11

The history of agricultural development [a]

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Introduction

Anyone travelling today in the Nile Valley and meeting a farmer coming back from his fields with his hoe on his shoulder might think that he is seeing a farmer straight out of Egyptian antiquity; he might well imagine that Egyptian agriculture has not changed since time immemorial. In his defence it must be said that none of the many tourist guides he will consult during his journey will help him to form an opinion. They nearly all present the Egyptian fellah as someone living by traditions and techniques that are a thousand years old. If they are to be believed, nothing has changed in Egypt since the days of Rameses.

This myth of the fellah as a direct descendant of the peasant from the land of Amon is still so rooted in people's minds that it must be denounced. There is now practically nothing in common between today's agriculture and that of antiquity or the Middle Ages. Techniques, crops, agricultural productivity, and even the very landscape have been transformed. These deep-rooted developments in agriculture stem, without any possible doubt, from the ways in which the Nile waters have been used. Whereas for thousands of years farming communities carried out extensive agriculture when the waters were low, today's farmers irrigate their fields through a very dense system of irrigation canals. Theirs is a very intensive and productive type of agriculture which was still quite unheard of at the start of the nineteenth century.

This chapter provides an overview of the recent history of Egyptian agriculture. For a fuller treatment, beyond the scope of this chapter, the points made should be developed further and considerable nuance introduced. There is, however, a basic pattern of Egyptian agriculture which gives a certain unity to the country.

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The significance of the changing use of the river Nile

From the time when the banks of the Nile were first built up downstream from Aswan by the first Pharaohs who unified Egypt until the fall of the Mameluke dynasty after French intervention in 1798, there had been some five thousand floods of varying strength, frequency, and effect—favourable or unfavourable.

For 5000 years the survival of inhabitants of the Nile Valley and Delta depended on how well they coped with the rapid rise of the waters between July and September. Not only was a certain amount of genius required to invent and deploy a system for spreading out the flood waters, moderating their force, and distributing their benefits over the land, but there also had to be some technical and political organization so as to keep the *nili* system of dams and canals in good repair. The use of the river has always been central to the objectives of central political and military authorities, and they have been able to organize the State around the Nile's vital function. This is an indispensable key to understanding the turbulent history of the country which was sometimes ruled by absolute aristocratic power and sometimes broken up into small independent fiefdoms in permanent conflict with each other. The latter description best fits the country as it was by the end of the eighteenth century.

After the period of French intervention and the failed restoration of the old regime, a new political-cum-military organization was set up in 1805 under the leadership of an Albanian officer, Muhammad Ali. Although nominally under the suzerainty of the Ottoman Empire, he re-established central authority and cleared the way for the restoration of the dams and canals which controlled the floods. The new regime intended to carry out its policies independently of Constantinople, while at the same time getting rid of the old feudal lords, who were finally murdered in 1811.

Muhammad Ali needed income from trade in order to begin his building works, guarantee his independence, and extend his authority to nearby regions. To this end he gave a considerable boost to the new crop, long staple cotton, which was discovered by Jumel (Gali 1889; Gregoire 1862; Rivlin 1961). Long staple cotton seemed an ideal product, being a non-perishable product much sought-after by the European textile industry, easy to export, and not on any list of products barred from trade outside the Ottoman Empire.

However, long staple cotton was not just a winter crop that could be grown when the waters were low; it demanded a lot of heat and water, and had a very long growing cycle centred on spring and summer. As a result the water reserves of the soil and the occasional shower (too infrequent to be of much use) were no longer adequate. This out-of-season crop needed to be irrigated at the start of its cycle when the Nile was at its lowest, and protected at the end of its cycle when the floods were likely to ruin the harvest.

Mindful of this twin problem, Muhammad Ali improved the central area of

the Delta where he had at his disposal considerable landed estates, taken over after the murder of the Mamelukes (Gregoire 1862). In order to irrigate the cotton, he deepened the canals which distributed the flood waters so that they could take water from the river when it was low (Barois 1887). Then on the edge of the fields he installed vast numbers of machines to lift the water from the bottom of the canals into the furrows. These *saqqiyas* were wooden wheels with pots attached to their rims; the pots went down into the canal for the water which was then emptied out sideways as the pots reached the highest point of the wheel's revolution. *Saqqiyas* were to play an essential role in the development of twentieth century agriculture. The metal type of pot developed in the 1920s and 1930s proved to be extremely efficient and these are still widely used today (Ruf 1986*a*).

Around 1830 the river's history underwent a sudden change. At this time the main idea was to optimize the distribution of the low waters of the Nile. Therefore, in the mid-nineteenth century the building of the Muhammad Ali Dam began at the narrow point of the Nile Delta. The intention was to raise the water level so as to feed big irrigation canals which were to be built. Unfortunately the dam was poorly built and it cracked when put into use; only in 1939, with the building of a second more solid dam was it possible to raise the low-water level by four metres (Besançon 1957).

The Nile Valley was developed progressively from the end of the nineteenth to the middle of the twentieth century. A series of dams were built to raise the water level and distribute the water needed to irrigate summer crops or year-round crops like sugar cane.

Having concentrated on raising different stretches of the Nile and reinforcing the dams, the irrigation service began, from 1885, to set up a system of irrigation water distribution using water towers to feed tertiary canals: these were fed with water for six days then left dry for twelve. It was in fact impossible to supply all the canals at once because of the very small volume available at low water (Barois 1887). This system is still used today in the cotton areas of the Nile Delta and Valley. In the north of the Delta where rice is grown the system is four days water, four days dry.

During the twentieth century the main concern of development engineers was how to increase the volume of water available. As early as 1902, the first Aswan Dam made it possible to store 1 milliard (1 milliard = 1000 million m^3) of water amounting to about one per cent of the river's annual flow through Aswan. The dam was raised twice, and a dam on the White Nile in the Sudan was added. By 1940, storage capacity was around 9 per cent of the annual flow. Although the volume at low water had been boosted, as evidenced by the increase in *sefi* crops (irrigated from February to August), water shortage remained one of the main factors limiting agricultural productivity. The building of the Aswan High Dam solved this basic problem, but led indirectly to others; these included a rise in the water table and an increase in salinity stemming from the delay in improving drainage.

The last Nile floods on Egyptian territory were in 1964. Today the river is kept at a regular volume all year. There are no more fears of the waters rising devastatingly, and every farmer in the land is certain of having water at all times of the year, provided that he has equipment for pumping water out of the supply canals and that he is not unlucky enough to be the last man in a chain of canal users where some users ahead of him take more than their share of water.

Population growth and the revolution in land ownership

When the first attempts at perennial irrigation were made around 1830, Egypt had barely four million inhabitants. With an arable surface of some 20 000 km^2 and a population density of 200 inhabitants per 'useful' km^2, Egypt was already one of the most densely populated areas in the world. Most of the people lived in agricultural communities, and were obliged to pay taxes to the State and to perform compulsory labour to maintain the earthworks. Today there are some 50 million Egyptians living on an arable surface of nearly 30 000 km^2. The rural population density can be calculated at 1000 persons per agricultural km^2, because half of the population lives in towns (Table 11.1).

The rural population is composed mainly of small peasant families, some working farms of one or two feddans, others having only one *kirat* of land (one twenty-fourth of a feddan). In 150 years, population and ownership structures have changed completely. In the nineteenth century, as a result of Muhammad Ali's tax and land reforms, with the spread of cotton production and rural trading, with the effects of conscription, and the opening up of new horizons for a great many peasants, rural society gradually changed its attitudes and its mode of organization. The rural community, originally formed of large extended families, broke up into smaller groups and collective identities weakened. Tax was levied only on individuals and finally, at the end of the process of change, the reform of land law gave peasants legal status as small property owners; for the first time their land rights were subject to the same law as those of the large landowners (Gali 1889; Rivlin 1961).

Under Muhammad Ali, the large landowners had been able to amass their hugh estates. The Viceroy of Egypt hit on the idea of rewarding his army officers and civil servants for services rendered, by granting them properties confiscated from the vanished Mamelukes, or land from villages which had fallen behind with their tax payments. The twentieth century saw a clash between two sectors of landowners—the big estates with peasants and agricultural labourers living in precarious tenure and status, and the small landowners whose insecurity derived from being indebted to various moneylenders.

The twentieth century began badly for the small peasant landowners, for they encountered two phenomena which questioned both their system of agricultural production and their system of social reproduction. The first of

TABLE 11.1. Egypt: population, area under cultivation, and area harvested, 1800–1976

Year	Total population (millions)	Rural population (millions)	Area under cultivation (million feddans)	Area harvested (million feddans)	Population density (persons per km²)
1800	2.3	NA	NA	NA	NA
1820	2.5	NA	NA	NA	NA
1844	4.4	NA	NA	NA	NA
1882	6.8	NA	NA	NA	NA
1897	9.7	7.8	5.0	6.8	462
1907	11.2	9.1	5.4	7.7	494
1917	12.7	10.0	5.3	7.7	570
1927	14.2	10.9	5.5	8.7	614
1937	15.9	11.9	5.3	8.4	714
1947	19.0	13.2	5.8	9.2	780
1960	26.0	16.3	6.1	9.9	1014
1966	30.1	17.9	6.4	10.5	1119
1976	36.6	21.4	6.8	11.2	1281

NA, data not available or non-existent
Source: Data for 1897, 1907, 1917, 1927, 1937, 1947–8, and 1960, Al Sarki (1964); 1844, Rivlin (1961); 1937, 1947, 1960, 1966–76, CAPMAS (1982); 1882, 1897, 1917, 1927, 1937, and 1947, Encyclopaedia Britannica (1964).

these, the salting up of land due to inadequate drainage exacerbated the second, which was debt. The social and economic crisis which was taking a grip on the country seemed too much for the Anglo-Egyptian Government. The Kitchener Act of 1913, to protect small property, forbade the expropriation of peasants' land for non-payment of debts, kept the peace within society, and kept this sector of agriculture alive. However the Act prevented peasants from obtaining agricultural credit for want of collateral, until the Nasser government brought in a system of supervision for agriculture.

Population growth meant the breaking-up of small property and it also resulted in a more difficult relationship between the big landowners and the agricultural labourers or sharecroppers. The 1952 Revolution was aimed particularly at the landowning oligarchy, and one of the first measures of the new authorities was a land reform bill.

In reality, the bill did not dismantle the big owners' sector which still survives today. Only big owners with ties to the previous regime were expropriated and these estates, some of which were very large, amounted to only 13 per cent of the arable surface of the country. This land was given to landless labourers and sharecroppers (9 per cent of farming families) in a system

of strict state supervision; state co-operatives brought together the new but indebted landowners who were to pay off the cost of the land in 30 annual payments (Radwan 1977). The Egyptian Government arranged the rotation of crops, looked after marketing, gave out seed and fertilizer in advance of the harvest, and took the lead in the struggle against cotton pests; this crop had been the mainstay of agricultural policy for over a quarter of a century.

Developing systems of production

When crops were grown after the floods had receded, their rotation depended almost solely on how far the floods had spread. Wheat was grown in most flooded areas but, where there had been insufficient water, barley was grown because it was more tolerant of dryness. Cotton became associated with a particular type of site, but the practice of growing it in the same place continually was soon given up and the site was then changed every year. Gradually the idea of planning a succession of crops was established. Cotton was grown every three, four, or five years, and in the meantime winter crops such as wheat, barley, and *bersim (Trifolium alexandrinum)* were grown. Sites were left fallow in summer so as to keep all available water for the cotton fields (Gregoire 1862; Gali 1889).

With more effective control of the flood waters and crop protection, peasants grew more and more crops, particularly maize, in the *nili* season. At this time it was easier to irrigate because the canals were at their highest levels. It is symbolic of the changes in society and in landownership that, at the

TABLE 11.2*a*. Egypt: area of winter crops (*chetwi*) in the nineteenth and twentieth centuries (thousands of feddans)

Year	Total area	*Bersim*	Wheat	Barley	Beans	Flax	Lentils	Others
1844	3582	286	914	872	839	306	168	197
1880	3972	941	1241	520	776	10	150	334
1950–4	4480	2160	1580	120	330	5	85	200
1955–9	4700	2360	1500	135	350	NA	80	275
1960–4	4760	2450	1380	130	365	NA	75	360
1965–9	4780	2630	1270	110	350	NA	65	355
1970–4	4900	2800	1300	80	280	NA	80	360
1975–9	NA	2804	NA	NA	290	NA	NA	NA

NA, data not available
Source: Data for 1844, Rivlin (1961); 1880, Gali (1889); 1950–74, El Tobgy (1976); 1974–9, Ramah (1982).

TABLE 11.2*b*. Egypt: area of summer crops (*sefi*) and perennial crops in the nineteenth and twentieth centuries (thousands of feddans)

Year	Total area	Cotton	Rice	Maize	Sorghum	Others	Orchards	Sugar cane
1844	507	224	98	0	0	185	NA	12
1880	1207	866	78	69	155	45	NA	70
1950–4	2280	1760	500	30	385	200	95	95
1955–9	3180	1790	640	55	390	295	110	110
1960–4	3600	1750	790	270	415	395	150	120
1965–9	4720	1680	1020	1070	460	460	205	145
1970–4	4870	1550	1090	1240	465	515	250	200

NA, data not available
Source: Data for 1844, Rivlin (1961); 1880, Gali (1889); 1950–74, El Tobgy (1976); 1974, Ramah (1982).

TABLE 11.2*c*. Egypt: area of autumn (*nili*) crops in the nineteenth and twentieth centuries (thousands of feddans)

Year	Total area	Maize	Sorghum	Others
1844	899	NA	NA	NA
1880	785	596	139	50
1950–54	1860	1720	50	80
1955–59	1970	1800	60	115
1960–64	1670	1460	55	155
1965–69	680	430	45	170
1970–74	620	350	35	215

NA, data not available
Source: Data for 1844, Rivlin (1961); 1880, Gali (1889); 1950–74, El Tobgy (1976); 1974, Ramah (1982).

end of the nineteenth century, maize became the staple food of the peasantry and barley declined (Tables 11.2*a–c*).

Cotton, which had been introduced originally by Muhammad Ali, was now grown in all sites in the Delta which had year-round irrigation, and it was now grown every two years. The Civil War in the United States, which deprived the Western textile industry of its main supplier, undoubtedly boosted the growth of cotton. Buyers turned to Egypt and prices went up fivefold in the 1860s. This was when the country and its farmers became integrated into the world market and, as a consequence, became indebted (Lorca 1979).

The State was caught in a spiral of investment, some of it productive as in the case of hydraulic infrastructure, some of it prestige; when it became

bankrupt the country came under the economic control of the West and, in 1882, under British military and political tutelage. The hydraulic and agricultural policies which were pursued in order to get rid of the huge public debt were focused entirely on cotton. Despite fiscal pressure which kept down the prices paid to producers, most of the country's farmers still grew cotton, sometimes forced to do so by landowners, but not always. In a money economy, the small grower had to face costs: water did not flow onto his fields by gravity alone, but had to be pumped by *saqqiyas*. Very often several small farmers shared this cost. They also had to pay land taxes which at the end of the nineteenth century still accounted for 40 per cent of government income (De Chamberet 1909)[1].

Thus cotton became the country's main crop in the areas which had been converted to year-round irrigation. For over 50 years the main cropping system was based on a biennial rotation: cotton in the first year followed by subsistence crops, such as winter wheat or *bersim* followed by *nili* maize.

One can understand the development of the crop rotation in terms of creating a cropping system that eliminates idle periods when the land is unused due to lack of irrigation. At the start of the nineteenth century one annual crop was grown after the floods; by the 1970s and 1980s the rotation had developed to include six different crops grown in a three-year span. This meant a remarkable intensification of agriculture which has caused new problems for farmers. Tables 11.3 and 11.4 illustrate the development of crop rotation in the Nile Delta (Daqahliya governorate) and the Nile Valley (El Minya governorate)

During this period of development, at the start of the nineteenth century, the main agricultural problems still besetting Egypt today became evident—namely, land exhaustion, salinity, and pest attack.

The more intensive agriculture resulting from improvements in water distribution was not immediately accompanied by changes in fertilization. In fact no one had worried about fertilization for thousands of years, because the Nile mud contained basic fertilizer. There are two vital elements to be taken into account in order to understand the crisis in Egyptian agriculture during the first half of the twentieth century. Firstly, the value of Nile mud as a fertilizer was something of a myth, for it could only compensate for the loss of nitrate when a single crop yielding only about 400 kg feddan^{-1} was grown. Secondly, from the end of the nineteenth century onwards, the new hydraulic infrastructure prevented the floods from remaining for long in the Nile Delta, thus considerably limiting any fertilizing input from the mud. At this time the main fertilizer used, *sebakh koufri*, came from old inhabited sites. Soon, however, the best sites became exhausted, and the effect of the residues on the soil was not only of negligible value but was also destructive, because of the high content of harmful salts. Chilean nitrate was imported from 1903 onwards but was used only marginally for a long time (Société Sultanienne d'Agriculture 1920; Mosseri 1928). It took more than 50 years for mineral fertilizer to become widely used.

TABLE 11.3. Crop rotation in Daqahliya governorate in 1844, 1885, and 1980

Year	Area ('000 feddans)			Percentage of agricultural area		
	1844	1885	1980	1844	1885	1980
Chetwi crops						
Bersim	20	100	390	5.7	26.3	63.5
Wheat	72	98	156	20.6	25.8	25.4
Barley	77	69	0	22.0	18.2	0
Beans	77	29	12	22.0	7.6	1.9
Flax	30	0	11	8.6	0	1.8
Others	10	24	29	2.8	6.3	4.7
Total *chetwi*[1]	286	320	598	81.7	84.2	97.2
Fallow	64	60	0	18.3	15.8	0
Sugar cane	0	0	2	0	0	0.3
Orchards	0	0	15	0	0	2.4
Total[2]	64	60	17	18.3	15.8	2.7
Agricultural area[3]	350	380	615	100	100	100
Nili crops						
Maize	100	65	41	28.6	17.1	6.7
Sorghum	0	4	0	0.0	1.1	0.0
Others	0	0	30	0.0	0.0	4.9
Total *nili*[4]	100	69	71	28.6	18.2	11.5
Sefi crops						
Cotton	30	154	200	8.6	40.5	32.5
Rice	38	54	274	10.9	14.2	44.6
Maize	0	12	58	0.0	3.2	9.4
Sorghum	0	11	0	0.0	2.9	0.0
Others	30	0	0	8.6	0.0	0.0
Total *sefi*[5]	98	231	532	28.1	60.8	86.5
Total area of cropping[6]	484	620	1218			
cropping rate[7]	1.4	1.6	2.0			

Agricultural area[3] = Total[1] + Total[2].
Total area of cropping[6] = Agricultural area[3] + Total[4] + Total[5] − fallow area.
Cropping rate[7] = Total area of cropping[6]/Agricultural area[3].
Source: Data for 1844, Rivlin (1961); 1885, Gali (1889); 1980, Directorate of Agriculture, Daqahliya Province.

TABLE 11.4. Crop rotation in El Minya governorate in 1844, 1885, and 1980

Year	Area ('000 feddans)			Percentage of agricultural area		
	1844	1885	1980	1844	1885	1980
Chetwi crops						
Bersim	11	47	120	3.8	13.3	27.8
Wheat	90	100	85	30.9	28.2	19.7
Barley	60	36	0	20.6	10.2	0
Beans	80	104	75	27.5	29.4	17.3
Flax	30	1	0	10.3	0.3	0
Others	18	38	45	6.2	10.7	10.5
Total *chetwi*[1]	289	326	325	99.3	92.1	75.3
Fallow	0	0	45	0	0	10.4
Sugar cane	2	28	42	0.7	7.9	9.7
Orchards	0	0	20	0	0	4.6
Total[2]	2	28	107	0.7	7.9	24.7
Agricultural area[3]	291	354	432	100	100	100
Nili crops						
Maize	30	9	35	10.3	2.5	8.1
Sorghum	30	20	0	10.3	5.6	0
Others	0	0	25	0	0	5.8
Total *nili*[4]	60	29	60	20.6	8.1	13.9
Sefi crops						
Cotton	0	0	120	0	0	27.8
Rice	0	0	0	0	0	0
Maize	0	5	190	0	1.4	44.0
Sorghum	0	24	0	0	6.8	0
Others	0	7	50	0	2.0	11.6
Total *sefi*[5]	0	36	360	0	10.2	83.4
Total area of cropping[6]	351	419	807			
Cropping rate[7]	1.2	1.2	1.9			

Agricultural area[3] = Total[1] + Total[2].
Total area of cropping[6] = Agricultural area[3] + Total[4] + Total[5] − fallow area.
Cropping rate[7] = Total area of cropping[6]/Agricultural area[3].
Source: Data for 1844, Rivlin (1962); 1885, Gali (1889); 1980, Directorate of Agriculture, El Minya Province.

Declining fertility does not alone explain the general decline in agricultural yield between 1905 and 1920. Rising ground water was also a factor. Until the crisis, the only real concern had been to increase irrigation opportunities. There was no drainage system. Gradually agricultural engineers and land managers became aware of the harmful effects of shallow stagnant water and the accompanying process of salting-over (Audebeau 1913). In succeeding years the irrigation service installed a huge system of open drains.

Finally in these conditions which were so unfavourable to plant growth, parasites appeared and multiplied in a very short time, destroying harvests. The leafworm (*Spodoptera literalis*) and the pink bollworm (*Pectinophora gossypiella*) did untold damage to cotton. In order to protect crops, the Egyptian Government was obliged to take legislative action, calling up peasant children to fight the worms by hand (Dudgeon 1918; Société Sultanienne d'Agriculture 1920). This method is still in use today; chemical methods are only used when other methods have failed to stem the tide of pests.

In this way the bases of a peasant system of agriculture for the twentieth century were laid down. This system bore the marks of a century of political history and international economic history, and of an ecosystem that was becoming more and more artificial. The system was also characterized by the ups and downs of Egyptian agronomy which was still at an early stage of development, and by rather rough-and-ready ways of adapting to the difficult conditions of production. Finally, the system was affected by the increase in social tension and especially by pressure on land (Ruf 1984).

The link between agriculture and livestock production: the key to understanding the development of peasant agriculture

Today, Egypt's main crop is neither cotton nor wheat nor even maize; it is the Alexandrian clover (*Trifolium alexandrinum*) known as *bersim* (Tables 11.2*a–c*). From November to April or May, farmers grow *bersim* in about two-thirds of their fields. This explains the importance of livestock, and why farmers are so keen to keep one or two head of cattle (or female buffaloes or ewes or goats) on their plots, even though they are sometimes tiny. The 1913 Act for the protection of the cotton fields prevents farmers growing fodder crops between May and October. In spite of this ban, cotton pests develop on other plants, and especially *bersim*. In summer, farmers feed their animals with the remains of other crops, such as stubble from cereals which they sometimes eke out with green leaves from the maize. The problem of animal feed has become so acute that cereal straw can now fetch a higher price than the grain.

Why then are farmers so stubborn? Why do they persist in keeping a cow

or a buffalo at all costs, despite the technical difficulties and the fact that it is taking up space which could be used for crops to feed humans? Once more history sheds light on the behaviour of Egyptian peasants.

Firstly, we must note that the widespread links between agriculture and livestock production seem to be quite recent; they derive from the mid-nineteenth century period of State interventionism when it was necessary to have animals near irrigated fields in order to work the *saqqiyas*. The links grew stronger at the end of the nineteenth century as peasant families became more individual entities; each one recognized by its land, house, and means for undertaking irrigated agricultural production, i.e. a *saqqiya*, a swing-plough and enough animal power to drive them. The number of cows and buffaloes registered was roughly equivalent to the number of peasant families: about a million (Table 11.5). After the crisis of 1900–20, the rise in animal production kept up with the rise in the number of small family farms. Today there are some 2.7 million cows, 2.5 million buffalo, and over 5.5 million sheep and goats (CAPMAS 1990). The density of animal units[2] per feddan is very high, working out at one animal unit per feddan over the country as a whole and 1.4 animal units per feddan in the centre of the Delta, where integrated farming is most developed.

The importance in social terms of owning animals, especially cows or buffaloes, does not wholly explain why small farms persist in integrating agriculture and livestock. Livestock perform vital functions in production units of this type, but animal traction, which goes back to the beginnings of integrated farming, is no longer the main one. Nowadays there is a tendency to mechanize pumping and any kind of soil cultivation because of the time gained in a system where crops follow on without rest periods[3].

Another very old function of the link between agriculture and livestock is fertilization. Surprisingly, its importance has not been recognized in Egypt, probably because the myths about fertile Nile mud have distracted attention from the much less spectacular task of dung-spreading. The tripling of the animal population between 1920 and 1980 has led to a similar increase in the supply of dung, which is the main source of fertilizer today. According to Ministry of Agriculture data, each feddan can be given some 12 t of manure (a mix of earth and excreta) which would provide about 30–40 kg N, 20–40 kg P_2O_5, and about 100 kg K_2O. Growing *bersim* provides an additional 100 kg N fixed by symbiosis. The system of state co-operatives set up by Nasser enables farmers to supplement this natural fertilizer with chemicals, mainly urea and composite fertilizers. These supplements provide an average of 60 kg N, 12 kg P_2O_5 and 0.3 kg K_2O feddan^{-1} (El Tobgy 1976, supplemented by the author's fieldwork, 1981–2). These data cover some very different situations, but they do show the importance of livestock in what has been described as the 'reproduction of the cultivated ecosystem'.

The food value of livestock is also important in helping to provide a protein balance in the diet of peasant families. The economic value is also essential;

TABLE 11.5. Livestock production in Egypt, 1885–1980

Year	Cattle	Buffalo	Sheep	Goats	Donkeys	Camels	Arable area (million feddans)	Animal (units[a] per feddan)
	(million head)							
1885	0.25	0.25	NA	NA	0.2	0.1	5.0	0.15
1905	0.75	0.7	NA	NA	0.5	0.1	5.4	0.35
1915	0.5	0.5	0.8	0.4	0.6	0.1	5.3	0.32
1935	0.95	0.9	1.7	0.7	0.8	0.15	5.3	0.55
1945	1.2	1.0	1.5	0.7	0.8	0.15	5.5	0.59
1955	1.35	1.3	1.3	0.7	1.0	0.15	6.1	0.62
1970	2.0	2.0	2.0	1.1	1.3	0.12	6.5	0.85
1975	2.1	2.2	2.0	1.4	1.4	0.1	6.8	0.87
1980	2.4	2.4	2.8	1.1	1.4	0.1	6.5	0.99

NA, data not available

[a] Measure equivalent to the energy (or fodder) needs of an adult cow with an annual milk production of 800 kg.

Source: Data for 1885, Gali (1889); 1903–17, Société Sultanienne d'Agriculture (1920); 1937–55, Encyclopaedia Britannica (1964); 1952, 1960, 1970, *and* 1975, *Ramah* (1982); *1960, 1970, 1971, 1978, 1980, Fitch and Soliman* (1981); 1970–4, CAPMAS (1982).

livestock provide a living form of savings together with a significant income, which is often managed by the women.

Complaints are often heard about the large share of the crop rotation taken up by *bersim* or the low level of productivity (in commercial terms) of traditional livestock breeding. The suggestion that 'unproductive' sites used for fodder crops should be reduced would jeopardize the keystone of the peasant production system. On the contrary, it is highly likely that the improvement of living conditions in the countryside will involve the solving of problems posed by integrated farming: the fodder system and animal feeding will have to be improved, as will zootechnical performance. If such steps were taken the result might be a huge leap forward in productivity right across the whole system of agricultural production (Ruf 1986*b*).

Recent history: changes and continuity under Nasser, Sadat, and Mubarak

Seen in historical perspective, the Nasser period must be regarded more as continuing the tendencies of the early twentieth century than as breaking sharply with the agriculture of the 1940s. Land reform brought changes in living conditions for large groups of the peasantry but did not change land distribution fundamentally. This underlying continuity is seen in hydraulic policy, where the building of the Aswan High Dam marked the end of the engineering programmes begun in the nineteenth century and designed to gain total control over the Nile. The setting-up in 1962 of compulsory state co-operatives for all farmers under the guise of 'Arab socialism' might suggest a change in agricultural and economic policy. From 1964 the Egyptian Government made it compulsory for farmers to rotate crops over about 50 feddans, justifying this measure by the need for better crop planning and a more effective struggle against cotton pests[4]. In return the co-operatives provided inputs such as seed and fertilizer on credit, to be paid for by law at harvesting. This policy continued the authoritarian tradition of twentieth century agricultural policy, which has been centred on cotton growing. It has much in common with similar measures taken in the nineteenth century by Muhammad Ali to get cotton growing started on the central delta estates and it fills out the legal framework set up in the crisis years 1900–1920.

In terms of progress, the results of this policy were disappointing. Not only did the dream of a 'scientifically planned' agriculture fail to lead to an industrial type of agriculture, but the growth in agricultural production still lagged behind population growth. Twenty years on from the beginnings of widespread state supervision of agriculture the country's dependence on food imports has become one of the biggest in the world; some 70 per cent of the wheat consumed is imported (Table 11.6 and Chapter 10, Table 10.9). Rice production which has developed with the available water supply is just able

TABLE 11.6. Wheat in Egypt, 1930–84

Year	Area (million feddans)	Production (million ardebs[a])	Yield (ardebs per feddan)	Consumption (million ardebs)	Imports (million ardebs)	Production: consumption ratio
1930–4	1.6	NA	NA	NA	NA	NA
1935–9	1.4	8.3	5.9	8.2	0.1	1.0
1940–4	1.6	7.9	4.9	8.0	NA	1.0
1945–9	1.6	7.5	4.7	9.2	NA	0.8
1950–4	1.5	8.7	5.8	12.7	3.5	0.7
1955–9	1.7	9.7	5.7	16.2	5.4	0.6
1960–4	1.5	9.8	6.5	17.5	8.0	0.6
1965–9	1.4	9.0	6.4	19.5	14.4	0.5
1970–4	1.3	11.0	8.5	26.0	15.5	0.4
1975–9	1.25	12.5	10.0	35.0[b]	22.5[b]	0.35[b]
1980–4	1.2[b]	13.0[b]	11.0[b]	45.0[b]	32.0[b]	0.30[b]

NA, data not available
[a] 1 ardeb of wheat = 150 kg.
[b] Extrapolation.
Source: Data for 1935–59, Al Sarki (1964); 1950–74, El Tobgy (1976); 1961–78, Lebas and Levy (1979); 1950–78 EMCIP (1978) and USAID (1976).

TABLE 11.7. Rice in Egypt, 1930–84

Year	Area (million feddans)	Production (million t)	Yield (t feddan^{-1})	Consumption (million t)	Exports (million t)	Production: consumption ratio
1930–4	0.5	NA	NA	NA	NA	NA
1935–9	NA	0.48	NA	NA	NA	NA
1940–4	NA	0.50	NA	NA	NA	NA
1945–9	NA	0.75	NA	NA	NA	NA
1950–4	0.5	0.80	1.6	NA	NA	NA
1955–9	0.64	1.05	1.6	NA	NA	NA
1960–4	0.79	1.80	2.3	1.5	0.4	1.2
1965–9	1.02	2.20	2.2	1.7	0.6	1.3
1970–4	1.09	2.50	2.3	2.0	0.3	1.3
1975–9	1.00	2.40	2.4	NA	NA	NA
1980–4[a]	1.00	2.40	2.4	NA	NA	1.0

NA, data not available
[a] Estimate.
Source: Data for 1935–59, Al-Sarki (1964); 1950–74, El Tobgy (1976); 1961–78, Lebas and Levy (1979); 1950–78, EMCIP (1978) and USAID (1976).

TABLE 11.8. Cotton in Egypt, 1900–85

Year	Area (million feddans)	Production (million kantars)	Yield (kantars feddan^{-1})
1900	1.2	6.0	5.0
1905	1.5	5.0	3.3
1910	1.5	5.0	3.3
1915	1.4	5.0	3.6
1920	1.5	5.0	3.3
1925	1.6	7.0	4.4
1930	1.5	7.0	4.7
1935	1.5	8.0	5.3
1940	1.0	5.0	5.0
1945	1.0	5.0	5.0
1950	1.8	7.5	4.2
1955	1.7	7.0	4.1
1960	1.8	9.0	5.0
1965	1.7	9.5	5.6
1970	1.5	9.5	6.3
1975	1.3	8.5	6.8
1980	1.1	10.0	9.1
1985	1.0	NA	NA

NA, data not available
1 kantar = 45 kg fibre.
Source: Data for 1900–18, Société Sultanienne d'Agriculture (1920); 1900–39, Besancon (1957); 1900–61, Al Sarki (1964); 1910–76, Ikram (1980); 1960–76, El Tobgy (1976); 1973–80, CAPMAS (1982).

to meet domestic demand (Table 11.7 and Table 10.9), and even cotton is in decline because of the difficulty in disposing of production on world markets (Table 11.8 and Tables 10.1, 10.9). Generally, peasants have tried hardest to increase production of the two crops which are not supervized by the state, namely *bersim* and maize (Table 11.9 and Table 10.1), in other words the subsistence crops of which they can be sure.

Moreover, the policy of developing desert land, which Nasser began, has run into problems. The model state farms occupying tens of thousands of feddans in Liberation Province, to the south-west of Alexandria, have failed; farmers were reluctant to give up rich land in order to settle in high-risk areas where farming is believed to be difficult.

Political change comes slowly in agriculture. Thus ten years after Nasser's death little had happened, with the exception of many exemptions from strict State supervision, granted to big landowners who wanted some freedom in their choice of crops. As the co-operative system was having trouble recovering its debts, the neo-liberal Government of President Sadat undertook a

TABLE 11.9. Maize in Egypt, 1935–74

Year	Area (million feddans)	Production (million ardebs)	Yield (ardebs feddan^{-1})	Human consumption (million ardebs)	Animal consumption (million ardebs)	Production: consumption ratio	Imports (million ardebs)
1035–39	1.5	11.7	7.8	NA	NA	NA	NA
1940–44	1.8	10.3	5.7	NA	NA	NA	NA
1945–49	1.5	10.3	6.9	NA	NA	NA	NA
1950–54	1.75	11.2	6.4	NA	NA	NA	NA
1955–59	1.6	11.5	7.2	NA	NA	NA	NA
1960–64	1.6	13.0	8.1	11.5	2.5	0.9	1.5
1965–69	1.5	16.5	11.0	13.5	2.5	1.0	0.75
1970–74	1.6	18.0	11.3	14.5	3.2	1.0	2.0

NA, data not available
1 ardeb of maize = 140 kg.
Source: Data for 1930–59, Al Sarki (1964); 1950–74, El-Tobgy (1976); 1961–74, Lebas and Levy (1979).

reform of agricultural credit in 1979–80. This made debtors deal directly with the banks. If they had not repaid their loan at the year's end, the bank would not allow the co-operative to supply them with inputs for the following year. Some farmers were thus cut off from the supply and credit system which had always been run by the administration. This raised the fundamental long-term problem of how the State might expect to systematize cotton growing if some of the growers no longer had the advantages of the state co-operative. A solution to the problem is all the more urgent as farmers are tempted by other crops (market gardening or horticulture) which give much better returns than cotton.

The agricultural situation today will certainly lead to the revision of the rules for the game played by the protagonists of the agricultural economy, namely the State, small farmers, and agribusinessmen. The State no longer depends on cotton which has been the main cash crop. Its main income comes from oil exports, Suez Canal dues, and tourism. Furthermore, the nation's accounts are swelled by remittances from the many Egyptians living abroad. The area in cotton production began to be reduced fifteen years ago, but there is great inertia in the State cotton system, which employs hundreds of thousands of people. It is hard for the Egyptian Government to liberalize the peasant economy, because there is a high risk that the whole textile sector will collapse. It seems that the cotton trap, which John Ninet denounced during the boom years of 1860–5, is still hampering the political choices that have to be made for the year 2000.

The small farmers who are regimented by the state co-operative system, but who are also to some extent protected by it, are facing enormous difficulties, due for the most part to the tiny size of their farms. The fragmentation of plots among heirs has meant that they no longer have enough land to survive. As in other countries, migrating to the capital city seems one way out, but often proves to be an illusion. Those who stay will probably intensify their system of growing, especially if they can stop growing cotton, which is too time-consuming. Moreover, official research in agriculture is moving towards intensification by testing very early varieties of cotton. In some non-cotton areas farmers are already growing seven crops in three years; by replacing cotton with soya beans, they can grow *bersim* before it and maize after. In the author's view small farmers should aim at better integration of crop production with livestock rearing, including the development of fodder production systems, genetic improvements, organic manure, perhaps even the production of biogas. It should also involve better mastery of the techniques needed for intensive growing, namely small-scale mechanization, which has in the case of Egypt the advantage of shortening the time-gap between one crop and the next.

Finally the agribusinessmen, who are as mistrustful of the State as they are of the landless peasantry, have gone in for systems of production which will make them fairly independent of political and social risks. Thus, the big

orchards in the Delta employ very little direct labour. The owner sells the harvest to a wholesaler when it is still on the trees and he recruits his own day-labourers. The other operations are mechanized wherever possible. There is no doubt that these 'gentlemen-farmers' all fear the return to power of a Nasser-style regime which would cut back their profit margins or even carry out a new land reform.

Notes

[1] Fiscal pressure decreased in later years, and today land taxes are insignificant.
[2] The animal unit is a conventional measure equivalent to the energy (or fodder) needs of an adult cow with an annual milk production of 800 kg (this is the average production for Egypt).
[3] Government energy policy also encourages the use of machinery: agricultural diesel is heavily subsidized.
[4] Cotton production plunged sharply in 1961. It was put down to the inefficiency of anti-pest measures. The market-gardening areas around the big cities are not subject to compulsory crop rotation.

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