

## MACHINE PRICES AND THE MECHANIZATION OF OTTOMAN AGRICULTURE, 1860-1914

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### ABSTRACT

*The last decades of the nineteenth century witnessed significant increases in the agricultural production of the Ottoman economy. The period also saw the introduction of modern machines and techniques to Ottoman agriculture. Foreign landowners and immigrants were primarily responsible for the introduction of modern machines and equipment in the empire. However, the widespread use of the machines and other equipment was very restricted by their high cost. The comparison of the average prices of some agricultural machines with the national average per capita income clearly shows how difficult it was for a common Ottoman farmer to afford them and explains the very limited use of agricultural machinery in the empire.*

**Keywords:** *Ottoman, Agriculture, Mechanization, Machines, Prices, Income Level.*

### ÖZET

*Ondokuzuncu yüzyılın sonları Osmanlı ekonomisinde önemli tarımsal üretim artışlarının yaşandığı ve aynı zamanda modern makinelerin ve tekniklerin Osmanlı tarımına girdiği bir dönemdi. Tarımda modern makineleri ve aletleri imparatorluğa getirenlerin başında yabancı toprak sahipleri ve göçmenler geliyordu. Ancak makinelerin ve diğer aletlerin kullanımı yüksek maliyetleri nedeniyle oldukça sınırlıydı. Bazı tarımsal makinelerin ortalama fiyatlarının dönemin ortalama kişi başı geliri ile karşılaştırılması ortalama bir Osmanlı çiftçisi için bunları satın almanın zorluğunu açıkça göstermektedir ve imparatorlukta tarımsal makinelerin kullanımının sınırlı kalışını açıklamaktadır.*

**Anahtar Kelimeler:** *Osmanlı, Tarım, Makineleşme, Makineler, Fiyatlar, Gelir Düzeyi.*

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## 1. Introduction

In the 19<sup>th</sup> century more open socio-economic policies were implemented in the Ottoman Empire compared to previous periods. Consequently, the Ottoman economy experienced a period of growth and significant changes pioneered by its agricultural sector.<sup>1</sup> Major factors important for the Ottoman agricultural sector were the increasing demand of Europe for agricultural goods, the remarkable population growth in the Empire and centralization of the Ottoman government together with increased internal security as a result of restructuring reforms. Market oriented production in agriculture had expanded as a result of the progression based on the Ottoman-British commercial treaty of 1838 (known also as the Baltalimanı Treaty) and following trade agreements and regulations of the Tanzimat (a series of reforms undertaken by the Ottoman Government between 1839-1876) period. This progression had led to the importance of modern machines and new techniques in Ottoman agriculture starting from 1860s.<sup>2</sup>

## 2. Developments in Ottoman Agriculture

Regulations brought by commercial treaties and Tanzimat policies led to significant changes in the Ottoman agricultural sector after the 1840s. The limitations and restrictions on the Ottoman export and interprovincial customs duties had been removed by Baltalimanı and later commercial treaties. Foreign merchants and their agents were allowed to purchase any goods produced or processed in Ottoman territories, and further tax and custom privileges were implemented.<sup>3</sup> On the other hand, more determined and planned state policies can be observed in the Tanzimat period. Agricultural bureaucracy and strategies had been introduced which aimed to increase the agricultural production and modernize the agricultural tools, machines and production techniques. Financial institutions had been established to meet demands for agricultural credits, along with the introduction of schools and model farms providing theoretical and practical education for farmers throughout the century. Similarly, new policies

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<sup>1</sup> It is a common view in the literature that the production and personal income figures had risen in the period between 1870-1914 in the Ottoman Empire (Eldem, 1994: Chapters IV, XI; Issawi, 1980: 5-9; Owen, 1981: 200-209). Pamuk has most recently contributed to this view by his assumptions about personal income values of the mentioned period (Pamuk, 2006: 809-828).

<sup>2</sup> Parliamentary Papers, *Accounts and Papers (1855-1914)*, Diplomatic and Consular Reports on Trade and Finance (Volumes for Turkey), Annual Series, Foreign Office, London, Great Britain [hereafter A&P] is the primary source for the article. From the Ottoman geography, only the territory of today's Turkish Republic has been taken into consideration.

<sup>3</sup> For the text of the 1838 Treaty see (A&P 1843 Vol. 57: 32-35).

including the amelioration of soil, seeds, crops and livestock breeds, tax and custom exemptions for farmers and agricultural equipment and elimination of state monopolies had been followed during this period (Quataert, 1973: 64-154; Önsoy, 1988: 37-45; Güran, 1992: 219-233). Furthermore, confiscation, which stood as a great obstacle in the way of capital accumulation, was considered a crime by the 1840 Criminal Law. By the Ottoman Land Code of 1858, property rights were given to Ottoman subjects and in 1867 foreigners were allowed to possess properties within the Ottoman Empire with the exception of Hicaz Province. The latter regulation made it possible for foreigners to purchase large amounts of land and start to establish plantations for export.<sup>4</sup> As a result of the above mentioned developments, some noteworthy increases appeared in the agricultural production.<sup>5</sup>

The reflection of increases in the agricultural production can easily be observed by examining the amounts of exports realized in Anatolian ports. According to the Table 1 export volumes had increased three-fold in İzmir; 3.2 times in Trabzon; 16.3 times in Samsun and 9.2 times in Mersin between 1834-1910. Cotton, grapes and figs in İzmir, hazelnuts in Trabzon, tobacco in Samsun and cotton in Mersin were the primary products stimulating the increase in exports.

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<sup>4</sup> The most important developments related to this matter occurred in the Aegean Region. Especially British companies and individuals had established cotton plantations and vineyards in counties like İzmir, Kuşadası, Aydın, Tire, Bornova, Buca, Nazilli, Ayaslug and Bergama between 1857-1892 (Kurmuş, 1974: 102-3). The Cukurova region followed the Aegean. Starting from the 1880s foreign companies had attempted agricultural operations primarily in cotton cultivation. For example, a French company was reported in 1912 to have obtained the privilege for running a 45000 hectare farm in Cukurova for 75 years (1912 report by Mr. Vice-Consul Matthews for Adana in A&P 1912 Annual Series [hereafter AS] no.5045, Report on the Trade of the Consular District of Constantinople for the year 1912: 37).

<sup>5</sup> The rise in agricultural production had become evident particularly after 1880. Between 1888 and 1911 grain production had risen by 51 %, tobacco by 191 %, figs by % 68, hazelnuts by 217 %, cocoon by 195 % in Anatolia and cotton production had risen by 471 % in the Adana region (Eldem, 1994: 37-8).

**Table 1: Export Volumes of Some Anatolian Ports**

Port	Export (thousands of pounds)		
	1834	1880	1910
İzmir	1473	3852	4500
Trabzon	245 (a)	296 (b)	798 (b)
Samsun	121 (c)	401	1980
Mersin	90 (d)	562	829

**Source:** (A&P 1843 Vol.57: 100-115; A&P 1883 Vol.73: 1045 and A&P 1912-1913 AS no. 5247: 9 for İzmir; A&P 1881 Vol.90: 1107, 1124 and A&P 1910-11 AS no.5014: 9 for Trabzon and Samsun; A&P Adana 1880 report: 1267 and A&P 1913 AS no.5045: 36 for Mersin).

a: total export (Anatolian+Persian)    b: Anatolian export only    c: 1841    d: 1836

### 3. Machinery in Ottoman Agriculture

The first records of the use of modern machines and tools in the agricultural sector in Anatolia date back to the mid-1860s. These records show foreign land owners residing in the Ottoman Empire pioneered the use of machinery, while immigrant farmers together with the native landowners followed their lead. British landowners around İzmir had started to use ‘modern’ agricultural implements including steam-powered machinery on their farms in the 1860s (Kurmuş, 1974: 112-119). The extensive use of English implements around Bursa had been reported in 1861.<sup>6</sup> These implements not only included familiar ploughs and harrows but also ‘thrashing machines, reaping machines and steam-ploughs’, which were stated to be ‘employed soon’.<sup>7</sup> In 1864 there were 650 foreigners established in Edirne and most of them held landed property.<sup>8</sup> These foreigners had played a major role in the mechanization of the agriculture in the region; in 1889 all of the machines available in Edirne were held by either state farms or foreigners.<sup>9</sup>

During the century government had preferred to follow settlement policies in Anatolia for nomads and Muslim refugees from civil wars in the Balkans and Russia. According to some estimates, the number of Muslim immigrants

<sup>6</sup> A&P 1862 Vol. 59 AS no. 3060, Report by Mr. Consul Sandison on the Trade & c. of Brussa for the year 1861: 353.

<sup>7</sup> A&P 1864, Report by Mr. Consul Sandison on the Trade of Brussa for the year 1864: 791.

<sup>8</sup> A&P 1864, Report by Vice-Consul Blunt on the Resources of the Sandjak of Adrianople: 167.

<sup>9</sup> A&P 1890 Vol. 77 AS no. 632, Report by Consul Cumberbatch on Agricultural Matters in the Vilayet of Adrianople in the year 1889: 10-11.

migrating from the Crimea, the Caucasus and the Balkans, who settled in Anatolia had approached some 5 million (including those settled in Syria and Iraq) (Karpat, 1985: 55). Immigrants were more courageous about the use of modern machines and techniques than local farmers. In the beginning of the 1880s the British Consul in İzmir noted that immigrants from Thessaly and Bulgaria were very effective in the extension of the use of agricultural machines and that they had settled in the interior lands and “greatly improved their lands by the use of European machinery”.<sup>10</sup> In 1897 the old and primitive methods were still common around Bursa, ‘unless on certain farms and lands owned or leased by Europeans and refugees from Bulgaria, Roumelia and Greece’. Emphasized was the use of English implements like ploughs, drills, harrows, corn-crashers and a few reaping and thrashing machines.<sup>11</sup> While the construction of the Baghdad railway continued, the British Consul in Istanbul stated that the railway and its transportation facilities had attracted a large number of immigrants from Bulgaria and Russia and ‘they had settled in the most fertile parts; they were accustomed to more civilized methods of cultivation than the Anatolian peasantry.’<sup>12</sup> In Konya, the use of relatively simple implements like ‘iron ploughs and reapers are really due to the Roumeliote immigrants, who, knowing their use, were able to set the fashion’ to the native people.<sup>13</sup>

Beside the foreign residents and immigrant farmers, practices of some native great landowners, instalment credits of foreign companies, the positive effects of railways on agricultural production and demand for machinery, custom exemptions on agricultural implements and employment of machinery in state farms all contributed to the use of machinery and modern techniques in Ottoman agriculture (Quataert, 1973: 155-185). However, the use of agricultural machinery had been very limited due to the very low income level of the peasantry.

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<sup>10</sup> A&P 1887 Vol. 86, Report by Consul Dennis on the Trade and Commerce of Smyrna for the years 1882 to 1885: 20.

<sup>11</sup> A&P 1898 Vol. 93, Miscellaneous Series no. 460, Report on the Vilayet of Brussa by Mr. Vice-Consul Gilbertson: 13.

<sup>12</sup> A&P 1904 Vol. 101 AS no. 3140, Report on the Trade of Constantinople and District for the year 1903 by Mr. Consul Waugh: 29.

<sup>13</sup> 1906 report by Mr. Vice-Consul Doughty Wylie for Konia in A&P 1907 Vol.93 AS no. 3776, Report on the Trade of Constantinople and District for the year 1906: 25. ‘After the Turkish-Russian War of 1877-1878, Tatar and Circassian immigrants migrated from Russia to warm areas of Eskişehir, Aydın, Balıkesir and Adana were to be the first in applying the cultivation of the soil by technology, that is by using plough, in our country.’ (Faik, 1934a: 235).

#### 4. Cost of Machinery

The major factor restricting the extensive use of machinery was the cost for local farmers. Machinery prices were very high compared to the purchasing power of an average farmer. In Bursa ‘peasants who witness the efficiency of English implements anxious to obtain the like but few have the means’.<sup>14</sup> In Adana province ‘the cost of the many of the machines puts them quite out of the reach of small farmers.’<sup>15</sup> In Sivas province ‘owing to the great scarcity of money’ there was a demand for ‘cheap agricultural implements such as scythes, sickles, shovels, spades and iron buckets’.<sup>16</sup> Similarly in Konya province the Vice Consul advised to the British firms who wanted to trade in the market to bring ‘cheap agricultural machines’. He further made inquiries about ‘collective purchases by villagers, for instance under the guarantee of the Moukhtar’ (head of the village).<sup>17</sup> For more complicated machines, which were even too expensive for collective purchases, rental was proposed as a solution. For example, one agent of American and German firms was planning ‘to get a threshing machine and intended to let it out for the harvest for £ 120’.<sup>18</sup> In the following year, 1908, the agent successfully hired one large and two small threshing machines for £ 100 (12.000 kuruş) during the harvest season.<sup>19</sup>

According to a recent study, the average personal incomes in the Ottoman Empire were 800 kuruş and 1200 kuruş in 1880-82 and 1913-14 respectively.<sup>20</sup> These figures when compared to the machine prices in various Anatolian regions

<sup>14</sup> A&P 1862 Vol. 59, Report by Mr. Consul Sandison on the Trade, & c., of Brussa for the year 1861: 353.

<sup>15</sup> A&P 1899 Vol. 103 AS no.2196, Report on the Trade of Constantinople, 1893-97: 24.

<sup>16</sup> 1897 report by Mr. Vice-Consul Captain Maunsell for Sivas Vilayet in A&P 1898 Vol. 99 AS no.2069, Reports on the Trade and Commerce of the Trebizond and Sivas Vilayets for the Year 1897: 16.

<sup>17</sup> 1908 report by Mr. Vice-Consul Doughty Wylie for Konia in A&P 1909 Vol. 98 AS no. 4188, Report on the Trade of Constantinople and District for the year 1908: 29.

<sup>18</sup> 1906 report by Mr. Vice-Consul Doughty Wylie for Konia in A&P 1907 Vol. 93 AS no.3776, Report on the Trade of Constantinople and District for the year 1906: 28. Vice Consul stated that when added to the price of coal, this amount would ‘make the hire enormous.’

<sup>19</sup> 1907 report by Mr. Vice-Consul Major Doughty Wylie for Konia in A&P 1908 Vol. 116 AS no.4009, Report on the Trade of Constantinople and District for the year 1907: 32. The transport cost and the mechanics’ wages were included in this rent price, but not fuel.

<sup>20</sup> (Pamuk, 2006: 819, Table 3). *Ottoman Empire* covers Balkans, Anatolia, Syria and Iraq. An older study estimated the average personal income in Turkey as 765, 911 and 1018 kuruş in 1907, 1913 and 1914 respectively (Eldem, 1994: 227).

as listed in Table 2, clearly show that how hard it was for an average farmer to purchase them.

**Table 2: Cost of Machinery**

Machinery	Price	Price	Average yearly income per capita	Duration	of work
	(pound)	(kuruş)		to buy the	Year
Threshing and straw chopping machines and engines (English) (Edirne 1889)	300-400	36000-48000	800	45-60	540-720
Agrimotor (Adana 1907)	280	33600	1200	28	336
Threshing machines (English) (İzmir 1908)	268	32196	1200	27	324
Reaping machines (İzmir 1908)	31.7	3804	1200	3.2	38
Reaping machines (U.S.A.) (Adana 1887)	28	3360	800	4.2	50.5
Reapers (U.S.A.) (Konya 1906)	20	2400	1200	2	24
Corn cutting machines (U.S.A.) (Edirne 1906)	18	2160	1200	1.8	21.5
Drills (English) (İzmir 1908)	17	2040	1200	1.7	20.5
Winnowing machines and sorters (İzmir 1908)	16.5	1980	1200	1.7	20
Rollers (France) (İzmir 1908)	14.6	1752	1200	1.4	17
Machines for fodder (İzmir 1908)	13.3	1590	1200	1.3	15.5
Cotton ginning machines (English) (İzmir 1908)	7.8	940	1200	0.8	9.5
Horse hoes (İzmir 1908)	4.4	525	1200	0.4	5
Rakes (İzmir 1908)	4.2	499	1200	0.4	5
Machines for maize (İzmir 1908)	2.4	288	1200	0.2	3
Ploughs (Edirne 1908)	2.25-2.75	270-330	1200	0.22-0.27	2.6-3.2
(Austria-Hungary and Germany)					
Vine sprayers (İzmir 1908)	1.5	178	1200	0.2	1.8
Ploughs (U.S.A.) (İzmir 1899)	1-1.75	120-210	1000*	0.1-0.2	1.2-2.4
Ploughs (Edirne 1908)	1	120	1200	0.1	1.2
Small ploughs (Konya 1907)	0.8	96	1200	0.1	1.2

**Source:** (A&P 1888 Vol. 103 AS no. 406: 3 for Adana 1887; A&P 1890 Vol. 77 AS no. 632: 11 for Edirne 1889; A&P 1900 Vol. 97 AS no. 2462: 10 for İzmir 1899; A&P 1907 AS no: 3767: 5 for Edirne 1906; A&P 1907 Vol. 93 AS no. 3776: 28 for Konya 1906; A&P 1908 Vol. 116 AS no. 4009: 32 for Konya 1907; A&P 1909 AS no. 4197: 8 for Edirne 1908; A&P 1910 Vol. 103 AS no. 4598: 60 for İzmir 1908). For agrimotor (Faik, 1934b: 267). For average incomes (Pamuk, 2006: 819, Table 3).

Note 1: Table shows the “average” prices derived from the figures for agricultural machines in import lists. Machines are sorted by their costs in descending order.

Note 2: Although it had fluctuated during the century, the average rate per pound remained around 110 kuruş. However, the exchanges in the Anatolian centres were realized at rates lower than this official rate. Therefore the rate is considered as 1 pound=120 kuruş in the Table. (Pamuk, 1999: 226, Table 13.1).

Note 3: The values closest to the nearest year are taken for the average personal income figures of the concerned year.

\*: The average of 1882 and 1913 incomes is taken for the 1899 average personal income.

While the ‘threshing and straw chopping machines’ were beyond the dreams of an average Ottoman farmer, the agrimotor (tractor) and threshing machines required nearly a lifetime of work for the farmer to afford them. Even machines with the simplest technologies like ploughs, in Edirne in 1908, were 300 kuruş and required almost three months income. Therefore, small ploughs with prices like 96 and 120 kuruş, in Konya in 1907 and in Edirne in 1908, were very popular among the farmers. Besides their low cost, they were supplied on 12 months credit.<sup>21</sup>

Prices were even very high for rich farmers. For instance, the price for ‘threshing and straw chopping machines and engines’ ranged from £ 300 to £ 400 and very few landed proprietors could afford them, because “£ 100 [was] the highest figure to which the generality of them would venture”.<sup>22</sup> The Governor of Adana Province imported some British agricultural implements and distributed them to some great landowners, by supplying long term credits from the *Memleket Sandığı* (a financial society, which later became Ziraat Bank, intended to finance the agricultural sector) in the 1880s (Faik, 1934a: 238). Machines like tractors and threshing machines could only be afforded by a few rich farmers and the only tractor in Adana was imported by the municipal government (Faik, 1934b: 267). In Konya Province there were ‘a few people rich enough to buy the large threshing machines’ and the British Vice Consul was giving a hint for British traders by stating ‘at £ 30 a machine will sell, but not at a much higher price.’<sup>23</sup>

The high prices brought about the local manufacture of some simple agricultural implements. These implements also were adopted to meet local needs. In Bursa, ‘some imitations have been made, amongst them of the ploughs, which, though imperfect, are very serviceable.’<sup>24</sup> In İzmir and its surroundings, ‘the local manufacture of agricultural implements, principally a kind of light draught plough... is steadily expanding. It is just the thing wanted by the farmers of this

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<sup>21</sup> A&P 1909 Vol. 98 AS no.4197, Report on the Trade of the Vilayet of Adrianople for the Year 1908: 8.

<sup>22</sup> A&P 1890 Vol. 77 AS no.632, Report by Consul Cumberbatch on Agricultural Matters in the Vilayet of Adrianople in the Year 1889: 11.

<sup>23</sup> 1906 report by Mr. Vice-Consul Doughty Wylie for Konia in A&P 1907 Vol. 93 AS no.3776, Report on the Trade of Constantinople and District for the year 1906: 28-9. At that time, the upper limit for agricultural loans from Ziraat Bank was 150 Liras (approx. £ 125) (Quataert, 1973: 177-179). Few small farmers possessed assets required to qualify for credit. That amount was also insufficient to purchase large machines both for rich and small farmers. See Table 2.

<sup>24</sup> A&P 1862 Vol. 59, Report by Mr. Consul Sandison on the Trade, & c., of Brussa for the year 1861: 353.

country, combining cheapness with lightness'.<sup>25</sup> The light ploughs made entirely of iron manufactured in İzmir and Akşehir in the early 1900s were very common in Aydın and Konya Provinces respectively (Faik, 1934a: 236).

**Table 3: Yearly Agricultural Machine Sales in Some Anatolian Centres**

Province or region	Year	Machinery	Sale number	Population*
Adana	1887	reaping machines	50	208041
Adana	1887	threshing machines	2	208041
Adana	1899	harvester	100+	201365 (a)
Konya	1907	ploughs	800	636798
Konya	1907	reapers	75	636798
Edirne	1908	ploughs	500	596250 (b)
Ayvalık	1911	threshing machines	2	31894 (c)
Ayvalık	1911	binders and reapers	30	31894 (c)
Çanakkale	1911	reaping and binding machines	10	165815 (c)
Çanakkale	1911	reaping machines	12	165815 (c)

**Source:** (A&P 1888 Vol. 103 AS no. 406: 3-4 for Adana 1887; A&P 1901 Vol. 85 AS no. 2587: 12 for Adana 1889; A&P 1908 Vol. 116 AS no. 4009: 32 for Konya 1907; A&P 1909 AS no. 4197: 8 for Edirne 1908; A&P 1912 AS no. 5011: 25 for Ayvalık 1911; A&P 1912-1913 Vol. 100 AS no. 4835: 28 for Çanakkale 1911).

\*: Male population only. For population (Karpaz, 1985: 127, 161, 167, 173, 186).

a: 1897                      b:1906                      c:1914 (total population)

The sale numbers of some agricultural machines from various regions of Anatolia clearly indicate that their use was very limited. In order to make a further comparison, the male populations of the Vilayets and the sale numbers are presented in Table 3. It can be observed from the table that the use of modern machinery was very uncommon, when considering that 80-90 % of the male population was employed in agriculture. Even the relatively high number of inexpensive ploughs sold was only 800, compared the total (male) population of 636,798.<sup>26</sup>

<sup>25</sup> A&P 1908 Vol. 117 AS no.4141, Report on the Trade and Commerce of the Consular District of Smyrna for the Year 1907: 9.

<sup>26</sup> In Table 3, approximately half of the population can be considered as male, for the data of 1911. Quataerts' pioneering chapter (1973: 155-185) about agricultural machinery in Anatolia concluded that use of agricultural machinery was extensive. On the other hand, price-income comparisons of

## 6. Conclusion

The prices and income levels interpreted in this study, clearly explain why the use of machinery in the agricultural sector was very limited in a subsistence economy like that of the Ottoman Empire. Together with high prices, operating costs should also be counted as important factors for the restricted use of agricultural machinery. As a matter of fact, operators' wages and fuel costs when added to the price made the total cost prohibitive for farmers. Furthermore, the lack of a maintenance and service network prevented the farmer from using the machinery extensively. However, the common advices (reported) for foreign traders to bring cheaper implements and the price-income comparisons lead us to conclude that the most important issue restricting the extensive use of agricultural machinery in late nineteenth and the early twentieth centuries in Ottoman Anatolia was their high cost.

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the time provides useful evidence for an opposite opinion. That is, extensive use of machinery was restricted by high prices.

**BIBLIOGRAPHY**

*Parliamentary Papers, Accounts and Papers (1855-1914)*. Diplomatic and Consular Reports on Trade and Finance (Volumes for Turkey), Annual Series, Foreign Office, London, Great Britain (Published Documents).

Commercial Tariffs & Regulations of the Several States of Europe & America, together with the Commercial Treaties between England & Foreign Countries. Part VIII, Ottoman Empire. *Accounts and Papers (1843)*, Vol. 57.

Eldem, Vedat (1994), *Osmanlı İmparatorluğu'nun İktisadi Şartları Hakkında Bir Tetkik*. Ankara: Türk Tarih Kurumu Yayını.

Faik (1934a), Türkiye'de Ziraat Makineciliğinin Tarihçesi. *Ziraat Gazetesi* 5, no. 8, 235-241.

Faik, (1934b), Ziraat Makineciliğinin Tarihçesi. *Ziraat Gazetesi* 5, no. 9, 267-270.

Güran, Tevfik (1992), Zırai Politika ve Ziraatte Gelişmeler 1839-1876. In *150. Yılında TANZİMAT*, 219-233. Ankara: Türk Tarih Kurumu Yayını.

Issawi, Charles (1980), *The Economic History of Turkey 1800-1914*. Chicago and London: The University of Chicago Press.

Karpat, Kemal (1985), *Ottoman Population 1830-1914*. Madison: University of Wisconsin Press.

Kurmuş, Orhan, (1974). *Emperyalizmin Türkiye'ye Girişi*. Ankara: Bilim Yayınları.

Owen, Roger (1981), *The Middle East in the World Economy 1800-1914*. London and New York: Methuen.

Önsoy, Rifat (1988), *Tanzimat Dönemi Osmanlı Sanayii ve Sanayileşme Politikası*. Ankara: Türkiye İş Bankası Yayını.

Pamuk, Şevket (1999), *Osmanlı İmparatorluğu'nda Paranın Tarihi*. İstanbul: Tarih Vakfı Yurt Yayınları.

Pamuk, Şevket (2006), Estimating Economic Growth in the Middle East Since 1820. *The Journal of Economic History*, 66 (3), 809-828.

Quataert, Donald (1973), *Ottoman Reform and Agriculture in Anatolia 1876-1908*. Ann Arbor, Michigan, University Microfilms A Xerox Company.