Malnutrition in XIXth Century Alsace

Michel Hau - Jean-Michel Selig
Université Marc Bloch, Strasbourg

Alsace, a rural region with a very high population density at the end of the eighteenth century, experienced a special pattern of industrialisation. In fact, it entered the industrial era with such a high population density that there was a risk of a Malthusian crisis. On account of the particularities of Alsatian economic development, its history has attracted considerable scholarly attention recently.[1] The present study contributes to this literature by presenting a history of malnutrition in the region.

1. Rural overpopulation and the threat of a Malthusian crisis:

The demographic explosion of the eighteenth century

Due to the devastation caused by the wars of the seventeenth century, Alsace's population had been reduced to some 260,000 by 1697,[2] which corresponded to a moderate density of about 30 inhabitants per km². During the eighteenth century, however, the region

[1] Michel Hau, *L'industrialisation de l'Alsace 1803-1939,* (Strasbourg, Presses Universitaires de Strasbourg 1987). Nicolas Stoskopf, *La petite industrie dans le Bas Rhin,* 1810-1870, (Oberlin, Strasbourg 1987). Jean-Michel Boehler, *Une société rurale en milieu rhénan : la paysannerie de la plaine d'Alsace (1648-1789),* (Strasbourg, Presses Universitaires de Strasbourg 1994). Jean-Michel Selig, *Malnutrition et développement économique de l'Alsace du XIXe siècle,* (Strasbourg, Presses Universitaires de Strasbourg 1996). Stéphane Muckensturm, *Soulager ou éradiquer la misère Indigence, assistance et répression dans le Bas-Rhin au XIXe siècle,* (Strasbourg, Presses Universitaires de Strasbourg 1999).

[2] Georges Livet, *L'Intendance d'Alsace de la guerre de Trente Ans à la mort de Louis XIV (1634-1715),* (Strasbourg 1991).

experienced a demographic explosion with population increasing rapidly through immigration and natural growth, reaching a total of some 675,000 in 1784 (78 inhabitants per km²) and 1 million (118 inhabitants per km²) by 1841. According to Jean-Michel Boehler, soil productivity declined continuously during this period because of overuse. In addition, the great estates were broken up, and as a consequence, the proportion of tenant farmers to labourers decreased throughout Alsace.[3] (For example, the ratio farmers/labourers in the fertile region of Kochersberg declined from 1,3 in 1746-1762 to 0,8 in 1787-1789.) The amount of land being cultivated per capita fell even as the population continued to grow. Available land was frequently less fertile, because farmers were being forced to cultivate fields previously used only as pasture. In turn, the reduction in pasturage led to a reduction in livestock and this affected the amount of meat available for consumption. Prices rose, while nominal wages remained unchanged. Nonetheless, there was a substantial decline in mortality among the poorest classes, which during the seventeenth century had been most stricken by epidemics and famines. Consequently, the segments of the population possessing the least amount of land grew the fastest during the eighteenth century.

Intensive farming

In order to cope with the decreasing size of farm holdings, the Alsatian peasantry turned to intensive farming. The development of commercial farming led to an increase in the density of land occupancy. The cultivation of grapes, tobacco and madder enabled families to survive on increasingly smaller holdings of less than 4 hectares. These crops were worth twice or three times as much per hectare as grain. Families, who then sold their produce at local markets, were able to buy the provisions they needed and to survive on holdings, which under grain cultivation would have been too small to support them. They paid the price in longer working hours, insofar as these crops needed more frequent and continuous attention than grain. Tobacco accounted for a

[3] Jean-Michel Boehler, *op. cit.*, p. 598.

quarter of the agricultural exports of Alsace.[4] It was a valuable commodity, purchased after drying by many small-scale Alsatian, German and Swiss manufacturers.

The low income of Alsatian farmers

This solution, however, had its obvious limitations. One of the surprising observations from a quantitative study of the Alsatian farming milieu in the first half of the nineteenth century concerns the poverty of the great majority of farmers, although their earnings per hectare were double that of the French average. The average Alsatian farmer's income in the nineteenth century was somewhat lower than the French average, and considerably lower than that which prevailed, for example in the Paris Basin, where farming was more extensive, but land occupation density much lower. According to the decennial agricultural census of 1852,[5] the net average annual farming income in Alsace was 508 francs per farmer, compared to the French average of 571 francs.[6] In this initial phase of economic development, intensive farming led to an increase in the number of inhabitants, but did not improve their living standards. Intensive farming methods in Alsace are clearly linked to the increase in population density in the rural cantons. Most rural communities in Alsace reached their highest density in the years between the population censuses of 1836 and 1846. The famine of 1845-1846, which lasted through the spring of 1847, resulted in a rural exodus that stopped the demographic growth in the Alsatian countryside.

Up to that time, the population increase in the rural cantons consumed the additional profits per hectare. Between the mid-eighteenth century and the crisis of 1845-1846 population density doubled and even tripled in most cantons. By 1840 there was more rural overpopulation in the Bas-Rhin region than anywhere else in

[4] Hidemi Uchida, *Le tabac en Alsace aux XVIIe et XVIIIe siècles*, (Strasbourg, Presses Universitaires de Strasbourg 1997), p. 28.

[5] *Statistique de la France*, 2e série, vol. 7 and 8.

[6] According to Jean-Claude Toutain, who uses only data based on male population, the productivity of the Alsatian peasants reaches in 1840 and in 1862 94% of the French level (J. C. Toutain, "La production agricole de la France de 1810 à 1990: départements et régions", *Cahiers de l'ISMEA* 11-12, 1992, p. 164).

France except in the Department of Nord. Higher earnings per hectare did not make the Alsatian peasants better off; they merely enabled the maintenance of the family on small holdings, whose average size decreased as a result of inheritance laws to 3 hectares by 1850. The average living standard of Alsatian peasants may actually have fallen in the first half of the nienteenth century. As a consequence, farm production per hour in Alsace in 1850 was lower than the national average, despite excellent farming practices and maintenance.

There are many indicators to support the hypothesis that a process of pauperisation took place among the peasantry in the first half of the nineteenth century. The largest groups of emigrants from France originated in Alsace, along with the Pyrenees and the Massif Central. Until 1870, it was also the region which provided the largest number of recruits for the army. Farm wages were little higher at harvest time than during the rest of the year, particularly in the northern Bas-Rhin (only 25% higher in 1862 as opposed to 82% in Eure-et-Loire), and labourers were in a very poor negotiating position. These indicators all point to a critical level of rural overpopulation. The extremely overpopulated cantons of northern Alsace were among the poorest in the mid-nineteenth century. Such poverty was found only in the Pyrenees. Farm wages were 578 francs a year in Seine-et-Oise, as compared to 231 and 274 francs in the Bas-Rhin and the Haut-Rhin.[7]

2. Malnutrition in Alsace at the beginning of the nineteenth century

Comparison with the other regions in France

Anthropometrical historical research confirms the poverty of a large number of rural Alsatians at the beginning of the nineteenth century. Emmanuel Le Roy Ladurie has documented the low living standards using conscripts records.[8] Between 1819 and 1826, recruits from the *departement*

[7] *Statistique de la France*, 2e série, vol. 7 pp. 318-343 and 8 pp. 396-423.

[8] Jean-Paul Aron, Paul Dumont, Emmanuel Le Roy Ladurie, *Anthropologie du conscrit français d'après les comptes numériques et sommaires du recrutement de l'armée (1819-1826)*, (Paris 1972). See also John Komlos, "De l'importance de l'histoire anthropométrique," *Annales de démographie historique* (1995), pp. 211-223.

Bas-Rhin had one of the highest incidence of hernias in France, and were second only to those from the *departement* Hautes-Pyrenees in the frequency of goitre; both ailments were characteristic of malnutrition.[9]

The method similar to the one first employed by Emmanuel Le Roy Ladurie can be extended systematically to Alsatian recruits.[10] The records of conscripts examined by the recruitment commissions (*conseils de révision*) are fully preserved in departmental archive depositories, catalogued by canton. The examinations list the many different indications of malnutrition: small size, goitre, cretinism, rickets, tooth decay, white eye flecks, xerophtalmy, scurvy, poor constitution, and hernias. Goitre and cretinism were two conditions particularly indicative of the poverty found in the mountains and flood zones along the Rhine River, where the soil contained no iodine. People there were too poor to compensate this deficiency with iodine-rich food products, or by using sea salt in cooking. The average size of young people is linked to nutritional intake, and to that of their parents. The percentage of those rejected on the basis of height is the best indicator of chronic malnutrition. White eye flecks are a sign of Vitamin A deficiency. Rickets and tooth decay reveal a lack of Vitamin D. Poor constitution has virtually the same symptoms as rickets, but it is evident in full-grown young men who were undernourished for extended periods of time. Hernias resulting from a weakening of the abdominal musculature can be caused by inadequate intake of animal protein.

The peak of malnutrition in the 1830s and 1850s

Between 1805 and 1868 the number rejected for military service in several rural cantons on account of symptoms linked to poor nutrition indicates just how prevalent malnutrition was there until mid-century.[11] In some years almost half the conscripts from the cantons of Villé,

[9] Jean-Paul Aron, Paul Dumont, Emmanuel Le Roy Ladurie, *op. cit.*, pp. 30 and 70.
[10] See also John Komlos, "Le Statut Nutritionnel des Elèves de L'Ecole Polytechnique," *Histoire, Économie et Société* 14 (1995), pp. 463-74.
[11] Jean-Michel Selig, " Physiopathologie et niveaux de vie. Les conscrits des campagnes alsaciennes au XIX^{e} siècle ", *Histoire moderne et contemporaine informatique n° 9*, 1986, pp. 5-26; from same author *Malnutrition et développement économique dans l'Alsace du XIX^{e} siècle*. (Strasbourg, Presses Universitaires de Strasbourg 1996).

Lapoutroie or Sainte-Marie-aux-Mines were rejected because of diseases related to these deficiencies.

Food shortages in 1817 and 1845-1847 had the most enduring effect. Ten years later large numbers of conscripts, who had not yet reached puberty at the time of the shortages, were rejected for poor constitution.[12] Moreover, twenty years thereafter a large percentage of conscripts was rejected because they did not meet the minimum height requirement.

With the exception of the Canton of the City of Strasbourg, all the cantons in Alsace suffered from a high degree of malnutrition. The fertile areas along alluvial plains were just as affected as the marshy areas near the Rhine and the Vosges valleys. For instance, in the 1820s fully 40% of the conscripts in Kochersberg, one of the most fertile areas of the region, suffered from malnutrition. Malnutrition occurred in the various cantons at diffferent times: in the Val de Villé during the Napoleonic period, near the Rhine River and on the Alsatian Plains during the 1820s, in the Munster Valley in the 1830s and in the Valley of Sainte-Marie-aux-Mines in the 1850s. Thereafter, it levelled off radically, first around 1830 in the wine-growing areas (Barr and Rosheim) or Kochersberg (Truchtersheim)[13], then several years later in the remaining cantons, with the exception of the upper Vosges valleys, where it only became less frequent at the end of the 1860s.[14]

The peak of malnutrition in the Vosges mountains

The most serious malnutrition was found among the inhabitants of the Vosges Mountains. This dubious record was held by the Canton of Lapoutroie with an average of 36% of all conscripts rejected for malnutrition in the period 1831-1870. In 1842, and again between 1854 and 1858 the rejection rate exceeded 45%. Retarded growth, a typical indication of chronic malnutrition, was even more widespread than poor constitution, another indicator. The incidence of goitre was two to three

[12] Jean-Michel Selig, *Malnutrition et développement économique dans l'Alsace du XIXe siècle*, (Strasbourg, Presses Universitaires de Strasbourg 1996), pp.203, 400.
[13] Jean-Michel Selig, *Méthode pour une recherche sur la malnutrition dans l'Alsace du XIX^{e} siècle*, mémoire de DEA, Univ. des Sciences Hum. de Strasbourg, (1987), p. 29.
[14] Jean-Michel Selig, "Physiopathologie et niveaux de vie. Les conscrits des campagnes alsaciennes au XIXe siècle", *Histoire moderne et contemporaine informatique*, 9, (1986), p. 24.

times as high as the Alsatian average, with 8% of conscripts examined in the Canton of Lapoutroie affected with this ailment between 1831 and 1870.[15] Apparently, the food shortages of 1845-1847 had severe consequences in this canton. Between 1850 and 1859, one in five was rejected for weakness of constitution.[16]

Urban – rural differences

According to evidence collected by John Komlos in a survey of countries in Europe, Asia, and North America from 1830-1850, the inhabitants of cities were at a disadvantage relative to those in the countryside in being able to obtain animal protein, a major factor in human growth.[17] The transportation revolution had only begun, and methods of food conservation were still in their infancy. Children and adolescents in working-class families had less milk and meat than their contemporaries in the countryside, even when family income was small. The Komlos model of disadvantaged cities, however, does not apply to Alsace and Bavaria during the first half of the nineteenth century: the population of Strasbourg and of Munich had a better nutritional standard at that time than the rural population.[18] It is true that Mulhouse had no such advantage, but this was a city with considerable immigration and industries, which had attracted the poorest segments of the population from outlying areas.[19] Malnutrition lasted longest in rural areas, particularly in the high valleys of the Vosges Mountains. Rural mass poverty persisted outside of the cities. The studies on Bavaria by Joerg Baten as well as those on Alsace show a different pattern from that found in other parts of the world.

[15] Jean-Michel Selig, *Malnutrition...* p. 644.
[16] *Ibid.*, p. 673.
[17] John Komlos, 'Shrinking in a Growing Economy? The Mystery of Physical Stature during the Industrial Revolution', *Journal of Economic History* 58 (1998) 3, pp. 779-802.
[18] Jörg Baten, 'Climate, Grain Production and Nutritional Status in Southern Germany during the XVIIIth Century', *Journal of European Economic History* 30, 1, (Spring 2001), pp. 9-47; Jörg Baten, 'Der Einfluss von regionalen Wirthschaftstrukturen auf den biologischen Lebensstandard', *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte* 83, no. 4 (1996), pp. 180-213.
[19] Achille Penot, 'Recherches statistiques sur Mulhouse', *Bulletin de la Société Industrielle de Mulhouse*, (1842), pp. 384-385.

Nutrition and professional status

Professional status is a good indicator of the inequality in dietary intake. In the wine-growing areas, between 1831 and 1870, 3.6% of the teachers examined for military service were rejected for being malnourished, 7.1% of the blacksmiths, 13.0% of the farm workers, 15.2% of the wine-growers, 22.8% of the day-labourers, 24.2% of the weavers, 29.3% of the tailors and 38.0% of the factory workers. During that period blacksmiths were an average of almost 5 cm taller than tailors (167 cm and 162 cm).[20]

3. Industrialization breaks the Malthusian cycle

The effect of demographic pressure on industrialisation

Overpopulation appears to have been a factor in the acceleration of industrialisation, itself dependent on technical progress, capital accumulation, and structural reforms that abolish any obstacles that might be in the way of entrepreneurial elites to steer the processes. This was the case in some regions of Central Europe at the end of the eighteenth, and the beginning of the nineteenth century.[21] Population density in Alsace exceeded 100 inhabitants per km² in 1821. The growth rate of industrial product reached its all-time peak between 1821 and 1836. In fact, industrialisation was so vigorous that it took place even in areas without an entrepreneurial elite. In the northern part of Alsace, small industry developed through the initiative of peasants and rural artisans, and manufacturing activity could be found even in the most distant hamlets. Industrialisation gave smallholders supplemental income, and reduced the seasonal unemployment of day labourers. It stopped the downward slide in the living standard of peasants and banned the threat of a Malthusian crisis.

The increase in per capita average income

A majority of the population experienced a slow improvement in

[20] Jean-Michel Selig, *Malnutrition*...., pp. 409 and 430

[21] John Komlos, *Nutrition and Economic Development in the Eighteenth-Century Habsburg Monarchy: An Anthropometric History*, (Princeton University Press 1989).

its living standard after the food shortages of 1845-1847. Economic growth slowed slightly compared to the years between the 1820s and 1840s, but at least it exceeded the demographic expansion and led to a perceptible increase in the welfare of most of the population. Areas of poverty began to recede, even in the countryside. It is difficult to date precisely when the number of farmers stopped increasing, and began to decline. The census of 1851 is unreliable and the agricultural inquiries between 1852 and 1862 allow only indirect inferences. According to the censuses, the population peaked during the 1820s in predominantly agricultural communities of the plains around Mulhouse, during the 1830s in the wine-growing areas, but only during the early 1850s in the highest valleys of the Vosges Mountains. It seems likely that, in general, the number of people engaged in agriculture began to decrease in the mid-nineteenth century, but still was at a high level. Industry was able to develop there in symbiosis with the local agricultural activities, thus allowing the maintenance of high densities in the rural population.

The process of industrialisation involved not only the creation of jobs in factories, but also an increase in employment in professions which benefited more or less directly from industrial growth: the crafts, transportation, public services, trade, etc. Poverty began to disappear gradually in stricken rural areas due to the emigration of workers who had previously kept down the wages of unskilled workers. Between 1846 and 1856 18,100 people emigrated and in the following decade 14,200 did so. This was followed by an increase in the income of both peasants and workers. There was a cost of living increase of 0.9% per year in Alsace during the Second Empire,[22] but nominal incomes increased more rapidly. In the period between the inquiries of 1852 and 1862 the peasant population decreased by 5%, while agricultural production increased by 13% in volume and 31% in value from 142 million to 186 million francs (in current prices). Commercial ventures doubled their earnings per

[22] Abbé Hanauer, *Etudes économiques sur l'Alsace ancienne et moderne*, t. II, (Strasbourg 1878), pp. 605 and 608 ; Francis Hordern, *L'évolution de la condition individuelle et collective des travailleurs en Alsace au XIX^e siècle, 1800-1870*, (Aix 1970), p. 63.

hectare through price increases,[23] and trading conditions in the agricultural sector continued to improve. Incomes increased by some 59% in the Bas-Rhin in the North, and 44% in the Haut-Rhin in the South. A similar inquiry does not exist for the end of the 1860s, so that this upward trend cannot be verified through to the end of the Second Empire, but based on figures for the 1880s the upward trend did continue.

Factory workers were the last to experience an increase in purchasing power, but after the mid-nineteenth century a considerable increase for this group also became evident. In the textile industry in Mulhouse nominal wages increased 1.1% per year between 1851 and 1870 for the most highly-skilled workers (spinners) and 2.7% for the less-skilled (thread tiers). Workers in Mulhouse no longer feared the competition in the labour market of poor people from rural areas. They began to feel powerful enough to make demands for a more advantageous distribution of the profit from the businesses. On 22 April 1870, the firm André Koechlin and Co. reduced the working day from twelve to eleven hours without a reduction of wages after being threatened with a strike. Dollfus-Mieg and Co. and several other large businesses in Mulhouse followed this example, but this was not enough to blunt the momentum of the labour movement. Workers at André Koechlin then requested a ten-hour working day and a 25% raise in wages. They began to strike on 8 July and were soon joined by all the workers in metallurgy and the textile industry in various manufacturing centres in southern Alsace as well as some workers from the building sector. The threat of war between France and Germany ended the strike on 15 July, but Alsatian workers at least in the *département* Haut-Rhin had adopted the role of an emancipated working class in an industrialised country .

C. The reduction of malnutrition in Alsace after 1847

In Alsace the reduction of malnutrition after the food shortages of 1847 was evident almost everywhere. This crisis was the last of its kind that produced malnutrition so extensive and severe that its effects

[23] Michel et Nicole Hau, 'La croissance du produit agricole alsacien, 1815-1974', in *Revue d'Alsace* n° 107, (1981), p. 135.

could still be documented ten years later with the number of conscripts rejected for poor constitution. Although grain prices did increase during the shortages of 1854-1856, they did not result in increased mortality rates, although there was an epidemic of cholera which killed 4,600 people in the departement Haut-Rhin in 1854-1855. At the same time, there were recurring signs of malnutrition among conscripts, but these are probably linked to the food shortages of 1845-1847, when the conscripts had not yet reached puberty.

Goitre, most prevalent in the mountains and along the Rhine river, reached its highest level in the mid-1830s.[24] Thereafter it began to retreat everywhere in Alsace, disappearing in the 1840s with the improved access to food supplies. In the most distant areas, i.e., the Canton of Lapoutroie in the Vosges Mountains, over 5% of the conscripts were rejected for goitre as late as the 1860s. In villages in the low-lying areas, particularly around Sainte-Marie-aux-Mines, and wherever industrialization and commercialization had stimulated trade and commodities of better quality were available, this retreat was rapid.[25]

During the 1860s the incidence of malnutrition continued to decline, affected to a great extent by geographic location and profession. This development can best be documented in areas such as the district around Colmar and several cantons in the *departement* of Bas-Rhin.[26] Here improvement was most rapid on the plains. During the 1830s, the percentage of conscripts rejected for malnutrition fell below 20%. In the 1860s no more than 6% of the conscripts from the Canton Neuf-Brisach were rejected. In the Ried in the Rhine Basin and in the lowest parts of the valleys in the Vosges mountains, this process began later. Not until after the food shortages of 1856 did the number of rejects fall below 20%. In the wine-growing areas

[24] Jean-Michel Selig, *Malnutrition...*, p. 404.

[25] Jean-Michel Selig, *Malnutrition...*, *op. cit.*, pp. 216 to 220 and 714. Goitre persisted in the most outlying areas, such as the canton of Lapoutroie.

[26] Jean-Michel Selig, *Données physio-pathologiques des conscrits du canton de Villé*, 1805-1868, loc. cit., Mémoire de Maîtrise, Univ. des Sciences Humaines de Strasbourg, (1985); *Méthode pour une recherche sur la malnutrition dans l'Alsace du XIX^e siècle*, mém. D.E.A., Strasbourg II, 1987; 'Physiopathologie et niveaux de vie. Les conscrits des campagnes alsaciennes au XIXe siècle', *Histoire moderne et contemporaine informatique*, n° 9, (1986); *Malnutrition et développement économique dans l' Alsace du XIX^e siècle*, (Strasbourg 1996).

between the plains of Alsace and the Vosges mountains, population densities were so high that, despite the presence of vineyards, the proportion of very poor people remained high. The number of conscripts suffering from malnutrition there fell below 20% only at the end of the 1850s with the development of small-scale industry. The last pockets of poverty were in the high valleys of the Vosges Mountains where the growing season was short and hamlets were isolated. In the mountainous Canton of Lapoutroie, the malnutrition of conscripts reached its peak in the 1850s (approximately 45% in 1858) and did not fall below 30% before 1870.

D. Industrialisation and malnutrition

Industrialisation drew the rural poor like a magnet into the urban centres. The percentage of conscripts who had been undernourished textile workers increased dramatically after 1850 in the small industrial cities situated at the foot of the Vosges Mountains (Ribeauvillé, Kaysersberg, Wintzenheim).This was undoubtedly due to the influx of rural poor from the high valleys.[27] At Kaysersberg, the percentage of conscripts rejected because of malnutrition exceeded 35% during the 1850s and was only somewhat less than 20% in the 1860s. According to military conscription registers in Colmar and Guebwiller, a very large number of the young men examined were not from the two cities, but had moved there to escape economic deprivation in the countryside. The composition of the population in these centres changed rapidly as extremely destitute people flooded in, and their numbers far outstripped the previous majority of well-to-do bourgeoisie and skilled artisans. Guebwiller's population grew from 4,000 to over 12,000 in the years between 1851 and 1871 and in the period 1831-1870 44% of the conscripts rejected there came from the group of malnourished workers not born in the city. Among textile workers this rate rose to 52%.[28]

Malnutrition continued to afflict farmers from the mountain parishes, day-labourers, weavers, unskilled workers *("manoeuvres", "ouvriers de fabrique")* and they were also the last to profit from improvements in

[27] Jean-Michel Selig, *Malnutrition...*, pp. 476-493.
[28] Jean-Michel Selig, *Malnutrition...*, pp. 764-769.

nutrition. Weavers in the small workshops were worse off than weavers working in factories and the same was true of textile workers as opposed to metallurgy workers. Economic growth led to an increase in employment and also raised the standard of living as well of those not directly employed in the factories. Pedlars, who at the beginning of the nineteenth century were among those most subject to malnutrition, saw spectacular improvement in their situation in some cantons (the Val de Villé).[29] They were the first to benefit from the increase in goods purchased by other sectors of the population.

Surveys taken in the parishes of the Canton of Villé show how the incidence of malnutrition varied, depending on demographic growth and economic development. Malnutrition declined rapidly in agricultural areas with a population decrease after the 1836 and 1841 censuses or in areas where weaving cooperatives were established. There was a delay to this process in agricultural villages on the southern sides of valleys *(ubac)* with little population reduction prior to 1870, as well as in low-lying parts of the valleys where the cottage weaving industries settled. Artisans and merchants providing services for the local population profited with a rise in income before all other residents. Farmers and home workers contracted by merchant-manufacturers were the last to benefit from improved economic conditions and nutrition, especially in parishes where the population declined slowly. The phenomenon of growing poverty observed in Alsace during the first half of the nineteenth century appears therefore to be well-linked to a crisis in the traditional agricultural system which was unable to feed a continuously growing population.[30]

The Canton of Lapoutroie, which had no industry, maintained the highest rates of malnutrition in the 1860s (32.4%) as opposed to 25.2% and 23.5% in the Cantons of Sainte-Marie-aux-Mines and Munster.[31] In

[29] Jean-Michel Selig, *Données physiologiques des conscrits du canton de Villé...*, pp. 59-60.

[30] Jean-Michel Selig, *Malnutrition* ..., pp. 795-798. For other parts of Europe see, John Komlos 'Le Développement de l'économie européenne dans la longue durée: ce que l'on peut retenir du cas de l'Autriche', in *Economies et Sociétés. Histoire quantitative de l'économie française* vol. 30, Série A.F. n. 22, 4-5 (1996), pp. 11-51.

[31] *Ibid.*, p. 638. The maximum values reached by these rates in 1854 was 45% and 35 % respectively.

the 1830s the Canton of Sainte-Marie-aux-Mines had been one of the most disadvantaged mountain cantons near Colmar, but by the end of the 1860's it had the lowest rate of malnutrition.[32] 38.2% of the conscripts were malnourished in the Canton of Munster in the years 1831 to 1835, but only 19.7% from 1860 to 1870 with a reduction in the number of rejects due to goitre from 6.8% to 0.5%. The number of malnourished conscripts who were factory workers and weavers remained high between 1851 and 1870 (50% and 40% respectively), but there was a significant decrease in the percentage of spinners afflicted (22.9%) which was even notable by comparison to day labourers (28.6%) in the same period.[33] Industrialisation increased the proportion of skilled workers who were better paid and showed less signs of malnutrition, i.e. mechanical engineers. In Colmar during the period 1831 to 1840, 1 worker in 67 was a mechanical engineer, but between 1861 and 1870, the ratio was 1 to 5.[34] Industrialisation led to a diversification in professional activity and an accompanying increase in the number of better-paid trades.

All the occupations, even the unskilled workers, experienced a more or less rapid improvement in living standards. The City of Guebwiller, even more highly-industrialized than Colmar, had the most rapid decrease in malnutrition: 35% of all textile workers who had been conscripted in Guebwiller between 1851 and 1860 were malnourished, but this rate declined to 16.2% in the years 1861 to 1870.[35]

Research on the economy of Alsace shows the development of a relatively dynamic industrialization based, in the absence of coal resources, on the responses of the peasantry to overpopulation of agricultural areas and the resulting malnutrition. In this model the demographic growth clearly preceded industrialization and led to a decline in the average standard of living in a first stage. The growing poverty in the Alsatian countryside constituted the first stage of the developmental process: the peasants managed to survive, but only barely. The process of industrialisation started later than in Great Britain, but

[32] *Ibid.*, p. 641.
[33] *Ibid.*, pp. 745-748.
[34] *Ibid.*, p. 786.
[35] *Ibid.*, p. 769.

then was sufficiently strong to raise the standard of living rapidly after the food shortages of 1845-1847.[36]

The middle of the nineteenth century marked a transition in Alsace to another model of growth. Until then improvements in agricultural methods and production had led to increases in population, and industrial dynamism depended mainly on the low labour costs. Thereafter agricultural growth contributed increasingly to the decline of malnutrition and industrial expansion siphoned off excessive rural population and reduced poverty through higher wages.

[36] For the European context see, John Komlos, "Penser la révolutionne industrielle," *Histoire économie et société* 15 no. 4 (1996), pp. 615-630, and John Komlos, "The Industrial Revolution as the Escape from the Malthusian Trap," *Journal of European Economic History* 29, no 2-3 (Fall/Winter 2000), pp. 307-331.