URBAN FOOD SUPPLY AND CHANGING AGRICULTURE: PARIS AND ITS SPATIAL FOOD IMPRINT, 19TH-21ST CENTURIES AND PROSPECTS

PETROS CHATZIMPIROS[*1]; SABINE BARLES[2]
1.UNIVERSITY PARIS-EST; 2.UNIVERSITY SORBONNE PARIS 1.

Big modern cities extensively depend for materials and energy on distant territories. Energy in the form of food is the most fundamental of all energies besides its decreasing share in the energy mix of cities since the dawn of the industrial era. In contrast to energy from fossil fuels and nuclear power plants, the most emblematic environmental dimension of food energy is land requirements that, in the case of cities, are referred to as the spatial imprint of urban food supply.

The imprint locates where the food and fodder crops are grown and its size depends on various parameters that can be divided into three main categories: urban diets, crop yields and "feed to food" conversion ratios. This latter depends on the conversion efficiency of fodder energy and nutrients into livestock biomass and determines the ratio of land requirements between primary and secondary products. For steady agricultural productivity and urban consumption patterns, the spatial imprint of food supply grows proportionally with population.

In this proposal we aim at determining the spatial imprint of the food supply to Paris – meaning the total conurbation of the French capital - since the early 19th century. Over this period, urbanisation and agricultural specialisation grew in deepening complementary relationships and in mutual stimulation: urbanisation first favoured agricultural specialisation in the vicinity of the city for some products (notably milk and vegetables) and in farther areas for other products (notably meat and cereals), then, large-scale agricultural specialisation provided greater food surpluses and set about favourable socio-economic conditions for further urbanisation. Thus, until the early 20 th century, the rapidly growing food demand of Paris is likely to have resulted in the expansion of the spatial imprint of the French capital as well as in structural changes in many pre-industrial agrarian systems. In the second half of the 20th century, agricultural revolutions and new transportation technologies did achieve considerable increases in both crop yields and livestock productivity that have probably underlain profound changes in both the size and the geography of the city's spatial imprint. In sum, during the last two centuries, the spatial imprint of fast growing occidental cities like Paris was the substrate of fundamental changes in the structure of agro-ecosystems and the common ground for transformations in both agricultural productivity and urban diets.

Indeed, in a recent study we showed that, from the early 19th to the early 21st century, the spatial imprint of the beef, pork and milk supply to Paris only increased 2-fold for 12-fold increase of the imports of those three products (measured in protein, 6.25xN). In addition, the acreage of the livestock is currently clustered between regions and countries due to extensive trade in feed, in contrast to the period before the second half of the 20th century when animals were mainly fed locally grown fodder. Both the unitary decrease and the spatial break-up of the Paris' imprint are largely due - directly and indirectly - to the rising share - from 10 % in the early 19th to 45 % in the early 21st century - of the pig meat in this supply. This rise altered the biogeochemical relationship between the city and its food supplying area and was probably driven by the fundamental changes experienced by agriculture since the mid 20th century, including of course the development of industrial fertilizers. By reconstructing the spatial imprint of the total food supply to Paris since the early 19th century in a time

series as continuous as possible, we intend to better understand the secular relationships between urban food consumption and agricultural production, productivity and resulting agro-environmental change as well as to look into turnovers and causal relationships between the structure of agrarian systems and the composition of urban diets.

Prospect thinking on the Paris' imprint should derive from this analysis in which we combine historical and current statistics on agricultural production and urban food consumption with modelling-derived data on animal rations and nutrient conversion efficiencies. In the current context of extensive suburban sprawl with low population densities over previously cultivated land, the spatial imprint of food supply can be a useful tool for designing (sub)urban agriculture and for integrating environmental sustainability with local economic growth.