

Evaluation of the Egyptian Agricultural Development During the Mamluk Era

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Abstract: This article evaluates the agriculture development in Egypt during the Mamluk era. This study shows that there are several factors that affected agriculture and its produce, such as the problems in the *iqta'* system, the problems in the irrigation system, the shortage of a productive labour force for the land, the lack of technological innovation in agriculture and the disturbances caused by climatic and biological disasters. However, these factors did not lead to a total decline and absolute collapse of the Mamluk agriculture era.

Key words: Agriculture • Mamluk era (872/1468 to 922/1517) • Iqta system • Climate change • Egypt

INTRODUCTION

It is interesting to discuss the history of agriculture of the Mamluk Kingdom (1250-1517) for two reasons. First, it is a continuation of the same sector during Pharaonic times. Second, it has close ties with modern agriculture. Modern scholars mention that some aspects of agricultural activity in Egypt have remained unchanged for a thousand years. Another interesting point is that natural aspects such as the climate, the role of the Nile and natural disasters have not changed much in the long history of Egypt [1]. For these reasons, a discussion of agriculture during the Mamluk period could reasonably be based on knowledge of both the ancient and modern agriculture of Egypt.

The Nile is the main factor in agricultural prosperity in Egypt. The importance of the Nile to Egypt is obvious from an understanding of the climate and geographical characteristics of the country. Egypt which occupies the north-eastern corner of the African continent has a dry climate and consists wholly of desert. There is a very little rainfall because the northeast trade winds which originate at about latitude 28° N. near the northern

boundary of the continent and warm as they approach the equator take up but do not redeposit moisture [2]. Indeed, the Nile saves Egypt from the desert and provides the means for agriculture and settlement along the river. The Nile in Egypt receives its water from two major sources: the White Nile, which drains a large area of equatorial Africa and the Ethiopian tributaries [3]. The Ethiopian tributaries, namely the Atbara and the Blue Nile, are more important for agriculture in Egypt since they contain a lot of sediment. Flooding has been by far the most fundamental and continuous aspect in the agricultural life of Egypt from Pharaonic to modern times. Thus, the yearly has always been the most important event in Egypt and for generations was eagerly awaited. This flood is caused by heavy rainfall in the highlands of Ethiopia where the Blue Nile and Atbara have their sources.

The Nile has formed two major and distinct areas of arable land in Egypt, namely the Nile Valley in Upper Egypt and the Delta in Lower Egypt. The Nile valley is a narrow strip of land running from Wadi Halfa to the Delta. It is variable in width, but five to six miles is perhaps a fair average. In Cairo, the Nile forms two branches, namely the

Rosetta and the Damietta which spread to diverge greatly from each other by the time they reach the Mediterranean Sea. In this way the Delta of the Nile is formed and within the sides of this triangle is to be found the most fertile soil in Egypt [4]. Modern research has found that the rocks of Egypt alone would provide only a poor, sandy and calcareous soil. However, the Nile makes life in this country possible. When the inundations begin the Nile flows down a reddish colour, loaded with sand and mud. This overflow covers the nearby fields and when subsiding leaves a rich fertilizing deposit which it has carried down from the highlands. The deposit contains a large percentage of carbonate of lime, oxide of iron and carbonate of soda. The land thus fertilised produces large crops.

The objective of this paper is to examine the nature of agricultural development activities in Egypt during the era of Mamluk from 872/1468 to 922/1517.

The System of Cultivation: The system of cultivation in the Mamluk period also showed historical continuity from earlier times. The peasants inherited the agricultural calendar from their pre-Islamic predecessors. It is still in use today. The times of sowing and harvesting of various kinds of crops were fixed and timed according to the Coptic solar year [5]. The first work that had to be done in preparing the soil for cultivation was tilling, furrowing and shaking it to loosen it and let the air and sun penetrate. This would remove moisture and clear the soil of weeds. Ploughing took place over a period of up to fifty or sixty days a year and a very small area could be ploughed in a day. There were various methods of sowing depending on the types of crops and soil. When the plants started to grow, the peasants had to pull out the weeds. This work was very important for productive agriculture.

When the harvest season arrived, the peasants used the short sickle to reap their crops. In the threshing activity to spread the grain out, cows and bulls were driven round the threshing floor in a circle and the hooves of these animals would tread the grain. The winnowing operation to remove the chaff from the grain followed threshing. They used a wooden winnowing fork or sometimes two small bent boards to aerate the grain, which fell straight down while the chaff was blown aside. The grain was passed through a coarse sieve to separate it from the worst chaff and dirt [6].

During the Mamluk period, winter was the principal agricultural season. Thus, most of the crops cultivated in

this season were the important agricultural products in Egypt. Winter crops were also grown on the largest portion of the cultivated land, especially in Upper Egypt. There were also summer crops in Egypt, especially on the Delta. It was possible to cultivate summer crops in this region because the level of the Nile and that of the agricultural land were not so different. Thus, by using artificial methods, water could be raised easily from the Nile to irrigate the fields. The crops which were cultivated in Egypt can be classified into two categories namely, main crops and secondary crops. The main crops can be further divided into three categories i.e. food crops, crops grown for oil and crops for industrial purposes. The secondary crops can also be divided into three categories, namely, vegetables, fruits and flowers [7].

The Agricultural Development During the Mamluk Era (1468-1517): It is quite complex to provide an adequate description of the changing situation of agricultural productivity during the period under review. A long-term perspective is needed to show the fluctuation of agricultural productivity and consequently to see whether it increased or decreased. Such detailed information is, however, not surprisingly unavailable for the period under consideration. From the Mamluk historians' works we can find only scattered figures and incomplete data, but these do indicate in general terms the situation of agriculture at that time. In order to supplement contemporary accounts and hence to shed further light on the agricultural situation during the fifty years before the fall of the kingdom, it is necessary to look at the economic situation before and after that period. The information thus acquired can be used to provide indirect testimony to the situation of agriculture during the period under consideration.

As discussed earlier, the cultivated areas in Egypt were confined to those places reached by the Nile flood or which could be irrigated by the primitive methods available, that is, the Nile Valley and the Delta. Ibn al-Ji'an [8] (d. 1480) gives an estimate of the size of the cultivable area during his period, stating that it was about 3.5 million *faddans*. (The size of a medieval *faddan* was 5,900 square metres). However, the modern scholars Muhammad Mahmud al-Sayyad and Ahmad Sadiq Sa'd maintain that the actual area which was cultivated was smaller than this for several reasons, such as problems with the irrigation system, political unrest and the reduction of manpower available to work in the agricultural sector. There was also a reduction in the number of villages, which meant that

some areas of land were left uncultivated. This was the result of emigration or mortality due to the plague, problems in the *iqta* 'system,¹ Bedouin encroachment and so on. For example, there were only 2,121 villages in 1477 as compared to 2,254 villages in 1375. The *'ibra* figure also shows a shrinkage in cultivated land during the Mamluk period.

During the period under review there was a reduction in the *'ibra* in several villages. This indicates that in those places agricultural production and the amount of land under cultivation also witnessed a reduction. A number of places were affected. Thus, there was a reduction in the *'ibra* in some villages in Sharqiyya province. It also got smaller in some villages in Daqhiliyya and Murtahiyya provinces. Other villages in which the *'ibra* lessened included several in Gharbiyya, Manufiyya, Buhayra, Fayyum, Bahnasa, Ashmunayn and Ikhmim Ibn al-Ji'an [9]. A contraction in the size of agricultural land during the period under review can also be seen in the *kharaj* (land-tax) revenue which was the main income for the Mamluk sultanate. This land-tax was taken from cultivated areas. In 1315, land tax in Egypt amounted to 9,428,289 *dinars* and in 1410 to 4,257,000 *dinars*. Shortly after the Ottoman conquest of Egypt in 1517, this figure had dropped to 1,800,000 *dinars* [10]. The changing situation of agricultural production during the period under review can be seen in the fluctuation of crop prices during that time. According to contemporary historians, the prices of crops increased several times because of shortages, such as in September 1468,² December 1469-January 1470, October-November 1474, February-March 1483, November-December 1484, January-February 1486, December 1486-January 1487, October-November 1508, March-April 1509, May 1511 and November-December 1511. The prices of crops increased during the period under consideration compared to the fifty years before it.³

The supply and demand of agricultural goods in a country can be taken as indicating the agricultural situation in that country. During normal years, the Mamluks were capable of exporting a quantity of agricultural produce to other countries, such as wheat to Syria, Hijaz and southern Europe. However, during the period under consideration, the Mamluks imported a quantity of agricultural produce in order to ensure a

sufficient supply of grain and other foodstuffs for people's consumption or to be re-exported to other countries. Among the foodstuffs which were imported into Egypt during the period under review were fruits, olive oil, honey, Apulian almonds, chestnuts, hazelnuts, figs, dried raisins and dairy products such as butter and cheese [11]. Wheat was also imported into Egypt. There are documents that refer to the import of this grain in years when the country faced problems due to the insufficient inundation of the Nile or for other reasons.

Human Factors Affecting Agricultural Development

The Problems in the *Iqta* 'System: Aside from natural factors, humans also clearly affect agriculture. The ill-effects that they may have can be seen in the later stage of the Mamluk kingdom when maladministration, extortion, exploitation and so on by sultans, amirs and officials all contributed to a reduction in agricultural production. The main areas where problems arose were with the *iqta* 'system, the irrigation system and the lack of both a productive labour force and of technological innovation. These are dealt with in what follows. The period under discussion was witness to the impacts of the changes in the *iqta* 'system in Egypt. The abolition of the hereditary character of the *iqta* ' made a number of the *iqta* ' holders abandon their agricultural lands or make no effort to maintain them. This was simply because the land could not be transferred to their heirs. The *iqta* ' holders were only concerned to get as much revenue as they could while they were still granted those *iqta* 's. As a result, great pressure was put on the peasants by imposing high taxes to gain great revenue. With this as a working environment, the peasants could not be productive labourers and some of them fled [12].

Some of the *iqta* ' holders also successfully avoided these lands being taken away by the sultan by converting them into *waqf*-land (pious endowments). In this way, the lands continued to benefit their descendants.⁴ The consequence of this transformation of agricultural land from *iqta* 's to another category of land tenure like *waqf* affected the *kharaj* (land tax) that was one of the main sources of the state treasury at that time. Another factor which affected the *iqta* ' system was the geographical scattering of *iqta* 's. From 1315, the Mamluk sultans

¹ The *iqta* ' could be describe as the land or, rarely, taxes allocated by the great amir or sultan to soldiers in return for military service.

² For example, the price of wheat increased from 400 *dirhams* to 900 *dirhams* per *irdabb*. (One *irdabb* was equal to seventy kilograms during the Mamluk periods).

³ For example, the price of wheat before the period under consideration was normally less than 300 *dirhams* per *irdabb*. It was very rare for the price of wheat to increase to more than a 1000 *dirhams* per *irdabb* as what was the norm during the period under review.

⁴ These *waqfs* were also exempt from taxes.

conferred upon the amirs *iqta's* scattered over many provinces of Lower and Upper Egypt. This was intended to reduce the influence of the *iqta'* holders in his *iqta'* and to prevent any move towards independence or rebellion. However, this situation reduced the desire of the *iqta'* holders to make an effort and manage his *iqta'*, since this was far away from his residence which was normally situated in the vicinity of Cairo [13]. The *iqta'* holders also needed to employ a separate agent and staff of clerks in each part of his *iqta'* and the cost of their salaries, as well as the frequent dishonesty, affected the revenue derived from the *iqta'*. This state of affairs was untenable and did not benefit the small *iqta'* holder. At the same time, the *iqta's* which were situated in the countryside and far from the city were exposed to the pillaging of the Bedouin.

The Problems in the Irrigation System: Regarding the situation of the irrigation system, the Mamluk chroniclers make a few remarks about the restoration of dykes and bridges by the government during the period under review. Sometimes, the work of maintenance and repairing could not be done on time because the allocation to cover the costs was not enough. Consequently, the peasants could not enjoy the benefits of the irrigation system.

At the end of the Mamluk period, the office of *kashf al-jusur* (inspection of irrigation dams) which was responsible for looking after the irrigation system was not properly run by the amirs. Thus, much of the maintenance work was affected. The results of this inefficiency were apparent. Thus, in 1478, the Abu al-Manja Dam collapsed resulting in casualties and affecting some cultivated lands. In July-August 1509, a dyke in al-Jiza province ruptured and damaged the fields [14]. The same thing happened when the Fayyum Dam was damaged in 1516. The inefficiency in maintaining the irrigation system also resulted in water not being supplied to the arable land, which meant some lands were not suitable for grain agriculture. The inefficiency therefore affected the area of land under cultivation and agricultural products.

The Lack of a Productive Labour Force for the Land: al-Asadi [15] says that the oppression of the peasants was one of the factors that affected the agricultural sector in Egypt. al-Maqrizi also mentions that maltreatment of the peasants affected farming areas and arable lands. Agricultural activities were sometimes discontinued and

productivity impaired because some peasants fled from the villages. Modern scholars also express a similar point of view when they say that the oppression of the peasantry through excessive taxation and exploitation affected Egyptian agriculture. The Mamluk sources mention that the peasants were always oppressed by the *iqta'* holders and were allowed to keep an insufficient proportion of their produce or had to pay a high rent. The peasants usually had to rely on the *iqta'* holders to provide them with them seed and the means of livelihood and were therefore heavily indebted to them. In the later Mamluk period, the burden of falling agricultural revenues was shifted to the peasantry in the form of higher taxes, higher interest rates for the loan of grain and extraordinary payments. Occasionally, the sultans ordered the peasants to provide for their own needs [16].

In brief, it can be noted that the peasants at the end of the Mamluk period were treated very harshly and suffered from such as financial burdens, exploitation, psychological pressure and tyranny. In this, the administrative apparatus is seen to have abused its authority and utilised illegal methods in the treatment of the peasants. The consequence of all this was considerable damage to the agricultural sector in Egypt. Indeed, some of the *iqta'* holders tried to rescue their lands by forbidding the peasants from leaving them.⁵ This migration resulted in a lack of labourers to work on the lands and this led to some of the cultivated areas being neglected with a necessary effect on agricultural products.

The Lack of Technological Innovation in Agriculture: It appears that the lack of initiative to adopt new techniques in agriculture, such as tools for cultivation and the irrigation system, was not a factor in the decline of Egyptian agriculture. Indeed, the earlier empires in Egypt achieved their prosperity in the agricultural sector using the same methods and tools. However, at the end of the Mamluk period, the lack of technological innovation in agriculture limited agricultural production at a time when the state needed more agricultural products for its own consumption and for trade. Added to this was the fact that cultivation was only possible once a year because it depended on the yearly flood and basin irrigation system.⁶ In times of drought, cultivation was not possible. Moreover, natural disasters and political and social unrest also had their effects on agricultural activity and production.

⁵ The migration of the peasants despite the government's attempt to keep them in the villages was not a new phenomenon at the end of the Mamluk kingdom. It had happened since the period of al-Maqrizi (d.1442).

⁶ Cultivation twice a year was possible only in a limited area in the Delta.

Among the main economic problems of mature empires is the lack of innovation in technology. At a certain time, mature empires need to apply new technology to enrich products. The Mamluk empire is a case in point. Medieval Egyptian peasants used the tools which were known and used in Pharaonic times and are still used by peasants today without much change. All of the tools used in agricultural activities in the Mamluk kingdom, from planting to harvesting, were primitive. The plough, for instance, had no wheels.⁷ It was not designed to turn the soil and had only a shallow penetration. During this era, a pair of oxen could plough two-thirds or less of a *faddan* a day in hard soil and in soft soil they ploughed about a *faddan*. For the purpose of tilling or hoeing the soil, the medieval peasants used the pickaxe and axe or spade. These tools are still used by modern peasants in Egypt. Other tools such as the sickle to reap the crops and agricultural techniques such as threshing, remain basically unchanged. Threshing by driving cows and bulls over the crops and winnowing by wooden forks, as well as other rudimentary techniques were similarly still in use until modern times.

Primitive techniques were used to irrigate the soil for summer crops. Water was carried to the fields in buckets or jars, tied to the necks of oxen or the sides of donkeys. The other methods of irrigation used by the medieval Egyptian peasants were the *nattala* and the *shaduf*. All of these methods were inherited from an older time and some of them still continue to this day. In spite of this and because there was no alternative, the medieval peasants in Egypt had to produce crops for their *iqta'* holders and for their own consumption. With these primitive implements they ploughed and tilled the soil. Using the ancient methods of artificial irrigation, they irrigated the land and they harvested their crops with sickles. They had no defences against disasters due to the vagaries of the elements, such as crop blight, rats or drought [17]. The consequence of using these primitive tools and old methods of irrigation was that agricultural production was always limited at a time when the state needed more products for its own consumption and for trade.

Natural Factors Which Affected Agriculture

Climatic Disasters: Two categories of disasters are significant in the present discussion, namely climatic and biological. Any assessment of the agricultural situation in

the Circassian Mamluk period is inaccurate without discussing environmental hazards and natural disasters since these often had an adverse effect on the agricultural sector and caused economic loss. The Mamluk historians have preserved valuable data on the natural disasters during their times which sometimes destroyed the crops.. Since Pharaonic times, many severe disturbances in the weather have occurred in Egypt and the Mamluk period was no exception. References to the occurrences of drought, floods, violent rain or storms, hail and severe cold are readily found in the works of contemporary historians. The following are some descriptions of the climatic disasters in Egypt and the implications these had for agriculture and the peasantry.

The consequences of drought are losses of standing crops and shortage of the water needed by people and livestock. The human impact depends on the extent to which a particular society relies upon the vagaries of climate to raise crops and make a living. In the case of Egypt, drought occurred when the level of the Nile was very low and not sufficient for cultivation.⁸ Indeed, the historians of the time say that insufficient flooding of the Nile meant difficulty for the peasants. Normally cultivation could only be undertaken if the Nile reached the level of sixteen cubits. If the water of the Nile did not rise sufficiently to cover the soil, the peasants could not cultivate the land. A level of fourteen or fifteen cubits was too low and would leave many of the agricultural areas and basins dry. An insufficient rise of the Nile in terms of quantity and duration resulted in crop diminution and consequently in a rise in the price of commodities.

In the Mamluk period, droughts sometimes took place in Egypt. There were occurrences of the insufficient rise of the Nile which affected agricultural activities. During the period under review, occurrences of insufficient rises of the Nile were reported in 1493, 1496 and 1510.⁹ Sometimes the Nile receded quickly after it had reached the level of sixteen cubits. This is reported to have happened in 1468, 1484, 1485, 1496 and 1505. The result was that some of the arable lands were not sufficiently covered by water and thus could not be cultivated and the price of commodities increased.

Contemporary Mamluk chroniclers also mention floods which were caused by the overflow of the Nile and unexpected heavy rainfall. Even though the Nile made life in Egypt possible with its water and alluvial soil deposits,

⁷ The French noble, Jean de Joinville, one of Saint Louis' Companions during his Crusade to Egypt in the middle of the thirteen century, was astonished to see a plough with no wheels, compared to what he had seen in his native Champagne.

⁸ It is worth noting that the climate of Egypt was already dry, and agriculture did not depend on the rainfall but on the yearly Nile flood.

⁹ According to Ibn Iyas, the drought in this year affected various kinds of fruit, vegetables, flowers and grain.

this river might also be the cause of misfortune in the economic and agricultural life of the country. If the flood exceeded seventeen cubits, some areas became submerged under lakes for a long period and the proper time for sowing passed without cultivation. If the flood was high for a long duration it would not only cause damage to crops and cultivated lands but also to property. During the period under review, there were floods and rainstorms. In 1471, damaging floods occurred and on 22 November 1469, violent rain caused the canals to overflow and damaged the houses. Heavy rain is also reported to have occurred in July-August 1474 and October-November 1481. In 1477, floods covered some lands and places such as the province of al-Minya. This flood also affected crops, dams, roads and houses. In 1497, another flood occurred and caused damage and in 1510, heavy rains inundated the markets. On 28 March 1516, Ibn Iyas reports the occurrence of flash floods in Cairo because of heavy rain in Upper Egypt. These events necessarily caused considerable hardship for the peasants [18].

Other weather conditions that commonly occurred during the Mamluk period were windstorms, hailstorms and periods of extreme cold. Windstorms, sometimes accompanied by sand, wrought destruction several times during the Mamluk period. Hailstorms also caused physical injury and affected agricultural activities and produce. Not surprisingly, damage appears to be correlated with the intensity and duration of the storms and the size of the hailstones which these produced. The damage itself was not only caused by the hailstones, but sometimes also by the high winds and torrential rains which accompanied them. Severe cold was another source of difficulty for Egyptian peasants. Frost would envelope the crops and kill some animals in the rural areas. All of these events caused hardship to the peasants and affected agricultural production [19].

Biological Disasters: Based on the work of contemporary chroniclers, it can be seen that biological disasters such as plagues, rat infestations, locusts, epizootics and crop blight also affected the agricultural sector. The occurrence of the Black Death in 1348, during the reign of Sultan Hasan b. al-Nasir Muhammad, is well known in the history of the Mamluk kingdom. The plague began in Egypt during the autumn of 1347. By April 1348, it had spread all over the country, reaching its peak during the months of October 1348 to January 1349. It came to an end in February 1349. The estimate given by Ibn Habib, a contemporary historian, that the Black Death reduced the population of Egypt by a third is perhaps not far from the

truth. After the first Black Death pandemic, there were recurring waves of plague in Egypt until the fall of the Mamluk kingdom. Historical evidence shows that pneumonic plague recurred regularly in this period. The effects of plagues on the agricultural sector have been emphasised by many modern scholars, particularly as concerns the increased mortality rate among Egyptians as happened, for example, as a result of the Black Death. Thus, Abraham Udovitch says that demographic changes caused by plague affected Egyptian agriculture and that smaller harvests were produced. While elsewhere Boaz Shoshan [20] likewise states that current assessments of economic trends in Egypt between 1350 and 1500 emphasise the causal relationship between depopulation and decreased economic productivity.

The effect of the plague also can be seen in the countryside. A number of peasants died in the disaster and those who survived migrated to areas not affected by the plague. Some villages were abandoned in the plague of 1476-1477. According to al-Sakhawi [21] in 1492 the plague killed a number of peasants in Siryaqus and reduced a number of farmers to working in the farmyard at the Bilbays. On another occasion in 1513, the plague hit Asyut and caused high mortality among the peasants. This disaster affected those members of the population who worked in the agricultural sector, especially in cultivation or harvesting.

Rats were another threat to the peasants and an infestation of them could cause damage to crops and harvests. Indeed, Ahmad b. 'Ali al-Dalaji al-Misri (d.1435) explicitly mentions the trouble for peasants caused by attacks of rats and mice. Other accounts from primary sources show that infestation by rats was one of the natural disasters that adversely affected the agricultural sector and they are reported to have destroyed plants, vineyards, fruits and other crops. Rats were not only responsible for damaging the crops in the fields, but also the harvest in the granaries. Contemporary historians state that during the Circassian period rats sometimes ruined the crops. For example, in 1416, during the reign of Mu'ayyad, rats destroyed plants in some areas in Lower Egypt. While in May 1511, they spoiled the harvest while it was on the threshing floors and in granaries. They also destroyed the wheat and barley in the fields [22].

Locust infestations also resulted in the destruction of crops and plants, sometimes destroying the food intended for livestock. During the period under review, there are two recorded instances where locusts ruined crops and grain, these being in July 1469 and August 1472. Although the exact losses are not specified, this must clearly have had an adverse effect on agricultural

production. During the Mamluk period, contemporary sources also mention the threat of an epizootic to the livestock and draft animals, which affected the life of the peasants and agricultural activities. The effect of animal disease can be seen in that one nobleman who owned 1,021 cattle before the outbreak of the disease, lost 1,003 of them. Similar occurrences took place in 1491-1492 and 1509 [23]. As a result, the price of cattle increased as did the cost of hiring animals for ploughing. The scarcity of cattle also led to a scarcity of meat. In addition to biological disasters, during the Mamluk period crops were also subject to blight and other diseases, one occasion of this occurring on 23 May 1468. Attacks of worms also contributed to the devastation of crops and some villages lost half of their yield because of them. On several occasions crops such as clover, wheat and berseem were affected. During the period under review, similar occurrences took place in 1485 and 1486 [24]. The usual result was that the peasants faced hardship because of losses and an increase in clover prices, this plant being the basic fodder for cattle in Egypt.

CONCLUSION

Agriculture was the mainstay of the economy for all the dynasties established in Egypt and the Mamluk sultanate was no exception. The Nile is the main source of agricultural prosperity since this country has a dry climate and consists wholly of desert. The peasants during the Mamluk period had their own unique knowledge of agricultural practice which they inherited from pre Islamic times. The period under review, however, saw some changes in the agricultural sector in Egypt. There was a reduction in the size of cultivated areas, a decrease in the number of villages and a diminution in the *'ibra* and the land tax compared to the previous period. The prices of crops also showed a gradual increase. During this time, the Mamluks imported certain agricultural productions for their own consumption and for the purpose of re-export to other countries.¹⁰

As mentioned earlier, several factors were identified that affected agriculture and its produce, such as the problems in the *iqta'* system, the problems in the irrigation system, the shortage of a productive labour force for the land, the lack of technological innovation in agriculture and the disturbances caused by climatic and biological disasters. However, these factors did not lead to a total decline and absolute collapse of Mamluk agriculture. As Carl F. Petry [25] remarks, there were no

disastrous famine or catastrophic shortages and no serious shortfalls in agrarian output. In fact, there was an excessive increase in demand for agricultural production from the rulers in order to cover military expenditure and the state budget. The profits that belonged to the peasants were sometimes sized by the Mamluks in order to cover those costs.

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¹⁰However, this does not show that the Mamluks were unable to exports agricultural produce during the period under review since Benjamin Arbel mentions that the Mamluks exported a small quantity of grains.

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