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# Structuring and Development of Poultry Sectors in Algeria: Limits of Modernization Policies: The Case of the "Turkey" Sector (2000-2020)

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## ABSTRACT

**Background:** The Algerian poultry industry has had the biggest growth in the country. The purpose of this study is to demonstrate that the modernization of the poultry industry, driven by the policies pertaining to poultry that Algeria enacted between 2000 and 2020, did not result in the creation of governance structures that were in line with the demands of improving the performance of these industries. This theory is supported by the "Turkey" sector example.

**Methods:** In order to explain Algeria's poor governance of the poultry industry, the new institutional economy (NIE) invests within the framework of the "Sector" approach. The 1,288 units of turkey farms dispersed among 38 wilayas, or 80% of all the wilayats in the nation representing all possible production regions, were the subject of surveys conducted on turkey farms between 2015 and 2017.

**Result:** The "atomized" breeding structures, the importance of "independent" breeding, the lack of economies of scale, the low level of development of integrated production and the absence of hybrid institutional arrangements are what set the "Turkey" sector apart, according to an analysis of its organizational structures. All of these things contribute to high production and transaction costs. Nonetheless, the "turkey" sector's lack of coordination mechanisms continues to be a serious problem that causes abrupt changes and volatility in producer pricing, which in turn causes cyclical crises. These crises are a source of uncertainty and dangerous hazards, especially for small farms.


**Key words:** Modernization, Sector, Structuring.

## INTRODUCTION

The Algerian poultry industry has had the biggest growth in the country. Since the early 1980s, these industries have always been given a key role in the State's agricultural development strategies and initiatives (Kaci and Cheriet, 2013).

In order to meet the growing needs of the national markets, particularly urban populations and low-income social categories, the development of the poultry sector is a part of the process of modernizing the sectors under the auspices of the State (Kaci, 2013, Kaci and Kheffache, 2016). This process aims to improve the supply of lower-cost animal proteins (Ferrah, 1997; Kaci, 2015).

In order to increase production and enhance the supply of white meat, public authorities started a massive modernization and upgrading process of the poultry sectors in the year 2000. This involved upgrading livestock buildings, controlling production processes, improving regulatory mechanisms and supporting investments in the processing industry (Kaci, 2014; Chehat *et al*., 2018; Bessaoud, 2019). Driven by the private sector within the framework of strategies for moving up the sectors, this dynamic was backed by the "National Agricultural Development Program" (2000-2008) and communicated by the "Policy for the renewal of the agricultural and rural economy" (2009-2018) (Kaci, 2014).

The three components of the explanatory factors mobilized by certain authors to explain the inadequate performance of the poultry sectors are underinvestment in private poultry farms and their relatively small size, which prevents them from achieving economies of scale; inadequate mastery of poultry technologies and breeding practices; and systematic reliance on international markets for poultry inputs (Kaci and Kheffache, 2016).

Numerous investigations have endeavored to elucidate the source of the subpar performance as far documented by Algeria's poultry industries. All of these studies have made an effort to connect Algeria's intensive poultry model's low technological proficiency with the poultry industry's bad performance (Ferrah, 1997). However, it has been demonstrated that intensive poultry sectors demand a high level of coordination because to their complexity,

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perishability of goods and high degree of specificity of assets related with the uncertainty of transactions (Martinez, 2002; Nin *et al*., 2007; Cook *et al*., 2008). The latter influences these industries' degree of economic performance far more than the technology that are offered on global markets. This is especially true for the "turkey" industry, whose operations are heavily regulated by downstream businesses (Aho, 2017; McDougal, 2018).

This article's goal is to demonstrate how the national poultry policies that were put into place between 2000 and 2020 drove the modernization of these sectors, but the resulting governance structures did not meet the requirements for enhancing these sectors' performance. This essay makes an effort to support this theory by examining the growth and organization of Algeria's "Turkey" industry.

## MATERIALS AND METHODS

### The theoretical framework

In order to test our hypothesis, we employed the ideas associated with the new institutional economy (NEI) that are incorporated into the "Sector" approach framework to explain Algeria's poor governance of the chicken industry.

Theorists of this analytical current (NEI) specifically hypothesize that transaction costs, which are crucial in mediating disputes between the different forms of governance that have been adopted, exist in addition to technological factors that determine production costs. These costs interact with the institutional framework to determine how well existing forms perform over the long run (Menard, 2000). Transaction costs are associated with the distinctiveness of the assets, the environment's unpredictability, the actors' opportunistic conduct and the information's asymmetry. The primary organizational forms or structures that are used, such as contracts, the spot market and vertical integration through hybrid arrangements-particularly cooperatives-determine the capacity to lower transaction costs (Jia and Bijman, 2013). NEI theorists contend that informal institutions, particularly social networks (families, friends), are critical to modernization and economic development and play a critical role in the operation of markets as a major mechanism for risk management, information dissemination and transaction cost reduction in the context of transitional countries, which are characterized by a high degree of uncertainty linked to the low maturity of formal institutions, including those of the market (Steer and Kunal, 2010; Casson *et al*., 2010).

The fact that intensive poultry industries demand a higher level of coordination at the mesosystemic scale has been proven. This is because these sectors have highly particular assets that are connected with unpredictability and asymmetry of information between commercial partners (Menard, 1996). This is especially true for the highly coordinated downstream businesses' production of turkey meat (Aho, 2017; McDougal, 2018).

More specifically, the contractual relations system helps breeders by improving income, ensuring a steady supply of inputs, securing markets, reducing market risks and, on the other hand, giving producers access to additional resources. Meanwhile, on the processing industries side, contractual relations help to reduce uncertainty in product production and marketing by closely monitoring quantity and quality to meet demand for lower-cost, high-quality products (Soullier and Moustier, 2018).

### Collection of data

The 1,288 units of turkey farms dispersed among 38 wilayas, or 80% of all the wilayats in the nation representing all possible production regions, were the subject of surveys conducted on turkey farms between 2015 and 2017. The whole community of businesses and "Turkey Breeders" farms that specialize in the manufacture of organic production factors was also the subject of our investigations (Fig 1).

The surveys were conducted in accordance with the plans created by the national agri-food sector observatory of the INRAA (Ferrah, 2021). The information in the resulting file was cross-checked against the National Center for Trade Registers (CNRC) file, chambers of agriculture and local agricultural and veterinary administration services.

Information about the farms' organizational structure is included in the questionnaire that formed the basis for the surveys. The variables include the legal sector that the economic entities are part of, the proximity of input and consumer markets (Wilaya of establishment and zoning), investment strategies (animal size, types of buildings, ownership methods), coordination mechanisms (animal level of integration in sector and formal economy; animal approval); and integration into "Family Strategies." Every query was marked as "Closed."

### Data processing and analysis

Descriptive statistical analysis was performed on the data to ascertain the general features of Algerian turkey farms. Using the XLSTAT software, a typological study was conducted using a "Multiple Correspondence Analysis" (MCA) and a "Cluster Analysis" to determine the major structures and their corresponding weights in Algeria.

## RESULTS AND DISCUSSION

### Structures of turkey farming in Algeria

### Structure of assets

Algerian turkey farms are still primarily composed of small, independent farms, with cooperatives having little influence and minimal integrated production (Table 1 and 2).

With a 3000 animal capacity instantaneously on average. Compared to "informal" farms that are independent and run in indirect ownership mode, approved integrated farms operating in DOM often have a higher size (Table 2).

In Algeria, the majority of producing structures are solid buildings with static ventilation, accounting for approximately 96% of the total production capacity. But we are seeing the rise of greenhouse farming, which accounts for 4% of the

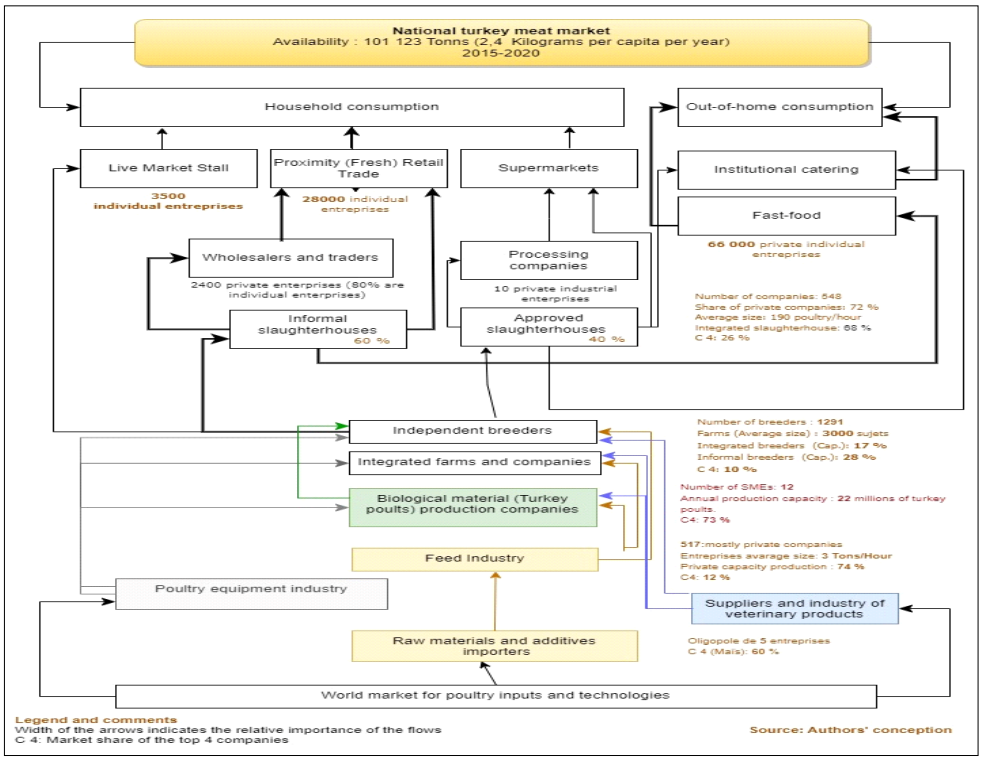



**Fig 1:** Overall structure of the turkey sector in Algeria.

**Table 1:** Structure of the productive potential of turkey farms in Algeria.

| Indicators | Units | Private farms | CF/IF | Cooperatives | Private companies | Public companies | Total |
|---|---|---|---|---|---|---|---|
| Number of farms | % | 94 | 4 | 0 | 1 | 0 | 100 |
| Instantaneous capacity | % | 76 | 4 | 0 | 20 | 0 | 100 |
| Average seize | Animals | 2 461 | 3 013 | 4 500 | 48 027 | - | 3052 |

CF: Collective farms, IF: Individual farms.

**Table 2:** Descriptive statistics of the variables studied.

| Variables | Modalities | Number of farms | | Instantaneous breeding capacities | | Average size of farms |
|---|---|---|---|---|---|---|
| | | Number | % | Capacity | % | |
| Approval | No | 444 | 34 | 1 101 775 | 28 | 2 481 (a) |
| | Yes | 844 | 66 | 2 829 121 | 72 | 3 352 (b) |
| Types of buildings | Solid | 1219 | 95 | 3 790 296 | 96 | 3 109 |
| | Greenhouse | 69 | 5 | 140 600 | 4 | 2 038 |
| Ownership mode | Rental | 99 | 8 | 174 745 | 4 | 1765 (a) |
| | Direct | 1189 | 92 | 3756 151 | 96 | 3159 (b) |
| Level of livestock integration | Upstream 1 | 2 | 0 | 107 820 | 3 | 53910 (b) |
| | Upstream- Downstream 1 | 1 | 0 | 70 000 | 2 | 70000 (c) |
| | Fattening- Feed manufacturing | 10 | 1 | 472 616 | 12 | 47262 (b) |
| | Independent | 1275 | 99 | 3280 896 | 83 | 2573 (a) |
| Family strategies | 0 | 910 | 71 | 2662 740 | 68 | 2926 |
| | 1 | 378 | 29 | 1268 156 | 32 | 3355 |
| Overall population of farms | - | 1288 | | 3930 896 | - | 3052 |

Obs: Significant effects marked by different letters at $p<0.05$.

country's productive potential and is a true revolution brought about by private operators to offset the astronomical costs of poultry buildings in Algeria, especially in the country's highly urbanized wilayat (Table 2).

Direct Farming Mode (DFM) is the primary method used in turkey farming. But as public assistance programs are put into place, we see the rise of indirect ownership-the linking of capital and asset leasing. The latter amounts to about 4 per cent of the total production capacity.

**The weight of informal livestock farming**

The survey found that a moderate amount of farms are unofficial. This amounts to 34% and 28% of the total size and potential for production of the animal population, respectively.

The prevalence of this type of animals is highest in urban wilayats near large consumer marketplaces.

**Family networks**

Family networks (FN1) are groups of breeders who have amassed substantial social capital and unquestionable knowledge and who are incorporated into networks of relationships connected by family ties. These family networks, which were primarily established in the wilayats comprising the northern Tell's interior plains and mountain regions (Group W 2) and the traditional areas of intensive production (Group W 4), account for 32% of the productive potential and contribute 29% of the total population size (Table 2).

**Level of integration of animals**

The part that farms turkeys is still rather lowly integrated. In fact, "independent" livestock farms account for 83% of total production capacities, whereas integrated livestock farms-which are essentially composed of "legal entity" businesses situated in the highland wilayat (Groups W 1 and W 4)-represent 17% of the population's potential for productivity and only 1% of the total population (Table 2).

Two-level integration, involving the livestock feed industries segment, is the most developed within the population for an average size of 47,000 animals, accounting for 12% of global livestock capabilities and 73% of integrated production capacities. These are industrial firms that specialize in fattening turkeys (Table 3). Integrated organizations with a noteworthy average size of 20,000 animals also engage in turkey breeding. In fact, compared to farms that fatten animals (17%), these farms exhibit a higher degree of integration of breeding capacities (89%). Groups W 1 and W 4 on the high plateau are where it is concentrated.

**Typology of the farms**

Using XLSTAT, the Multiple Correspondence Analysis (MCA) showed that the first three elements of the factorial plan account for 66.33% of the significant variability.

It was feasible to create a typology of farms based on four groups (Table 4) after conducting a cluster analysis of the farms in the population under study using Ward's aggregation method: small independent approved farms, small informal farms, family network farms and integrated industrial enterprises.

**Class 1. Small approved "independent" farms**

Small, autonomous and authorized private farms operating in direct farming mode (DFM) in permanent buildings make up the majority of this class, accounting for 44% of the total output capacity for an average size of 3,100 subjects. This class is by far the most significant in Algeria and is mostly found in the intensive production zones of metropolitan regions (W5). It is primarily composed of elements of cluster-size G3.

**Classe 2. Small livestock farms in the informal sector**

Class 2 comprises primarily of components of the G4-size cluster and accounts for 27% of the population's total output capacity at an average subject size of 2,300. Two things set this class apart: the practice of greenhouse breeding (DFM), which accounts for 13% of the class's total breeding capacity and the influence of the informal economy (100%). Class 2 is mostly found in the interior plains and mountains of the Tell-north wilayas (W2), with ancillary locations in the urban wilayas' consumer marketplaces (W3).

**Classe 3. Approved farms of family networks**

With an average size of 1900 animals, this group accounts for 22% and 14% of the population's total size and breeding potential, respectively. The weight of family networks (Kinship) connected to the indirect farming method (IFM), which account for 86% and 28% of the class's total breeding capacity, respectively, sets it apart. Small permitted farms in traditional intensive poultry production zones (W5) are represented by this group. These farms are centered on metropolitan areas close to the wilayat-metropolises, which are their sources of supply (large consumer markets).

**Table 3:** Structure and levels of integration of Turkey fattening farms in Algeria.

| Integration type | Average seize | Number of farms | % of farms | Global livestock capacity (animals) | Breeding capacity % |
|---|---|---|---|---|---|
| Upstream- Downstream1 | 70 000 | 1 | 0 | 70 000 | 2 |
| Upstream- | 53 910 | 2 | 0 | 107 820 | 3 |
| Fattening- Feed manufacturing | 47 262 | 10 | 1 | 472 616 | 12 |
| Independents | 2 573 | 1275 | 99 | 3 280 460 | 83 |
| Total | 3 052 | 1288 | 100 | 3 930 896 | 100 |

**Classe 4. Integrated industrial poultry companies**

This group, whose average size is higher at 65,000 subjects, accounts for 1% of the population and contributes 15% of the total productive capacity. Among the population examined, the two-level integration including the animal feed industry section has 85% of the category's production capacities, making it the most developed design. These farms, which consist of integrated businesses, are primarily located in the highlands (W4) and the intensively produced areas of metropolitan areas (W5).

The importance of small "independent" farms-which make up the majority of the sector in Algeria-distinguishes the "turkey" sector in terms of governance structures (Classes 1, 2 and 3). These farms actively participate in the market for the selling of their goods and the provision of inputs. The average farm size has increased by 20 times in almost 20 years, from 150 animals in 1999 (MADR, 2003) to 3,000 animals in 2017. Algerian turkey farming has changed dramatically over the years, although it is still mostly an agricultural rather than an industrial enterprise. Today, farms in Turkey are part of organized industries that are linked to global markets for poultry inputs as well as urban consumer markets.

In general, the atomized structure of turkey farming leads to the dominance of transactions on the market, which is comprised of several small dealers and breeders, resulting in high transaction costs (Alloui and Bennoune, 2013; Kaci, 2015).

Additionally, this research showed that while the percentage of "informal" turkey farms is still moderate, it is notably higher in regions with large populations. The predominant nature of informal poultry production linked to greenhouse farming sets apart the major consumer markets. Due to land limits, pressure from environmental and health regulations and strategies used by small-cap holders near large metropolitan markets that have been growing since 2000, the informal sector has a significant weight in these areas. According to Imache *et al*. (2011); Semmoud and Ladhem (2015); Maachou and Otmane (2016) and others, peri-urban agriculture is characterized by the innovative adaptation strategies of small farms, such as the development of greenhouses and poultry farms, as well as the "promotion" of informal institutional arrangements.

It should be highlighted that the development of the turkey industry in Algeria was supported by the use of assets with low specificity, such as converted broiler buildings and poultry greenhouses, with the exception of class 4 farms and the breeding of turkey breeders. The use of greenhouse farming by private poultry operators to offset the high expenses of poultry buildings in Algeria is a true revolution in the poultry industry. These greenhouses, which are incorporated into ad hoc institutional frameworks, are common in heavily urbanized provinces. Poultry greenhouses are a low-specificity, low-cost asset that can be quickly put into use (Kaci, 2014). They are an adaptive strategy to the need to lower the risks associated with the practice of poultry farming in the metropolitan provinces' surrounding heavily urbanized areas.

In the end, the modernization initiatives for the poultry industry carried out between 2000 and 2020 lacked the backing of effective governance frameworks as compared

**Table 4:** Typology of Turkey fattening farms in Algeria.

| Indicators | | Class 1 | Class 2 | Class 3 | Class 4 |
|---|---|---|---|---|---|
| Number of farms of cluster | | 555 | 444 | 280 | 9 |
| Capacity of farms of cluster | | 1749 | 1054 | 538 | 589 |
| | | 025 | 275 | 160 | 436 |
| Cluster weight | Number (%) | 43 | 34 | 22 | 1 |
| | Capacity (%) | 44 | 27 | 14 | 15 |
| Informal farms | Number (%) | 0 | 100 | 0 | 11 |
| | Capacity (%) | 0 | 100 | 0 | 8 |
| Breeding in greenhouses | Number (%) | 0 | 16 | 0 | 0 |
| | Capacity (%) | 0 | 13 | 0 | 0 |
| Farms in IFM | Number (%) | 0 | 3 | 30 | 0 |
| | Capacity (%) | 0 | 2 | 28 | 0 |
| Breeding of family networks | Number (%) | 3 | 30 | 81 | 33 |
| | Capacity (%) | 12 | 32 | 86 | 44 |
| Average size of farms | | 3151 (a) | 2374 (a) | 1922 (a) | 65493 (b) |
| Integrated farms | Number (%) | 0 | 1 | 0 | 100 |
| | Capacity (%) | 0 | 6 | 0 | 100 |
| Group of wilayat of establishment | | W1, W2, W5 | W2, W3 | W2, W5 | W4, W5 |

Average size of farms: Means with different letters are significantly differentat $p<0.05$. Group of wilayate of establishment: W1- Emerging group of the highlands. W2- Group of the interior plains and the northern tell mountains. W3- Consumer markets (Metropolises). W4- Djelfa development center. W5- Intensive production zones in northern metropolitan areas.

to the close of the 1990s. Based on an examination of the institutional structures that arose from these initiatives, "independent" farms continue to hold a predominant position in the turkey farming industry. Integrated manufacturing is still relatively small and cooperative organizations have little effect.

This upstream dynamic contrasts with the downstream segments of the "Turkey" sector, whose structures act as a barrier to the modernization of sectors understood to be the emergence of effective governance structures and do not support the growth of processing/slaughtering industries generated, in other countries, by metropolisation (Bessaoud, 2019).

In the end, the "turkey" industry is unique among all Algerian poultry sectors (Kaci and Kheffache, 2016) due to institutional structures that, while modified to fit the sector's structure, are nonetheless ineffective. The strong variances in turkey meat output and availability, as well as the low technical and economic performance of farms, can be explained by this circumstance, which also explains the low degree of coordination and, consequently, the modest performances (Douibi, 2019).

From this viewpoint, our claims corroborated those made by some authors (Kaci and Kheffache, 2016; Mahmoudi, 2016), but we were able to contextualize them because of what we had seen as the relative importance of family strategies, the expanding role of upstream businesses and the relatively small importance of informal poultry economies.

## CONCLUSION

The "Turkey" sector's inadequate coordination mechanisms continue to be a real problem, contributing to abrupt changes and volatility in producer pricing (2000-2020). Specifically, it indicated a negative impact on the operations of small fattening farms and even Turkey breeding farms, which in turn led to a decrease in the amount of turkey meat produced and available in Algeria. From this vantage point, strengthening governance mechanisms within the framework of the NIE seems to be a more relevant course for enhancing the performance and resilience of the Algerian poultry industries than investing in poultry technologies.

### Conflict of interest

All authors declared that there is no conflict of interest.

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