per kg	Calcium gm	Iron mg
Infants				
0–6 Months	100 (per kg of body weight)			
6–12 Months	90 (per kg of body weight)			
Children				
1–2	840	3.5	1.0	
2–3	1000	3.5	1.0	
3–5	1200	3.0	1.0	
5–7	1440	2.5	1.0	
7–9	1680	2.5	1.0	
9–11	1920	2.5	1.0	
11–12	2160	2.5	1.0	
12–15	2400	2.5	1.0	
15–17	2400	2.0	1.0	
17–21	2400	1.5	1.0	
Men	2400	1.0	0.75	10
Women	2400	1.0	0.75	10+
Pregnant (1–3 months)	2400	1.0	1.5	10+
Pregnant (4–9 months)	2400	1.5	1.5	10+
Nursing	3000	2.0	1.5	10+
	Extra calories to be added per hour of work			
Light work	Up to 75			
Moderate work	75–150			
Hard work	150–300			
Very hard work	300 calories and upwards			

Source: Compiled from mixed reports League of Nations (1936a,b); League of Nations (1936a,b); League of Nations (1937).

2.15 Growing multilateralism

During this period, regardless of Ruxin's (1996) suggestions to the contrary, many national and international research studies and articles surrounding the issues of food and the developing world were undertaken (Firth, 1934; Gilks, 1935; Worthington, 1936; Watson, 1937; Auchter, 1939). Having said that though, in Ruxin's defense, the LoN's Nutrition report of 1935 did in fact highlight a shortage of research in certain developing countries, particularly

TABLE 2.12 Nutritional recommended requirements for adults 1919 to 39.

Date/ Authority	Load (default man)	Protein	Fat	Carbohydrate	Calories
1932 Ministry of Health's Advisory Committee on Nutrition (ACN)					
MoH suggested a standard 3000 calories as being adequate for daily requirements for the average person (Ministry of Health, 1932; BMJ, 1934)					
					3000
		67–75			
1933 British Medical Association (BMA)					
The BMA's 1933 report caused a social outcry by citing 3400 calories as their recommendations for health and maintenance (BMJ, 1933; BMJ, 1934)					
					3400
1933 USDA					
Under the auspices of Hazel Stiebling (an American Nutritionist), the first recommendations were made containing not only energy requirements but also proposed vitamin and mineral allowances for calcium, phosphorous, iron, and vitamins A and C (Stiebling, 1933)					
					3–4500
1934 Joint Ministry of Health and British Medical Association Memorandum					
The disagreement and political consequences caused as a result of the MoH and the BMA's disagreements resulted in collaboration out of which an agreed sliding scale of values was recommended (BMJ, 1934; Smith, 2003)					
	Man				2600–4000
	Woman				2600–3000
1932 League of Nations Conference of Experts					
The LoN met to consolidate several different dietary values so that nutritional status could be compared across and within countries. (League of Nations, 1936a,b; League of Nations, 1937; Hwalla and Koleilat, 2004)					
		Not less than 1 g per KG			2400

Source: Compiled from Multiple Data sets

in Asia. In due course though and building on 10 years of research, the 1935 meeting of the League of nations described previously was in fact the first of its kind. Indeed, it was the first major multilateral forum whereby ideas inter alia food, nutrition, and public health came together synthesizing into one lofty, multilateral global objective to expand principles of good nutrition throughout the world (League of Nations, 1937). It was also noted that food and nutrition vis-à-vis good health and well-being was a multidimensional beast that had to be tackled on many fronts if progress were to be made (Campbell, 1938; McDougall, 1943; FAO, 1970; Shaw, 2007). Furthermore, to tackle such a wide-reaching goal of sufficient food

for everyone, it was recognized that there was a need for a multilateral world food security organization that could combine both food and agriculture under one sphere of responsibility. And the LoN was not that body (Gibson, 2016).

2.15.1 Poverty and supply

To date, the problem of sufficient quantity and quality of food had only been considered in terms of production and supply. Yet the Burnet–Aykroyd report opened people's eyes to the idea that amid talks of surpluses and excessive food production, the main hurdle in fact was poverty and low purchasing power that ultimately led to much hunger and malnourishment around the globe (Burnet and Aykroyd, 1935). Much later, the idea of inadequate or low purchasing power was central to Amartya Sen's 1981 essay on deprivation and entitlement and one that incidentally contributed to his 1998 Nobel Prize on Welfare Economics. Yet it, even before poverty, as central to the notion of inadequate food supplies, had its genesis long before. Saying that, however, the idea was perhaps first properly elucidated in the mixed committee's report—the first internationally focused scientific publication that unconditionally placed poverty at the center of the problem:

> Poverty and ignorance remain formidable obstacles to progress in the disparity between food prices and incomes and increases the difficulty experienced by the poorer sections of the community in obtaining an adequate supply of the proper foods … That this situation can exist in a world in which agricultural resources are so abundant … remains an outstanding challenge to constructive statesmanship and international cooperation. ***League of Nations (1937)*.**

2.15.2 The League of Nations: for Whom the Bell Tolls

During its early years, as an institutional body, the League of Nations flourished. Yet despite great leaps in international economic and social cooperation over the years, particularly in the fields of health and nutrition; the inability of the institution to foresee or prevent hostilities of the next World War sounded the death knell for the first truly international organization. Indeed, the league suffered from many shortcomings, the biggest of which was its inability to offer little more than sound bites and moral outrage when hitherto friendly states (in this case, Japan, Italy, and Germany) became aggressors. The stage was set for an almighty confrontation when in 1931 Japan, in defiance of both the Assembly and the Council, waged war against China. Furthermore, in 1935, Italy invaded Ethiopia and the resultant League's sanctions were limited and only half-heartedly supported. Finally, in 1936, the League's impotency became clear as the illegal German reoccupation of the Rhineland left the League looking powerless, unwilling or unable to do anything about it. Indeed, even in 1939, while Hitler's army marched into Poland, not one member of the League raised his/her voice or called for a meeting of the Council or Assembly (Encyclopedia, 2002). In this one move, it had become clear for all to see that the LoN had ultimately failed in its main duty to prevent what was looking to become the outbreak of World War Two. Effectively, the LoN was undermined and was seen as powerless and incapable (Shaw, 2007).

By contrast, up to 1938, the HOLN had, even now, been busy in the spreading of its message far and wide with resultant nutrition committees springing up everywhere (in 21 countries, to be precise). However, despite such progress, there still remained a lack of material or

evidence on the gravity or extent of poverty and undernutrition throughout the world. In response, in 1939, the HOLN called for more, in-depth extensive nutritional surveys. Unfortunately, with the outbreak of the Second World War, such ideas had to be put on hold (Ruxin, 1996).

As the debate over good, bad, and adequate nutrition continued, Rudolf Steiner was at the forefront of a new, more gentle method of organic farming.

2.16 Organic farming and environmentalism

(See also Section 2.6 Bio-dynamics and Organic Farming Chapter 7)

As mentioned previously, Rudolf Steiner had by 1924 already acquainted those that were interested with the notion of bio-dynamics and reenforcing the benefits of organic farming. In this, Steiner's central belief in "natural agricultural" bio-dynamic farming became the forerunner of the modern organic movement. One keen practitioner was the British agriculturist come writer Lord Northbourne, born Walter Ernest Christopher James. Northbourne tended his estate—Northbourne Court as well as his Home Farm in accordance with the principles of biodynamic as advocated by Steiner. In doing so, Lord Northbourne avoided the use of all chemical fertilizers, herbicides, and pesticides. Also, in tune with the movement, all organic waste was composted and returned to the soil. In this one can easily argue that Lord Northbourne was indeed one of the first organic farmers in Britain. In fact, such was his importance within the organic movement as in 1938/9—the first known conference on organic farming took place at Northbourne Court. On top of this, in 1940, Northbourne authored an influential book entitled "Look to the Land." In the book he foresaw the many fears that were to preoccupy people both inside and beyond the organic movement. This was also undoubtedly one of the key inspirational works that influenced the then-to-be-famous environmentalist of the 1960s Rachel Carson. In a moment of prophetic clarity, Northbourne wrote

> In the long run, the results of attempting to substitute chemical farming for organic farming will very probably prove far more deleterious than has yet become clear. ***Northbourne (1940, p. 61)***.

Additionally, Northbourne has since been credited as first person to use the phrase "organic farming" (James and Fitzgerald, 2008).

Shortly before in 1939, inspired by the work of Sir Albert Howard and Sir Robert McCarrison, Lady Eve Balfour started the famous Haughley Experiment. It began in 1939 on her own farm in Suffolk whereby she intended to investigate the beneficial claims of organic husbandry. She began by managing three side-by-side tracts of land, allowing Balfour to study the full cycle of food chains over successive generations of plants and animals. By 1945, such was the scale and involvement of the experiment that Lady Balfour helped to manage the experiment and correlate the information. This led to the creation of a body called the Founders Committee, which later, in 1946, became the Soil Association (SA). A year or so later under the threat of financial strain, the experiment was fully taken over and administered by the SA. Incidentally, the longitudinal experiment lasted for over 40 years by which time enough information was collated and analyzed to make some firm conclusions. The experiment's results exhibited moderately higher moisture content, as well as

higher organic C, and other mineral components N, P, K, and S content within the organic soil (Balfour, 1975; Blakemore, 2000) (Gibson, 2016).

From such modest beginnings, so the world's first organic association - the Australian Organic Farming and Gardening Society (AOFGS) came into being in Sydney in 1944 (Paull, 2008).

During the same period, the advent of the beginning of the Second World War brought with it the specter of more food worries with low provisions, surpluses and rationing.

2.17 Second World War: provisioning and rationing

Just as before, once hostilities of the Second World War broke out, the threat of food shortages once again raised its head. Previous surpluses of previous years had dwindled and it became one of the priorities for the allied powers to scale-up production and provision of food on a massive scale. As one commentator acknowledged

> …the food and nutrition problems of a nation at war are tremendously complex and involve a wide network of interrelated activities… ***Clayton and Black (1943, p. 105)***.

2.17.1 Production of food

So, throughout Europe, not surprisingly, those nations heavily reliant on imported foodstuffs once again had to adopt widespread rationing and other food control measures (Bacon, 1943; Volin, 1943; Whipple, 1943; Lloyd, 1943; Richter, 1943). As needs must, so those more reliant, and economically capable, paid more attention to the long-term vision. Thus, for some, reduced dependence on imports while increased local agricultural acreage helped secure some measure of success. However, not all nations in need faired the same, due to many factors. To offset some of these food shortages and general aid in the War effort, the United States created the Lend Lease Agreement. Introduced in 1941 the lend lease arrangement was a simple measure that allowed countries to purchase goods and services from the United States on a loan basis, but under favorable terms (Clayton and Black, 1943). Procurement was then expedited through the Office of the Lend Lease Administration before being transferred to the respective countries. During this time countries and region's fared quite differently due to adaptation and policy shifts.

2.17.1.1 Britain

As the Second World War broke out, Britain was still in a period of food surpluses. However, as needs grew so surpluses dwindled, or were being managed, once again the UK Ministry of Food introduced rationing in 1940. This move was also the result of genuine worries of a successful bombing and submarine campaign by the German forces (Black, 1943; Lloyd, 1943). This meant that food imports were drastically reduced and increased acreage under production grew by as much as 50%. It also meant that national production was jointly micromanaged by both the Ministry of Food and the Agricultural Department. The Ministry of Food also aimed to keep staples like bread and meat affordable by becoming the nation's sole purchaser of food imports. This also meant employing interventionist policies

to aid in the goal of feeding the nation (Clayton and Black, 1943). Thanks to the US lend lease program and Britain's wartime food planning policies atop equitable distribution through rationing meant that Britain's general nutritional status was, quite possibly, better than that accomplished in the United States at that time (Cassels and Hall, 1943; Lloyd, 1943).

2.17.1.2 *Europe*

Generally, before the war broke European countries, particularly Austria, Czechoslovakia, Germany, and Sweden were mostly self-sufficient in the range of 80% caloric production to need (Richter, 1943). However, hostilities took its toll and by about, midway through the war, Belgium and Norway at least had become reliant on imports of grain and other feedstuffs. Imports were meagre and both countries ended up suffering badly from suboptimum diets. This was further compounded by the German acquisition of fish from Norway and meat from Belgium. Alternatively, both Sweden and Switzerland, with continued access to imports, fared better. In Denmark though, they still managed to produce much of its needed national requirement of food, even after exports to Germany. So much, in fact, was produced that

> …enough was left for the Danes to maintain the highest food allowances in all of rationed Europe. ***Richter (1943)***.

In France, Spain, and Italy though, rationing was introduced while a thriving black market and peasant revolts guaranteed it was the urbanized population that mostly suffered from shortages (Bacon, 1943). Contrastingly, with an agricultural workforce largely comprising women and children, Greece was less affected than other highly developed regions (Whipple, 1943).

2.17.1.3 *Africa and Asia*

It was realized that in Central Africa to achieve the goal of sufficient food in areas deficient of sufficient caloric intake, extensive international action would be required. And in some cases, this would have to include considerable financial aid. Overridingly, in Central Africa, the problem of supply was thought to be mainly one of education that would bring together farmers and producers to the table with the express goal of innovating and exploring ways to increase production (McDougall, 1943). In Asia, however, (Japan, China, Manchuria Philippines, Netherland Indies, French Indo-China, British Malaya, Thailand, Burma, and India), the food situation was a little different. The self-sufficiency of rice and other basic staples was not adversely affected by the war and the respective countries nutritional status quo was largely maintained (Ladejinsky, 1943).

2.17.1.4 *The Americas*

During the pre-war abundance of food, Americans were used to thinking in terms of agricultural surpluses rather than shortfalls (Cassels and Hall, 1943). However, that all changed as military needs, the allies lend lease requirements, on top of labor shortages, and challenged the continuation of the status quo (Clayton and Black, 1943). At this juncture, previous agricultural abundance gave way to a system of rationing based more on need rather than a person's ability to pay. To say that food shortages came as a shock to the Americans might be a bit of an understatement but the Americans nonetheless rallied to the challenge by increasing

production that helped supply the war effort. Also aiding in this collective war effort was the political inclusion of the Secretary of Agriculture into the Defense Council in May of 1940. This essentially placed agriculture on a war footing. The aims of the Advisory Commission to the Defense Council was in part the maintenance of pricing parity between both industrial and farm prices and the scaling-up of production where possible (Clayton and Black, 1943). However, in spite of such ambitious goals, it quickly became clear that such measures were not working as was hoped. Then, shortly after, in 1941, President Roosevelt inaugurated the Office of Production Management solely accountable for production and purchasing.

In areas of Central and South American countries, despite certain regional variations, particularly in Central America, the region was basically self-sufficient in production, although in some instances, especially in the temperate zones, some countries were producing large surpluses (Almonacid, 1943).

2.17.1.5 Russia

Midway through hostilities Russia collectivized national agriculture and while every effort to increase acreage under cultivation, as well as large-scale heavy mechanization, for one reason or another, policy after policy failed. With such significant failure, it was noted by the allies that Russians were increasingly under grave threat of mass hunger and starvation—so much so that substantial allied assistance was seriously anticipated (Volin, 1943). One major downside with Russia's particular system was seen after the collectivization of agricultural land. However, things did not pan out as some had wanted and so perishable food stocks fluctuated somewhat. Not surprisingly, between 1932 and 1933, this led to either feast of famine on localized and regional scales. For much of this, the blame was laid squarely at the government's feet. Indeed, failures of Soviet central planning were bad in themselves but was further compounded by Stalin's decision to deny or withhold food from the masses, reserving food instead for the Red Army. This, together with the tendency of funding the war machinery through sales of much-needed food (through exportation) of food supplies, led to huge loss of life (Gantt, 1936). Such was the estimated volume of numbers who died through starvation and other opportunistic diseases at the time ranged between 2 and 15 million (Gantt, 1936); however, these figures seem somewhat vague and too broadly ranged, that later estimates asserted the figures were more likely closer at between 3 and 7 million (Dyson and Ó Gráda, 2002).

Thus, rationing and other measures while having a drastic effect on the region or nations population did highlight and focus attention on a person or nations nutritional need as well as directed like-minded people of the need to increase food production on a massive scale (WHO, 1958).

2.17.2 Food and health on a war-footing

In the field of health, with the outbreak of the Second World War nutritional health strategies, especially in the United Kingdom, the United States and a few other countries were becoming increasingly bound up with national health directives (Beardsworth and Keil, 1997). One major consequence of improved scientific knowledge within issues of health was that it allowed rations to be more precisely determined at the national level. But that's not all, interest was also shifting in favor of understanding nutritional needs of

disaggregated populations. This effect trickled down the social demographic ladder—firstly directed in favor of population subgroups, then onto household, and then to the individual (Beaton, 1992). However, one major drawback regarding the work of respective National Nutrition Committees was the fact that once the Second World War raised its arms in aggression; it also effectively shut down many domestic nutritional programs throughout several countries; although some slipped the net and were able to carry on their research as well as on the ground policies (McDougall, 1943). In this respect and at this time (1940s), Britain was very much at the forefront of studies such as health and nutrition. At the heart of such policies was the almost zealous belief that nutrition was a wholehearted remedy for many social ills of the day (Ruxin, 1996). So, armed with a renewed zeal, up to date knowledge and a general acceptance of a necessary rationing culture the UK government embarked on several nutritional education programs.

About this time, even before the United States had entered the Second World War, a report by the revered and influential National Research Council (NRC) was passed along, assuring the US government that the American people were in no immediate threat of a shortfall in protein supply. That said, the NRC did acknowledge that, were the country once again called upon to export their high-protein foods to allied nations, etc., then a protein shortage would probably indeed affect the American population. At about this time too, both the US and British governments concerned for their respective troops attempted to establish an ideal nutritional requirement for soldiers in the field. However, as an aside, the NRC and numerous other similar agencies and bodies had, for a few years now, tended to be preoccupied with proteins in the diet. Although, as mentioned, the NRC was in the frontline in this respect, others seemed to follow blindly. The obsession with protein at this time not only fueled an ongoing obsession but also went on to dominate much scientific nutritional literature in the years that followed.

Science and technology in the war years seemed to advance in leaps and bounds gathering momentum as one invention or discovery after another was quickly applied to real-life situations. The timing could not be better either, as much weight was given to the application of existing technologies for the benefit of the war effort.

2.18 Science and technology: increased momentum

This was a time during which the automation and mass production of food really took off. Whether frozen, dehydration, and concentration of foods, the application of science and technology was readily adopted. Perhaps more so during this period as the War encouraged innovation and application. Whether concentrated juice, for example, was perfected and was readily available to the troops. As was flour that had been fortified with iron and vitamins. Furthermore, technology brought advances like aseptic processing and packaging of foods which prolonged shelf life through the treatment of high-temperature, short-time sterilization techniques. Such advances further improved the quality and safety of food through the retention of much needed nutrients (IFT, 1999; Gardner, 2002).

Other events around this time witnessed the large-scale manufacturing of penicillin; at the same time the introduction of electron microscopy was moving quite rapidly, which incidentally was effectively used in the identification of viruses that infect bacteria (bacteriophage).

This was 1942 and within a year separate studies by Salvador Luria and Max Delbruck who independently studies mutation in bacteria. This, among other previous developments in the field, observed the growth of a new field of scientific discipline, bacterial genetics. In the following year, further research led to the uncovering of the fact that intricate protein was shown not to be the pathway of genetic heredity bat rather DNA was the material substance of the gene and responsible for generational transformations (BioTech Institute, 2010).

2.18.1 International standards of dietary nutrition

As increasing involvement in all aspects of food's production and supply by the British government of the day, it was inevitable that a new philosophy evolved that looked to enhance the quality of the diet and in turn the nation's nutritional health. This was partly due to the Boer war of 1899–1902 in which more than one-third of British applicants were rejected on the grounds of poor health. And things did not seem to get much better either. In 1917/18, conscription to fight in the First World War left a further 2 1/2 million Britons graded "C3" meaning unfit for military service. Yet again the government was at a loss and was shocked to find the problems were that of nutrition. This further politicized the public health issues of the day and additionally increased interventionist policies regulating and monitoring suitable and adequate standards of dietary intake (Starling, 1918; Smith, 2009).

This was about the same period when other countries began to recognize the need for long-term monitoring of food issues and to finally take responsibility for the nation's health and well-being. This was especially so with children (Acheson, 1986).

As such, this was a seminal time when many governments from around the world began to adopt nutritional guidelines based on scientific guidelines. As luck would have it, this was also about the same time as that new technology and further understanding was readily forthcoming especially in the field of food microbiology, health, and nutrition particularly when it came to vitamins and minerals (Beardsworth and Keil, 1997). Fortuitously such understanding came at a time when nutritionists were beginning to understand the growing body of work of chemical and physiological understanding of microorganisms (DuBois, 1940; Passmore, 1982; Carpenter, 2004). Concurrent research into diseases of deficiency including beriberi pellagra and scurvy to name but a few led to the realization in 1901 that

> …there occur[s] in various natural foods, substances which cannot be absent without serious injury to the peripheral nervous system … ***Grijns (1936, p. 38)***.

This moment of epiphany led to further pioneering work by leading notable scientists of the day including Eijkman, Grijns, Funk, Hopkins, Osborne, McCollum, Mendel, and others led to the detection of nutrients such as vitamines (as they were then called) and essential minerals and trace elements. Therefore, one can see that clearly such advances began to pull all the strings together upon which foundation of nutrition, health, and by extension food could only grow (Carpenter, 2003). Alas over the next few decades, many more common vitamins were discovered along with the realization of the importance of such nutrients to the subsequent vitality and general health of humans (Table 2.13) (Carpenter, 2003). This era of discovery also became known as "the golden age of nutrition" in which anything seemed possible (Carpenter, 2003; Ordovas and Mooser, 2004; Go et al., 2005).

TABLE 2.13 Timeline of the discovery of particular vitamins.

Vitamin	Year of discovery or proposed existence
Thiamine	1901
Vitamin C	1907
Vitamin A	1915
Vitamin D	1919
Vitamin E	1922
Niacin	1926
Biotin	1926
Vitamin K	1929
Pantothenic acid	1931
Folate	1931
Riboflavin	1933
Vitamin B_6	1934

Source: Based on Carpenter's 'A Short History of Nutritional Science: Part 3' (1912–1944). Journal of Nutrition 133 (Oct.): 3023–3032.

2.19 Economic front

While the previous interwar years were busy in terms of nutritional advancement, governance and multilateral cooperation were coming together on an as-yet unprecedented scale. However, a cautionary note on free trade and the idea of comparative advantage (a staple of international economics at the time) came from Karl Brandt when he noted in "War in our Time" (1939) that in general, nations' seemingly growing overreliance on foreign resources was the result, more through political expediency rather than necessity (Brandt, 1939). Furthermore, in arguing (in the economic sense) against the oft parried phrase "the have's and have-not's," Brandt went on to argue that it was in fact this overdependence and neglect of a country's own resource base that was more likely at the heart of widening economic gaps between inter- and intraregional areas.

In his rationale, Brandt suggested that nations were very adaptable (historically, at least) when talking of food and raw materials in the past. Following on from this Brandt also offered that, rather than pursuing an economic course, heavily dependent on imports in general, a rethink of the whole economic chain was perhaps warranted. That is not to say that Brandt was against free trade either. Instead, he proposed that in times of "supposed" free trade, when protectionism, quotas, and other barriers rendered the international economic playing field uneven, then a fundamental change of focus in favor of domestic reliance might be one answer to the economic trade gaps. Brandt was also insightful when looking at localized resource allocation touching on many of the natural resource issues that became predominant in the 1990s to the present day. Although his main focus had been economics, trade, and foodstuffs, Brandt also advocated thrift in sustainability and consumption. In such issues, he was ahead of his time in the sympathetic use of local natural resources.

Furthermore, it can be found that in his works (again ahead of his time) that more than a hint of the modern-day food sovereignty movement is laid out in principle, especially in his advocacy of self-determination and food self-reliance (Brandt, 1939).

2.20 More surpluses

Going back to interwar food surpluses, on the whole the situation became bad, as not surprisingly, these same surpluses ended up overheating an industry at a time when real prices were falling. On top of this, a once healthy, but now fading, demand from a near bankrupt Europe coincided with increased competition and the reentry of military personnel back into the US civilian labor market. All these factors came at a time of drastic changes in fiscal and monetary policies, principally in America which ultimately brought about prodigious unemployment and further depressed purchasing power—not just in America, but gradually throughout Europe and eventually leading to worldwide economic depression. It goes without saying that the resultant depression was hard for everyone. By now, agriculture, with its increasing mechanization of and growing industrial sector, all led to free-falling real farm incomes (Black, 1942). In an attempt to rebalance the floundering sector in the United States, polices of agricultural parity were introduced. This was an important concept and a sharp tool in the interventionist's arsenal. Of particular note was the Agricultural Adjustment Act (AAA) of 1938, which ensured that congress

> Establish and maintain such balance between the production and consumption of agricultural commodities … as will reestablish prices to farmers at a level that will give agricultural commodities a purchasing power with respect to articles that farmers buy … ***USDA (1985)***.

Such policies basically aimed to connect farmers' incomes with costs of labor and materials in an effort to register them on par other industries' incomes (Tenny, 1938). This was important from many angles because this particular intervention policy, it was expected, would encourage and maintain real farm incomes at a time when farms and farm laborers were vulnerable. Just as importantly too, such measures helped the industry reflect the sectors growing importance within the overall national economy (Black, 1942; Varnee, 1955). Parity (described in detail later) meant the preservation of farm grown product prices through federal support to make sure that farming remained an essential part of the US economy. Consequently, parity had to reflect a real starting point for the sake of a true income-based approach. As such the golden era of farming (considered to have occurred in the 1910–14 period) was used in the calculations of parity pricing.

In the midst of all of this, there was still many that remained in a situation want. This dichotomy could not be allowed to continue and several initiatives, not least of which was the food stamp program, aimed to address this very situation.

2.21 UK food stamp program

By 1938/39 the UK food stamp program was introduced—this allowed people on relief to buy orange stamps equal to the value of their normal reasonable food expenditure. In turn,

they would also receive 50% of the value of their orange stamps in blue stamps. These could then be redeemed for food that has been considered by the US department of agriculture to be surplus (Waugh, 1943). Other social welfare initiatives too, like the school lunch program, also profited from this new government viewpoint. Indeed, such distribution programs prospered during a period when mountains of surpluses were just hanging over the market while many on welfare were living on the bread line. This led Waugh to comment:

> We were confronted with the striking dilemma of want and hunger in the midst of plenty. ***Waugh (1943)***.

Luckily, there was a mounting social awareness to the plight of the hungry and needy. This was particularly noticeable during the last half of World War One. It was also recognized that what was needed was collaborative action on the part of the governments and institutions—a necessity for governments and institutions including humanitarian and other aid agencies to work together as a single collective entity with an international remit. And as history has shown (part one), what came after was a new era of cooperation with goals and objectives firmly sighted on the international platform (Belshaw, 1947; Encyclopedia, 2006).

In the social arena around this time, things were changing too. Spurred on by a new emerging socio-cultural ideology that embraced artistic, literary, philosophy, musical, and cultural movements, people were taking more notice of what was happening around them.

Surpluses aside, the fight for hunger, famine, and food for all was advanced in leaps and bounds with the creation of the United Nations.

2.22 The inception of the United Nations

With the collapse of the League of Nations in 1946, it became clear that what was needed was an international body with stronger executive powers (UNOG, 2009). In fact, the League's failure to prevent cross-border hostilities in 1939 did not put paid to the overall belief in the concept of a multinational organization with the remit of international peace. On the contrary, the new body resolved to learn and adapt from previous mistakes and to shape a new multinational body, more able and more willing to maintain international peace envisioned. Indeed, so strong was this belief that, even before the League of Nations itself came to an end, a new multilateral body had been fully conceived. Setting the foundation for the new body to be called the "United Nations" was the inter-allied assertion "the London Declaration" of June 1941. This declaration came about from several meetings, although the most important was the meeting at St. James's Palace in London where representatives of major powers including Australia, Canada, New Zealand, the United Kingdom, and the Union of South Africa, as well as governments in exile like Belgium, Czechoslovakia, France, Greece, Luxembourg, the Netherlands, Norway, Poland, and Yugoslavia each pledging to not sign a separate or independent peace document with Germany and collectively declared

> The only true basis of enduring peace is the willing cooperation of free peoples in a world in which, relieved of the menace of aggression, all may enjoy economic and social security…. ***UN (2006)***.

A few months after the above meeting, aboard the warship USS Augusta off the coast of Newfoundland, a declaration outlining the key articles of agreement between Prime Minister Winston Churchill and President Roosevelt was issued. Although not a treaty per se, the document, the "Atlantic Charter" of August 1941, as it became known was further strengthened in 1941 by Roosevelt's congressional State of the Union speech in which the Four Freedoms concept was made known and elucidated upon. The Four Freedoms were (1) the freedom of speech, (2) the freedom of worship, (3) the freedom from want, and ultimately (4) the freedom from fear. Such freedoms, Roosevelt insisted, were central to the growth of humankind throughout the world (Roosevelt, 1941; UN, 1945). Collectively, these four notions established a broad and succinct permanent ideology of all-round social security.

After further talks, this led to the signing of the United Nations Declaration by 27 nations on January 1 and 2, 1942. By signing the declaration, governments were effectively bound to any future war effort and the inability to unilaterally sign any separate peace deal with aggressor powers (UN, 2006). However, while declarations of interest had been signed and sealed by 1943, the foundation for the anticipated world organization was still not in place. Instead, and once again, after great discussion, the cause was further strengthened by the Foreign Ministers of the United States, Great Britain, and the Soviet Union along with a Chinese ambassador who together drew up the Four-Power Moscow Declaration of October 1943, which, among other things, recognized the need to for a global organization responsible for the preservation of international peace and security. So, while the initial ideologies were now created, it was during the Dumbarton Oaks (a private mansion in Washington, D.C.) talks that the ideologies were forged into workable goals. Thus, by October 1944, the structure of the proposed United Nations four bodies was hammered out. These included a General Assembly, comprising provision for an Economic and Social Council; a Security Council composed of 11 members; an International Court of Justice; and of course, the *Secretariat*. However, in 1945, before fleshing out the final text, President Roosevelt suddenly passed away, yet despite this, the scheduled United Nations Conference on International Organization still convened in San Francisco. At the conference 50/51 (depends on who you read) representatives from various countries met to finally hammer out the final text that inevitably became the Charter of the United Nations. In 1945, the United Nations was finally born.

When it came to food and the United Nations (UN), one astute observer, Frank McDougall, a member of the Economic Committee of the League of Nations said of the UN's responsibilities at the time, said:

> If the United Nations decide to make freedom from want of food … will require national action in every country and international action to assist countries lacking technical knowledge and financial means to secure improvements in food production … [therefore] the more economically advanced United Nations should pledge themselves, first to institute policies designed to ensure that the foods required for diets adequate for health are within the purchasing power of their own citizens, and second to provide technical and financial aid to enable the less advanced nations to progress towards the accomplishment of this objective. ***McDougall (1943)***.

While this was what the UN had planned for itself, how it fared in this endeavor is unraveled in the course of the book.

2.22.1 The Food and Agriculture Organization is born

With all that had happened vis-à-vis food and the two World Wars; and predating the San Francisco Conference that helped shape the yet to be created UN by 2 years, President Roosevelt convened the first UN conference on Food and Agriculture at Hot Springs, Virginia, in May and June of 1943 (UN, 1943). This came to be, in no small part, due to the efforts of Frank McDougall who wrote a report in 1942 predating the above quote, titled "Draft memorandum on a United Nations Program for Freedom from Want of Food." The report gained the attention of President Roosevelt, the two men finally met. In this and subsequent discussions, McDougall counseled the president on the need for the new, as yet unborn UN to tackle the problem of food as their first priority. Out of these discussions, Roosevelt, in the following year, called for a United Nations Conference on Food and Agriculture (FAO, 1995). The conference was a success and recommendations were made re-iterating the 1935 League of Nations commission for universal, multilateral action to reduce instances of hunger and malnutrition. This would be (as both bodies had envisaged) through the creation of a permanent body responsible solely for the domains of food and agriculture (Parran, 1943; Thompson, 1943; Evang and McDougall, 1944). Essentially, what was being proposed was an organization able to act as a central information clearing house, while promoting stability through international commodity instruments; the maintenance of sufficient reserves; and when necessary the disposal of any surpluses (Shaw, 2007). This pre-UN Conference on Food and Agriculture was nevertheless held under the banner of the UN, which further led to the formation of a Provisional Commission on Food and Agriculture. The Commission even went as far as to draft a Constitution for a new permanent body to be known as the Food and Agriculture Organization (UN, 1943; Phillips, 1981).

2.23 Freedom from want of food

The 1943 conference (UN) was also a turning point in the history of food security (a concept dealt with in 11). Furthermore, using Roosevelt's notion of "freedom from want," the conference defined—as one of its main objective—the "freedom from want of food suitable and adequate for the health and strength of all peoples" (Thompson, 1943). In addition, the conference also acknowledged that

> The first cause of hunger and malnutrition is poverty. It is useless to produce more food unless men and nations provide the markets to absorb it. There must be an expansion of the whole world economy to provide the purchasing power sufficient to maintain an adequate diet for all. ***The freedom from want of food*** ***UN (1943)*****.**

This was groundbreaking as the conference covered three main arenas of operation. These included the improvement of the national nutritional health and diets of the populace, increased food production by means of global agricultural expansion, and lastly, better support in terms of resources for the accomplishment of such aims. The talks also noted several important matters regarding the accomplishment of sufficient food for all:

- The first freedom, the "Freedom from Want," among other things, would ensure a secure, suitable, and nutritious supply of food for every man, woman, and child on the earth;
- The conference also aimed to create an enabling environment for the growth of national nutritional organizations and to collect, collate, and disseminate information and experience;
- The conference also advocated essential ideals about sustainability in its aim to provide sufficient nutritious food while conserving lands and water resources;
- It was also understood the interdependence of both producers and consumers and that coordinated agricultural policies must be considered with this in mind;
- It was also encouraged to create cooperative movements to create of preserve land tenure, education, and research;
- The conference, having brought together so much material research, concluded certain connections were evidently clear of many dietary deficiencies and diseases;
- The recognition of special or vulnerable groups such as the young, pregnant women, or the marginalized must be given equal if not greater protection by placing these groups at the top of food security.

The conference stimulated much chatter among individuals and institutions and the resounding implicit feeling was of the acceptance of an overarching multilateral body that could bring the full might of its power in the search for solutions (UN, 1943; Carlson, 1944; Evang and McDougall, 1944; Schultz, 1945; Phillips, 1981). Indeed, in this endeavor, the conference could be succinctly described by one of its own resolutions which stipulated that

> There has never been enough food for the health of all people. This is justified neither by ignorance nor by the harshness of nature. Production of food must be greatly expanded; … [and] requires imagination and firm will on the part of each government … to make use of that knowledge ***UN (1943)***.

In accomplishing this, much work, understanding, collaboration, and the creation of new bodies was required—which should include the cooperation of existing, on the ground agencies; the introduction of nationwide nutritional organizations; and more agricultural investment opportunities like credit agencies; increasing cooperative movements; international commodity agreements; more equitable distribution measures. Even at the macroscale, financial and commercial instruments were needed to secure expanding world economic growth, which would naturally filter down to the agricultural sector. And this was just the beginning: improved land tenure was needed for resident security; humanitarian aid policies were required in times of emergencies and for fallback safety nets. But above all, what was needed most was improved education and research, particularly in the areas of sustainability and areas of conservation (McDougall, 1943; Thompson, 1943; UN, 1943; Phillips, 1981). The urgency

of these needs was not lost on McDougall, as poor social and nutritional conditions across much of the developing world meant that as much as 60% of the global working population was employed in agriculture:

> …on the basis of numbers, the social condition of the peasants, sharecroppers, and other farm workers is the [single, most] outstanding social problem of the world ***McDougall (1943, p. 126)***.

The flip side of the above, as outlined in the conference, was the very real issue of farmers' incomes, sustainability, and consumers spending power. In real terms at the time, it was shown that farmers could not rely on sufficient returns to lead a normal healthy nutritional life, or would consumers be in a position where they can purchase sufficient food for themselves and their families. The answer, as suggested, was that real progress was needed and not at the national/regional level; but rather, change was needed at the international level, and the best way to achieve this was through increased employment across all sectors in all countries, i.e., the general worldwide expansion of economic activity (UN, 1943). Such a huge project would be achieved through increased regulation policies of production and other instruments of development (Thompson, 1943). Such forward thinking placed food and agriculture at the heart of the first United Nations conference as said by the then Surgeon General of the United States Thomas Parran (Parran, 1943) to have been a rare moment of epiphany by Roosevelt. Consequently, in 1945 and not surprisingly, the preofficial UN conference (1943) became the forerunner of two new bodies: the new bodies of the United Nations and the Food and Agriculture Organization. The first meeting was held in Quebec that year and was headed by British nutritionist Sir John Boyd Orr.

2.23.1 Bretton Woods Agreement

Another of the fledgling United Nations founding conferences was the UN Monetary and Financial Conference, which quickly came to be known as the Bretton Woods Conference of 1944. The need for certain financial agreements was evident in the previous years and, in part, in response to practices that heralded the 1930s era of depression. Such practices saw certain nation's attempts to gain a competitive edge (usually economic) by increasing obstacles to "fair" foreign trade. Having said that, certain practices, such as the devaluation of currencies to better compete in export markets, ironically became counterproductive. In the end, a rapid slowdown in world trade affected much of the world's living standards, which dropped significantly. One aim of the Bretton Woods agreements saw new financial instruments designed ostensibly to regulate international monetary and financial directives as well as aiding in the post-war reconstruction of many countries (Bordo and Eichengreen, 1993; IMF, 2010b). Some success out of Bretton Woods agreement came into being when in 1945 the International Monetary Fund (IMF) formally came into existence beginning operations in 1947. Its remit was simple—to oversee the international monetary system—a system of exchange rates and international capital and current payments with the role to facilitate the free flow of goods and services between countries. The IMF ensured cross-border trade through stability of the exchange rate and aimed to achieve this using the par value system. On top of this, the IMF acted as the international lender of last resort.

Next from the Bretton woods agreement came the International Bank for Reconstruction and Development (IBRD), which was originally created to finance international post-war reconstruction. Although in recent times its goals have been extended to help with the extension of long-term investments for the benefit of development, especially in structural improvements in underdeveloped nations, as well as to fight poverty, today, collectively the IMF and the IBRD are known as the World Bank.

2.23.2 UN Relief and Rehabilitation Administration

Meanwhile as the war came to an end, there became greater need for international action and coordination. This need was put before the fledgling United Nations and resulted in the creation of the *United Nations Relief and Rehabilitation Administration* (UNRRA) in 1943 (Foreign Office, 1943; House of Commons, 1944; League of Nations, 1946). This new body incorporated another newly formed office of the US State Department (1942) *Office of Foreign Relief and Rehabilitation* (OFRRO) (Williams, 2005). Ultimately the UNRRA's remit was both broad as it was sweeping (League of Nations, 1946). That is to say, in the UNRRA's brief 3-year term, it aimed to manage

> … relief of [the] victims of war in any area under the control of any of the United Nations through the provision of food, fuel, clothing, shelter and other basic necessities, medical and other essential services ***League of Nations (1946, p. 92)***.

2.23.3 Aid, welfare, and surpluses in the United States

Originally, in the beginning (1930s), the United States department of Agriculture (USDA) began buying up surplus commodity stocks that appeared on the market almost on a regular basis and which were then passed along to state welfare agencies. Initially, this altruistic measure was a convenient way of controlling farm prices. And while a good idea in principle, the distributed food relied heavily on the surpluses available rather than any attempt to provide a variety or satisfactory nutritional diet to the needy. That was the early 30s. Later (the mid- to late 1930s), the US Department of Agriculture (USDA) was becoming busy once again with fluctuating surpluses. Its main aim this time around was twofold—first, to adjust pricing policies, effectively aiming to depress surpluses, and second, where surpluses existed, the USDA utilized these surpluses in a nationwide effort for the benefit of school children and low-income families (Waugh, 1943). Ultimately though, this had to change as it was recognized that the two problems of farm incomes and food prices were intricately related. This meant that with restrictions, poverty, and other social barriers, millions of people were still unable to afford to buy farmers' products. Consequently, farmers' incomes suffered while people went hungry. As a result, it became clear that larger nationwide, welfare feeding programs were required. But this time the focus was more holistic with more consideration of the diet and nutritional requirements of the nation.

2.23.4 Inter-allied committee on post-war food and relief

In 1940 in a House of Commons speech by the then Prime Minister Churchill, it was agreed that at the end of hostilities, the peoples of Europe would receive food and relief

(House of Commons, 1944). Not long after in 1941 at St. James's Palace, the Allied powers met to consider relief and rehabilitation passing a resolution stating:

> … the only true basis of enduring peace is the willing co-operation of free peoples in a world, in which, relieved of the menace of aggression, all may enjoy economic and social security; and that it is their intention to work together, and with other free peoples, both in war and peace to this end. ***House of Commons (1944)***.

This meeting, before the signing of the Atlantic Charter, reaffirmed the mutual cooperation of the Allied forces. In another meeting in September, a resolution was passed securing supplies of food and raw materials for post-war liberated countries. It was through these committees that the Inter-Allied Committee (IAC) was set up to gather relevant information in which to formulate policy to this end (Foreign Office, 1943; House of Commons, 1944; League of Nations, 1946). Furthermore, it was because of these efforts that the committee advanced the use of food balance sheets (FBS), which remained in common use long after the war had ended (Foreign Office, 1943; FAO, 2001). Eventually, the same committee, because of the diligent work and ideology, was later transformed to become the European advisory Board (EAC) (Williams, 2005).

Meanwhile back in the new scientific discipline of nutritional research the first ever recommended dietary allowances (RDA) were made.

2.23.5 Recommended dietary allowances

Thanks to the work of Mitchell Stiebling and Roberts, who worked for what began in 1940 as the Committee on Food and Nutrition, under the auspices of the National Research Council of the US Federal Government, which was later to become the Food and Nutrition Board under the US research Council of the National Academy of Sciences produced, the first widely accepted RDA in 1941. This was a milestone in nutritional science and was built on 50 years of collaborative research and analyses of countless scientists and individuals.

Indeed, despite the dillydallying, the Board of Nutrition finally presented their recommended allowances at the Spring Meeting of the American Institute of Nutrition (1941) (Editorial, 1943; Harper, 1985; Rosenberg, 1994; Aggett et al., 1997; McArdle et al., 1999; Harper, 2003), and once again despite further procrastination, these recommended allowances were not published by the National Academy until 1943. Nonetheless, the table did appear in the Journal of the American Dietetic Association in 1941 forming the basic needs of the diverse population (Table 2.14) (ADA, 1941; NRC, 1943; Harper, 1985; Mayer, 1986; Harper, 2003). Furthermore, since then, this groundbreaking work was built on and

TABLE 2.14 The Food and Nutrition Board's 1941 recommended dietary allowances.

Energy kcal	Protein g	Calcium g	Phosphorus g	Iron mg	Vitamin A IU	Vitamin B1 IU2	Vitamin C mg	Riboflavin mg	Nicotinic acid mg	Vitamin D IU
2775	66	0.91	—	12	4696	516	71	2.3	15.5	210

Source: Recommended Dietary Allowances: Report of the Food and Nutrition Board, Reprint and Circular Series No. 115. (Washington, DC, National Research Council. 6, 1943).

expanded with many countries adopting, adapting, and "borrowing" entire recommendations (see also Appendix Table 30.1).

Meanwhile, a few key dates (Table 2.15) help place much of the previous information in context.

TABLE 2.15 Key dates of the period: 1939 to 45.

Key dates of the period	
1939 US Food Stamp Program	Around this time many food distribution programs were developed by the United States. Coinciding with massive unemployment and surpluses the first few programs later became known as the Supplemental Nutrition in Assistance (SNAP) (Waugh, 1943; Dimitri et al., 2005; Landers, 2007; National Archives, 2009).
1941 The term "Genetic Engineering" is first used	Danish microbiologist A. Jost coined the term "genetic engineering" in a lecture on sexual reproduction in yeast.
1941 Recommended Dietary Allowances **(RDA)**	Building on previous nutritional research work by the League of Nations as well as Burnet and Ackroyd among others, the US Research Council of the National Academy of Sciences set the Committee on Food and Nutrition. Consequently, it was not long before the US research council provided the first Recommended Dietary Allowances in 1941, which was subsequently published in 1943. The committee was renamed the Food and Nutrition Board in 1941 (Harper 1985, 2003; Mayer, 1986; Rosenberg, 1994).
1941 The Atlantic Charter	Premiers Churchill and President Roosevelt met aboard the USS Atlanta and signed a declaration indicating to many that the two powers would work toward the creation of a new global organization as soon as peace once again prevailed (UN, 1943; UNOG, 2009).
1941 US Lend Lease Act	The US Lend Lease Act was responsible for essential food supplies and other vital war materials to the allied nations (Ficker, 1967; Hoffmann and Maier, 1984).
1942 International Wheat Council **(IWC)**	The International Wheat Council (IWC) superseded the Wheat Advisory Committee of 1933. The wheat advisory committee, headquartered in Washington, finally established an international seat of IWC in London in 1949 (League of Nations, 1933; IGC, 2009a).
1942 OXFAM	OXFAM began in Oxford by an enthusiastic group dedicated to famine relief. The acronym translates as Oxford Committee for Famine Relief (OXFAM, 2007).
1943 United Nations Relief and Rehabilitation Administration **(UNRRA)**	The UN Relief and Rehabilitation Administration began work in 1943 providing health care and relief to regions liberated from the Axis powers after the cessation of World War II. The UNRRA further provided billions of dollars in aid packages, before ceasing operations in 1947 (Europe) and in Asia in 1949. UNRRA was ultimately disbanded in 1946 and its functional duties transferred to the Interim Commission of the World Health Organization (WHO) (WHO, 2009).
1944 Norman Borlaug and the Rockefeller Foundation	Norman Borlaug is often referred to as the father of the green revolution because of his work with the Rockefeller Foundation as well as his other studies in the field of crop hybridization during the 50s and 60s led him to the Nobel Peace Prize in 1970 (Herdt, 1998; USAID, 2009).

TABLE 2.15 Key dates of the period: 1939 to 45.—cont'd

Key dates of the period	
1944 UN Monetary and Financial Conference—The Bretton Woods Agreement	The monetary and financial conference of the United Nations (more commonly referred to as the Bretton Woods conference) signatories signed an agreement regulating international monetary and financial order after the end of WW2. Agreements also established the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (IBRD) (IMF, 2010a,b).
1943 Plant Breeding as Foreign Aid	In the first of its kind, the collaboration with the Rockefeller Foundation and the Mexican government on the Mexican Agricultural Program became the first incarnation of plant breeding as foreign aid.
1945 CARE	CARE, the Cooperative for American Remittances to Europe later renamed Cooperative for Assistance and Relief Everywhere, was inaugurated (CARE, 2009).
1945 United Nations **(UN)**	The incorporation of the United Nations in 1945 was a milestone in international cooperation with the remit covering economic, political, judicial/security, and social governance (UN, 1945; UN, 2000).
1945 Food and Agriculture Organization **(FAO)**	The FAO, a branch of the United Nations, was responsible for the overall economic and social development of food and agriculture. It dealt with all the major issues of agriculture, forestry, and fisheries via both its field programs and its regular programs (FAO, 1946; Phillips, 1981; FAO, 2010). (Phillips, 1981).
1945 World Bank Group **(WB)** International Bank for Reconstruction and Development **(IBRD)**—International Monetary Fund **(IMF)**	The International Bank for Reconstruction and Development (IBRD) was created to finance post-war reconstruction. Nowadays, however, its remit has been changed somewhat to deal with poverty and development issues. While the financial aspect, the orderly currency practices in international trade has been handed over to the IMF (IMF, 2010a,b).
1945 UN Educational, Scientific and Cultural Organization (**UNESCO**)	UN Educational, Scientific and Cultural Organization (UNESCO) was formed in 1945 as a specialized United Nations agency. The organization serves as a clearinghouse or repository of ideas while importantly, ensuring the sharing and dissemination of information and knowledge (UNESCO, 2009).

Source: Derived from multiple sources League of Nations (1933); UN (1943); Waugh (1943); UN (1945); FAO (1946); Ficker (1967); Phillips (1981); Hoffmann and Maier (1984); Harper (1985); Mayer (1986); Rosenberg (1994); Herdt (1998); UN (2000); Harper (2003); Dimitri et al. (2005); Landers (2007); OXFAM (2007); CARE (2009); IGC (2009a,b); National Archives (2009); UNESCO (2009); UNOG (2009); USAID (2009); WHO (2009); FAO (2010); IMF (2010a,b).

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