

STRATEGY SUPPORT PROGRAM | WORKING PAPER 05

# Impacts of COVID-19 on Myanmar's Poultry Sector

Implications for achieving the Sustainable Development Goals

Peixun Fang, Ben Belton, Xiaobo Zhang, and Hnin Ei Win

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# ABSTRACT

This paper analyzes the impact of COVID-19 on two types of poultry production systems, broilers and layers, in Myanmar using five waves of telephone surveys from June to August 2020. The surveys were implemented with 269 poultry farms previously surveyed in 2019. There are three major findings from the recent surveys:

- First, COVID-19 has landed a heavy blow on poultry production.
- Second, the sector has experienced a V-shaped recovery. However, production capacity is still below pre-pandemic levels.
- Third, the impact varies by production system. Because broiler farms have a much shorter production cycle than layer farms, they quickly responded to the initial COVID-19 shocks by adjusting their operational status. When demand began to recover, some previously closed broilers farms quickly resumed production. However, very few layer farms reopened after closing.

The slow supply response of layer farms to increased egg demand after the initial COVID-19 shocks has resulted in higher egg prices for consumers. This, in turn, has affected nutritional intake, making it more difficult for Myanmar to achieve the second Sustainable Development Goal of ending hunger and malnutrition by 2030.

Within both broiler and layer production systems are found both integrated poultry and fish farms and pure poultry farms. For layer farms, integration of poultry production with fish has provided a buffer against risk; the bankruptcy rate among integrated layer-fish farms was much lower than among pure layer farms. However, such advantages of integration of poultry with fish production are not seen for broiler farms.

### **INTRODUCTION**

The COVID-19 pandemic has hit Myanmar's economy hard. The country's GDP growth forecast for FY2019/20 has been revised downward from 6.4 percent to just 0.5 percent, and GDP for the April to June quarter following the start of the COVID-19 outbreak is expected to fall by at least 17.4 percent compared to the same quarter in 2019 (World Bank 2020; Diao et al. 2020). Though the impacts of COVID-19 have been less severe for Myanmar's agricultural sector than for the industry and services sectors due to strong crop production in 2019, livestock and fishery output has declined (World Bank 2020). In addition to supply side challenges, including logistical disruptions associated with movement restrictions implemented to slow COVID-19 transmission, livestock farmers in Myanmar have faced collapsing demand for livestock products since the onset of the COVID-19 outbreak (Diao et al. 2020; USDA 2020b).

Consumption of chicken and eggs increased substantially in Myanmar in recent years, up 72 and 40 percent, respectively, between 2010 and 2015. In contrast, consumption of fish has remained stable over this period, while consumption of other meats has fallen. This shift in consumption patterns is related to a decrease in the real price of chicken and eggs. Relative to the price of other meats, chicken and eggs are cheaper now than they were in 2010. These price declines are an outcome of the very rapid growth of Myanmar's intensive poultry sector over the past decade (Belton et al. 2020).

Consumption of animal sourced foods, such as meat, fish, eggs, and dairy, is strongly associated with reductions in the prevalence of child stunting and other indicators of undernutrition (Headey et al. 2018). However, high prices of animal-sourced foods are a key constraint limiting their consumption in Myanmar (Mahrt et al. 2019). Other than fish, chicken and eggs are now the most important animal-source foods for low-income households in Myanmar. Thus, any shock affecting the supply or the price of eggs or chicken would have implications for food security and nutrition. For example, a June 2020 survey conducted in Myanmar's Dry Zone found that around 40 percent of rural households consumed meat less frequently or in smaller portions than they had done so before the onset of COVID-19, mainly due to pandemic-related reductions in household income (Lambrecht et al. 2020).

There are two main types of intensive commercial poultry farms in Myanmar: broiler farms raise broiler chickens for meat, while layer farms raise layer chickens for eggs. The total number of farms in Myanmar raising broilers and layers was estimated at 10,700 and 6,300, respectively, in 2018 (LBVD 2019). Most farms are located in peri-urban areas around major cities, with the largest concentrations around Yangon. Layer farms in Myanmar, with median flock sizes of 6,235 birds, are usually larger than broiler farms which have a median flock size of 3,000 birds. Layer farms have higher fixed and operating costs, but generate larger revenues than broiler farms (Belton et al. 2020).

Production cycles for broilers are much shorter than for layers. It takes around 1.5 months (45 days) to raise a broiler to harvest, whereas layers have an average economic lifespan of 18 months (79 weeks) (Belton et al. 2020). Beyond these time windows, broilers stop growing and the egg laying rates for layers decline, eroding farm profitability since the birds continue to require daily feeding. The short broiler production cycle makes it possible for broiler farms to close temporarily when facing business shocks, being able to resume production relatively quickly if conditions improve later. In contrast, the long layer production cycle may in greater lagged effects of business shocks on layer farm operations. We hypothesize that these dissimilarities have implications for the different responsiveness and resilience of broiler and layer production systems to both supply and demand side shocks resulting from COVID-19.

A second form of differentiation in poultry farming systems in Myanmar is between 'integrated' and 'non-integrated' farms. Poultry houses on integrated farms are constructed above fishponds, allowing poultry manure and uneaten feed to be utilized as inputs for fish cultivation. Manure acts as a fertilizer that stimulates growth of plankton in the pond that are eaten by filter-feeding fish. This enables production of fish with little or no feed inputs (Little and Edwards 2003). Two-thirds of poultry farms in our sample are integrated with fish. We hypothesize that integrated farms, in particular integrated layer farms, are more resilient to economic shocks than are non-integrated farms. Integration of poultry with aquaculture facilitates low cost production of fish, which may be sold to strategically smooth cash flow and incomes, offset financial losses, or pay for inputs for poultry production.

We test the two hypotheses using data from a five-round telephone survey of 190 broiler and 79 layer farms in Myanmar that was conducted from June to August 2020. Our sample of poultry farms draws from a cross-sectional survey of poultry farms conducted in 2019. We present evidence on several aspects of the performance of both types of farms over the five waves of the survey: farm operational status (the extensive growth margin); production capacity relative to 2019 (the intensive growth margin); on-farm employment levels; and a purchasing managers index (PMI) of business sentiment.

Our paper makes the following contributions to the literature: First, our methodology enables us to study the evolving impacts of COVID-19 on different types of poultry farms by comparing current farm performance with that realized prior to the shock. To our knowledge, few other high-frequency longitudinal surveys of poultry farms have been conducted amid the pandemic. Second, the performance of the poultry sector is important for achieving the Sustainable Development Goals (SDG) in Myanmar. Low income households are heavily reliant on egg and poultry for affordable high-quality protein and micronutrients. The stable supply of these commodities is thus crucial for meeting the SDG 2 on "Zero Hunger". The poultry sector also employs large numbers of workers. Increasing unemployment will make it more difficult to achieve SDG 1 on "No Poverty" and SDG 8 on "Decent Work and Economic Growth". Third, results from Myanmar may be applicable to countries, such as Nigeria, where the poultry sector is expanding rapidly and plays an increasingly significant role in ensuring food security and nutrition (Liverpool-Tasie et al. 2017)

The remainder of the paper is organized as follows: First, we describe the surveys conducted. Second, we present the impacts of COVID-19 on poultry farmers in terms of farm operational status, behavior changes in response to the shock, and expectations for business operations (measured using the PMI). We also evaluate differences in performance among integrated and non-integrated farms. We then examine the impacts of the pandemic on other players in the poultry value chain, such as feed mills, breeder farms, and maize farmers. The final section concludes by summarizing the key findings.

### **METHODOLOGY**

The findings presented here were drawn from telephone surveys with 269 poultry (190 broiler and 79 layer) farms located within a 100 km radius of central Yangon city, corresponding roughly to the city's peri-urban fringe. Three-quarters of broiler farms and half of layer farms were integrated with fishponds.

Five survey rounds were conducted. The first four rounds were conducted biweekly in June and July 2020, and the fifth round in August. We drew the sample from a survey of 423 poultry farms conducted by the authors in August and September 2019. This enables comparison of poultry farm business performance from after the onset of COVID-19 with farm performance in the previous year. However, the survey sample should not be seen as representative of all poultry farms in the

surveyed area because we lack information on the total population of poultry farms necessary to randomly select a representative sample and to calculate survey weights. Nevertheless, the fairly uniform nature of production practices among the farms surveyed should make our findings reflective of what would be found on other farms in the same size range within the zone surveyed.

To provide greater contextual understanding of the impacts of COVID-19 and associated government policies on the poultry sector, we also conducted a dozen key informant interviews with other players in the poultry and egg value chain, government agencies, and non-government organizations, including representatives from day-old-chick breeder farms; the Livestock, Breeding and Veterinary Department of the Ministry of Agriculture, Livestock and Irrigation; and the Myanmar Livestock Federation.

# RESULTS

#### Impacts on poultry farmers and broiler and egg supply

#### Operational status of poultry farms

Both broiler and layer farms were hit hard by the outbreak of and response to COVID-19 in Myanmar. Demand for broilers in Myanmar suffered a double hit in 2020 with a salmonella outbreak in January and February that was followed immediately by COVID-19. According to interviews with the Yangon Poultry Association, without COVID-19 the broiler market was expected to recover by March for Thingyan, the main national holiday. However, the COVID-19 outbreak caused many broiler farms to close temporarily or permanently. Because production cycles for layers are longer than broilers, the responses from layer farms were delayed: Closures of layer farms due to COVID-19 began in May 2020.

Low demand and cash flow problems were reported as the two main reasons for poultry farms closing. After July fewer farms reported low demand as a reason for closure, while the share of both broiler and layer farms reporting their being unable to maintain operations on current cash flow increased gradually. In August, 9 percent of broiler farms reported that they could not maintain operations on their current cash flow for longer than three months, while 14 percent reported that they could not do so for longer than five months. For layer farms, the share reporting that they could not maintain operations on their current cash flow for longer than five months increased from 14 percent in June to 28 percent in August.

	Broiler farms					Layer farms				
	early June	late June	early July	late July	August	early June	late June	early July	late July	August
Both integrated and non-integrated farms										
Still in operation	69	72	78	82	81	90	85	83	85	83
Temporarily closed	25	22	11	7	8	4	6	8	6	6
Permanently closed	6	6	11	11	11	6	9	9	9	10
Integrated farms										
Still in operation	68	70	77	80	80	95	93	93	93	90
Temporarily closed	26	24	11	8	8	3	5	5	5	5
Permanently closed	6	6	12	12	12	3	3	3	3	5
Non-integrated farms										
Still in operation	71	75	81	85	85	85	76	78	76	76
Temporarily closed	21	17	10	6	6	5	8	11	8	8
Permanently closed	8	8	8	8	8	10	16	11	16	16

#### Table 1: Operational status of poultry farms by survey round, percent of farms surveyed

Source: 2020 Yangon peri-urban poultry farmer survey - first to fifth rounds.

Broiler farms have gradually recovered since early June thanks to rising demand and many broiler farms that closed temporarily having reopened. The share of broiler farms in our sample that were operational increased from 69 percent in early June to 81 percent in August. On the other hand, the share of layer farms in our sample that were operational decreased from 90 percent in early June to 83 percent in July, a level at which it remained in August (Table 1). Broiler farms have a faster supply response than layer farms due to their short production cycle and lower operational cost and this accounts for this divergent pattern in farms closing and reopening.

We compare the resilience of integrated and non-integrated farms by comparing their operational status, assuming that farms able to remain open are more resilient to shocks than those that closed. Many farms in our sample reported that they sold fish recently and used the money to maintain their poultry production.

Integrated layer-fish farms appear to have been more resilient to the impact of COVID-19 on their business than non-integrated layer farms. Of the non-integrated layer farms in our sample, 24 percent were closed and non-operational in August. Of these, two-thirds of their owners reported that they expected the shut-down to be permanent. In contrast, 90 percent of integrated layer farms remained operational in August and only half of those that closed expected to not reopen for business (Table 1). Although the sub-samples for layer farms is quite small with 39 non-integrated and 40 integrated farms, this difference strongly suggests that integrated layer-fish farms have proven more resilient to the economic shock of COVID-19 than non-integrated farms.

However, no difference was observed in the performance of integrated and non-integrated broiler farms in terms of farm closure rates. We hypothesize that this is because demand for broilers suffered a double hit from the salmonella outbreak in January, followed immediately by COVID-19. These demand challenges for broiler farms were compounded on the supply side by shortages of day-old-chicks, which is explored later in this paper. Challenges in acquiring chicks impacted broiler farms much more than layer farms due to the short production cycle of the former. For broiler farms, these additional challenges to their business may have exceed the cash flow buffer provided by income from sales of fish in determining whether broiler farms were able to remain operational.

#### Changes in production

Besides changing operational status, poultry farms were also able to adjust the quantity of birds in their flocks. Because the broiler production cycle is much shorter than the layer production cycle, broiler farmers have greater flexibility than layer producers in adapting to short term changes in input costs and demand. However, this is circumscribed by the biology of the birds and levels of productivity required to remain economically efficient.

For example, the average length of broiler production cycles increased from 45 days in 2019 to 51 days around early June 2020. Likewise, the average length of the gaps between cycles increased from 17 days in 2019 to 28 days by early June 2020. The number of birds stocked by broiler farms also decreased by 20 percent in early June compared to the 2019 average. Poultry farmers continued to adjust their behavior in July and August in response to the evolving market. Their operational capacity has gradually recovered since late July and August. While no differences are seen between integrated and non-integrated broiler farms (Figure 1). This is consistent with our finding that integrated layer-fish farms are economically more resilient, thanks to sales of fish.

# Figure 1: Percentage change of operational capacity in poultry farms compared with 2019, monthly average level, by poultry type and integrated/non-integrated system



Source: 2020 Yangon peri-urban poultry farmer survey - first to fifth rounds.

We also estimated<sup>1</sup> changes in the supply of broiler and eggs over the survey period relative to average 2019 levels. In early June, reductions in the supply of broilers mainly were a result of farms closing. Since then, broiler farms improved their production capacity – the average production cycle shortened from 51 days in early June to 46 days in August and the gap between cycles decreased from 28 to 18 days. The average number of broilers raised per cycle per farm also increased, especially in August as a supply shortage of day-old-chicks eased. Moreover, a large share of broiler farms that had closed temporarily early in the pandemic reopened, which also contributed to increasing farm output. As a result, the supply of broilers increased from June to August, although it remained 26 percent below the 2019 average level in August. However, broiler supply in June 2020 was 53 percent below the 2019 average level, highlighting the significance of the COVID-19 shock on broiler farm operations.

	Early June	Late June	Early July	Late July	August				
Broiler supply change resulting from									
Operational farms	-27	-26	-27	-25	-9				
Permanently closed farms	-5	-5	-11	-11	-11				
Temporarily closed farms	-21	-18	-8	-5	-6				
Total change	-53	-50	-46	-42	-26				
Egg supply change resulting from									
Operational farms	7	9	11	5	9				
Permanently closed farms	-9	-17	-17	-17	-19				
Temporarily closed farms	-3	-5	-5	-5	-5				
Total change	-4	-12	-11	-16	-15				

# Table 2: Percentage supply change of broilers and eggs among surveyed farms in earlyJune and August 2020 relative to 2019 monthly average supply levels

Source: 2020 Yangon peri-urban poultry farmer survey – first to fifth rounds.

By comparison, the supply of eggs fell from 4 percent below average supply levels in 2019 in early June to 15 percent below in August (Table 2). This drop was mainly caused by many layer farms having shut down. Because it is more costly to reopen a closed layer farm than a closed broiler farm, layer farms are slower in responding to market signals. Steadily rising egg prices

<sup>&</sup>lt;sup>1</sup> Changes in supply are estimated based on changes in the length of production cycles, changes in the chicken population raised, and the share of surveyed farms in operation. Supply changes due to farms closing are estimated based on the share of farms closed and the size of those farms.

since May 2020 reflect in part the lagged reaction of layer farms to changing business conditions (Figure 2).



# Figure 2: Daily farmgate prices of broiler chickens and chicken eggs and price of broiler day-old-chicks, May to August 2020

Source: Authors' compilation based on the daily broiler and egg price posted on Facebook by Myanmar Livestock Federation. The price of day-old-chicks is based on the Yangon peri-urban poultry farmer survey (five rounds). Note: Viss is a traditional unit of mass in Myanmar equivalent to 1.63 kg. In early 2020, MMK 1,375  $\approx$  USD 1.00.

#### Farmers' expectations

Over the survey period, poultry farmers became more optimistic about improving their operational capacity and increasing revenues. However, they also became more worried about the higher costs they were experiencing. In each survey round, poultry farmers were asked about their expectations about changes in operational capacity, operating costs, and revenue, compared to the 2019 average level. These questions followed the standards of the Purchasing Managers' Index (PMI). The PMI is a measure of economic trends in the manufacturing and service sectors that summarizes whether market conditions, as viewed by purchasing managers, are expanding, staying the same, or contracting. An index reading of 50 means that the variable is unchanged. An index above 50 signals growth or expansion, while below 50 indicates decline or contraction. Based on their responses to survey questions, we compute a PMI for operational capacity, operating cost, and revenue to track changes in poultry farmers' expectations on these aspects of their businesses.

The PMI operational capacity indices for both broiler and layer farms increased significantly in August but were still below 50 (Figure 3). This suggests that the operational capacity of both broiler and layer farms improved between July and August but remained lower than the 2019 average. The Myanmar government's policy of allowing importation of day-old-chicks since mid-May meant that fewer broiler farms have suffered from a shortage of day-old-chicks since this time, which has contributed to their improvement in operational capacity. Additionally, price increases for eggs in August helped the operations of layer farms.

#### Figure 3: Purchasing Managers' Indices (PMI) of poultry farms in 2020 compared with 2019



Source: 2020 Yangon peri-urban poultry farmer survey – first to fifth rounds. Note: In order to compare with the August monthly data, we converted the four rounds of biweekly data in June and July to monthly data. If the value is above 50, it means expansion. Below 50 implies expectation of contraction.

The PMI revenue indices for both broiler and layer farms increased considerably in August compared with July. The revenue index for broiler farms in August was slightly higher than 50, which suggests that operational broiler farms expect their revenues to reach the 2019 average level. Though broiler prices decreased in August, more surveyed farms were able to make sales and the quantity of broilers sold slightly increased compared to July. This resulted in the overall PMI revenue index of broiler farms to increase. However, likely due to a rapid supply response, the price of broilers decreased significantly after our survey period in August, which might result in the PMI revenue index again falling below 50. For layer farms, the PMI revenue index in August (62) surpassed that of broiler farms (52). Layer farms likely benefited from a 10 percent increase in the price of eggs in August, even though the total quantity of eggs sold by the farms surveyed barely changed.

The PMI cost index for both broiler and layer farms decreased between June and August, indicating cost increases over the survey period. These increases are mainly caused by price increases for day-old-chicks and for feed since the outbreak of COVID-19. Overall, both the survey results on production capacity and the PMI index show a partial V-shaped recovery for poultry farms from June to August.

#### Change in employment

Poultry farming is a labor-intensive activity. Poultry farms hired an average of seven long-term workers per farm in 2019, most of whom were migrants from low-income households in remote rural areas. According to the Myanmar National Livestock Baseline Survey (LBDV 2019), there are approximately 23,900 long term farmworkers in the poultry sector. Particularly in the beginning of the COVID-19 outbreak in Myanmar, poultry farms reduced the number of workers employed due to reduced production.

The total workers hired by the broiler farms surveyed decreased by almost half between September 2019 and June 2020 – from 998 to 521 (Figure 4). Although many broiler farms that had closed have reopened since early June, the total number of workers hired did not increase for either integrated or non-integrated farms. As the broiler market became more volatile due to COVID-19, (see price fluctuations in Figure 2), broiler farmers were likely more cautious about rehiring workers.



# Figure 4: Changes of total number of hired workers in operational poultry farms, by poultry type and integrated/non-integrated system

Source: 2020 Yangon peri-urban poultry farmer survey – first to fifth rounds.

On the other hand, among the layer farms in our sample, integrated layer-fish farms in particular started to rehire workers in late July (Figure 4). This again suggests that integrated layer farms are more resilient to shocks than non-integrated layer farms. Layer farms probably benefited from the relatively more stable market and rising price of eggs and increased the number of workers that they employed accordingly. Nonetheless, the total number of hired labor by layer farms remained much lower than in 2019.

Taking closed farms into consideration, the total job losses in poultry farms up to the August survey round accounted for 35 percent of the total 2019 labor force on the farms surveyed. This translates to a loss of an estimated 8,420 full-time poultry farm jobs and a monthly wage loss of USD 960,000 for Myanmar as a whole.

#### Impacts on the poultry value chain

COVID-19 has also impacted upstream and downstream players in Myanmar's poultry value chain beyond the producing farms alone. These include feed mills, maize farmers, and day-old-chick breeder farms.

#### Upstream

Feed mill operations in Myanmar were impacted by government restrictions related to COVID-19 as well as by sluggish demand for poultry feed. Their responses to reduced demand in turn affected poultry farms. Broilers and layers are selectively bred to mature quickly and lay eggs productively and are raised at high densities. The physiology of broiler chickens has been so altered by selective breeding that they are unable to survive without human intervention (Bennett et al. 2018). Their production is therefore highly dependent on formulated feeds supplied by feed mills; any shock that disrupts feed supply or access can adversely impact poultry production.

Curfews and travel restrictions were imposed by the government in early-April to contain the spread of the COVID-19 virus. Though some restrictions were eased in May, more than a quarter of poultry farmers reported in the early June survey round that they had problems accessing feed due to the logistic disruptions. Feed mills also faced shortages of skilled workers who were unable to return to work due to travel restrictions (Diao et al. 2020).

These logistical problems have faded since July. According to our in-depth interviews with key informants at feed companies, feed production has been reduced since the lockdown in response to lower demand and the earlier logistical disruptions. Many poultry farmers also reported high feed prices as one of the main challenges that they have faced since late July. Increases in the price of feed are likely a delayed effect of feed mills reducing production in response to earlier reductions in demand coupled with delays in ramping up production in response to increased demand later. This supply disruption will probably correct itself soon.

Breeder farms that produce day-old-chicks for poultry farms were also hit hard by COVID-19. Our informants reported that, in order to cope with the low demand for chicks due to the outbreaks of salmonella and COVID-19, some breeder farms lowered day-old-chick production by either selling breeders for meat or producing and selling more eggs instead of incubating them. Some breeder farms also closed. For the farms that kept their breeders, it would take at least 21 days to incubate a new cohort of day-old-chicks. For the farms that got rid of their breeders, it would take an additional four months to rear new breeders. Therefore, a supply shortage of day-old-chicks became the key bottleneck for broiler farms in June as demand for broilers began to pick up. This caused the price of day-old-chicks to spike in June and July (Figure 2). The Myanmar government's swift action in allowing importation of day-old-chicks, taken in mid-May in consultation with the Myanmar Livestock Federation, greatly eased supply shortages by August.

COVID-19 impacts on the poultry sector are likely to trickle down to maize farmers. We estimate that there are more than 350,000 maize farmers in Myanmar (USDA 2020a; Fang and Belton 2020). Maize production in Myanmar increased dramatically in recent years due to growing demand for domestic feed production and for exports to China, with about 70 percent of feed demand coming from the poultry sector (Htwe 2020). Maize exports are expected to decrease significantly because of lower demand in China due to COVID-19 (Diao et al. 2020). With further reductions in demand for feed from the domestic poultry sector, maize farmers in Myanmar are likely to face lower prices and returns in 2020. The gross margin earned by smallholder maize farmers in Myanmar is already modest at about \$122/acre in 2018 (Fang and Belton 2020). Thus, the impacts of COVID-19 on the poultry sector in Myanmar and China are likely to have negative implications for the incomes and livelihoods of very large numbers of maize growers in Myanmar who have been supplying maize for use in poultry feed.

#### Downstream

The reduction in supply and the increase in prices of broiler and eggs will have adverse implications for food and nutrition security in Myanmar, given their importance for consumers. The price of eggs has increased by more than 30 percent since May 2020 (Figure 2). Although broiler prices have fallen below the 2019 average level in August due to sluggish demand, after briefly doubling in May due to constrained supply, the total supply of broilers has not recovered to the prepandemic level, suggesting that total poultry consumption has declined.

#### Implications for Myanmar's achievement of Sustainable Development Goals

SDG 2 ("Zero Hunger"), specifically "Target 2.1 – Universal access to safe and nutritious food", is likely to deteriorate in Myanmar due to the impacts of COVID-19 on the poultry sector. The prevalence of undernourishment, which is an indicator for Target 2.1, decreased significantly in Myanmar over the past two decades from 32 percent in 2004-06 to 10.6 percent in 2016-18 (FAO et al. 2019). Consumption per capita of animal-source foods has increased considerably in urban areas, although it has remained almost unchanged in rural ones (Belton et al. 2020). Among low income households, egg is the only category of animal-source food for which consumption has increased. All recent increases in animal-source food consumption have been driven by growth in the supply of chicken and eggs and their falling real prices (Belton et al. 2020). The outbreak of

COVID-19 has partially reversed these trends. Such impacts have significant potential to delay the achievement of the SDG Target 2.1 in Myanmar.

Recent job losses and reductions in income for poultry farms and other participants in the poultry value chain in Myanmar are substantial. These are expected to have adverse implications for Myanmar's achievement of SDG 8 ("Decent Work and Economic Growth") – specifically, Target 8.3 to "Promote policies to support job creation and growing enterprises".

### CONCLUSIONS

We present evidence on the impact of COVID-19 on broiler and layer farms in Myanmar, based on a high frequency longitudinal survey of 269 farms. We find evidence of a partial V-shaped recovery from March to August for broiler farms. Broiler farms rapidly responded to undersupply and rising prices following the easing of COVID-19 lockdown restrictions in May. The outlook for revenue in the August PMI also surpassed 50, indicating an expectation of expansion in coming months. However, monthly broiler sales remain well below the average for 2019, indicating that demand remains lower than usual.

Layer farms were slower to close than broiler farms, but once shut down, they faced difficulties in reopening in response to rising egg demand. The slow supply response of layer farms has resulted in a 30 percent increase in the price of eggs from May to August.

Integrated layer farms have proven more resilient to shocks than non-integrated layer farms, with a much lower failure rate. For broiler farms, large swings in the price of broiler chicken and day-old-chicks seem to have overridden the ability of integrated farms to offset risk through sales of fish, causing integrated and non-integrated broiler farms to suspend operations at the same rate.

Close to one-third of poultry farm workers lost permanent employment since the beginning of the crisis. Beyond the farm, we hypothesize that some the largest aggregate negative effects may be experienced by maize farmers if reduced demand for maize to use in poultry feed results in low prices for the 2020 maize harvest, set to begin in October. Low income consumers for whom eggs now represent a vital source of micronutrients, will also suffer from reduced intakes of this important nutritious food. These trends will negatively impact Myanmar's ability to reach SDG targets 1 on poverty, 2 on hunger and malnutrition, and 8 on employment.

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#### **ABOUT THE AUTHORS**

Peixun Fang is a Research Analyst in the Development Strategy and Governance Division (DSGD) of the International Food Policy Research Institute (IFPRI), based in Washington, DC.
Ben Belton is an Associate Professor of International Development in the Department of Agricultural, Food, and Resource Economics at Michigan State University. Xiaobo Zhang is a Senior Research Fellow in DSGD of IFPRI and Chair Professor of Economics at Peking University.
Hnin Ei Win is a Research Analyst in DSGD of IFPRI, based in Yangon.

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#### INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

1201 Eye St, NW | Washington, DC 20005 US. T. +1-202-862-5600 | F. +1-202-862-5606 ifpri@cgiar.org www.ifpri.org | www.ifpri.info

#### **IFPRI-MYANMAR**

No. 99-E6 U Aung Kein Lane Than Lwin Road, Bahan Township Yangon, Myanmar IFPRI-Myanmar@cgiar.org www.myanmar.ifpri.info



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