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Impact of COVID-19 on Egypt's dairy and artichoke value-chains

Qualitative findings from rapid value chain assessments

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ABSTRACT

This report discusses the impact of the COVID-19 pandemic on the overall Egyptian economy from a macro perspective, presents two case studies on its impacts on specific value chains, and assesses the relative advantages of different investment alternatives to support agricultural growth in the context of recovery from the COVID-19 crisis.

For estimating the economy wide and sectoral impact of COVID-19, we employ a Social Accounting Matrix (SAM) multiplier model of Egypt's economy. Using this model, COVID-19 is estimated to have resulted in an 8.6 percent decline in Egypt's GDP during the period of most intense disruption during the spring quarter of 2020.

To understand in detail the impact of COVID-19 on selected agricultural value chains, we conducted a rapid assessment using telephone interviews with several actors in the dairy and the artichoke value chains. In the dairy sector, respondents reported that the curfew forced milk collection centers to reduce their working hours, limiting the number of milk deliveries farmers could make, and resulting in lower revenue for them. While this disruption adversely affected the entire value chain, it highlighted the importance of the private sector which was more flexible to adapt to the curfews.

In the artichoke sector, respondents reported that lockdown restrictions in Egypt's prime artichoke markets (Italy, Spain, and the United States) resulted in a negative demand shock for producers, adversely affecting the whole artichoke cluster in El-Beheira, our study area. With almost no demand in the local market for artichoke, the negative impacts highlight the importance of promoting access to new international markets, as well as investing in final processing and higher value-added products, such as frozen, preserved, and packaged artichoke.

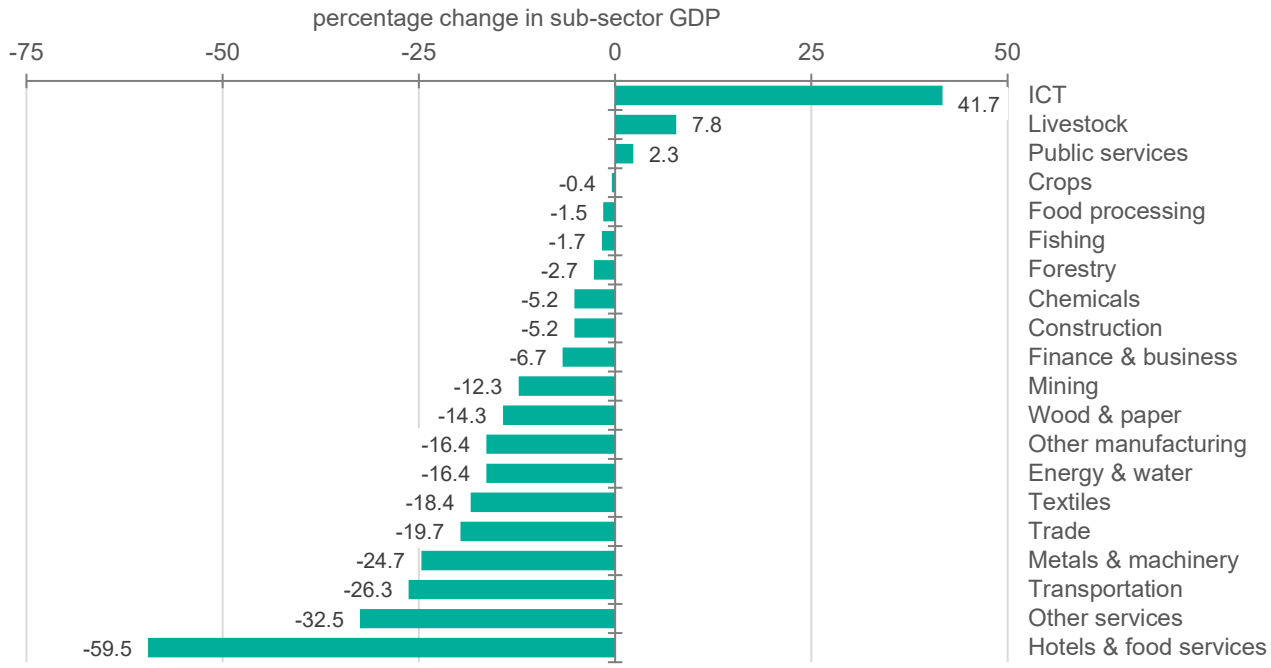
Finally, to generate additional insights for post-COVID-19 recovery options, we use IFPRI's Rural Investment and Policy Analysis and Agriculture Investment Data Analyzer (RIAPA-AIDA) economy wide model for Egypt to evaluate the potential impacts of public investment options on the development of the agri-food system. We rank investment options according to their impact on several different goals. This analysis shows that increased investment in agricultural research and development has the greatest potential impact on poverty and GDP, increased resources for agricultural extension services has the highest impact on dietary diversity, and expanded land reclamation has the greatest impact on increasing employment.

1 ECONOMY WIDE IMPLICATIONS OF COVID-19 FOR EGYPT

The COVID-19 crisis is having strong impacts on the Egyptian economy, but these impacts differ strongly across sectors.[1] Based on scenarios run using a Social Accounting Matrix (SAM) multiplier model of Egypt's economy, COVID-19 is estimated to have resulted in an 8.6 percent decline in Egypt's GDP during the 4th quarter of FY 2019/20 (April to June). The services sector was hit hardest, falling by 10.9 percent, followed by industry, which contracted by 8.3 percent. Agriculture was the most resilient sector, although there are large differences in the relative impact of COVID across agricultural subsectors.

While the wheat and livestock subsectors in agriculture likely grew due to government support, other agricultural subsectors were estimated to have seen reductions in production levels. The loss of GDP in the services sector was dominated by the partial closing of trade activities and the reduction of air and land transport, both of which have a significant impact on Egypt's GDP (Figure 1). The reduction of industrial and manufacturing activities is due to both significant direct and indirect effects.

Figure 1: COVID-19 final estimated impacts on sub-sector production in Egypt, fourth quarter, FY 2019/20



Source: COVID-19 Egypt multiplier model.
Note: Fourth quarter (April to June) of 2019/20 fiscal year. ICT = Information and Communication Technologies

Almost all the sectors were affected negatively by the COVID-related partial lockdown and curfews. Moreover, direct impacts were magnified by indirect effects induced by changes in the demand for intermediate inputs or strong forward linkages, especially for food processing, trade, and transportation.[2] On other hand, some sectors and services (e.g., information and

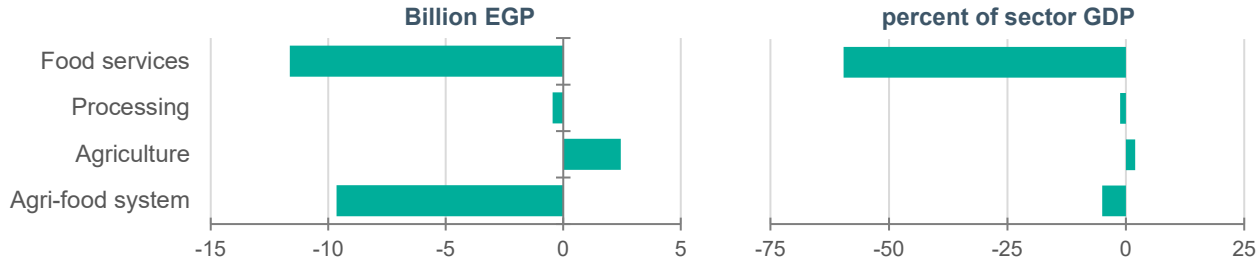
[1] See the Appendix for a timeline of the progression of COVID-19 infections in Egypt between February 2020 and April 2021 and some of the policies instituted in response.

[2] Breisinger, C., M. Raouf, M. Wiebelt, A. Kamaly, and M. Karara. 2020. *Impact of COVID-19 on the Egyptian economy: Economic sectors, jobs, and households*. Middle East and North Africa Regional Program Policy Note 06. Cairo: International Food Policy Research Institute.

communication technologies (ICT)) experienced significant positive demand shocks associated with the pandemic.[3]

Impacts on food systems also were substantial, although less severe than elsewhere in the economy. The loss in Egypt's agri-food system due to COVID-19 is estimated to be around EGP 9.6 billion. Most of this economic damage occurred in food services, including hotels and restaurants, with an estimated loss in output of 59.5 percent (Figure 2). Agriculture is the most resilient component of Egypt's agri-food system, seeing an estimated increase in output of around EGP 3 billion. This was driven chiefly by increased livestock production. Losses in food processing were relatively small and primarily driven by indirect effects, such as the reduction in demand for food by restaurants and hotels. Some food processors may have benefitted from the COVID-19 crisis if they were able to engage in production of processed foods that previously were imported.

Figure 2: COVID-19 impacts on Egypt's agri-food system, fourth quarter, FY 2019/20

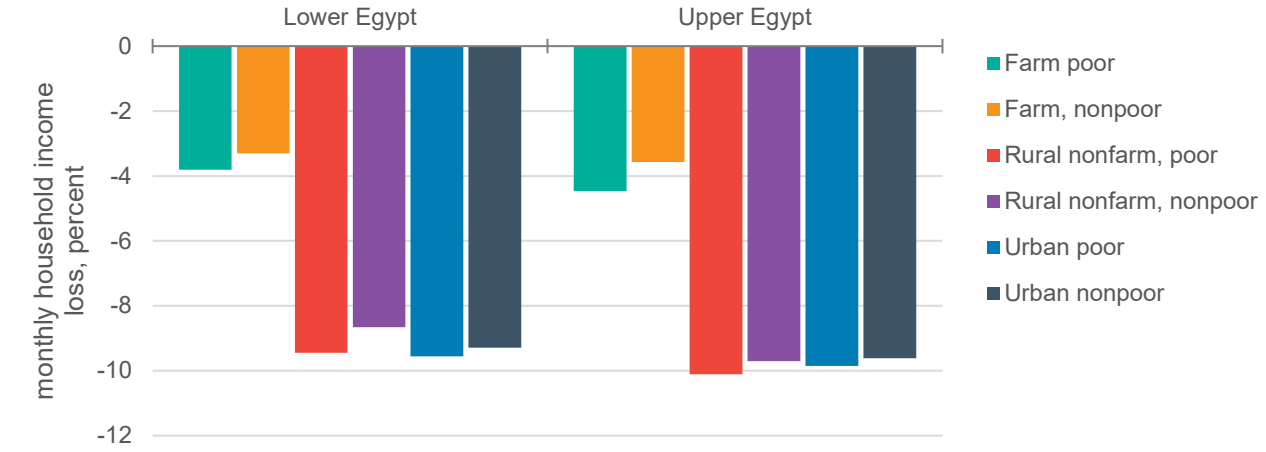


Source: COVID-19 Egypt multiplier model.
Note: Fourth quarter (April to June) of 2019/20 fiscal year.

The estimated impact of COVID-19 on households' income was substantial, but varying, across income groups and regions. Average household income is estimated to have declined by 7.5 percent (or EGP 405 per household per month) between April and June 2020 (Breisinger et al. 2020). The reduction in service sector activities had the strongest effect on all households. These reductions were driven especially by declines in trade, transport, retail, hotel, and sport services.

In Figure 3, we report the estimated disaggregated impact of COVID-19 on households' income by region (Upper and Lower Egypt), location (rural/urban), and income status (poor/non-poor).

Figure 3: COVID-19 final estimated impacts on households, monthly household income loss, percent, fourth quarter, FY 2019/20



Source: COVID-19 Egypt multiplier model.
Note: Fourth quarter (April to June) of 2019/20 fiscal year.

[3] Abay, K.A., and H. Ibrahim, 2020. *Winners and losers from COVID-19: Evidence from Google Search Data for Egypt*. Middle East and North Africa Regional Program Policy Note 08. Cairo: International Food Policy Research Institute.

In Lower Egypt, all households were estimated to be hurt by the reduction in economic activities, but urban and rural nonfarm households suffered the most from the economic impacts of COVID-19. The urban poor are estimated to have lost 9.6 percent of their monthly income, while the urban non-poor lost 9.3 percent. Urban households receive most of their income from employment in the services and industrial sectors, which were the sectors of the Egyptian economy most hit by the closing of businesses and lower tourist expenditures due to COVID-19.

Rural nonfarm households saw their incomes decline substantially, with the poor among them seeing steeper declines of 9.5 percent, compared to the non-poor at 8.7 percent. In contrast, rural farm households in Lower Egypt also lost income, but less than their rural nonfarm (and urban) counterparts. These results are mainly driven by an assumption of a growing livestock sector that mitigates some of the adverse income effects of COVID-19, resulting in a relatively modest decline in income for farm households. Non-poor rural farm households are estimated to have seen reductions in their incomes of 3.3 percent, whereas poor farm households saw a reduction in their monthly income of 3.8 percent. (Figure 3).

In Upper Egypt, the general patterns of income losses across household groups are comparable to those estimated for Lower Egypt. Farm households are more resilient than rural nonfarm and urban households – a result driven by the overall assumption of a relatively resilient agricultural sector. As in Lower Egypt, it was the urban and rural nonfarm households that were hardest hit by COVID-19, with monthly income losses of between 9.6 and 10.1 percent.

In summary, the agriculture food system is more resilient than the rest of the Egyptian economy and farm households are more resilient than are urban and nonfarm rural households. The agriculture food system therefore provides a strong basis for post-COVID recovery and transformation in Egypt. Urban and rural nonfarm households face the largest income losses, including for the poor among them. The level of social protection required to fully offset the income losses that poor households have experienced is likely to be prohibitive, especially given falling revenues from reduced economic activity. Therefore, additional measures to support poor households are needed. The agri-food system is a promising starting point.

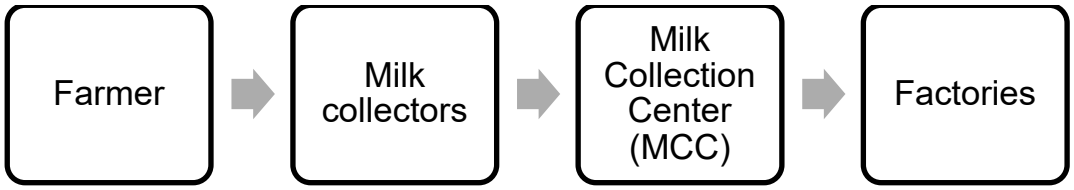
2 IMPACT OF COVID-19 ON EGYPT'S DAIRY AND ARTICHOKE VALUE-CHAINS

This section summarizes the findings from two rapid-assessment to assess the impact of COVID-19 and associated partial lockdowns and curfews-imposed in Egypt on a dairy value chain and an artichoke value chain. These value chains have been successful within the Egyptian agri-food system, while being susceptible to potential disruptions caused by COVID-19 related restriction. The rapid assessment involved conducting telephone interviews with a small number of players in each value chain to assess how their work and their livelihoods have been affected. The phone interviews were mostly conducted between 17 and 22 May 2020, with some follow-up calls in the first week of June 2020. We focused on the dairy value chain in Beni-Suef (Upper Egypt) and the artichoke value chain in El-Beheira (Lower Egypt). While these results may not be nationally representative, they provide important perspectives and insights from key stakeholders in each, which can inform policymakers in a time-sensitive manner. Moreover, while informing immediate policy responses, these results also can form the basis for more in-depth studies.

2.1 Dairy value chain in Beni-Suef

The dairy sector accounts for 0.3 percent of the country's GDP.[4] The dairy sector in some governorates are characterized by large farms, while that in others is dominated by smallholder farmers. The dairy value chain in Beni-Suef follows the latter model, being composed of three main players, namely farmers, milk collectors who operate as intermediaries, and milk collection centers (MCC), which are connected to a dairy products factory in greater Cairo (Figure 4). Beni-Suef, located about 120 km south of Cairo in the Nile valley, has been playing an important role in the dairy sector in Egypt since 2011. At that time, milk collection centers were established through a local project and promoted by Danone, a dairy production enterprise.[5] MCCs are still run by the local agricultural association, and Danone continues to collect milk from the MCCs on a bi-weekly basis.

Figure 4: Egypt's dairy value-chains



Source: Authors construction

2.1.1 Dairy value chain description in the context of COVID-19

The value chain starts at the farmer-level. Farmers milk their cows twice a day, usually at 7am and 7pm, or three times a day for some cow breeds. The fresh milk is then delivered to the MCCs either by the farmers themselves or by milk collectors who collect milk from dairy farms using a motorbike or a tricycle and deliver it to the MCCs. The collectors may own cows themselves, so they deliver their own milk, along with the milk of others. The milk collectors pay the farmers directly when they collect the milk for delivery to the MCC. MCCs also will deal directly with farmers who decide to deliver their own milk. When the MCCs receive the fresh milk, they inspect its quality, pasteurize, and store it until it is transported to the dairy production enterprise. MCCs pay farmers or milk collectors on a monthly basis based on the quantity of milk they delivered. The last actor in the value chain is Danone, whose facilities are located outside of Beni-Suef. Danone receives the milk in refrigerated trucks, using it to produce unflavored and flavored pasteurized milk, yogurt, pudding, and other products.

As noted, the dairy value chain starts with the cow. Cows are most productive when they follow a milking routine. Milk yield is dependent on the cows' nutrition and on their milking schedule. If that schedule is altered and they are milked earlier than normal, the cows do not produce the same amount of milk per milking session. Cessation or postponement of milking can also lead to physical problems for the cows, such as engorgement of the udder, which leads to discomfort, milk leakage, and possible inflammation. To restrict unnecessary movement of the population in order to prevent the spread of COVID-19, on 24 March the government of Egypt imposed a curfew from 7pm to 6am.[6] The curfew forced MCCs to close at 5pm, which resulted in the last batch of milk produced daily by farmers not reaching the MCC on the same day. This disruption adversely affected the entire value chain.

[4] Randriamamonjy, J.; M. Raouf, and J. Thurlow. 2019. *First Regionalized Social Accounting Matrix for Egypt: A 2015 Nexus Project Social Accounting Matrix*. MENA RP Working Paper 22. Washington, DC; Cairo, Egypt: International Food Policy Research Institute.

[5] Daburon, A., M. Radwan, V. Alary, A. Ali, S. Abdelghany, and K. Fouad. 2016. "Evolution of a milkshed and role of alternative milk collection centres in Egypt." *Cahiers Agricultures*. 25 (6): 65008.

[6] On 8 April, the curfew period was relaxed to start at 8pm, and then on 23 April to 9pm.

2.1.2 Impact of COVID-19 on the different actors in the dairy value-chain

To assess the impact of COVID-19 and the imposed curfew on the dairy sector in Ebshana and Elhalabeya communities in Beni-Suef governorate, 12 value-chain actors were interviewed, including farmers, intermediaries, staff at milk collection centers, and a representative of Danone.

Farmer-level impacts. Eight of the 12 individuals interviewed judged that the curfew had a negative impact on both milk production levels and the local dairy sector as a whole. First, milk production, sales, and, consequently, the income of farmers declined because the curfew interrupted the milking schedule of their dairy cows. Farmers were not able to milk at 7pm as scheduled. They were left with two options: either to milk their cows earlier, which resulted in a reduction in milk production; or to milk their cows as scheduled, but to not sell the last batch of milk. In both scenarios, farmers sold less milk and, thus, earned less. Farmers estimated their losses due to the curfew at between a quarter and a third of their income under normal conditions.

In addition, the full-day curfew on weekends meant that farmers could not sell any of the milk they produced on those days. Since none of the dairy farmers have storage equipment, the milk cannot be stored and ends up wasted – the milk must arrive fresh at the MCC within a couple of hours of milking. As one farmer explained that “earlier in March during the weekends when there was a lockdown, we ended up using the milk in our household, since we could not sell it”. Another said, “I give the extra milk to my neighbors as a gift.” Lower milk production and sales resulted in lower income for the farmers.

However, two farmers interviewed stated that the curfew did not affect their production. The first reported that he had gradually shifted his cows’ daily milking schedule, so instead of milking at 7am and then again at 5pm like everyone else, he pushed the morning milking session earlier to 5am and the second milking to 3pm. By doing this, he was able daily to deliver the same quantity of milk to the collection center as before the curfew. The other farmer reported that the MCC he supplied created three sub-collection points where farmers could deliver their milk that were easier to reach than the main MCC facility. Moreover, he observed that the curfew situation was short and temporary – “The collection center went back to operating until 8pm. I am selling the same quantity. I do not think that COVID-19 negatively impacted the sector.”

Farmers responded in different ways to mitigate their losses. Farmers’ costs did not change during the COVID-19 curfew period, since they needed to continue feeding their cows and managing their barns. Some farmers reported incurring extra costs related to sanitizing their barns or purchasing personal protective equipment. MCCs stipulated that anyone delivering milk had to wear a mask, which became increasingly expensive. To mitigate the impact of his loss in income, a farmer stated that he reduced the feed for his cows. While this reduced his costs, it also reduced his cows’ milk supply, of course. Another farmer reported selling some cows and sheep to buy feed for his lactating cows. He could not sell the lactating cows, as they were the collateral for a loan he took in March 2019 from the National Bank of Egypt. Other farmers reported borrowing from neighbors and friends.

Apart from the loss in production and income, one farmer complained about the closure of local livestock markets, since he is unable to sell cows that are in their dry period and are not produce milk. Another farmer complained about veterinary services not being available due to COVID-19, which puts dairy farmers at risk if any of their cattle become sick.

Collector-level impact. As a consequence of the decline in the amount of milk produced by the dairy farmers, milk collectors delivered less milk to the MCCs, reducing their own incomes. One of the milk collectors mentioned borrowing money from neighbors to cover his running expenses – he had decided not to borrow from a bank to avoid paying interest. Another stated that he encouraged the farmers from whom he collected milk during the curfew period to store the milk from their

evening milking in their fridges until the next day when the curfew would be over and he could collect it. Yet, such measures increase the risk that milk collectors will pay farmers for poorly stored milk that would end up being refused by the MCC.

Another milk collector estimated that under the curfew he supplied one-third to one-half of the amount of milk he used deliver to MCCs – “I used to deliver between 500 and 600kg per day, now I only deliver around 200kg”. The milk collectors stated that they continue to take milk from farmers and pay them, because they see that the farmers cannot afford a loss in income, as they need to continue feeding their cows and milking them. Otherwise, the entire local dairy value chain would come to a halt. This attitude shows how strong community collaboration is within the cluster.

Milk collection center-level impact. The MCCs are the key input suppliers for the dairy production enterprises at the end of the value chain. MCCs in Beni-Suef abided by the curfew and closed earlier than their regular hours of 9am to 9pm. This resulted in lower milk collection, since farmers and collectors were not able to deliver all milk they produced or collected to the MCC before the start of curfew during the weekdays and not at all during the weekends. One dairy collection center reported that “before curfew hours, we dealt on average with 1,000 farmers per day, but during the curfew we would deal on average with 750 farmers”.

The COVID-19 related curfew had a direct impact on the mobility of the refrigerated dairy trucks used by the MCCs. One center manager reported an incident in which their truck was stopped and held by police officers during curfew hours. Resolving the problem required the MCC reporting it to Danone managers, who reached out to officials in the governorate to authorize the release of the truck. The manger noted that, “There is a law that allows our trucks to move during curfew hours. But officials here are unaware of it, even though Danone had provided the truck drivers with special licenses to avoid such complications.”

Government granted exemptions to allow some businesses to operate during curfew hours, but exceptions were not granted to the MCCs. A collection center worker explained that in the weeks during which curfew hours were long and strict, i.e., 7pm to 6am, the center saw an estimated 30 percent decline in the quantity of milk collected.

However, another manager of a collection center highlighted that in 2020 Danone expanded the number of milk collection points within Ebshana, with five now in the community. He explained that during COVID-19 these collection points enabled dairy farmers to still deliver their milk, so that any adverse effects on the local dairy value chain due to the curfew or other limitations on mobility were only temporary. He stated, “These disruptions only occurred for a few days. The milk collection center is now operating with the same capacity as in March 2019. Whatever we produce is fully demanded by and sold to Danone.”

Factory-level (Danone) impact. Danone is the dairy production enterprise dealing with the MCCs in Beni-Suef. The factory collects milk from the MCCs on a bi-weekly basis using refrigerated cold-chain trucks. Danone is responsible for ensuring the smoothness in operations of the MCCs. Indeed, and as also reported by MCC managers, under COVID-19, Danone enhanced safety measures at the MCCs, providing them with all necessary sanitization tools and resources.

Despite the enactment of a new law to allow the free movement of cold-chain trucks, some of Danone’s were stopped. The trucks were unable to move between Beni-Suef and Cairo after the curfew was put in place until the company resolved the issue with the Federation of Egyptian Chambers of Commerce and the Federation of Egyptian Industries after a few days.

Demand for Danone’s products has not been affected by the curfew or the closure of hotels and restaurants, since these are not the main consumers of the company’s products. Danone’s main consumers are households, who increase their demand for dairy products during the month of

Ramadan and reduce it later on; a normal consumption pattern that the company was used to even before the COVID-19 crisis.

According to the company representative interviewed, the MCCs in Beni-Suef proved to be more resilient during the crisis, compared to unorganized milk collection activities. Farmers who had previously delivered their milk to other factories that produce local cheese or milk came to realize during the period of COVID-19 restrictions the benefit of their being linked to a well-established value chain. The operations of these other more local dairy production enterprises were disrupted during the crisis, leaving dairy farmers who previously supplied them without an outlet to which to deliver their milk. Since the curfew, more dairy farmers have reached out to the MCCs linked to Danone. In addition, the Danone representative noted that the well-organized value chain of MCCs and sub-collection points was used successfully to provide information to farmers on the necessary safety precautions they should take in their milk production.

2.1.3 Policies and government response affecting dairy value chain

Most of the dairy value chain actors interviewed were aware of different government initiatives taken to control the spread of the virus and to enable their businesses to continue to operate during the crisis. These included allowing the free movement of food transport trucks and the Central Bank of Egypt's initiative to postpone interest payments.

With regards to food transport truck movements, it was believed that this was a positive move. However, complaints about the inconsistent enforcement of this exemption from movement restrictions for food transport were raised. Many police officers ended up stopping drivers, as the officers lacked knowledge of the exemption.

The dairy value chain actors did not find the delay in interest payments beneficial because, with the exception of one respondent, none of them had loans. Even when in need, the dairy farmers stated that they prefer to borrow from friends or relatives, since they will not be paying interest to them. One farmer reported that before the crisis began he had planned to apply for a loan to expand his milk operations, but he then postponed doing so due to COVID-19 in order to avoid unnecessary contact with other people.

In terms of social protection provided by the government, at least one farmer mentioned the unemployment benefits that the Ministry of Social Solidarity is providing. However, he added that none of the youth in his community had received such benefits, even though many had applied.

The policy lessons that can be drawn from this analysis of the dairy value chain in Beni-Suef include the following:

- Better enforcement of exceptions to movement restrictions by milk transporters during curfew could have prevented economic losses and dairy waste.
    - The government of Egypt wisely allowed exceptions to the curfew restrictions to allow the free movement of food trucks during curfew hours. The exceptions were widely known by people within the sector. Yet, better coordination with other government officials at the local level is needed, since the operations of MCCs were not exempted from the curfew hours and some dairy transport trucks were stopped by local officers.
- Take advantage of existing value chain connections to spread messages on safety.
    - Hygiene and food safety requirements were effectively shared from Danone to the MCCs supplying the enterprise. This flow of information can eventually benefit the dairy farmers. , For instance, based on this information, the MCCs requested all milk suppliers to wear face coverings when interacting with MCC staff.

- Enhance collective action for contingency planning.
  - To better prepare the dairy sector in Egypt to react to health and other crises, it should be recognized that the smooth operation of the value chain is very sensitive and susceptible to disruptions caused by these crises. Smallholder farmers and milk collectors suffered losses due to the COVID related curfew. Some coped by selling off assets or taking on debts – actions which can increase their vulnerability to future shocks.
  - It is necessary to have a strong network connecting farmers, milk collectors, milk collection centers, and dairy production enterprises as well as other relevant bodies, so that challenges arising in the operations of the dairy value chain are resolved quickly. Value chain actors with long experience in the sector will be valuable in advising how participants in the value chain should react in times of crises. However, almost all of the dairy value-chain actors interviewed stated that there was no formal mechanism for collective action to be decided upon and implemented within the value chain.
- Place the private sector in the driver's seat to guide the evolution of local dairy value chains, while also investing in dairy infrastructure within communities.
  - The private sector has an embedded interest to lobby for more efficient policies to enhance the process of doing business, whether for dairy products or for other commodities.
  - Danone's role in providing cattle feed to farmers through the MCCs highlights the benefits that can flow to dairy producers from private sector involvement. Establishing sub-collection points and communicating issues faced by all value chain actors also is a valuable benefit from the involvement of private sector players.
  - The importance of improving the dairy infrastructure within Beni-Suef was highlighted by Danone representatives. More cold storage facilities are needed at the bottom of the value chain where an MCC is not readily accessible. A denser network of sub-collection points should be installed to ensure that the milk produced by the farmers in those communities is delivered in a timely and safe manner. In addition, the general infrastructure needs improvement, particularly roads. The storms which hit Egypt on 12 March 2020 prevented many dairy farmers and collectors from delivering their milk for several days.
  - Continued investment in dairy value chains is needed. Danone reported that it will continue to invest in MCCs to supply its factory in Cairo, having a budget of EUR 3 million to do so.

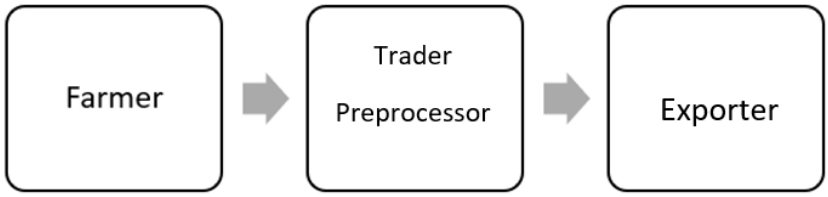
2.2 Artichoke value chain in El-Beheira

The artichoke cluster in El-Beheira is composed of three main players – farmers; traders who are also preprocessors; and exporters who further process the artichoke to export as fresh, frozen or preserved, connecting the value chain to the international market (Figure 5). Egypt is among the eight countries that represent 85 percent of global production of artichoke. Between 2015 and 2018, artichoke exports from Egypt rose by 37 percent. In 2018 alone, Egypt sold almost 1,800 tons of artichoke, earning 3.1 million USD.[7]

This pronounced recent positive growth for artichoke production has attracted the attention of policy makers and international organizations to the community of Kafr El-Dawar, located 25 km southeast of Alexandria city in El-Beheira governorate, where an artichoke cluster is located. Artichoke has a large export potential, which makes the crop a significant source of foreign currency, while also generating jobs and increasing incomes of participants along the value chain.

[7]See Egypt Artichokes Prices https://www.selinawamucii.com/insights/prices/egypt/artichokes/; Egypt Artichokes Market Insights https://www.selinawamucii.com/insights/market/egypt/artichokes/

Figure 5: Egypt's artichoke value-chains



Source: Authors construction

2.2.1 Artichoke value chain description in the context of COVID-19

Almost everyone in the Kafr El-Dawar community in El-Beheira calls the artichoke production season the season of all fortunes, as it is the period of the year during which marriage expenditures for their sons and daughters can be made and debts can be paid off. Farmers in Kafr El-Dawar report having produced artichokes for at least 30 years. They plant artichokes in July and August, sufficiently early to make sure they are ready for export in December before the harvest season begins in Europe. The harvest season will last for five or six months from early December to late May.

Traders are the link between farmers and exporters. There are two types of traders. The first are simply involved in trading, whereby they purchase, collect, and transport artichokes during the harvest on weekly basis from farmers to preprocessing facilities (Nawalat). The second type are involved in both the trading and managing their own preprocessing facilities.

Most traders do not pay farmers in full in advance. Rather, they pay up to half of the amount due upfront, giving the farmer sufficient funds to cover the costs of necessary inputs for artichoke production, including land rent and to purchase fertilizers and pesticides. The balance of the payment by traders to artichoke farmers is made once market prices are set during the harvest period. Farmers will generally have to wait until the end of the season to receive payment in full. By signing a sales contract, farmers are committed to sell their artichokes only to that trader.

In the preprocessing facilities, artichokes are sorted, their stems are cut, they are cleaned, and then stored in salt or citric acid. Pre-processing is very labor intensive and involves mostly women who are paid an average daily wage of EGP 100 (USD 6.50). From the preprocessing facilities, the artichokes are transported to the exporters.

The exporters are considered the leaders of the artichoke value chain, as they direct the Egyptian supply to match international demand, closely monitoring international market prices. Exporters are able to add value to the artichokes and enhance product differentiation, as they have more sophisticated facilities and larger storage than do preprocessors. Once exporters receive the artichokes from the preprocessing facilities, they either place them, with no further processing, in plastic containers and transport them to the ports in a cold-chain, or they further process them to export them as frozen, pickled, or preserved; depending on different consumer and market demands, and ship them.

Artichoke is a winter crop with the harvest season in Egypt running from December to early May. In March and April 2020, COVID-19 full lockdown restrictions were imposed in Italy, Spain, and in much of the United States, which were Egypt's prime artichoke markets. El-Beheira artichoke producers were shocked by a sudden decrease in demand due to associated trade and export market disruptions. With almost no demand in the local market for artichoke – as one farmer put it, "artichoke is not the dish for Egyptians" – all artichoke value chain actors faced a significant adverse market shock. They did not know what to do with their stocks or where to direct their produce. This market disruption had a clear negative impact on the community of Kafr El-Dawar, whose inhabitants rely heavily for their income on revenue from artichoke.

2.2.2 Impact of COVID-19 on different actors in the artichoke value-chain

To assess the impact on the artichoke value-chain of the curfew imposed by the government of Egypt to halt the spread of the COVID-19 virus, 12 value-chain actors involved with the Kafr El-Dawar artichoke cluster were interviewed: four farmers, two respondents who were both farmers and traders, three traders and preprocessors (Nawala), and three exporters.

Farmer-level impacts. Artichoke farmers in the community were hit by a heat wave at the beginning of the 2019/20 production season, which led to significantly reduced yields. The second hit experienced was COVID-19 and the restrictions put in place to bring the virus under control in Egypt. The COVID-19 curfew had no direct impact on farming activities, as farmers could operate on their own lands even during curfew hours. The pronounced impact of the curfew was losses in farm income due to low prices. As one exporter put it, “Farmers lost the season”. In a good season, the price per artichoke bud can rise to EGP 5.00. However, amid international market lockdowns and decreases in exports, in early 2020 the artichoke price started at EGP 2.00, but dropped to EGP 0.50 in March and April. All farmers interviewed reported having sold their harvest at a loss. “Artichoke is a crop for the international market. It is not for the local market. When traders stopped purchasing our produce, we did not know what to do.”

Respondents reported no changes in the prices of their inputs, including pesticides, fertilizers, irrigation, and land rental fees, so their reduced revenues did not cover these costs. Most farmers work their own lands or rely on family members to do so, so there were no reports of laying off labor within artichoke production. The cost of production of artichoke per feddan, including labor costs, is estimated at EGP 20,000. In a good season, a farmer could expect to earn EGP 30,000 per feddan, leaving EGP 10,000 of profit. Four of the six farmers interviewed reported that they are now in debt. One farmer who had a contract with a trader and borrowed money from him earlier in the season reported that he was not able to pay him back. Another reported being in debt to the agriculture cooperative bank. One said, “All my neighbors here are in debt of tens of thousands of [Egyptian] pounds, I am pretty sure a lot of farmers will end up in jail soon when things go back to normal.”

Physical losses were mostly reported at the farmer level. Artichokes are harvested weekly. The very low market price of artichoke led farmers to either sell their produce at a loss to the local market, leave the artichokes unharvested to avoid further handling costs, or simply switch to other crops. A respondent who was a farmer and a trader highlighted that farmers who did not sign a contract to commit themselves to producing artichoke for a trader were better able to change the crop they planted amid the change in the market situation and the sudden decrease in value of artichoke. “Farmers who signed a contract are committed to harvest until the last bit of fruit.” While one farmer reported deciding to dump all of his artichokes early on in the season to avoid further losses, another reported selling some for a low price, but threw away a larger share. Another said that early in the season he sold a quarter of his harvest at the EGP 2.00 price, then sold half at EGP 0.50 to the local market. He threw away and wasted the remaining quarter of his harvest. The farmers who did not switch to other crops explained that they did not do so because they were hoping prices would recover or because they were bound by a contract with a trader.

Farmers do not have the capacity or the capital to store artichokes. While artichokes can be stored frozen for a period of up to three years, when farmers were asked why they did not store their produce and wait for a higher market price, the consensus was that the quantity of artichokes produced by each farmer was insufficient to cover the cost of storage. “It would be costly for us to store and wait until prices rise up again. Those who would benefit from storing artichokes would be the owners of the storage facilities, whether they are traders or exporters”

When farmers were asked whether they had tried to jointly address their business bottlenecks, it was clear that their collective action attempts were unsuccessful. A few mentioned that in previous bad seasons when prices went down farmers would come together and agree to set a price floor and not to sell to traders at lower prices. Nonetheless, not all farmers can commit to do so for very long for fear that they would lose any return on their harvest. Another farmer explained that, due to the volatility of the price of artichoke and the complexity of the international market, farmers are not aware of the prevailing global price at the time they sign sales agreements with traders – “We are price takers, but what can we do”.

Trader and processor-level impacts. The curfew imposed by the government as a measure to fight COVID-19 had a direct impact on trading and preprocessing activities. All traders reported limitations on their normal daily logistical activities, including collecting artichokes from farmers and transporting them to preprocessing facilities and then on to exporters. They had less time to operate during the day. Mobility restrictions, especially during weekends when there was a full lockdown, made it very difficult for traders to transport their goods from one place to the other. One explained, “Before the government-imposed curfew hours, I was able to preprocess and preserve 100,000 artichokes per week. This is almost double the quantity I preprocess today.”

Preprocessing the artichokes is labor intensive. Abundant labor must be present in the preprocessing facilities. During curfew hours, facility working hours were cut down, impacting productivity levels. In addition, to promote social distancing, the government imposed restrictions on the number of workers that could be at work together in a factory. This also limited productivity. The preprocessors interviewed reported experiencing labor shortage in their facilities. “People started dreading big groups and gatherings. Many female workers stopped coming to work out of fear of catching the virus.”, one explained.

These labor shortages resulted in the costs of labor going up. One trader reported that the few workers who chose to continue working in his preprocessing facility requested higher pay. “I used to pay them EGP 100 per day. Now it went up to EGP 130.” Besides increases in labor costs, other traders reported finding the cost of sanitation and prices of masks and disinfectants to be high in Kafr El-Dawar. This made it challenging for the facility owners to abide by all safety measures. To remain in business, however, they had to prevent any COVID-19 infections in their workers. Otherwise, their facility would be closed by the government, one explained.

There were varied views among traders on the impact of COVID-19 on their income. One explained that, “Traders are less likely to be impacted than are farmers, as their business is simply commission-based. Traders take EGP 0.15 to 0.25 per fruit sold. So, if nothing is sold, then no gains are acquired, but also no huge losses are incurred, unlike for farmers.” The traders who reported being most negatively impacted were those who pre-financed farmers before the season started, so the farmers could purchase necessary inputs. The value of the artichoke harvests of these farmers, given the low prices in 2020, were often insufficient to cover the initial payment.

Exporter-level impacts. COVID-19 and the disruptions to international trade that it caused were not the only reasons behind 2020 being a bad year financially for artichoke exporters in Egypt. The heat wave early in the production season was clearly another important factor. One exporter noted, “Non-virus related impacts should be considered, as the weather too had a counter effect on yields and produce.” Moreover, all three exporters interviewed mentioned that the curfew impacted all crops, not only artichoke.

The exporters explained that for the first two months of the harvest season in early 2020, the export price for artichoke was high, as the markets in Italy, Greece, and Russia were operating with high demand. But, starting 20 March most business activity was halted.

While there was a consensus that foreign demand was distorted and exports decreased, shipping operations used by artichoke exporters were maintained and ports functioned. Most of the business challenges reported by the exporters were local. Their activities in Egypt were negatively impacted by the curfew, as transportation routes were disrupted. Traders, accordingly, were not easily able to deliver artichokes to the exporters in a timely manner.

In consequence, the level of business activity of exporters shrank, with little or no profits realized. One exporter explained that he suspended his business for a time, for fear that clients abroad would default on some orders and not pay him. He took this action after one of his clients in Italy died due to COVID-19. Another highlighted that he was unable to recover funds from farmers and traders with whom he had signed contracts and made advance payments to earlier in the season after the farmers and traders did not deliver to him any artichokes.

All exporters interviewed reported negative impacts of the COVID-19 curfew on productivity due to fewer working hours and workers in their facilities. In line with what traders experienced, exporters reported that a shortage of labor resulted in increased labor costs. An exporter said, “The workers demanded higher pay, claiming that this is the price for risking their lives and working in such circumstances while others have chosen to stay at home.” Others pointed to an increase in the costs of masks, gloves, and sanitizing products as factories tried to abide by government and international safety and health regulations.

While exporters have the capacity to store produce, they see no benefit in doing so in times of market uncertainty. “I have fixed and running costs, so I cannot afford to store a quantity that I cannot sell.” Another said, “I would not store, because the situation seems to be getting worse.” They explained that not all exporters can afford to store artichokes in hopes of higher prices later – many would prefer immediate low profits over higher future ones.

None of the exporters reported having laid off workers. Ties within the community matter in this regard. One exporter explained that, while he wanted to lay off workers, his brother insisted that he keep them on, since the workers cannot risk their livelihoods and the workers’ families will be harmed. Another said, “I could not lay them off. They work with us every season. It unfair to let go of them during a bad one.” Artichoke exporters viewed the 2020 season as an outlier that had now ended. “Even if there was no COVID-19, for people in Kafr El-Dawar, the season has ended. Whoever is working in the artichoke value chain has concluded their work for the winter. They will work in anything else now as usual.”

2.2.3 Policies and government response affecting artichoke value chain actors

Most individuals interviewed were aware of the different initiatives of government to mitigate the adverse effects of COVID-19, including the free movement of food trucks during curfew hours and the Central Bank of Egypt’s initiative to postpone interest payments.

With regards to transportation restriction, the exception for food trucks was well received by exporters. They highlighted that officials in Kafr El-Dawar were well aware of the importance of the timely delivery of artichokes and of the livelihoods that rely on it. “They never stopped us when we transported the produce from preprocessing facilities to factories during the curfew hours.”

However, none of the artichoke value chain actors interviewed found the postponement of interest payments beneficial. Most farmers are in debt, but they did not consider themselves candidates for the CBE initiative. Those who already borrowed from traders and exporters were not interested to borrow again, whether from lenders in the CBE program or from others.

Traders, while an integral part of the artichoke value chain, observed that they were the least likely among value chain actors to benefit from any government support or initiative, since they are not directly connected to an association or a federation, as the exporters are.

The policy lessons that can be drawn from this analysis of the artichoke value chain in El-Beheira include the following:

Farmers

- Enhance artichoke farmers' cooperative ability to work on collective action issues during market disruptions.
    - Almost all interviewed farmers reported that, while they bear the most risk, they acquire the least profits in comparison to other actors in the artichoke value chain. Enhancing their collective action and cooperative ability will contribute to helping solve some of the non-individual binding constraints farmers face. These include, but are not limited to:
        - Bargaining for better prices for fertilizers and pesticides;
        - Managing production during price shocks due to international artichoke market volatility; or
        - Overcoming unfavorable weather conditions by employing best production practices.
- Expand possibilities and legal support for sharing risk.
    - Current contracting arrangements between farmers and traders or exporters are very simple. They either place most of the risk on the farmer, in the case of payment at harvest, or on the trader or exporter, in the case of pre-payment. This burden could be shared more fairly through the promotion and enforcement of legally binding contracts between the two parties. Alternatively, the risks could be distributed more widely through the development of crop futures markets.
- Improve market information dissemination at the farmer level.
    - Access to information on prevailing artichoke market prices can help farmers avoid losses and entering into unfavorable payment conditions with traders. Most farmers reported that during lockdown periods in export destinations, artichoke market prices were changing by the day. However, as they are very far from the international market, whatever the trader set as the "new low price" is what they were forced to accept.

Farmers and traders

- Enhance access to rural finance and financial products.
    - Consider innovative farmer and agricultural small and medium enterprise (SME) finance models to enhance access to credit, specifically for farmers and preprocessors. It is important to consider alternative loan arrangements to facilitate their paying down their current high debts to banks and to other actors in the value chain.
    - New financing schemes should become available during times of crisis. Banks should be encouraged to develop new financial products or tools to expedite payments along the value chain. This is necessary to avoid delays in payments to those value chain actors who must have sufficient cash flow and stay financially liquid to remain in business.
- Encourage private sector involvement to build common collection centers and artichoke storage facilities for farmers to overcome their storage constraints.

Exporters

- Improve infrastructure and services, including cold-chain infrastructure, storage facilities, and services at ports to minimize wastage during any disruptions to trade flows.
- Promote access to new international markets beyond Italy, Spain, and the United States to reduce the risks to Egypt's artichoke producers related to any disruptions in these few markets.

- Consider other market outlets in Europe, like Germany and the United Kingdom, in Asia, and within Africa, such as Algeria, Morocco, Mauritius and Seychelles.
- Support small and medium exporters to participate in international exhibitions.

- Ensure adequate representation of artichoke exporters in the Agricultural Export Council of the Ministry of Trade and Industries.
- Promote more investment in final processing and higher value-added products; there is increased demand for frozen, preserved and packaged artichokes.
  - For example, Egypt has a competitive advantage in frozen artichoke, as evidenced by Egypt supplying 88 percent of the frozen artichoke imported by Italy between 2012 and 2016.[8]

3 INVESTING IN THE AGRI-FOOD SYSTEM FOR POST-COVID-19 RECOVERY

Not only is agriculture playing a stabilizing role during the COVID-19 crisis, the agri-food system is also well positioned to support post-COVID economic recovery in Egypt. Agriculture generated 12 percent of national GDP in 2015, 25 percent of total employment, and 4 percent of export earnings. We consider several different public investment options in the agriculture sector for post-COVID economic recovery using the Rural Investment and Policy Analysis and Agriculture Investment Data Analyzer (RIAPA-AIDA) tools.[9] These nine options are land reclamation, irrigation improvements, extension services, input subsidies, research and development (R&D) for crops, R&D for livestock, agro-industries, horticulture, and greenhouses. The RIAPA-AIDA tools allow us to prioritize the investment options based on specific economic development outcomes desired.

Our results show that all of the agricultural investment options yield positive development outcomes. However, there is no single option that is effective at achieving all four of the development objectives examined –poverty reduction, GDP growth, enhanced employment, and improved nutrition outcomes (increased dietary diversity). This is seen in Figure 6, which shows the RIAPA-AIDA results for each of the investment options, ranked by their cost-effectiveness in reducing poverty.

Crop R&D is the most cost-effective investment option in reducing poverty and, hence, has a score of 1.0 for its effect on poverty reduction. In contrast, irrigation improvements are the least cost-effective for poverty reduction, so are given a value of zero for purpose of presentation. All other investments are scored in relation to crop R&D. For example, investments in greenhouses are 56 percent as cost-effective as are investments in crop R&D in raising the consumption levels of poor households and, thereby, reducing poverty.

[8] Export Development Authority (EDA) & Green Trade Initiative (GTI) Report, March 2018. “Artichoke Market overview in Italy” https://eda-gti.org/wp-content/uploads/2018/08/Artichoke-market-overview-in-Italy.pdf

[9] For more information on the AIDA modeling tool, see:

- Thurlow, J., B. Holtemeyer, Y. Kassim, S. Kurdi. J. Randriamamonjy, M. Raouf, D. Elsabbagh, M. Wiebelt, and C. Breisinger. 2020. *Investing in the agri-food system for post-COVID-19 recovery An economywide evaluation of public investments in Egypt*. Middle East and North Africa Regional Program Policy Note 07. Cairo: International Food Policy Research Institute.
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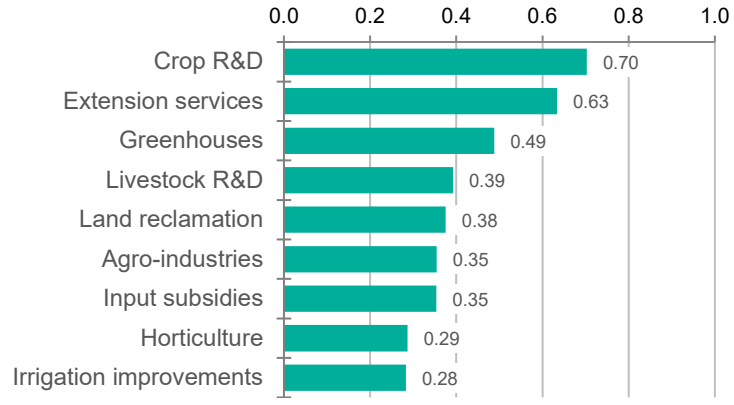
Figure 6. Normalized outcome scores across four development outcomes, by agricultural investment option

Source: Egypt RIAPA-AIDA model.
Note: Poverty effect is the increase in poor households' income for every dollar spent. GDP and employment effects are the increase in agri-food system GDP and employment, respectively, for every dollar spent. Diet diversity effect is the change in the dietary diversity score per dollar spent. Outcomes are normalized so that the weakest (strongest) investment option is assigned a value of zero (one).

There is some similarity in the ranks of investment options between poverty reduction and GDP effects, partly because household incomes are heavily influenced by the level of GDP in the country. The ranking of investment options for their employment effects diverge, however, partly because increases in productivity can sometimes be labor shedding. Land reclamation, on the other hand, brings new lands into production, which greatly increases demand for labor to work on these new lands. Much of the new land is used to grow wheat and maize, which are lower-value crops. Consequently, while the employment effects of land reclamation are strong, its impacts on poverty and GDP are modest. We find that land reclamation investments will result in less, rather than more, diverse diets. With the exception of crop R&D, which greatly improves dietary diversity, the other investment options have fairly similar benefits for dietary diversity.

The main motivation for normalizing the results is to combine results for each indicator into a single "composite" score. If each outcome is considered equally important, then a simple average of the four scores for each outcome is appropriate. This result is shown in Figure 7.

Figure 7. Final composite outcome scores for agricultural investment options using equal weights



Source: Egypt RIAPA-AIDA model.
Note: Equal weights assigned to each of the four normalized outcome indicators in Figure 2.

Crop R&D has the highest composite outcome score using equal weights, although it is less than 1.0 because it did not achieve the highest scores for the employment and dietary diversity effects – the composite score of 0.70 for crop R&D is an average of 1.00 for the poverty effect, 1.00 for the GDP effect, 0.38 for the employment effect, and 0.43 for the diet diversity effect (Figure 6). In contrast, irrigation improvement is the lowest ranked investment option, although its score is not zero. This is because, while being least cost-effective at reducing poverty and raising GDP, it did score better than crop R&D for both the employment and the dietary diversity effects. Overall, crop R&D, extension services, and greenhouses are the three top-ranked investment options if each outcome is considered equally important.

Table 1. Final rankings of agricultural investment options under different weighting schemes

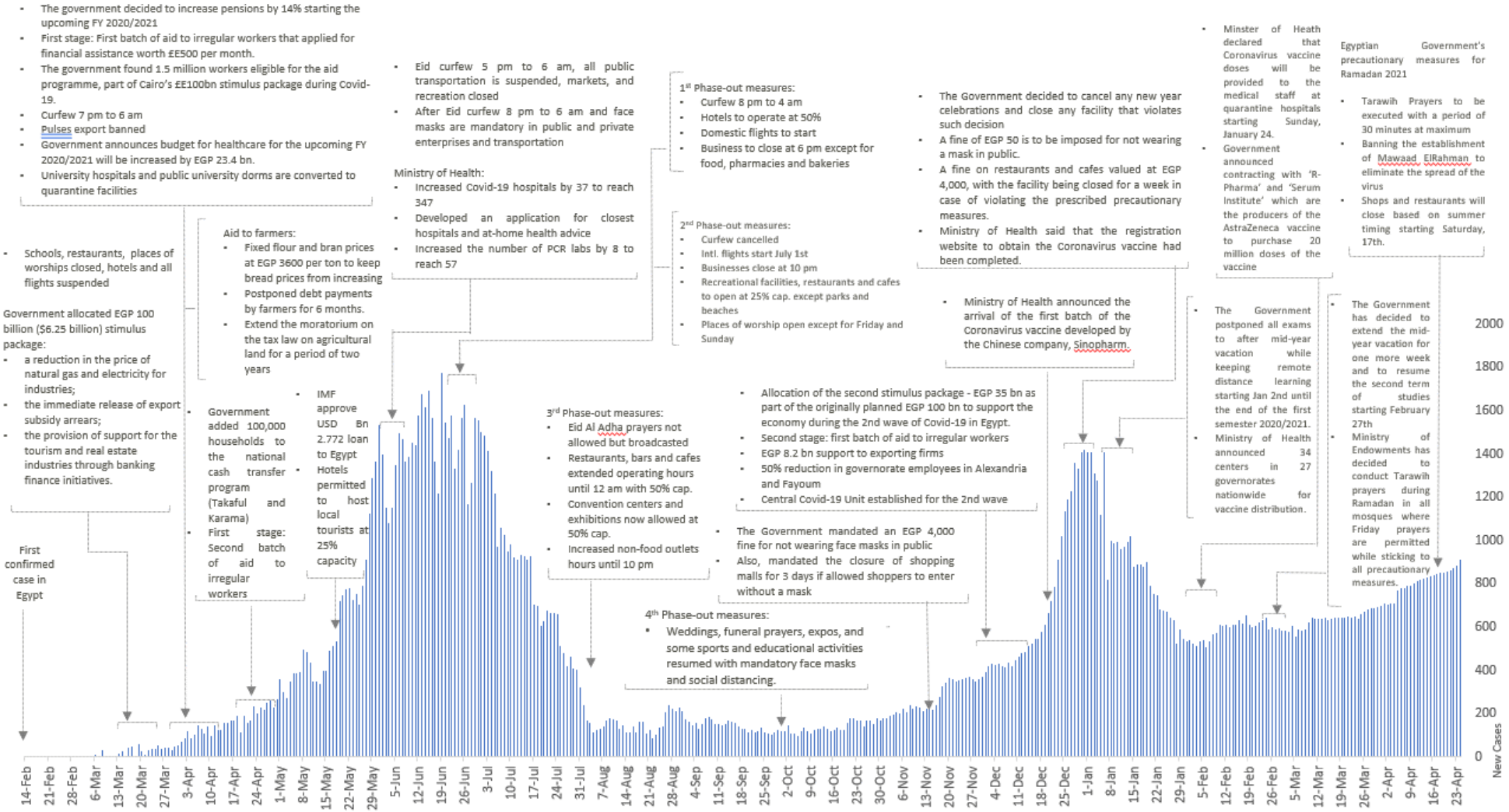
Rank	Equal weights	GDP bias	Poverty bias	Employment bias	Dietary diversity bias
1	Crop R&D	Crop R&D	Crop R&D	Extension services	Extension services
2	Extension services	Greenhouses	Extension services	Crop R&D	Crop R&D
3	Greenhouses	Extension services	Greenhouses	Land reclamation	Greenhouses
4	Livestock R&D	Land reclamation	Agro-industries	Livestock R&D	Livestock R&D
5	Land reclamation	Livestock R&D	Land reclamation	Input subsidies	Input subsidies
6	Agro-industries	Input subsidies	Input subsidies	Agro-industries	Agro-industries
7	Input subsidies	Agro-industries	Livestock R&D	Horticulture	Irrigation
8	Horticulture	Horticulture	Horticulture	Irrigation	Horticulture
9	Irrigation	Irrigation	Irrigation	Greenhouses	Land reclamation

Source: Egypt RIAPA-AIDA model.
Note: Rankings based on weighted sum of outcome indicators. Equal weighting is one-quarter each; biased weighting favors one indicator (one-half) at the expense of others (equal shares of remaining half).

Table 1 reports the final prioritization of investment options using different weighting schemes for each outcome. The first column assigns equal weights across outcomes, as per Figure 7. However, the other columns give greater weight to a specific normalized indicator. This is done by attributing half of the total weight the development outcome specified in the column heading and one-sixth to the other three outcomes, thus creating a bias towards the specified outcome.

This weighted analysis suggests that crop R&D and extension services should be priority interventions, since these are highly-ranked almost irrespective of how the four development outcomes are weighted. Land reclamation's rank, on the other hand, is highly sensitive to the preferences assigned to different outcomes. It scores highly when employment is considered particularly important for investment decision-making, but falls to the bottom of the investment options when dietary diversity is the primary focus. Similarly, greenhouses are a clear priority for all but the employment-biased rankings.

APPENDIX: COVID-19 CASES IN EGYPT AND POLICY RESPONSES, FEB. 2020 TO APRIL 2021



Note: To provide an overview of key food policy responses to the COVID-19 pandemic in Egypt, IFPRI's Egypt Strategy Support Program has developed the Food Policy Response Monitor for Egypt (http://egyptssp.ifpri.info/2021/03/21/covid-19-food-policy-response-monitor-for-egypt-2/).

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