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# AGRICULTURE IN A TURBULENT WORLD ECONOMY

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*From the United States to a World System: Technological Change, International Trade, Agricultural Policy in the Twentieth Century*

This paper attempts to build a comprehensive framework of the transformations of agriculture in the twentieth century, focusing mainly on the case of the United States where they first took place. The moving force behind these transformations is an enduring overproduction crisis which began at the end of the First World War, exploded during the 1930s, was more or less under control after the Second World War and is again becoming particularly threatening. Overproduction has triggered the search for a new system of agricultural production and food consumption based on the transformation of grain into meat. This could be done economically thanks to high protein concentrates (soybean meal). Soybeans appear in Agricultural Statistics for the first time in 1924 and now are grown on as many acres as maize. The corn belt has become a corn soybean belt. A general process of capital accumulation and commoditisation of the farm economy has led to a powerful agribusiness system which has little to do with previous forms of organisation of agriculture.

This new model has spread in most parts of the world, making it possible to rebuild the US share of world trade in basic agricultural products. New forms of agricultural policies corresponding to the new situation have been implemented to foster capital accumulation. Family farms, considered the most efficient method of organising agricultural production, have undergone such structural changes that they now appear obsolete and a drastic change of agricultural policy appears possible.

Statistics of international agricultural trade show that the present dominant situation of the US on world markets for staple food or feedstuff is not nature's gift but the result of an historical process. The US was a very large exporter at the end of the nineteenth century but her position started to erode under the competition of Argentina, Australia and Canada. At the end of the 1930s the US was a marginal supplier of world markets and only 2 per cent of US cropland was cultivated for export in 1940. Now it is one-third.

The situation of the 1930s is in sharp contrast with the present situation where the US makes up 50 per cent of world maize production, 80 per cent of world exports of maize or soybeans, and 40 to 50 per cent of world wheat exports. World grain exports have tremendously increased since the Second World War.

The index of total agricultural production shows a progressive slowing down of the rate of growth from the Civil War to the Second World War.<sup>1</sup> The yearly rate of growth of agricultural production declines from 2.8 per cent during the period 1870–97, to 0.9 per cent during the period 1897 to 1939. These periods can be themselves subdivided: 4.7 per cent between 1870 and 1880; 2.1 per cent between 1880 and 1897. From 1897 to 1920, the rate of growth is 1.2 per cent and declines to 0.7 per cent from 1920 to 1939. Whether including the drought years of 1934 and 1936 artificially lowers the rate of growth of the period is uncertain: they did also restore the balance between supply and demand, and laid the ground for the recovery of the late 1930s. Moreover, statisticians compute the volume of *final* agricultural production, and not the volume of *total* agricultural production. The difference between the two is the production being used as an input, that is seeds and feed for horses and mules. The amount of seeds does not change significantly during the period but the amount of feed declines drastically because tractors and trucks replace horses. This concept overestimates the actual growth.

USDA computes for research purposes an index of total agricultural production.<sup>2</sup> This index shows that the volume of agricultural production remained stable during the period 1920–39.

Last, the moving average of the index of agricultural production per caput shows a regular decline from 1897 to 1939; the keystone of the present food system has seen for 40 years a *steady decline* of the volume of food production per caput! In the 1920s, it was doubted whether the United States could feed her population!

This overall picture is in sharp contrast with the Second World War and its aftermath which sees a steady and vigorous growth: 1.8 per cent during a period of more than 40 years, with a noteworthy acceleration in the 1970s and the early 1980s. This growth has been largely fuelled by exports.

Many factors have contributed to such a recovery: economic recovery in Europe and Japan, 'finely tuned' agricultural policies, trade liberalisation, rise in real incomes, the political and economic might of the United States to shape favourably to her interests the course of economic policies in Europe and elsewhere etc. However important, these factors are of the second order of magnitude. What has to be dealt with is the structural transformation which has laid the ground for the post war growth of agriculture and the shaping of the present world food system.

## AGRICULTURAL DEVELOPMENT IN THE US

### *The technological frontier and the roots of overproduction*

Beginning in the 1920s, the dominant problem of US agriculture

*becomes overproduction* (Johnson and Quance 1972). It still is. Quickly stated, draft animals on farms were using 28 per cent of the harvested cropland in the late 1910s, while 72 per cent was used for final consumption (which includes draft animals used in cities or in industries). In two decades, the replacement of draft animals by gasoline motors increased by 39 per cent (28/72) the potential final production, while motorisation in cities suppressed another important outlet of agriculture (Barger and Lansberg, 1942, p. 29). Hence the development of a rampant overproduction crisis in the 1920s and its explosion in the 1930s.

The oat crop, 20 per cent of the corn crop, and part of the hay crop was grown for horse feed. With the advent of automobiles, tractors and trucks, the number of horses began to decline regularly while the remaining ones were doing lighter work and needed less feed.

If the geographical 'frontier' was closed by 1910, a new frontier, a technological one, opened. It was invisible since it ran through each farm and could not justify any 'manifest destiny'. Huge amounts of cropland became free for final production and consumption. From the point of view of available food resources, the development of this new frontier is the equivalent of the discovery and of the development of a new continent, of a new North America right into the 20th century! The same process took place in Western Europe, after the Second World War.

The distribution of a stable volume of production between final uses and agricultural input began to shift. The agricultural recovery of Europe decreased its imports needs, while Canada, Australia and Argentina took a larger share of world exports the percentage of US cropland harvested for exports declined. Domestic markets were increasingly unable to absorb this excess capacity: food consumption per caput did not show any drastic changes. Cereal consumption declined notably and meat slightly. Fruit and vegetable consumption went up as well as milk but these products are marginal in the heart of US agriculture, the Midwest.

In 1929, the underlying tendencies broke out: agricultural markets collapsed, entailing a severe and lasting overproduction crisis alleviated by the droughts of 1934 and 1936.

### *Power farming and its problems*

Power farming is touted as a gigantic progress. From the point of view of capital accumulation, it certainly is. However, it also opened the farmers' Pandora box; difficult problems had to be solved and fewer farmers were able to solve them! Farmers who had mechanised were confronted with a threefold problem: finding a crop that would fit into crop rotations, be easily mechanised, and more importantly provide cash.

*Crop rotations.* A crop had both to provide fertilizer since the volume of horse manure decreased and to fit into a balanced rotation system. The decline of corn yields during the 1920s and early 1930s is evidence of the disruption brought about by power farming to the old order. Oats (not a

profitable crop by itself) as well as some of the pasture or hay had become useless. the ideal crop had to be a legume since legumes fix the nitrogen from the air into root nodules.

*The mechanisation problem.* The new crop had to be handled with the machinery and implements already available on farms.

*The cash problem.* Since cash was going out to pay for the machinery, parts and replacement (while draught mares could be left idle to breed), energy and car transportation, cash had to come in. Up to then, the farm economy of the Corn-Belt was working to a large extent under the simple exchange, commodity-money-commodity. In sociological terms: 'For a large number of farmers the production of agricultural commodities is not carried on as a means of making money, but rather as a mode of existence' (Barger and Lansbury 1942, p. 6).

Farm records of Iowa or Illinois show that farmers were working largely alongside a market economy: a typical farmer on his quarter section would grow 50 acres of corn, 20 acres of oats, maybe some wheat with the rest of his land with hay, clover, timothy and alfalfa. His rotations were based on corn-oat-pasture with a number of variants depending upon fertility of his land, location, markets etc. Corn was fed to hogs and horses. Farmers got their main source of cash from hogs, sometimes dubbed 'land whales' because they provided the fat for candles, cooking and other uses, and from butter or cattle. His wife was raising chicken or eggs and covered her current outlays with this 'chicken money'.

A typical farmer and his team of horses could plant and cultivate about 50 acres of corn in the spring. Ploughing and preparing the seed bed was a very arduous operation and when the soil was particularly wet or dry, horses could not work. Cultivating corn was the most time-consuming farm operation (Wallace and Bressman 1937) at a time when the work load was important. Horses had to rest; increasing the acreage of corn or the size of operation entailed the use of a second team of horses, the hiring of another driver and the purchase of other implements. A farmer had to incur a large increase of his fixed costs for a dubious benefit. There were hardly any economies of scale under corn belt conditions (Barger and Lansberg 1942, p. 4).

Production itself did not involve much expense: implements were relatively simple and lasted for a number of years, little commercial fertilizer was used on corn until the late 1930s, draft animals were bred on farms, repairs could be handled by farmers or by the local craftsman. Land prices were still reasonable and debts low. These years prior to the power age are remembered as a golden age.

Automobiles were the first sign that times were changing. The 6 million plus farms had 50,000 automobiles in 1910, 2.1 million in 1920 and 4.1 million in 1930. Farmers converted part of their large windfall war income – the net income of farm operators of 4 billion dollars in 1915 reached 9

and 9.6 billions in 1918 and 1919 – into cars, tractors and trucks. Few realised that the operating costs of these glittering wonders would drain their cash year after year and subvert the very sense of farming.

Power farming began to make money the driving force. It replaced the simple exchange by the more complex and contradictory capitalist circuit of money-commodity-money which makes sense only if the amount of money at the end of the circuit is larger than the one at the beginning, i.e. accumulation is the aim of production.

Tractors created important economies of scale. They worked faster than horses and they worked longer under difficult conditions. They removed directly and indirectly the bottleneck of preparing the seed bed and cultivating corn. In Illinois one-third of the farms that had acquired a tractor in 1916 and 1917 were cropping a larger acreage in 1918 (Yerkes and Church 1918), and this at the very beginning of the tractor age, when the machines left much to be desired.

Thus, the tractor – and more generally power farming – simultaneously made capital accumulation necessary and possible. Necessary by subverting the simple exchange into a capitalist one; possible by creating economies of scale. Growth and elimination of individual farms through the competitive system has ever since been a permanent feature of the farm economy.

But all this hinged upon the development of a new crop.

Soybeans were the obvious solution – with hindsight! This mere botanical curiosity in the Corn Belt until the 1930s now occupies as much land as corn. It is a legume plant, it is easily mechanised and when processed into oil and meal, it brings in cash. The ultimate triumph of soybeans is not the result of some masterminded design but of a necessary historical process and struggle which span the two decades of the 1920s and the 1930s.

### *Towards a solution*

Space does not permit a description of the development of the soybean oil market (Berlan et al. 1976), except to mention four breakthroughs.

In 1928, a few industrialists, co-ops and processors (some large companies) offered to contract farmers their bean production at a fixed price. This event symbolises the very close links between farming and industry. It marks the birth of the soybean complex as the core of the modern agribusiness complex.

In 1930, soybean production was protected through the Hawley-Smoot tariff. The US imported only one staple: vegetable oils. Replacing foreign oils with domestic oils was an obvious demand from farmers and processors at a time of shrinking markets. However, this tariff could not keep out coconut oil from the Philippines and soybean oil only found limited markets in industrial uses, particularly paints and varnishes.

In 1934, hydrogenation of soybean oil became feasible on a large scale. Soybean oil could be stabilised and used in margarine manufacturing or other food uses. Research had a key role in shaping the American soybean.

In 1935, the margarine manufacturers agreed 'to use only domestically produced oils and fats' at a *Domestic Oils and Fats Conference*.<sup>3</sup> The industry had no choice: it had shifted progressively away from domestic fats to tropical oils, particularly copra oil from the Philippines and had lost all support from farmers – western cattle ranchers had lost interest, dairy states took more and more retaliatory measures and corn-belt states were becoming hostile. Rather than taking the risk of having margarine banned by law, as several bills in Congress had attempted the industry decided by this move to placate the opposition of dairy interests. In addition, a first processing tax had made Philippines oils less attractive. Within a few years, soybean oil became the largest component of margarine and shortening and the acreage of soybeans for beans – as opposed to hay or green manure – increased dramatically (Table 1).

TABLE 1 *Soybean production and use (1,000 metric tons)*

	soybean for grain	processing oil	% used in			meal
			margarine	shortening	other	
1931–33	420	111	15	1	2	82
1939	2,453	1,543	208			1,224

Source: *Soybean Blue Book*, various years.

These first victories would have been short-lived if economical uses had not been found for the meal. Meal (some 80 per cent of the weight of the bean) had to be a full commodity and not only a byproduct. In the 1930s, the work of experiment stations and USDA showed that this source of concentrated protein had magic properties after heat treatment: (i) it made it possible greatly to improve the ratio of feed consumed per unit of gain in meat animals (ii) the growth rate was considerably increased, (iii) the meat was leaner. Electricity was reaching farming communities and land was becoming useless.

Most pigs were raised on a corn ration sometimes with minerals added. More advanced farmers were adding tankage, a byproduct of the meatpacking industry, high in protein content. Being a byproduct, the quantities of tankage available were set by slaughtering. By contrast, soybean meal could be a full commodity by itself. By the end of the 1930s, meal was worth as much as oil and in the post-war period, the ever-increasing market for meal was the driving force behind the expansion of soybeans. A large part of the oil had to be disposed of through the various aid programmes. To put it in a nutshell, a much more 'efficient' system of animal production becomes feasible.

The control of this source of raw material was immediately an important stake. The first instances of *vertical integration* took place in the Delmarva Peninsula in the late 1930s and the supply of feed enriched with soybean meal, that is of a more 'efficient' ration, was the reason and



the means of this new organisation of agricultural production. Within ten to twenty years, poultry production, scattered all over the United States in 1935, moved to the south-eastern states where impoverished small farmers were numerous. These farmers had no choice but to sell cheaply their labour power under the disguise of contracts and without the fringe benefits of a wage worker (National Commission 1966). At times strikes and violence have erupted in the south.

At the eve of the war, the core of the new system of agricultural production and consumption based on a more efficient transformation of grain into meat and other animal products was well established. During the following decades, it was technologically, economically and socially perfected and expanded first in the United States and later abroad.

The consequence has been a profound decline over the long term of the cost of meat and a corresponding increase in consumption per caput. Poultry meat consumption has increased more than threefold and beef has doubled between the 1930s and 1970 (*Historical Statistics* 1975). The use of soybeans, the development of a new source of energy (carbohydrate) in the Great Plains (sorghum) has led to an entirely different pattern of production: fattening previously done on scattered lots on a number of farms is now concentrated in few huge feedlots in the west. Some cattle funds have been introduced on the NY stock exchange!

#### NEW AGRICULTURAL POLICIES

This period of emergence of the modern agribusiness complex saw, of course, the birth of new ideas on agricultural policies. Historians (Rasmussen 1960; Schlesinger 1957) but not economists (Benedict 1953) have remarked that G. Peek and H. Johnson, advisers to Henry Wallace and agricultural policy-makers of the 1930s (the principle of which was that the price system was unable to shape a smooth path of capital accumulation through the agribusiness complex, and that this situation has to be corrected by the State), were, in 1921, directors of the Moline Plow Company (later to become John Deere) which was thrown into insolvency by the price collapse in the fall of 1919. As a result, they published in early 1922 a small book *Equality for Agriculture* (Peek and Johnson 1922), which elaborated, albeit in a confused manner, what should be the new principles of an agricultural policy serving the needs of the emerging agribusiness complex. The book fed the heated discussions around the McNary-Haugen Bill. New ideas, to be implemented later, took shape (Fite 1953).

The shaping of modern agricultural policies was triggered by the crisis of the 1920s which occurred at a time when agriculture became a market for the mechanical industries that are characteristic of the first part of the twentieth century. It is an *agribusiness policy*.

Agricultural policies in the modern sense, that is a sophisticated system of state interventions to foster capital accumulation in an agribusiness complex dominated by large corporations has little to do with what was

done earlier – basically a tariff policy as noted somewhere by Hathaway. These policies create the illusion of working independently of the structural transformation which they accompany and foster and which in its turn define their characteristics. In fact, their success is accounted for by the emergence of a new technological and social base of capital accumulation which reduced the overproduction crisis to a manageable proportion. It remains to be seen if they can work at a time of sagging markets.

The same movement took place in Western Europe which has adopted a specific version of the corn-soybean model: giving up the protection given to its traditional colonial sources of vegetable oils and meals in favour of American soybeans, while at the same time protecting its cereal and particularly its wheat production. This trade-off founded the Common Market agricultural policy but in this period of increasing overproduction becomes the source of conflicts.

Food production is now a high technology activity (people often are surprised to see the US exporting foodstuff *and* electronics or weaponry as if there was a contradiction between the two). These technological advances are capitalised under high land prices, that is under the form of a Ricardian rent. Hence, agricultural production has tended to move back from Third World countries to industrial countries. Third World countries, turned into sources of agricultural commodities during the colonial era, are becoming now the dumping ground of agricultural surpluses which are a powerful means of political control and jeopardise their own agriculture.

## CONCLUSION

Food production and consumption has now little to do with traditional agriculture. A farmer of the 1910s is closer to farmers of the Roman Empire (slavery not taken into consideration) than to his grandson. In France, 50 years ago, feeding wheat to poultry or hogs would have been considered as a capital sin. Now it is a way of life and three-quarters of wheat production goes to animal feed. The ‘wasteful’ (as often stated) transformation of cereal and high protein feed into meat is the historical response to the challenge of overproduction. When American agribusinessmen call soybean ‘the miracle bean’, they are right to the point, for in the absence of this technological revolution, it is doubtful if US agriculture would have pulled out from the doldrums of stagnation into a period of rapid capital accumulation.

The seventeenth and eighteenth centuries saw, first in Flanders and later in other parts of Europe, the abandonment of fallowing. Historians have stressed how important this agricultural revolution has been and how it laid the ground for the Industrial Revolution. What has happened in the twentieth century deserves also to be called a revolution leading in few decades to an entirely new technical, economic, cultural and social world system of food production and consumption. However, this system remains still beset by overproduction in spite of the opening of the

markets of the communist world. This framework may be useful, we hope, to examine the present crisis.

## NOTES

<sup>1</sup>Among early studies of aggregate output, one may cite: Strauss, Frederick and Bean, Louis H., *Gross Farm Income and Indices of Farm Production and Prices in the United States, 1869–1937*, USDA, Technical Bulletin 703, 1940. Bressler, R. G. and Hopkins, J. A., *Trends in Size and Production of the Aggregate Farm Enterprise, 1909–1936*, National Research Project, Philadelphia, 1938.

<sup>2</sup>I would like to thank Dr. D. Durost for making available to me this index in manuscript form.

<sup>3</sup>This *Domestic Fats and Oils Conference* is mentioned once in the *Proceedings of the American Soybean Association* and is alluded to in some issues of *Soybean Digest* (August 1946, editorial and p. 19). A bibliographic search (including the National Archives) with the help of Wayne Rasmussen, head of the history branch of USDA has been unsuccessful in uncovering any further material illuminating this important point. It is likely that this conference was unofficial and was held discreetly to prepare the defeat of the bills introduced in Congress to ban margarines.

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- amer, Mirko, *The World Fertilizer Economy*, Stanford University Press, 1957; 'The average application of fertilizers materials (in the Corn Belt states of Illinois and Iowa) quadrupled in the decade 1938–1948', pp. 495–6.
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- National Commission on Food Marketing* writes: 'A question remains why the system of coordination that developed was not ownership integration at all stages, including growing the broilers? At this stage, coordination was achieved by contract instead. The answer is to be found in the fact that many underemployed farmers with facilities had few or no alternatives. Also, contracts were attractive to integrators because they involved no social security, no workman's compensation and other employee costs. Capital of feed companies and poultry processors could earn higher returns in other uses' (1966:2).
- Peek, George N. and Johnson, Hugh S. *Equality for Agriculture*, 1st and 2nd edition, H. W. Harrington, Moline, Illinois 1922.
- Rasmussen, Wayne, D. *Readings in the History of American Agriculture* University of Illinois Press, 1960, is to my knowledge one of the few to have realised that the ideas which underly the New Deal are rooted in the material transformation of the 1920s.

'Thus the Moline Plow Company, managed by George N Peek and Hugh S. Johnson, was thrown into insolvency (by the post war decline in farm purchasing power). Peek and Johnson, who had served on the War Industries Board and believed that government action could promote economic stability, decided that farm prosperity must be restored before the farm machinery could prosper' (p. 228). Rasmussen ends his presentation of 'Equality for agriculture' with the following words: 'Pressure for farm relief continued until by 1929 the federal government was committed to the idea of accepting some responsibilities for farm prices' (p. 228).

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