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Challenges Regarding Food Resources in the Context of Globalization and Population Growth

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Abstract

Taking into consideration the peregrinations of goods and exchange between merchants, agricultural producers and customers in good time, the distribution structure implies high efficiency, which can result in higher costs mainly incurred by the consumers. These transactions are often restricted by the geographical position of the agricultural land used for the road infrastructure and the distribution of the population, thus underlining the ties between merchants, farmers and consumers, the links and the distribution of the population. The technical advancement created by the transport system used the advanced agriculture systems and the mode of delivery to the consumer in real time. In order not to enter into exogenous or endogenous generation cycles, we should apply optimum field growth to the farms. Through this article, we intend to present the current challenges regarding food resources in the context of population growth and globalization.

Keywords: globalization, demography.

JEL Classification: F6, N3, Q15

1. Introduction

Today, the agricultural industry is focused on delivery to the trader and the consumer, to the agricultural producer in a timely manner and is based on productive economic processes of size, including three evolutionary factors: the development of working standards, the large-scale execution and the optimization

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of downtime (Bran et al., 2018). A clear example of this is the evolution of tomatoes, which while purely normal, can be regulated and manipulated anthropologically. The tomato warehouse (ketchup, tomato juice, canned whole tomatoes, etc.) needs an integrated technology flow to avoid high costs during downtime. The operating structure of the agricultural-consumer network must also be streamlined by means of a timely delivery mechanism. In order for the final picture to be complete, it is important to take into consideration not only the appropriate authorities, but also the fact that environmental and health requirements are also in place in the cultivated crop (if the processed vegetables are bio-, eco-or GMO-modified organisms), which are already regarded by the customer (Low & Vogel, 2011). With respect to the region of origin, we apply in particular to the US sector (Kummer, 2010), where Walmart has sought to reduce the gap between the agricultural producer and the final consumer, up to the point of forcing local conglomerates to enforce a strategy of financial assistance to outsourced farmers (Radulescu, et al., 2018). Through these new features of products, new needs emerged from the distribution chain that reduced the distance, but increased the working rate. However, in order to increase the efficiency of the distribution to the trader (respectively final customer), the strategy of work and development has been assigned to the carrier, because it can optimize the dead times by calculating the production, harvesting, processing and transport times to the trader and which can also offer a product whose life is long enough to not create losses due to the expiry of the shelf life.

2. Literature Review

Recent studies show that developing countries have grown much faster than industrialized countries and this convergence of growth has potentially very important implications for global food demand and global agriculture. The same studies show that food demand will double by 2050 and the determining factors are the increase in per capita income rather than population growth, which, the researchers conclude, contrasts with the historical pattern in which population growth influences food demand growth (Fukase & Martin, 2020).

In fact, more and more researchers believe that in the coming decades mankind will demand more food (Schneider et al., 2011). This consideration would not be surprising and alarming if it were not corroborated by the fact that throughout history, human populations that have experienced deficiencies in food production would have been growing. And this growth caused the local overexploitation of natural resources and most likely led to the disappearance or collapse of several ancient societies (Diamond, 2005 apud Schneider et al., 2011).

But these threats seem to be present today. Global population growth and urbanization have meant a decline in natural resources, such as land for food production (Mok, Tan, & Chen, 2020). The problem becomes essential when trying to resolve the situation by abandoning traditional production methods and including risk models. In this regard, worrying examples are given such as India, in which it is expected that fertile land will be increasingly scarce because of rapid

urbanization (Shukla, 2017). Of course, some modern methods are considered useful by current research, such as the exchange of food between human populations. These exchanges can mitigate the risk resulting from variable food production (O'Dwyer, 2020). Other theories such as consumer resource theory recognize the importance of finding food. They examine the problems as a whole and explore both optimal dietary patterns and behavioural strategies or population dynamics and the structure of the food web (Wilson et al., 2018). Other researchers associate various relationships such as the relationship between food production and the use of water resources or energy consumption. They find that beyond ensuring the necessary resources, it is also very important to guarantee food security (Yang, Wang, Wang, & Shao, 2017). Some research has gone further and established that climate change, population growth and economic development are critical challenges in ensuring water, energy and food security both nationally and globally (Zarei, 2020).

3. Research Question

Can Trade be considered the soul of food distribution to the population and the basis of globalization?

In our study, the notion of a merchant as a sign of organizational productivity was introduced by the fact that major merchants come from developing countries with access to logistics and global growth. We notice that a scalable model has been developed for optimum performance (in terms of volume and time). Another result was that in order to secure access to a high shelf life, major retailers included indigenous suppliers who were autonomous of the decision-making process, but not in terms of distribution time and volume. In order to minimize the costs of the manufacturer, to subcontract the agricultural conglomerate and to buy the supplier, the producer becomes a niche for a single agricultural commodity or for a single agricultural class only. We may conclude that this direction has been partly imposed, since the profile studies have suggested that there is loss of consistency by industrial manufacturing processes from the point of view of nutritional content, but also of the minimum requirements to be achieved (USDA). Between 1950 and 2000, agricultural crops had a nutritional loss of 6% in protein and 38% in riboflavin (Davis et al., 2004), albeit with a rise in pesticide amounts (Ata et al., 2012) and organic fertilizers that are now present in agricultural groundwater via the natural circuit (Berman et al., 2005). Another question that our study tried to address was: why are there such findings that affect the nature of the commodity, the atmosphere and the wellbeing of the consumer? One potential explanation is that since they have a long-life cycle, productivity is above average, and they look really "healthy" and still young. The finding is that these are traits of mass production, of poor dietary content and that they spend a lot of time in the flow of delivery. Thus, processing can be seen as an aspect of the horizontal growth of the agro-industrial process, which is part of the vertical delivery chain for the final customer and which by the payment of the commodity, helps many complementary

industries. Local agriculture could thus become the first step towards agricultural wellbeing, to the detriment of global production, either super-industrialized or chemically super-processed. One of the only viable long-term outsourcing models is to be considered. In the case of a corporation, the outsourcing process has a long-term propensity to disrupt the corporate culture and to obstruct the company, creating a malicious reliance on the chances of creating a rival within the outsourced business (Burlacu et al., 2018). The balance gained through the method of exporting production to an agricultural conglomerate may be considered exceptional, since it reflects a win-win scenario in the long run. In order to outsource the corporate mechanism locally, it could be coordinated with the retailer's delivery system by converting the working arrangement of the distribution network into operation or by improving the relationship between the agricultural producer/processor and the retailer's chain of stores. Or by building constant flow warehouses from which to supply the stores of the merchant (additional storage costs and new delivery costs arise in the warehouse-store relationship) and the high degree of rivalry would not allow the use of price differences (For example, Walmart introduced the Heritage Agriculture Initiative, which emphasized all distribution systems, while highlighting local character and in line with competition rates.

We also suspected that the agricultural cycle, which involves the productivity of the cultivation of exogenous factors, also had to be applied in the processing and cyclical growth of the outsourcing producer (weather and pests). In agricultural development models, the "Three Sisters" concept is illustrated, which is based on an alternate crop: wheat, beans all pumpkins, and at the same time, on the same arable field. That is because maize gives the climbing structure for beans, because beans provide the nitrogen required for maize and because the pumpkins do not give pests access to cover the field (Ata, et al., 2012.) This practical balance could be a model of agricultural cover base. For the outsourcing phase, we have big consequences in the manufacturing of product and brand specifications depending on the conglomerate or trader with which it is made (Bodislav & Bran, 2017).

4. Research methodology

In order to highlight the challenges of globalization, we tested the following hypotheses:

Hypothesis 1. Population growth is directly influenced by cereal production

Hypothesis 2. The densely populated areas are close to the cereal areas

For typing hypotheses, the economic literature abounds in standard tests such as multicollinearity (Farrar-Glauber test, Klein criterion, Belsey-Kug-Welsch test), error autocorrelation (Durbin - Watson test), heteroscedasticity of errors (Goldfeld-Quandt test), normality of distribution errors (Jarque-Bera test, Shapiro-Wilk test) etc. In recent times, however, there are several modern methods that come to complete the collection such as the BDS test, the test based on the dispersion ratio or the Ng-Perron tests (Jula & Jula, 2014). In the paper, we highlighted the trends of data series over comparable time intervals.

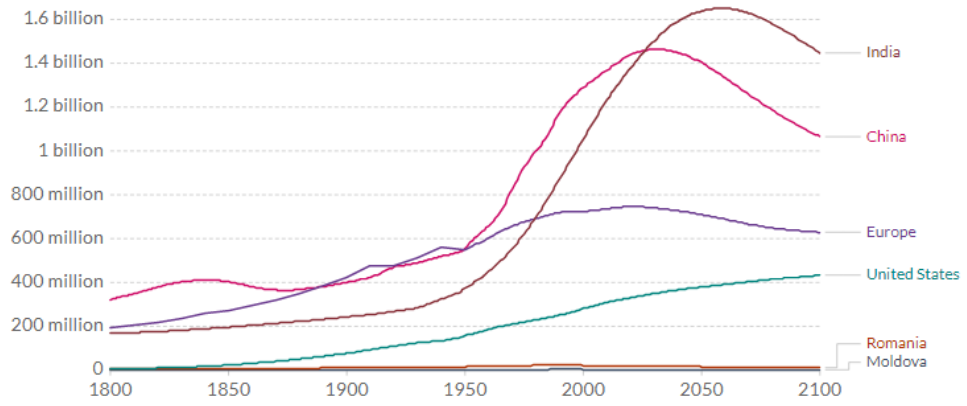

Figure 1. Population growth and forecasts
Source: https://ourworldindata.org/grapher/projected-population-by-country

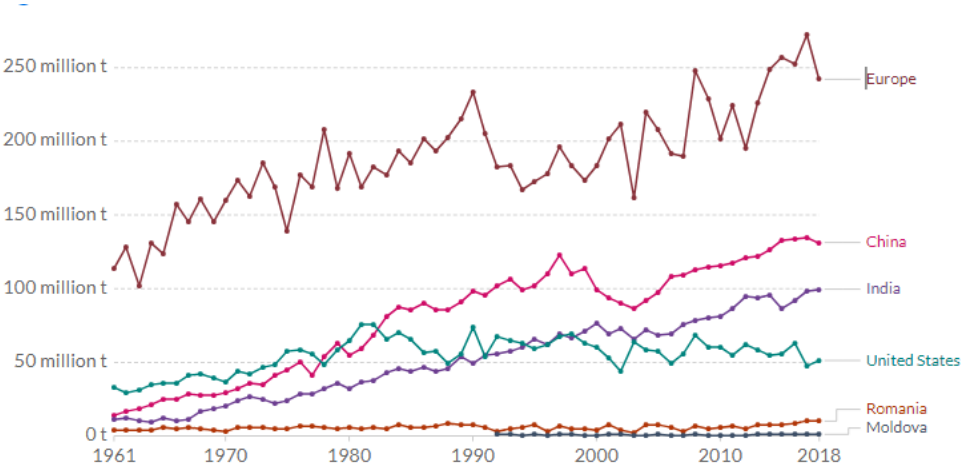

Figure 2: Cereal production
Source: https://ourworldindata.org/agricultural-production#cereals

Figures 1 and 2 highlight the evolution of the population and its trend, respectively the evolution of cereal production. The analysis of the available data allowed us to find that although the trends are increasing, there are not enough researches to justify the existence of a correlation between the global population growth and the increase in cereal production. There are a number of factors of technological progress on the one hand and socio-economic changes on the other that would justify these increases. The hypothesis remains open and we will consider it in our future analyses.

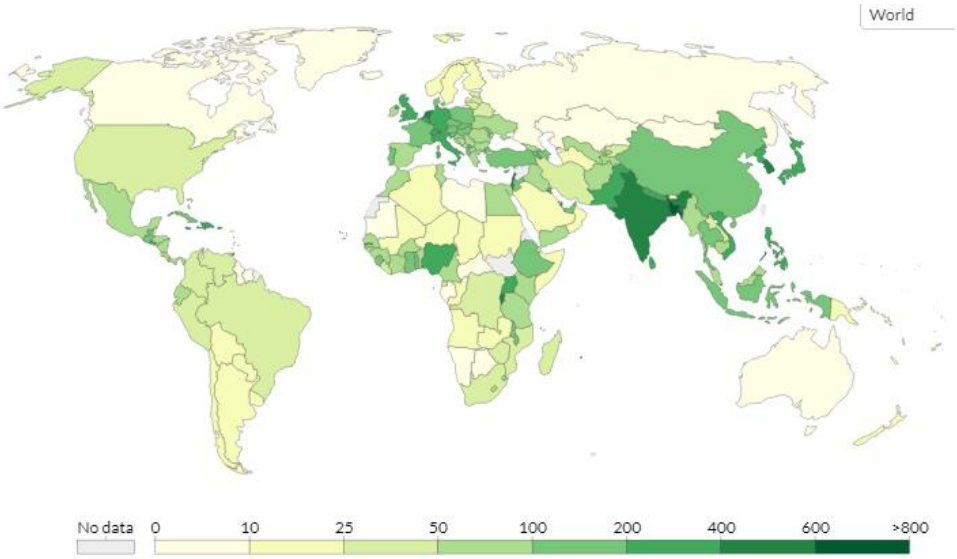

Figure 3. Population density (inhabitants / square km)
Source: https://ourworldindata.org/

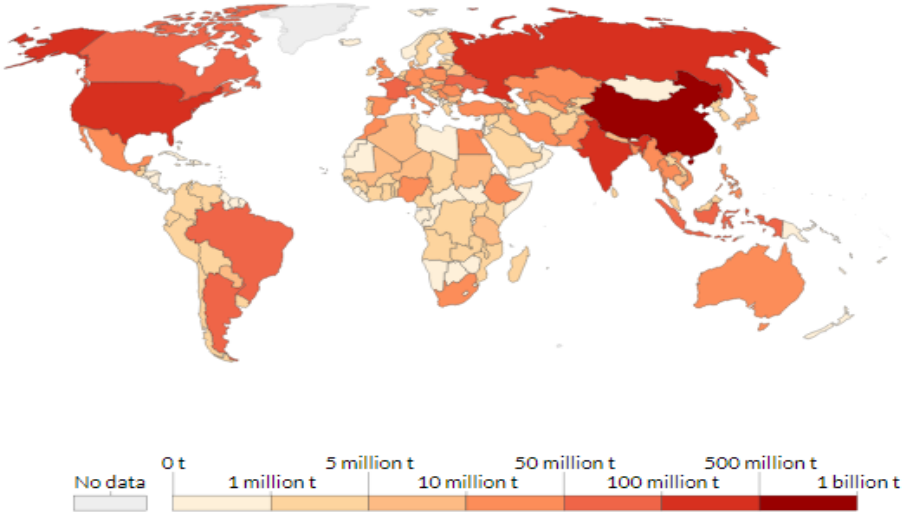

Figure 4. Cereal production in 2018
Source: https://ourworldindata.org/agricultural-production#cereals

As can be seen in Figure 3, areas with high population density are found mainly in territories whose climate allows both agricultural activities and where there are

important soil and subsoil resources, including drinking water. Figure 4 highlights recent cereal production. Starting from the observations in these figures, correlated with the analysis of globally available data, we can say that hypothesis 2 is partially confirmed. To clarify our suspicion, we will analyse in future works other possible factors that may directly influence the density of inhabited areas such as geo-political, strategic-military and environmental factors. Also for clarification, in the continuation of our research, we started from general aspects and we continued with aspects specific to a standard production-processing-distribution model of perishable products.

5. Findings

The standard model of the production − processing − distribution system of agricultural perishable products

Usually, any model that is based on a perishable product distribution process starts from the manufacturer, who cultivates the product being subcontracted or whose products are contractually reserved by a merchant who offers them for sale to the customer. The only factor that could be calculated in advance with a high rate of compliance with reality was the total expected demand for the product in question. Given the short product validity period, the expected demand was relatively easy to quantify, as it was short-term and thus traders were able to place fixed orders to the producers with whom they developed long-term business relationships and to which, depending on the order, they could add new producers, which led to the idea that for the unprocessed products the spot market can be approached. Another finding was that the short-term relations between the agricultural producer and the trader may arise as a result of temporary excesses in customer consumption and the surplus of some producers (Troop, et al., 2008). As far as the agricultural producer is concerned, it has two options:

1. Coverage of agricultural production: to produce limited quantities of several products and based on contractual relations with one or more traders;
2. Specialization on a single agricultural product (the tomatoes in question): this increases the risk of achieving optimal production, but also at the request of the trader (this risk is optimized through the contract with the trader).

In this research, we can also bring forth the idea of competitive advantage and comparative advantage of the independent agricultural producer, which by the risk assumed can ensure a sale price without competition, at an amount cultivated per hectare higher than the competition and at a share of advantage above average. Considering that we do not deal with a complex production or with too many variables in the production model, it turns out that the involvement of the production factors on the product is the same for the single product and for the diversified manufacturer.

At this point, the choice made by the retailer to protect its continuous distribution flow, if it buys tomatoes from a single manufacturer that covers its

needs (the supplier's monopoly), will get a very good price that will allow it an excellent additional commercial advantage, respectively a large profit (Jianu et al., 2019). If this does not include distribution, then this variable is negotiated and supported in whole or in part by one of the parties. In the model based on storage before distribution, there is an additional cost compared to the initial and the modification of the structure of the transport costs, respectively there are the costs of managing the check-in and check-out at storage, plus the cost of inventory.

The structure of the transport costs in the distribution system has not been the subject of our research, but to understand the context, it will be presented broadly hereunder:

1. The agricultural producer: if the agricultural producer bears the cost of transport to the distribution warehouse or to the merchant's stores, it may include it in the price asked to the seller asking price. Volume variables over cross-distances result in the type of trucks used, whether they are included in their fleet or are an outsourced service. The small quantities carried are contrary to economies of scale and thus may lose the competitive advantage initially created;
2. Central warehouse trader: aggregating the distribution of fresh products from several categories decreases the cost of transport for the seller, but only over medium or long distances significant gains are noticed and that when the trucks used in the distribution are always full and the travel of return to the central warehouse are also taken into account (these are empty, but with a tax, that would not be paid in the case of direct distribution);
3. Direct distribution retailer: in this case there are costs related to inspecting the goods in each store (which in the centralized distribution are covered at the central warehouse) and the cost of the commercial space, being cheaper to build a warehouse for several stores in an area with cheap land or in an area with former decommissioned production facilities (Greenfield versus Brownfield).

In order to show the true value of distribution cost as the main selection factor between the local agricultural producer as compared to the economies of scale-based system, we will approach the dispersion of the positioning of agricultural land and the central warehouse or the seller stores, depending on the seller's storage mode. In addition to the idea addressed in the first part of this article, that of the advantage created by the specialization regarding the production of a single product, the tomato, in our case, it must also be justified the location of the agricultural land and the distribution of agricultural production.

In our research, we conducted an experimental study in which we assumed that three producers are at the same distance from the central warehouse or retailer's stores and can produce the same quantity, using arable land to the maximum potential, the differences being in the choice of having a specialized or diversified crop. Then, we assumed that one decides to specialize and the other decides to protect the production. Upon harvesting, the contracting retailer has chosen the final supplier and completes its strategy, which can be with a single supplier of products or with several suppliers per agricultural product (here the quantity being

the same in both cases, it proves that they had to divide the quantity taken over by the retailer). We found that the merchant's strategy also included the inventory / warehousing model, either through the central warehouse or through the direct warehouse storage. The seller's work balance was based on the balance between long distance transport from multiple suppliers versus a single supplier offering the maximum transport load to a central warehouse. The distance between the warehouse and the assigned stores could be calculated for a single return flow (all stores were supplied and there was only one travel-back with the empty truck). Depending on the distance between the central warehouse and the store (or the order in the delivery process), there were some differences in the prices charged in stores for the same agricultural product, from the same stock. Basically, the cost with a central warehouse was partially depreciated by the disappearance of quality control positions created and by taking over inventory in each store, this process taking place at the warehouse, and the inventory was managed electronically. Checking the quality of the products was a procedure that eliminated at least one employee from the workflow, and those responsible for this were occupied with receiving other goods in the store.

At the same time, the price paid to the agricultural producer became a cost to the trader, and the good became an intermediary good in the flow to the consumer. This cost of the product was surrounded by handling and transport, which according to the staff is standard, but the transport could create significant differences between the profit share on the product and its competitiveness compared to the others, and an influence can have external variables, in mainly the transport infrastructure that can reduce the delivery times if it is optimally designed and this is the defining element in creating a full scale economy (including here the production of the agricultural product, the distribution and the competitive price implemented at the shelf). Returning to an element previously highlighted, that of the cost of space in a store per square meter, here the comparison between the rent paid per square meter and a policy of daily or semi-annual distribution of products appeared, thus limiting the storage area of the store. The flow from the producer was not daily, from where a warehouse is needed to store agricultural products before entering the store.

Returning to the choice of the producer whether to specialize in the production of a single agricultural product (tomato production), it had the open path to an economy of scale, but with the risk assumed by a single good production, which becomes a competitive advantage, which is possible or attenuated in relation to the retailer, if the agricultural producer provides transportation to the store (most often, the transport is provided in a warehouse to which several shops are assigned). If the manufacturer had to deliver to several stores, it made the same transport (preferably with the same truck to reduce costs), and the cost per kilometre was higher, as well as the economic value and time consumed, taking into account the fact that the shops were located in crowded areas and, consequently, to the time spent in high traffic, the time of unloading and taking over the delivered product was added.

Conclusions

In order to be able to draw a conclusion on the subject of the choice made by a global trader to keep the production geographically dispersed or to use agricultural conglomerates by subcontracting production exclusively for the trader, and from the perspective of the agricultural producer, we have the problem of whether approaching the market at the global, regional or local level and the costs that arise in the agricultural products offered.

To the two views are added the perishability of the products, these being ones that require a calculation of the distribution times (which relate to the natural environment, producer and processing for distribution and retailer) and creating an optimal working time between process times, crop harvesting and geographical distribution (either in distances or in population density). Lowering costs with transportation and product differentiation bring profitability rates to farmers and traders as well, but the balance tends to lean towards the surplus of profitability for the merchant, as it can monetize customer-targeted marketing (profit margins are higher in business-to-consumer, than in business-to-business relations). Developing transport strategies can be the solution for attracting a large retail group as a future customer for agricultural producers, all at the expense of another supplier (agricultural producer), because the cost of transport incorporated by the producer leads to obtaining a supply contract. Regarding the diversification on the same perishable good (tomatoes, in the case of this work), we have to deal with the construction of brands based on how the final product is obtained, either bio or eco or mainstream and this differentiation can be profitable for the producer because it will charge a higher price for the products offered differentiated, but the profitability is on the part of the trader because it can monetize the respective product by marketing its characteristics: local origin (appeals to the nationalism of the customer and the feeling of belonging to the group), and the way the product is obtained (bio and eco products are obtained from soils that are not chemically impregnated, treated with natural products and that do not harm the environment in the long run). These two characteristics create added value for the product and the trader, which are not obtained by direct quantification of some products but are obtained as a secondary calculation, thus the profitability rate being higher.

Finally, it should be remembered that certain production methods are only feasible in certain areas and that, thus the implementation and feasibility process will be pursued after the analysis of soil, atmosphere, anthropogenic environment and usable infrastructure characteristics, taking into account the relationship established during the research phase: the distance between a city or an urban centre and an agricultural supplier is directly proportional to the land area required for the production of the requisite agricultural products. In the long run, the effect of the breakthrough introduced by the IT&C sector may be one that will generate a split in the conventional structure of processing, delivery and selling of agricultural, ecological, organic and natural goods, which may contribute to the disappearance of the industrial intermediary circuit of retailers, but which will result in the benefit of the bio-consumer, the end-user.

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