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Vegetable value chains during the COVID-19 pandemic in Ethiopia

Evidence from cascading value chain surveys before and during the pandemic

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CONTENTS

TABLES

FIGURES

ABSTRACT

We combine in-person survey data collected in February 2020 (i.e., just before the pandemic was declared) with phone survey data collected in March 2021 (i.e., one year into the pandemic) and August 2021 (i.e., approximately 18 months into the pandemic) to study how vegetable value chains in Ethiopia have coped with the COVID-19 pandemic. Focusing on the major vegetable value chain connecting farmers in East Shewa zone to consumers in Addis Ababa, we applied a cascading survey approach in which we collected data at all levels of the value chain: vegetable farmers, urban wholesalers, and retailers.

In March 2021 and August 2021, the COVID-19 pandemic is having only a limited impact on this major vegetable value chain. Farmers' access to credit, labor or extension services have not markedly changed since the pre-pandemic period in February 2020. The main concern among farmers relates to the soaring prices of key inputs with prices of key fertilizers having increased by more than 40 percent between February 2020 and March 2021.

Among the many pandemic related policy adjustments was the relocation of the wholesale vegetable market from a crowded area in the city center to the outskirts of Addis Ababa. Most wholesale traders viewed that while the pandemic itself has had a limited impact on their business activity, the re-location of the wholesale market had a considerably larger negative impact. Most wholesaler traders reported that they are trading less vegetables and have fewer clients to sell in March 2021 compared to the situation in February 2020. Almost all of these wholesaler traders identified the re-location of the vegetable wholesale market to the outskirts of Addis Ababa as the primary reason for the declined sales and clientele, and thus, as a major concern for their trading activities.

The urban retailers seem to have been relatively more affected by the pandemic than farmers and wholesalers, although many reported to have also been negatively affected by the relocation of the wholesale market. Out of the 210 retailers interviewed in February 2020, 32 had quit their business by August 2021. Out of these 32 traders that quit, only 4 responded that the pandemic was the main factor for quitting, 9 responded at it was a factor while the remaining 19 responded that the pandemic played no role in their decision to quit. In March 2021, nearly two-thirds of the retailers reported that there is less choice with respect to transporters from wholesale markets compared to the situation in February 2020. Nearly 80 percent of retailers who reported a decrease in choice of transporters, said that the change was due to the re-location of the wholesale market, while 19 percent said it was due to the COVID-19 pandemic.

We document considerable volatility in prices and marketing margins using four rounds of vegetable price data collected at all levels of the value chain. For instance, onion prices soared during the first months of the pandemic when imports from Sudan came to halt. Encouraged by these price increases, many farmers began allocating more land to onions. This, together with important markets being closed because of instability and conflict in some parts of the country, led to a considerable oversupply of onions in Addis Ababa which in turn resulted a sizable drop in farm gate and final consumer prices between May 2020 and February 2021. Combined with soaring input costs, these plummeting onion prices must have led to considerable losses among farmers. This price volatility was identified by many farmers, wholesalers, and retailers as the most pressing concern to their farming or trading activities.

Finally, we attempted to estimate post-harvest losses along the vegetable value chain. Using the data from the March-2021 survey round, the largest losses are estimated for tomato (11.5 percent), head cabbage (11.8 percent) and Ethiopia kale (10.5 percent) and lowest for green pepper (7.2 percent) and onion (2.6 percent). Interestingly, the main origin of these losses varies substantially across vegetable types. For example, for tomatoes, sizable share of the total losses occurs at the retail level, while in the case of head cabbage, almost all of the total losses occur at the wholesale level. This variation has important implications for policies aiming to reduce post-harvest losses in this sector.

1. INTRODUCTION

The food systems in Ethiopia are undergoing a major transformation. Population growth accompanied with rapid urbanization and income growth mean that food demand will substantially increase both in terms of quantity and variety (Dorosh & Minten, 2020). Previous research shows how household consumption baskets have begun shifting toward high-value foods, such as animal sourced foods, fruit and vegetables (Hassen Worku, Dereje, Minten, & Hirvonen, 2017). However, the production side has been slow to adapt to this increased demand, as implied by the rapidly rising prices of these foods, even when compared to general inflation or cereal price trends (Bachewe, Hirvonen, Minten, & Yimer, 2017).

Vegetables can be characterized by a 'triple-win' sector for Ethiopia. The first 'win' is that vegetables are high-value crops, providing higher average farmer incomes per area than cereals. This is also recognized in the 2nd Growth and Transformation Plan of Ethiopia that puts a greater emphasis on promoting vegetables and other high-value crops (FDRE, 2017). Minten, Mohammed, and Tamru (2020) estimate that the value of production from the commercial vegetable cluster alone was roughly 200 million USD in 2019, almost matching the value of the much-heralded flower export sector in the country.

The second 'win' is that vegetable value chains employ a significant number of people. For instance, casual and seasonal labor are needed to undertake various tasks such as preparing land, digging wells and ponds, weeding, harvesting, and loading. Importantly, many of these tasks cannot be easily mechanized. Minten et al. (2020) estimate that the commercial horticultural cluster in East Shewa directly employs more than 4,000 workers, which is about 20 percent of the nearby Hawassa industrial park.

The third 'win' is that increased vegetable supplies are associated with better nutrition. This is because vegetables are important sources of micro-nutrients, providing protection against chronic diseases such as cardiovascular diseases and various cancers (Forouzanfar et al., 2015). In Ethiopia, low consumption of fruit and vegetables together with high salt intake, are estimated to be the largest contributors to the burden of non-communicable diseases (Melaku et al., 2016). Meanwhile, the consumption of fruit and vegetables remains low, especially among vulnerable populations such as women and young children (Baye & Hirvonen, 2020; Gelibo et al., 2017).

The COVID-19 pandemic has raised major concerns about food and nutrition security and the resilience of agricultural value chains amid lockdowns and border closures (Laborde, Martin, Swinnen, & Vos, 2020; Reardon, Bellemare, & Zilberman, 2020). In Ethiopia, the first detected COVID-19 case was confirmed on 13 March 2020. Just three days later, schools were closed, public gatherings and sporting activities were banned, and bars were closed. The government encouraged physical distancing and began major public awareness campaigns across the country. The federal level State of Emergency was declared on 8 April 2020. Land borders were closed, except for cargo. Facemasks became compulsory. Restrictions on long distance public transportation and city transportation were also declared, e.g., by limiting the carrying capacity of public transportation providers by half of their regular capacity. Some administrative regions took even stricter measures by closing restaurants and limiting movement between rural and urban areas. However, unlike some other countries in the region, the country never went into a full lockdown that severely restricted movement, imposed curfews, or fully closed all borders (Hirvonen, 2020). The State of Emergency was lifted on 6 September 2020; transportation restrictions were lifted, bars reopened, and facemasks were no longer compulsory. Schools reopened on 19 October 2020.

Against this backdrop, we combine in-person survey data collected in February 2020 (i.e., just before the pandemic was declared) with phone survey data collected in March and August 2021 to study how vegetable value chains in Ethiopia have coped with the COVID-19 pandemic. Focusing on the major vegetable value chain connecting farmers in East Shewa zone to consumers in Addis Ababa, we applied a cascading survey approach in which we collected data at all levels of the value chain: vegetable farmers, urban wholesalers, and retailers. Using these longitudinal data, we report on how many farmers, wholesalers and retailers exited the sector during the pandemic; how the cultivation and trading practices changed; what happened to input and output prices and trader margins; and so on.[1]

2. DATA

2.1. In-person survey in January-February 2020

The COVID-19 phone surveys build on an in-person vegetable value chain survey conducted by the authors, just before the pandemic began in January and February 2020. Focusing on the main value chain supplying vegetables to the urban customers in Addis Ababa, we fielded primary surveys at three different levels of the value chain: rural producers, wholesale traders and urban retailers.

The sampling strategy varied at the level of the value chain. The sampling frame for the rural producers was based on the four major vegetable producing woredas (districts) in East Shewa zone in the Oromia region (Adami Tulu, Bora, Dugda, and Lume). From these woredas, we selected kebeles (sub-districts) that had at least 100 hectares of irrigated land. A total of 37 kebeles were identified (Dugda: 12 kebeles; Adami Tulu: 12 kebeles; Bora: 7 kebeles; Lume: 6 kebeles). Then within each eligible kebele, we classified all farmers either as smallholders or investors depending on the amount of land that they were renting in. Farmers that operated less than 0.5 hectares of land were considered as smallholders and those operating more than 0.5 hectares were considered as investors. Within each kebele, a random sample of 10 smallholders and 10 investors were drawn for in-depth interviews.[2] In this February survey round, a total of 810 vegetable farmers were visited and interviewed out of which 634 were smallholder farmers and 176 investor farmers.[3] The survey focused on five vegetables: onion, tomato, green pepper, cabbage, and Ethiopian kale. These are the most important vegetables grown in this area, with 33 and 31 percent of the irrigated land in 2019 allocated to tomatoes and onions, respectively while cabbage, green pepper, and Ethiopian kale are estimated to be grown on 8, 8, and 9 percent of the land, respectively. Other crops make up the remaining 12 percent.

At the wholesale level, the sampling frame constituted all wholesale traders based in Addis Ababa that were trading at least one of the 5 major vegetables. A total of 56 randomly selected wholesale traders were visited and interviewed between January and February 2020.

At the retail level, the sampling frame comprised all retail outlets selling at least one of the five major vegetables in Addis Ababa. We randomly selected five sub-cities in Addis Ababa (out of 10) and in these sub-cities we visited all supermarkets and minimarkets, as well as all the Ethiopian Fruit and Vegetable Marketing Share Company (ET-FRUIT) outlets. From this exhaustive list of retail outlets, we then visited 10 randomly selected fruit and vegetable shops in each woreda. Within each woreda, two ketenas (neighborhoods) were randomly selected and all micro-sellers of the five vegetables were listed. From this list, three micro-sellers were randomly selected and interviewed.

Finally, during the survey, the survey team also collected daily vegetable price data from the wholesale market and four large wet markets in Addis Ababa. Combined with the vegetable price

[1] Our research with the earlier data are reported in Minten et al. (2020), Bachewe and Minten (2021) and Hirvonen, Mohammed, Minten, and Tamru (2021).

[2] If there were not enough investors in the kebele, they were replaced by randomly selected smallholders.

[3] We also interviewed 169 beneficiaries of SNV's Horti-Life project but did not attempt to re-contact these farmers in the phone surveys.

data collected at all levels of the value chain at the same time, this permitted us to assess price formation within the whole value chain (see Hirvonen, Mohammed, et al., 2021).

2.2. Phone survey in May 2020

In May 2020, we conducted a phone survey with the respondents that took part in the earlier in-person survey administered in February 2020. The primary purpose of this follow-up survey was to understand how the COVID-19 pandemic is affecting the vegetable value chain. The phone survey attempted to re-contact half of the vegetable farmers as well as half of the wholesale traders and retail outlets. All phone survey respondents were randomly selected from the pool of previous survey respondents. If the respondent could not be reached, refused to take part in the survey, or was no longer active in the vegetable sector, he or she was replaced with another randomly selected respondent from the original in-person survey sample.

The final phone survey sample was formed of 433 farmers,[4] 30 wholesale outlets and 235 retail outlets. The average phone interview took approximately 30 minutes. The questionnaire administered to farmers focused on access to inputs, marketing and income, behavioral responses to COVID-19 and their plans for the next cropping season. The questionnaire administered to wholesale traders centered around trading activities, and changes in operations in the past three months. At the retail level we asked questions about procurement and sales, and changes in operations in the past three months. All three instruments asked about the vegetable prices at the time of the survey permitting us to compare prices at different levels of the value chain in the same period. As in the earlier survey, we collected daily price data at the wholesale market and four major wet markets.

Using data from the February-2020 round, Table 2.1 compares the respondent characteristics between respondents that took part in the May 2020 phone survey and those who did not. We see that the two randomly selected sub-samples are generally well-balanced. For most characteristics, the differences in means are not statistically different from zero. The exception is that farmers that took part in the phone survey were, on average, somewhat more educated and more likely to originate from male-headed households. In addition, among the retail outlets, fruit & vegetable shops were less represented in the phone survey compared to the in-person survey conducted before the pandemic.

[4] The survey team attempted to call 570 farmers. Out of these, 433 were successfully interviewed, 51 experienced phone problems (no network or wrong number) and 14 farmers refused to take part in the phone survey. Moreover, 72 farmers did not sell or grow one of the 5 major vegetables in the previous month.

Table 2.1: Comparing respondent characteristics in the February-2020 survey sample between respondents that were and were not included in the May-2020 phone survey

Observations and variables	Included in phone survey	Not included in phone survey	Difference	p-value
Farmers				
Number of observations:	433	546		
Male headed households (%)	96.1	92.9	3.2	0.04
Level of education (in years)	6.6	5.1	1.5	0.00
Experience in vegetable business (in years)	10.1	9.6	0.5	0.25
Urban wholesalers				
Number of observations:	30	26		
Male respondent (%)	93.3	100.0	-6.7	0.18
Level of education (in years)	9.2	9.5	-0.3	0.68
Experience in vegetable business (in years)	11.3	10.4	0.9	0.63
Urban retailers				
Number of observations:	235	211		
Supermarket (%)	19.2	12.8	6.4	0.49
Fruit & vegetable grocery shops (%)	46.4	57.82	-11.4	0.08
Fruit & vegetable micro-sellers (%)	28.5	23.69	4.8	0.56
ET-FRUIT shops (%)	6.0	5.69	0.3	0.98
Male respondent (%)	45.1	49.5	-4.4	0.53
Level of education (in years) of the respondent	7.5	7.0	0.5	0.25
Experience in vegetable business (in years) of the respondent	7.8	7.9	-0.1	1.00

Note: Difference in means between the groups tested with a t-test (null-hypothesis: difference in means = 0).
Source: Own calculation based on the February 2020 and May 2020 vegetable value chain survey data.

2.3. Phone surveys in March-April 2021

This report focuses on the phone surveys conducted in March-April 2021 and August 2021. In these survey rounds, the survey team attempted to recontact all respondents that took part in the May-2020 phone survey, plus those 72 farmers who reported not have growing any of the 5 major vegetables at the time of the May-2020 survey.

The March-2021 survey was conducted by STSMOD Economic Modeling Institute PLC with inputs from IFPRI researchers. The survey team had extensive experience in conducting similar value chain surveys in Ethiopia and also led the previous phone survey conducted in May 2020. The team consisted of 1 supervisor and 13 enumerators. The enumerator training took place in 23-24 March and the phone interviews began on 27 March and ended on April 11.

Table 2.2 summarizes the number of successful and unsuccessful interviews. Out of the 433 farmers interviewed in May 2020, the survey team successfully interviewed 359 farmers. Despite multiple attempts, 69 farmers could not be recontacted because the phone number no longer worked, the phone was switched off or because no one answered the phone. Only 5 farmers refused to be interviewed. The second row in the table shows the interview rate of additional farmers. These are those 72 farmers who were interviewed in February but had quit vegetable farming by May 2020. In addition, the survey team also attempted to interview 79 additional farmers who were interviewed in February 2020 but not in May 2020. Fifty-two of these farmers were interviewed in this survey round. Meanwhile, all 30 wholesalers interviewed in May 2020 were recontacted and they agreed to be interviewed in March 2021. Finally, out of the 235 retailers, the survey team successfully interviewed 210 and 18 could not be reached and 7 retailers refused to be interviewed. The total attrition rate was 14 percent with attrition rates being highest among farmers (17 %) followed by retailers (11 %).

Table 2.2: March-2021 survey outcomes

	Interviews	Unsuccessful calls *	Refusals	Total
Farmers interviewed in May 2020	359 (83%)	69 (16%)	5 (1%)	433 (100%)
Additional farmers **	52 (68%)	27(34%)	0(0%)	79 (100%)
Wholesalers interviewed in May 2020	30 (100%)	0 (0%)	0 (0%)	30 (100%)
Retailers interviewed in May 2020	210 (89%)	18 (8%)	7 (3%)	235 (100%)
Total	**651 (83.8%)**	**114 (14.7%)**	**12 (1.5%)**	**777 (100%)**

Note: * "Unsuccessful calls" refers to cases where the phone number no longer worked, the phone was switched off, the network was down, nobody answered the phone, or the person who answered the phone was not the same person as in the previous survey and was not knowledgeable of the vegetable farming or trading activities. ** Farmers (N=72) that were not interviewed in May because they did not grow any of the 5 major vegetables at the time of the survey and additional farmers (N=7) that were interviewed in February 2020 but not in May 2020. Source: Own calculation based on the May 2020 and March 2021 vegetable value chain survey data.

2.4. Phone survey in August 2021

The purpose of the August-2021 survey was two-fold. First, we wanted to understand how the situation of the farmers, wholesalers and retailers had changed since we last called them in March 2021. Second, the March-2021 survey revealed some interesting and somewhat unexpected dynamics in the value chain. To gain a better understanding on some of these issues, we added new questions and modules to the August-2021 survey instruments. However, in order to keep the interviews relatively short we had to drop some of the questions and modules we had in the previous surveys to accommodate this new material.

As before, the survey was carried out by STSMOD Economic Modeling Institute PLC and largely by the same enumerators as in the March-2021 survey round. The sampling frame for this survey consisted of all respondents in the May-2020 survey round, except those respondents who reported to have quit vegetable farming or trading in the March-2021 survey. The enumerator training took place between 27 and 31 July and the phone survey was conducted between 1 and 15 August.

Table 2.3 provides the overview of the survey outcomes. Out of the targeted 369 farmers, the survey team successfully interviewed 352 farmers. Only one farmer refused, and 16 farmers could not be recontacted because of connection problems. Out of the 30 wholesalers, 25 were successfully interviewed, 1 refused and 4 could not be contacted despite multiple attempts. Finally, out of the 190 retailers that were interviewed in March 2021 and had not quit the business by then, the survey team successfully interviewed 174. Four retailers refused, and 12 could not be reached. The total attrition rate was 6.5 percent with attrition rates being highest among wholesalers (16 %) followed by retailers (8 %).

Table 2.3: August-2021 survey outcomes

	Interviews	Unsuccessful calls *	Refusals	Total
Farmers interviewed in March 2021	352 (95.4%)	16 (4.3%)	1 (0.3%)	369 (100%)
Wholesalers interviewed in March 2021	25 (83.3%)	4 (13.3%)	1 (3.3%)	30 (100%)
Retailers interviewed in March 2021	174 (91.6%)	12 (6.3%)	4 (2.1%)	190 (100%)
Total	**551 (93.5%)**	**32 (5.4%)**	**6 (1.0%)**	**589 (100%)**

Note: * "Unsuccessful calls" refers to cases where the phone number no longer worked, the phone was switched off, the network was down, nobody answered the phone, or the person who answered the phone was not the same person as in the previous survey and was not knowledgeable of the vegetable farming or trading activities.
Source: Own calculation based on the May 2020 and August 2021 vegetable value chain survey data.

3. FINDINGS – FARMER LEVEL

3.1. Introduction

We begin by presenting the survey findings focusing on the farmers. The chapter is organized by themes. In Section 3.2 we look at farmer turnover; how many farmers left the business since February 2020 and the reasons associated with these departures. In Section 3.3 we look at issues around land: land sizes, land rental and so on. In Section 3.4 we focus on input use and prices. In Section 3.5 we report on input use and prices, in Section 3.6 vegetable marketing and sales. Section 3.7 focuses on farmers' access to credit and Section 3.8 on farmers' exposure to extension services. In Section 3.9 we report on farmers' labor use. In the final two sections of this chapter, we try to understand how farmers choose the vegetable they grow on their land and their concerns regarding their vegetable farming activities.

In all sections, as much as possible, we compare the data collected in March and August 2021 to the data collected in February 2020. However, the phone survey methodology imposes a limit on the interview length and therefore, we could not administer exactly the same modules as we did in the in-person survey in February 2020. For example, in the in-person survey we collected plot level information about input use, harvests and so on. In the March and August 2021 phone surveys, we collected similar data but only for the largest plot operated by the farmer during the last irrigation season. To ensure comparability across survey rounds in this report, we have restricted the February-2020 data to the largest plot operated by the farmer during the previous irrigation season.

3.2. Farmer turnover

Since our first visit in February 2020, 10 percent (42 out of 411) of the farmers had stopped growing vegetables in March 2021. Table 3.1 shows that the reasons for quitting farming since February-2020 were mostly related to vegetable not being profitable (57 % of the responses) and government mandated closures (21 %) and difficulties in getting inputs (12 %). We also specifically asked if the reason to quit vegetable farming was linked to the COVID-19 pandemic. Out of the 42 farmers that quit, only 3 (7 %) responded that COVID-19 was the main factor for quitting, 3 (7 %) responded as it was a factor while 36 (86 %) responded that COVID-19 played no role in their decision to quit. Almost all farmers (37 out of 42) that had quit farming reported that they plan to return to vegetable farming in the next 6 months.

Additional 18 farmers quit vegetable farming between March 2021 and August 2021 (Table 3.2). As before, the main reason for quitting vegetable farming was related to the business not being profitable (9 farmers out of 18). Some farmers (4 farmers out of 18) paused their vegetable farming activities during the rainy season because of poor road conditions.

Table 3.1: Reasons for quitting vegetable farming since February 2020

Reason	N	%
Business was not profitable	24	57.1
Government mandated closures	9	21.4
Unavailability or difficulty to get inputs	5	11.9
Other personal reasons	2	4.8
Illness in the family (including COVID-19)	1	2.4
Found better business opportunities	1	2.4
Total	**42**	**100.0**

Source: Own calculation based on March-2021 vegetable value chain survey data.

Table 3.2: Reasons for quitting vegetable farming between May and August 2021

Reason	N	%
Business was not profitable	9	50.0
The road is not suitable in the rainy season	4	22.2
Unavailability or difficulty to get inputs	1	5.6
Found better business opportunities	1	5.6
Lack of buyers (limited demand)	1	5.6
Illness in the family (including COVID-19)	1	5.6
Other personal reasons	1	5.6
Total	**18**	**100.0**

Source: Own calculation based on August-2021 vegetable value chain survey data.

3.3. Land use

Table 3.3 compares the total cropland cultivated by the farmers in our sample across the survey rounds. Comparing the land use during the irrigation seasons in 2020 and 2021 we see that land allocation increased from 1.7 hectares to 2.1 hectares (24% increase), driven mainly by increases among the smallholder farmers. Since land cannot be sold or bought and because there are no substantial changes in land rentals (Table 3.3), we believe that the increase is due to expansion of irrigated lands (i.e., conversion of previously non-irrigated land to irrigated land). The share of cropland allocated to vegetables remained stable across the two survey rounds. Overall, very few vegetable farmers rent out their land.

The bottom part of Table 3.3. shows how the land allocation during the rainy season in 2021. During the rainy season, vegetable farmers use more land than during the irrigation season. However, we also see that the land allocated to vegetable decreases substantially this season. As a result, the average land allocated to vegetables decreased from 1.97 hectares in the irrigation season to 1.50 hectares in the rainy season.[5]

[5] The average farmer in March-2021 survey reported to have cultivated 2.1 hectares in the previous irrigation season, out of which 94 % was allocated to vegetables. Consequently, 1.97 hectares were allocated to vegetables (2.1*0.94). In August 2021 survey, average farmer reported to have cultivated 4.6 hectares out of which only 32.6 % was allocated to vegetables: 1.50 hectares (4.6*0.326).

Table 3.3: Land cultivated, rented-in and rented-out, by farmer type and survey round

	Crop land cultivated by the farmer		Allocated to vegetables	Land rented-in	Land rented-out
	mean ha	*median ha*	*%*	*ha*	*ha*
February 2020 (irrigation season):					
Smallholders (N=211)	0.9	0.5	92.7	1.06	0.00
Investors (N=82)	3.7	2.3	95.6	3.39	0.00
All (N=293)	**1.7**	**1.0**	**93.5**	**2.34**	**0.00**
March 2021 (irrigation season):					
Smallholders (N=211)	1.3	1.0	93.0	1.02	0.07
Investors (N=82)	4.0	3.0	96.7	3.11	0.05
All (N=293)	**2.1**	**1.3**	**94.0**	**2.17**	**0.06**
August 2021 (rainy season):					
Smallholders (N=211)	3.8	3.0	26.6	1.62	0.00
Investors (N=82)	6.8	5.1	48.4	3.24	0.06
All (N=293)	**4.6**	**3.3**	**32.6**	**2.51**	**0.03**

Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data. ha=hectares.

3.4. Vegetable cultivation during the irrigation season

Table 3.4 reports on the share of farmers cultivating each vegetable type during the previous irrigation season.[6] While onion is widely produced by both smallholder and investor farmers, smallholders are more likely to produce Ethiopian kale, while the opposite is true for tomato. Relatively small (and comparable) share of smallholders and investors participate in the production of green pepper and cabbage. Compared to February 2020, we see a considerable increase in the share of farmers who cultivated onions in March 2021. This pattern holds true for both smallholder farmers and investors. Nearly 69 percent of farmers grew onion in March 2021, which is about 18 percentage points higher compared to situation one year ago (February 2020). Our previous research based on the May-2020 phone survey showed that onion prices rose sharply during the first months of the pandemic, at least partly because imports from Sudan came to halt (Hirvonen, Mohammed, et al., 2021). Informal discussions with vegetable farmers in March 2021 suggest that these price increases in 2020 motivated several farmers to switch to onion farming. We also see that many farmers began growing tomatoes at the time of the March-2021 survey. Nearly 40 percent of the farmers cultivated tomato while in February 2020 only 28 percent of the farmers in our phone survey sample did so. The changes in the share of farmers growing green pepper and cabbage are less dramatic. Ethiopian kale was the only vegetable out of the five vegetables that was grown by fewer farmers in March 2021 than in February 2020. This was particularly the case among investor farmers: in February 2020, 9 percent of the investor farmers grew Ethiopian kale, in March 2020 only 4 percent did so.

[6] These data were not collected in August-2021. Therefore, this section focuses on irrigation seasons only.

Table 3.4: Vegetables grown, by farmer type and survey round

	Tomato (%)	Onion (%)	Green pepper (%)	Cabbage (%)	Ethiopian kale (%)
February 2020:					
Smallholders	17.0	49.5	14.1	17.5	33.0
Investors	58.6	55.7	15.7	10.0	8.9
All	**27.5**	**51.1**	**14.5**	**15.6**	**26.8**
March 2021:					
Smallholders	29.6	67.5	13.6	22.3	28.2
Investors	68.6	72.9	15.7	17.1	4.4
All	**39.5**	**68.8**	**14.1**	**21.0**	**22.1**

Source: Own calculation based on the February 2020 and March 2021 vegetable value chain survey data.

3.5. Input use and prices

Table 3.5 reports on the type of seeds used by the farmers on their largest plot in February 2020 and March 2021.[7] For onion, green pepper and Ethiopian kale, local varieties are much more common than hybrid varieties. For tomatoes, nearly 77 percent of the farmers reported to have used hybrid varieties on their largest plot in February 2020 while for head cabbage, about half used hybrid and the other half local varieties. We also see that the percentage of farmers cultivating hybrid varieties in March 2021 increased for all vegetable except Ethiopian kale. As for the sources, almost all farmers report to purchase seeds from the market.

Table 3.5: Seed type used and source on the largest plot, by vegetable type and survey round

	Tomato	Onion	Green pepper	Head cabbage	Ethiopian kale
February 2020:					
Number of farmers	72	146	20	25	54
Type of seed:					
Hybrid variety (%)	76.4	7.5	(20.0)	(52.0)	5.6
Local variety (%)	23.6	92.5	(80.0)	(48.0)	94.4
Source of seeds:					
From own harvest (%)	0.0	1.4	(0.0)	(0.0)	5.6
Purchased (%)	100.0	97.3	(100.0)	(100.0)	94.4
For free or in barter (%)	0.0	1.4	(0.0)	(0.0)	0.0
March 2021:					
Number of farmers	72	170	12	28	35
Type of seed:					
Hybrid variety (%)	95.8	14.7	(66.7)	(92.9)	0.0
Local variety (%)	4.2	85.3	(33.3)	(7.1)	100.0
Source of seeds:					
From own harvest (%)	4.2	1.2	(0.0)	(3.6)	2.9
Purchased (%)	95.8	98.8	(100.0)	(96.4)	97.1
For free or in barter (%)	0.0	0.0	(0.0)	(0.0)	0.0

Note: Numbers in parentheses should be interpreted with caution as they are based on less than 30 observations.
Source: Own calculation based on the February 2020 and March 2021 vegetable value chain survey data.

[7] These questions were not asked in August-2021 round.

In our informal discussions with the farmers, limited access to inputs, such as fertilizers and agro-chemicals, was frequently mentioned as a major challenge faced by the vegetable growers in the area. These shortages also become evident when we look how input prices have changed across the survey rounds. Using the price data based on the farmers' reports, we see that prices of DAP and NPS increased by 42 percent between February 2020 and March 2021 (Figure 3.1).[8] In the same period, price of urea increased by 51 percent (Figure 3.2). These fertilizer price increases are in line with the developments in the international markets where fertilizer prices, particularly those of phosphate and urea, surged between January and October 2020 (Koh & Baffes, 2020).

Fertilizer prices declined between March-2021 and August-2021 survey rounds (Figures 3.1 and 3.2). This is expected because fertilizers are normally supplied by the government during the rainy season for the *meher* harvests.[9]

Figure 3.1: Average DAP/NPS prices (birr/quintal), by survey round

Note: N = 268 farmers in February 2020; 298 farmers in May 2020; 331 farmers in March 2021; 334 farmers in August 2021; Capped lines represent 95% confidence intervals.

[8] We merge DAP and NPS here because farmers often confuse the two fertilizer types. Moreover, at the time of the March-2021 survey, our respondents told us that DAP was not available at the local markets.

[9] Fertilizers are typically imported by the government and distributed through unions and cooperatives for the farmers for the rainy season. As a result, vegetable farmers have better access to fertilizers at relatively lower price during rainy season than in other seasons.

Figure 3.2: Average Urea prices (birr/quintal), by survey round

Note: N = 243 farmers in February 2020; 282 farmers in May 2020; 327 farmers in March 2021; 333 farmers in August 2021; Capped lines represent 95% confidence intervals.

3.6. Vegetable marketing and sales

The survey instruments in February 2020 and March 2021 asked about the vegetable sales made by the farmers in the previous 12 months.[10] The average farmer in our sample made 5.6 vegetable sales transactions over the 12-month period in April 2020 to March 2021. Meanwhile, the median number of transactions over the same period was three.

In Table 3.6 we look to whom farmers sold their produce to (i.e., main buyers of farmers largest transaction). We see that vegetables are mostly sold to travelling traders. Averaging across all vegetable types, about two-thirds of the farmers reported to have sold their largest transaction to the travelling traders in both survey rounds. Cooperatives and governments play a negligible role in these transactions. Similarly, very few farmers sell directly to consumers, especially so in March 2021. Compared to February 2020, assemblers have become less important for all vegetable types in March 2021. In contrast, local farmers who play a dual role as traders have become more important for farmers growing head cabbage, green pepper, and Ethiopian kale.

[10] We asked these questions in the August-2021 survey but with a shorter, 3-month recall period. Consequently, the data are not comparable and, therefore, are not reported here.

Table 3.6: Main buyers (sales destination) of the largest sales transaction, by vegetable type and survey round

	Tomato	Onion	Head cabbage	Green pepper	Ethiopian kale	Total
February 2020						
Other farmer	1.4	0.7	0.0	9.5	0.0	**1.2**
Farmer-trader in village	0.0	3.9	9.4	4.8	8.0	**4.2**
Assemblers from outside village	5.4	9.8	12.5	19.1	38.0	**13.9**
Traveling trader going to Addis	63.5	40.5	43.8	23.8	4.0	**39.4**
Traveling trader going elsewhere	21.6	35.3	21.9	33.3	30.0	**30.0**
Trader with fixed shop, selling to Addis	6.8	5.2	0.0	0.0	0.0	**3.9**
Trader with fixed shop, selling elsewhere	1.4	3.3	6.3	9.5	10.0	**4.6**
Cooperative	0.0	1.3	0.0	0.0	0.0	**0.6**
Government	0.0	0.0	0.0	0.0	0.0	**0.0**
Consumer	0.0	0.0	6.3	0.0	10.0	**2.1**
Other	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**100**	**100**	**100**	**100**	**100**	**100**
March 2021						
Other farmer	14.1	15.5	4.4	0.0	2.7	**12.2**
Farmer-trader in village	0.0	0.6	13.0	36.4	18.9	**5.0**
Assemblers from outside village	0.0	1.2	0.0	18.2	27.0	**4.6**
Traveling trader going to Addis	47.9	37.9	39.1	27.3	0.0	**35.3**
Traveling trader going elsewhere	21.1	34.8	34.8	18.2	37.8	**31.4**
Trader with fixed shop, selling to Addis	14.1	5.6	0.0	0.0	0.0	**6.3**
Trader with fixed shop, selling elsewhere	2.8	4.4	4.4	0.0	10.8	**4.6**
Cooperative	0.0	0.0	0.0	0.0	0.0	**0.0**
Government	0.0	0.0	0.0	0.0	0.0	**0.0**
Consumer	0.0	0.0	4.4	0.0	2.7	**0.7**
Other	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Own calculation based on the February 2020 and March 2021 vegetable value chain survey data.

Table 3.7 gives an overview of the sales places of the largest transaction. For tomato, onion and head cabbage, most transactions are made at the farm gate with no substantial changes across survey rounds. However, relative to February 2020, more farmers took their tomatoes and onions to the Addis wholesale market in March 2021.[11] Local daily markets and fixed shops are relatively more important for green pepper and Ethiopian kale. Relative to February 2020, fixed trader shops have become slightly more important in March 2021.

[11] This could be due to the relocation of the vegetable wholesale market from the city center of Addis to the outskirts of Addis – an area that is relatively closer to the producers than the previous area.

Table 3.7: Sales place of the largest sales transaction, by vegetable type and survey round

	Tomato	Onion	Head cabbage	Green pepper	Ethiopian kale	Total
February 2020						
On farm or at farmer's home	89.2	92.2	75.0	28.6	10.0	73.3
Trader shop (fixed)	2.7	0.7	3.1	23.8	6.0	3.6
Local (daily) market	0.0	5.2	21.9	47.6	82.0	20.0
Roadside	0.0	0.7	0.0	0.0	2.0	0.6
Cooperative	0.0	0.0	0.0	0.0	0.0	0.0
Addis wholesale market	8.1	1.3	0.0	0.0	0.0	2.4
Other	0.0	0.0	0.0	0.0	0.0	0.0
Total	**100**	**100**	**100**	**100**	**100**	**100**
March 2021						
On farm or at farmer's home	80.28	93.17	78.26	36.36	24.32	78.55
Trader shop (fixed)	0.0	0.6	4.4	18.2	13.5	3.0
Local (daily) market	1.4	1.2	17.4	45.5	56.8	10.9
Roadside	0.0	0.0	0.0	0.0	5.4	0.7
Cooperative	0.0	0.0	0.0	0.0	0.0	0.0
Addis wholesale market	18.3	5.0	0.0	0.0	0.0	6.9
Other	0.0	0.0	0.0	0.0	0.0	0.0
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Own calculation based on the February 2020 and March 2021 vegetable value chain survey data.

3.7. Access to credit

In February 2020 and March 2021 survey rounds, we asked farmers whether, in the last 12 months, they themselves or someone in the household took out a loan of at least worth of 100 birr, in cash or in-kind. In both rounds, about 20 percent of the farmers reported that they did take out a loan (Table 3.8). Most farmers reported that they did not take out a loan because they did not need one. The remaining response options, such as being refused a loan or not trying because of likely rejection, are suggestive of problems in getting access to credit. In February 2020, these response options were selected by 15 percent of the farmers. In March, they were selected by 24 percent of the farmers, indicating that access to credit may have become more difficult over the year.

Table 3.8: Access to credit, by survey round

	February-2020	March-2021
	%	**%**
Took out a loan	20.6	18.7
Did not take out a loan:		
No need for a loan	64.8	57.5
Tried, but was refused	4.9	2.4
No one available to get a loan from	2.2	3.8
Expected to be rejected, did not try	1.4	3.3
No assets for collateral	0.5	3.5
Afraid of losing collateral	1.6	3.0
Afraid that cannot pay back	1.9	4.6
Interest rates too high	2.2	3.3
Total	**100.0**	**100.0**

Note: N=369 farmers in each round.
Source: Own calculation based on the February 2020 and March 2021 vegetable value chain survey data.

3.8. Exposure to extension services

The February-2020 survey contained questions about farmers' exposure to various extension services during the last 12 months. We repeated these questions in our March-2021 phone survey to see how access to extension had changed during the pandemic. Overall, the changes are not dramatic as seen in Table 3.9. The share of farmers reporting to have met a government extension agent to discuss vegetable cultivation in the past 12 months increased from 33 percent in February 2020 to 39 percent in March 2021. In contrast, the share of farmers who participated in a community meeting to discuss vegetable farming decreased from 47 percent to 37 percent. In both rounds, roughly one-third of the farmers reported to have visited a demonstration plot of vegetables with a model farmer, farming training center (FTC) or a research station. In both rounds, about 25 percent of the farmers reported to have visited a government office of agriculture to discuss vegetable related issues.

Table 3.9. Exposure to extension services in the last 12 months, by survey round

	February-2020	March-2021
	%	%
Talked with an extension agent about vegetables	32.5	38.5
Participated in a community meeting about vegetables	46.6	36.6
Visited a demonstration plot of vegetables with a model farmer, farming training center (FTC) or a research station	32.8	35.8
Visited a government office of agriculture and discussed vegetable related issues	25.2	25.5

Note: N=369 farmers in each round.
Source: Own calculation based on the February 2020 and March 2021 vegetable value chain survey data.

3.9. Labor

The farmers in the East Shewa zone rely extensively on hired laborers who mainly come from other regions of Ethiopia to do digging, plowing, spraying, harvesting and other important tasks. Using the data from the February 2020 survey round, Minten et al. (2020) conservatively estimate that the East Shewa horticultural cluster directly employs more than 4,000 workers, which is about 20 percent of the labor force in the nearby Hawassa industrial park. Revising these estimates through a phone survey was not feasible due to the necessity of keeping the interviews short. However, in the March-2021 survey round we asked farmers whether they are currently hiring laborers and their views about the origin of laborers and the means to find them. Similar questions were asked in February 2020 permitting us to compare the situation before and during the pandemic.

Table 3.10 shows that more than 95 percent of all farmers were hiring daily laborers in March 2021 and August 2021, up from 77 percent in February 2020. Similarly, the share of farmers hiring laborers on seasonal contracts increased from 69 percent to 78 percent in March 2021 and to 90 percent in August 2021. The share of farmers employing workers on permanent contracts remained the same between February 2020 and March 2021, at around 8 percent. However, by August 2021, more than half of the farmers reported to have hired workers on permanent contracts. This increase in labor use is because during the rainy season, vegetable farmers cultivate more land (see section 3.3), therefore requiring more outside help than during the irrigation season.[12]

In February 2020, 55 percent of the workers employed by the farmers came from the neighboring SNNP region. In 2021, this had increased to 82 percent in March and 79 percent in August.

[12] Daily laborers are contracted only for one day. The contract of seasonal laborers is for one cropping cycle. We defined permanent employees as workers whose contract is longer than one cropping cycle.

Farmers mostly obtain laborers directly by picking them up from a local labor market or by calling them by phone. However, we see that in 2021 brokers have become relatively more important with 20 to 30 percent of the farmers relying on them to find laborers. In all survey rounds, more than 75 percent of the farmers report that there is a lot of choice with respect to laborers in their locality.

Table 3.10: Share of farmers hiring laborers, origin of laborers and means of finding them, by survey round

	Feb-20	Mar-21	Aug-21
Currently hiring daily laborers	77.0	99.4	94.9
Currently hiring seasonal laborers	71.6	77.8	90.2
Currently hiring permanent employees	7.8	8.7	53.1
Origin of laborers:			
From the same kebele	19.2	6.6	9.0
From other kebele, but same woreda	9.1	5.1	6.9
Another woreda in East-Shewa zone	5.0	1.5	3.3
Elsewhere in Oromia region	5.6	3.6	1.5
From SNNP region	56.1	82.6	78.8
From Amhara region	3.5	0.3	0.6
From another region	1.5	0.3	0.0
Total	100	100	100
How laborers are obtained:			
Travel to the labor market	59.1	42.5	48.1
Call potential laborers by phone	28.7	23.1	10.2
Travel to brokers (who get laborers)	3.9	7.5	9.6
Call brokers (who get laborers) by phone	7.8	23.1	31.6
Other	0.6	3.9	0.6
Total	100	100	100
Is there currently choice in laborers?			
No choice	1.2	0.6	0.9
Little choice	21.5	22.8	14.0
A lot of choice	77.3	77.3	85.1
Total	100	100	100

Note: N=335 farmers in each round. SNNP stands for Southern Nations, Nationalities, and People's region.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

In all survey rounds, we asked farmers about the current wage levels of daily laborers in their locality. Figure 3.3 shows how mean nominal wages of daily laborers increased considerably between February 2020 and May 2020. In March 2021, daily laborers in the vegetable sector earn 32 percent more per day than they did in February 2020. [13] Between March 2021 and August 2021, the wages of daily laborers increased by 10 percent [14], unlikely enough to offset the high inflation in the country during this period.[15]

In Figures 3.4 and 3.5 we look at the wages of seasonal and permanent laborers, respectively. These wage data were not collected in the May-2020 phone survey. We see that the mean wages

[13] A simple regression model with White (1980) adjusted standard errors informs us that this difference is statistically different from zero ($p < 0.001$).

[14] A simple regression model with White (1980) adjusted standard errors informs us that this difference is statistically different from zero ($p < 0.001$).

[15] The Central Statistical Agency (CSA) of Ethiopia reported that the year-on-year general inflation for September 2021 was 34.8 percent, while the food inflation surged to 42.0 percent.

among seasonal workers increased, on average, by 17 percent[16] and among permanent workers by 21 percent[17] between February 2020 and March 2021. The average wage among seasonal workers increased by 12 percent between March 2021 and August 2021[18] while the average salary of permanent workers increased by less than 4 percent during this period. [19]

Figure 3.3: Average daily laborer wage (birr/day), by survey round

Note: N = 235 farmers in February 2020; 299 farmers in May 2020; 332 farmers in March 2021 and 318 farmers in August; Capped lines represent 95% confidence intervals. Source: Own calculation based on vegetable value chain survey data.

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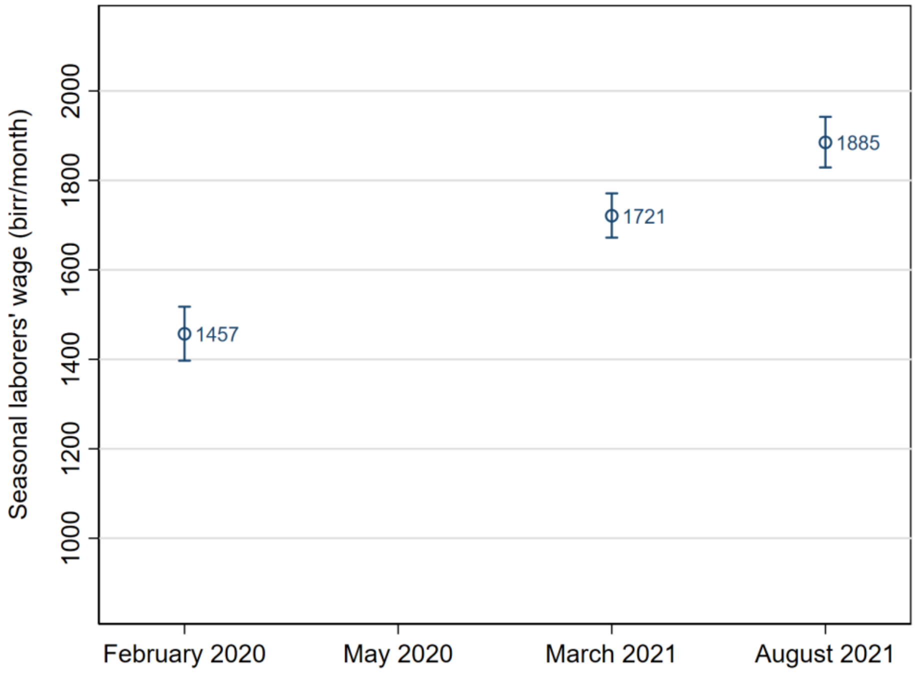
[16] A simple regression model with White (1980) adjusted standard errors informs us that this difference is statistically different from zero ($p < 0.001$).

[17] This difference is not statistically significant ($p = 0.143$), possibly because of limited statistical power due to small number of farmers who employed permanent workers.

[18] A simple regression model with White (1980) adjusted standard errors informs us that this difference is statistically different from zero ($p < 0.001$).

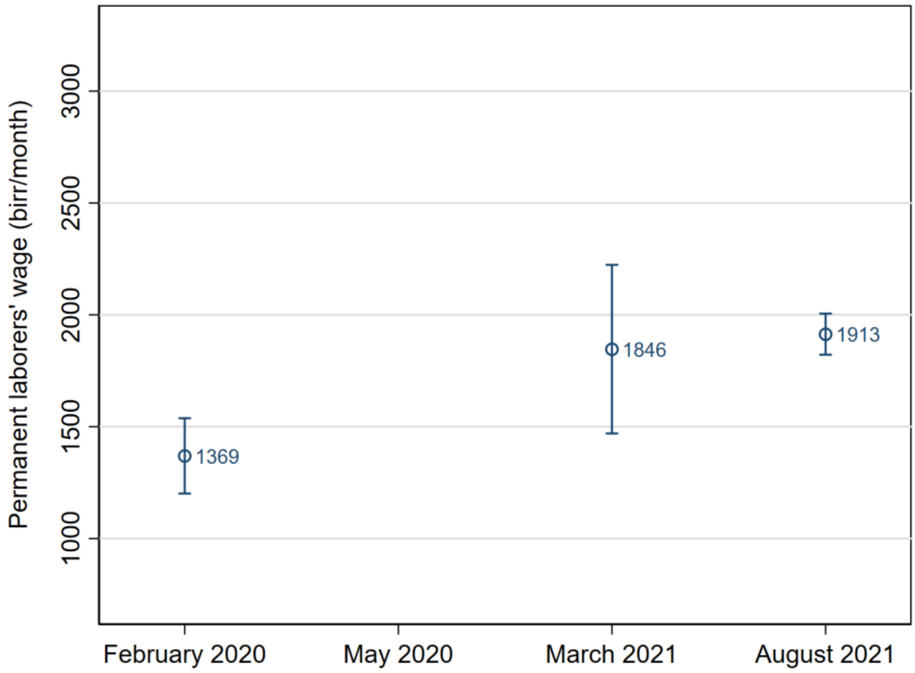
[19] This difference is not statistically different from zero ($p = 0.721$).

Figure 3.4: Average seasonal laborer wage (birr/month), by survey round



Note: N = 235 farmers in February 2020, 260 farmers in March 2021 and 302 in August. These wage data were not collected in May-2020 phone survey round. Capped lines represent 95% confidence intervals. Source: Own calculation based on vegetable value chain survey data.

Figure 3.5: Average permanent laborer wage (birr/month), by survey round



Note: N = 26 farmers in February 2020, 29 farmers in March 2021 and 178 farmers in August 2021. These wage data were not collected in May-2020 phone survey round. Capped lines represent 95% confidence intervals. Source: Own calculation based on vegetable value chain survey data.

3.10. Drivers of cropping decision

In the August-2021 survey round, we wanted to understand the factors farmers consider when they choose the vegetables they grow on their land. To this end, we asked farmers what vegetables they are currently growing on the land and what vegetables they are planning to grow in the next irrigation season that starts in November 2021.

More than 60 percent of the farmers reported that they were growing vegetables in the ongoing rainy season, while about 98 percent of them planned to do so in the next irrigation season (Table 3.11). In other words, nearly 40 percent of the vegetable farmers in the Central Rift Valley switch away from vegetable farming during the rainy season.

Out of those farmers growing vegetables during the ongoing rainy season, 35 and 31 percent reported to have allocated most land to tomato and onion, respectively. The remaining farmers indicated that they had allocated most land to green pepper (13 %), head cabbage (6 %) or Ethiopian kale (15 %). In contrast, a relatively larger proportion of farmers will allocate most land to onion (42 percent) in the coming irrigation season while a smaller proportion of farmers (21 percent) will allocate most land to tomato. About 9 percent of the farmers had not yet decided their land allocation for the coming irrigation season (Table 3.11).

The decision which vegetable to focus on is largely driven by positive price expectations and profitability (Table 3.11). Prior experience or expertise in a particular vegetable as well as favorable weather conditions were other important reasons why certain vegetable was focused on. Finally, farmers were asked their price expectation for the vegetable they allocated most land in comparison to the current price. Consistent with the statements reported above, 83 percent expected higher price for the vegetable they planned to grow both in the current rainy and next irrigation (Table 3.11).

Table 3.11: Farmers' plans for the current rainy season and the next irrigation season

	Current rainy season		Next irrigation season	
	N	**Percent**	**N**	**Percent**
Are you planning to cultivate tomatoes, onion, green pepper, head cabbage or Ethiopian kale? %Yes	211	63.0	328	97.9
Out of these 5 vegetables, what vegetable will you allocate most land?				
Tomato	74	35.1	70	21.3
Onion	66	31.3	138	42.1
Head cabbage	12	5.7	37	11.3
Green pepper	27	12.8	36	11.0
Ethiopian kale	31	14.7	19	5.8
Don't know yet	1	0.5	28	8.5
Total	**211**	**100.0**	**328**	**100**
What is the main reason for allocating most of your land to this vegetable?				
Positive expectations about sales price	98	46.7	139	46.3
My own skills and experience cultivating this vegetable	48	22.9	49	16.3
Weather conditions are favorable for this vegetable	32	15.2	40	13.3
It is more profitable	31	14.8	52	17.3
Soil conditions are favorable for this vegetable	1	0.5	19	6.3
Less costly to cultivate	0	0.0	1	0.3
Total	**210**	**100.0**	**300**	**100**
When you harvest the vegetable grown, do you think the price of this vegetable will be lower or higher than it is now?				
Much lower	4	1.9	3	1.0
Somewhat lower	14	6.6	10	3.3
Same	18	8.5	39	13.0
Somewhat higher	132	62.6	205	68.3
Much higher	43	20.4	43	14.3
Total	**211**	**100.0**	**300**	**100.0**

Source: Own calculation based on the August 2021 vegetable value chain survey data.

3.11. Farmers' concerns regarding vegetable farming

In the August-2021 survey, farmers were given the opportunity to state their main concern regarding their vegetable farming activities regarding the current rainy season and the coming irrigation season. Table 3.12 shows that uncertainty about the sales price of the vegetables was the main concern for many farmers, both in the current rainy season (32% of farmers) and the next irrigation season (25%). This is not a surprise given the considerable volatility in vegetable prices (see Section 6.2 below). Similarly, limited availability or soaring price of fertilizers and agro-chemicals were the main sources of concern for about 23 percent of farmers in the rainy season and for about 32 percent of farmers for the next irrigation season. Nearly a quarter of the farmers reported that instability at the local, regional, or country level as their main concern in the current rainy season, while 15 percent of them consider instability as the main concern for the coming irrigation season.

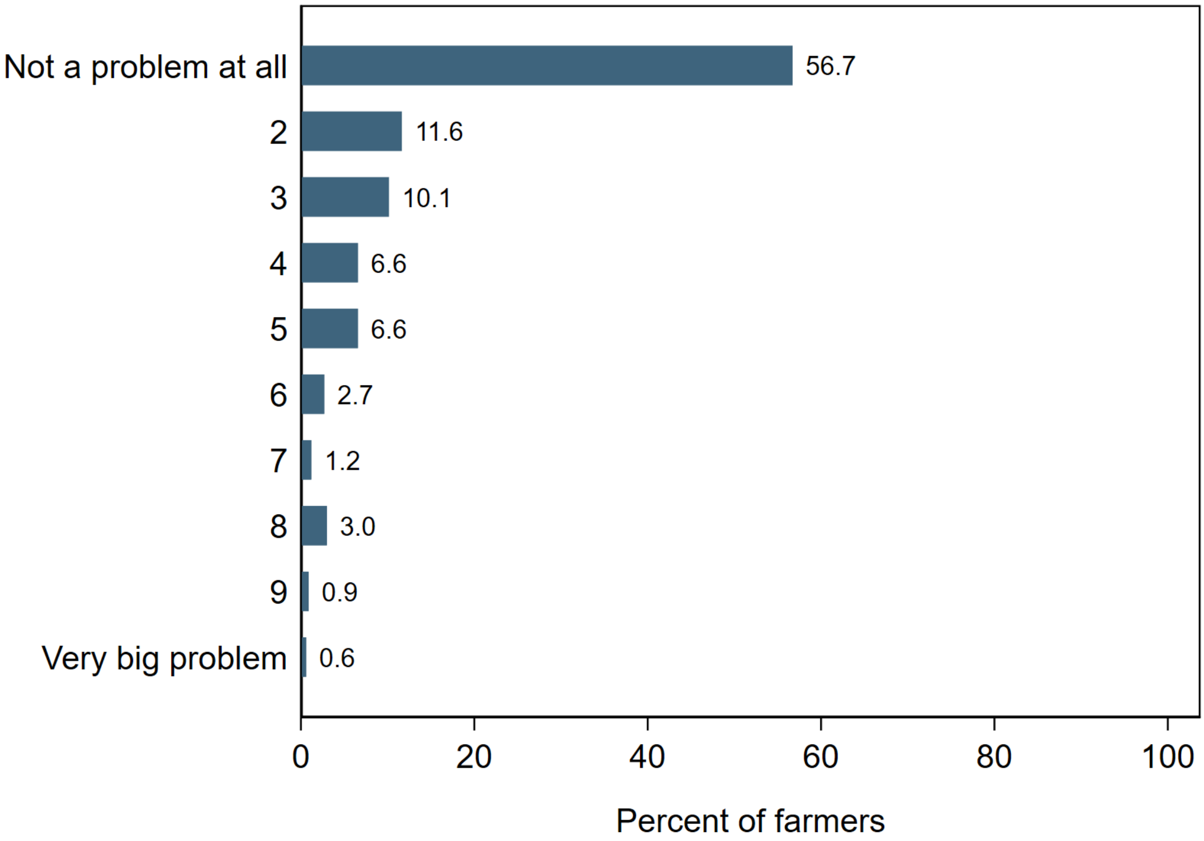
Table 3.12: Farmers' main concern regarding vegetable farming activities during rainy season

	Current rainy season		Next irrigation season	
	N	**Percent**	**N**	**Percent**
What is your main concern regarding your vegetable farming activities during this rainy season?				
Uncertainty about the sales price of the vegetables	68	32.2	82	25.0
High prices of fertilizers or agrochemicals	34	16.1	53	16.2
Instability in the country	31	14.7	45	13.7
Limited availability of fertilizers or agrochemicals	16	7.6	53	16.2
Instability in the region (Oromia region)	13	6.2	6	1.8
Poor weather	13	6.2	14	4.3
Low quality of insecticide	12	5.7	10	3.0
Brokers' behavior	10	4.7	6	1.8
Fuel price increase	3	1.4	14	4.3
Instability in my locality	3	1.4	3	0.9
High prices of improved seeds	2	0.9	20	6.1
Limited availability of improved seeds	2	0.9	5	1.5
Limited availability of water pumping motor	0	0.0	3	0.9
Limited availability of workers	0	0.0	1	0.3
No concerns	3	1.4	10	3.0
Don't know	1	0.5	3	0.9
Total	**211**	**100.0**	**328**	**100.0**

Source: Own calculation based on the August 2021 vegetable value chain survey data.

Finally, in August 2021, we asked the farmers to use a scale between 1 and 10 to indicate their level of concern regarding the COVID-19 pandemic. In this response scale, value 1 indicated that the pandemic is not a problem at all to their vegetable farming activities and value 10 that the pandemic posed a very big problem. Figure 3.6 shows the distribution of the farmers responses. The mean value among 335 farmers was 2.3 with more than 55 percent reporting value 1.

Figure 3.6: "On a scale of 1 (not a problem at all) and 10 (very big problem), how big of a problem is the COVID-19 pandemic to your vegetable farming activities currently?"



N = 335 farmers. Source: Own calculation based on the August 2021 vegetable value chain survey data.

4. FINDINGS – WHOLESALE LEVEL

4.1. Introduction

In this chapter we report on our findings regarding the wholesale sector. As before, the chapter is organized by themes. In Section 4.2 we assess wholesaler turnover; how many wholesale traders left the business between February 2020 and March 2021, and between March and August 2021, the reasons associated with these departures. In Section 4.3 we report on trading activities and in Section 4.4 we focus on sales patterns. In Sections 4.5 we study credit and payment terms as well as services offered by the traders. In Section 4.6 we report on traders' views regarding the market situation and the COVID-19 precautions. Finally, in Section 4.7 we discuss the main concerns of wholesalers regarding their vegetable trading activities.

In all sections, as much as possible, we compare the data collected in March 2021 and August 2021 to the data collected in February 2020. However, the phone survey methodology puts a limit on the interview length and therefore, we could not always administer exactly the same modules as we did in the in-person survey in February 2020. The other limitation of these data relates to the small sample size with only 19 wholesale traders took part in all three survey rounds. Thus, the results should be interpreted with considerable caution.

4.2. Wholesaler turnover

None of the 30 wholesalers in our sample had quit their trading business between February 2020 and March 2021. However, between March and August 2021, six out of the 25 wholesalers quit their vegetable wholesale business. As Table 4.1 reveals, half of them quit vegetable trading because they found better business opportunities. Two out of 6 wholesaler attributed their exit to personal reasons while 1 wholesaler reported to have quit the wholesale business because of the relocation of the wholesale market from Piazza (city center) to Haile Garment (outskirt of the city). We also specifically asked if the COVID-19 pandemic contributed to their decision to quit the trading of vegetables, but none of them attributed their exit to the pandemic.

Table 4.1: Reasons for quitting vegetable trading between March 2021 and August 2021

Reason	N	%
Found better business opportunities	3	50.0
Personal reasons	2	33.3
Re-location of the wholesale market	1	16.7
Total	**6**	**100.0**

Source: Own calculation based on August-2021 vegetable value chain survey data.

4.3. Trading activities

In each survey round we asked the wholesale traders to estimate the amount of vegetables they procured in the past 7 days. Mindful of the very small sample sizes, in Table 4.2 we report the mean and median procurement amounts in quintals. Between February 2020 and March 2021, focusing on the median values, that are less sensitive to extreme values, we see that procured amounts increased for tomatoes, head cabbage and green pepper and decreased for onions and Ethiopian kale. In contrast, apart from onion, the procured amounts declined for all vegetables in August 2021. We also note that only 2 wholesalers we interviewed reported to have traded Ethiopian kale in February 2020 and March 2021, and none in August 2021.

Table 4.2. Amounts (in quintal) procured in the previous week, by survey round and vegetable type

	February 2020			March 2021			August 2021		
	N	mean	median	N	mean	median	N	mean	median
Tomato	4	489	333	4	360	360	5	157	70
Onion	4	1235	970	4	285	240	5	319	350
Head cabbage	4	316	333	4	473	480	5	211	175
Green pepper	5	372	400	5	394	400	4	159	170
Ethiopian kale	2	244	244	2	50	50	0	n/a	n/a

Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

Table 4.3 shows the sources that the wholesalers procured by vegetable type. In both February-2020 and March-2021 survey rounds, wholesalers were more likely to procure tomato, green pepper, and Ethiopian kale from farmers directly, while they mostly procure onion and head cabbage from other traders, located in or outside of Addis Ababa. In August 2021, wholesalers procured tomato and green pepper mostly from farmers or farmer-traders. Using brokers in the procurement process is also common (Table 4.4).

Table 4.3: Manner of procurement, by survey round and vegetable type

	Tomato	Onion	Head cabbage	Green pepper	Ethiopian kale
February 2020					
Farmers	69	25	50	30	88
Farmer-traders or rural assemblers	0	0	0	10	0
Traders located outside Addis	31	75	25	60	13
Traders in Addis	0	0	25	0	0
Total	**100**	**100**	**100**	**100**	**100**
March 2021					
Farmers	75	0	25	60	50
Farmer-traders or rural assemblers	0	0	0	0	0
Traders located outside Addis	25	100	25	40	50
Traders in Addis	0	0	50	0	0
Total	**100**	**100**	**100**	**100**	**100**
Total	**100**	**100**	**100**	**100**	**100**
August 2021					
Farmers	24	30	20	60	n/a
Farmer-traders or rural assemblers	76	50	80	40	n/a
Other sources	0	20	0	0	n/a
Total	**100**	**100**	**100**	**100**	**n/a**

Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data. n/a=not applicable; none of the wholesale traders traded Ethiopian kale.

Table 4.4: Use of brokers in procurement, by survey round and vegetable type

	February 2020			March 2021			August 2021		
Vegetable type	**Brokers**	**Other**	**Total**	**Brokers**	**Other**	**Total**	**Brokers**	**Other**	**Total**
Tomato	56	44	100	25	75	100	76	24	100
Onion	100	0	100	100	0	100	70	30	100
Head cabbage	50	50	100	100	0	100	80	20	100
Green pepper	70	30	100	50	50	100	40	60	100
Ethiopian kale	88	13	100	50	50	100	n/a	n/a	n/a

Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data. n/a=not applicable; none of the wholesale traders traded Ethiopian kale.

4.4. Sales patterns

In February 2020, about 20 percent of the procured supplies were sold to other wholesalers (Table 4.5). In March 2021, this share was 16 percent. Compared to February 2020, fewer wholesalers reported to have sold to consumers, institutions, micro-sellers, and supermarkets in March 2021. In contrast, the role of restaurants and fruit & vegetable shops had increased in March 2021. In August 2021, we see that the wholesalers' clientele has shifted away from micro-sellers (*gulits*) and fruit & vegetable shops to other wholesalers. Table 4.6 shows how almost all vegetables procured by the wholesalers end up in Addis Ababa.

Table 4.5: Type of clients sold to, by survey round and vegetable type

	February 2020	March 2021	August 2021
% sold to other wholesalers	20.3	15.8	54.7
% sold to consumers	4.2	0.0	10.3
% sold to institutions (schools, universities, jails, army, hospitals,...)	6.1	1.6	0.5
% sold to restaurants	6.6	17.9	14.7
% sold to supermarkets	7.9	4.2	6.6
% sold to micro-sellers (gulits)	35.8	30.5	10.3
% sold to fruit & vegetable shops	18.7	30.0	2.9
% sold to other	0.5	0.0	0.0
Total	**100**	**100**	**100**

Note: N=19 wholesaler traders.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data. n/a=not applicable; none of the wholesale traders traded Ethiopian kale.

Table 4.6: Final destination of the vegetables, by survey round and vegetable type

	February 2020			March 2021			August 2021		
Vegetable type	Addis Ababa	Other	Total	Addis Ababa	Other	Total	Addis Ababa	Other	Total
Tomato	93	7	100	93	7	100	100	0	100
Onion	93	7	100	95	5	100	84	16	100
Head cabbage	95	5	100	70	30	100	100	0	100
Green pepper	62	38	100	76	24	100	95	5	100
Ethiopian kale	95	5	100	100	0	100	n/a	n/a	n/a

Note: N=19 wholesaler traders.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data. n/a=not applicable; none of the wholesale traders traded Ethiopian kale.

4.5. Payment terms and services delivered to suppliers and clients

Our data indicate that credit and advance payments are an important part of the transactions in the wholesale sector (Table 4.7). In February 2020, 10 out of the 19 wholesalers (53 %) reported to have paid their suppliers, at least partly, in credit during the past month. In March as well as August 2021, 13 out of the 19 wholesalers (68 %) reported to have done so. In February 2020, 9 out of the 19 (45 %) wholesale traders gave at least partial advance payments to their suppliers in the past 6 months. While 13 of the 19 (63%) of wholesale traders provided at least partial advance payments in August 2021, none of them reported to have done so in March 2021. In February 2021 and March 2021, all but one wholesale trader reported to have been paid at least partly on credit by their clients. In August 2021, a relatively smaller portion (79%) of wholesalers indicated to have been paid at least partly on credit by their client. Receiving advance payments from clients was not reported by any wholesale trader in February 2020 and March 2021, while about a quarter of them reported to have received advance payments from their clients in August 2021.

In all rounds, almost all wholesaler reported to use their own or rented truck to pick up vegetables from the suppliers' place (Table 4.8). Regarding customers, none of the wholesale traders deliver produce by a truck to their clients.

Table 4.7: Credit and payment terms

	Unit	February 2020	March 2021	August 2021
In the last month, did you pay your suppliers on credit (at least part of it)?	%Yes	52.6	68.4	68.4
In the last 6 months, did you give advance payments to your suppliers?	%Yes	47.4	0.0	63.2
In the last month, did your clients paid on credit (at least part of it)?	%Yes	94.7	94.7	79.0
In the last month, do you receive advance payments from your clients?	%Yes	0.0	0.0	26.3

Note: N=19 wholesaler traders.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

Table 4.8: Services delivered to suppliers and clients

	Unit	February 2020	March 2021	August 2021
Do you pick up vegetables in your own/rented truck at the suppliers' place?	%Yes	89.5	100.0	89.5
Do you deliver by truck?	%Yes	0.0	0.0	0.0

Note: N=19 wholesaler traders.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

4.6. Changes in wholesale trading business and COVID-19 precautionary measures

The March-2021 questionnaire asked wholesalers to compare their current business situation to the situation in February 2020 (i.e., before the pandemic was declared). More than 80 percent of the wholesalers (25 out 30) reported that they are trading less or much less vegetables now compared to the situation in February 2020. Among those who responded to trade less, only 5 wholesale traders put the blame on the COVID-19 pandemic. Instead, nearly all (19 out of 25) wholesalers identified the recent re-location of the vegetable wholesale market from central Addis Ababa (Piazza) to outskirts of Addis Ababa (Haile Garment) as the primary reason for the declined sales. One respondent said that, compared to one year ago, there is less demand for vegetables in Addis Ababa these days.

Similarly, 25 out of 30 wholesale traders said that they now have fewer clients to sell to compared to the situation in February 2020. Again, the most common cited reason for this was the re-location of the wholesale market (19 out of 25). One-third of the wholesale traders (10 out of 30) said that there is less choice with respect to laborers now and all these traders blamed the re-location of the wholesale market for this change. Finally, almost all wholesale traders (29 out of 30) said that there has not been a change in the number of transporters going to rural areas to pick up vegetables.

When asked about the precautions taken by the wholesale traders to minimize the risk of contracting COVID-19, 26 out of 30 (87%) reported to use facemasks when conducting business. However, no other precautionary measures were taken (such as gloves, avoiding contact with other traders or clients, or restricting the business to suppliers who wear masks).

4.7. Wholesalers concerns regarding their business

In the August-2021 survey, we asked the wholesalers to report their main concern regarding their vegetable trading activities. As Table 4.9 shows, almost half of them reported to concerned about the re-location of the wholesale market from the city center to the outskirt of the city. About a quarter of them identified shortage of vegetable supply as their main concern in their trading activities currently. Similarly, about 21 percent of the wholesale traders reported the high price volatility of vegetable prices as their main concern.

Table 4.9: Wholesalers' main concern regarding their vegetable trading activities

Main concern	Number	Percentage
Re-location of the wholesale market in Addis Ababa	9	47.4
Vegetables supply shortage	5	26.3
Vegetable prices fluctuating a lot	4	21.1
Limited demand for vegetables in Addis Ababa	1	5.3
Total	**19**	**100**

Source: Own calculation based on the August 2021 vegetable value chain survey data.

We also asked the wholesale traders to rank the severity of the relocation of the wholesale market to their business activities using a 1 to 10 scale where 1 indicated that the relocation was not a problem at all while 10 indicated that the relocation was a very big problem for their business. The average score of 7.3 out of 10 implies that the wholesalers consider the relocation of the wholesale market as a major problem to their business.

Finally, we asked the respondents to the same scale to measure the impact of the ongoing COVID-19 pandemic to their trading activities. On average, they responded 4.2 out of 10, implying that the pandemic is perceived to have less negative impact compared to the relocation of the market.

Table 4.10: The severity of the relocation of the wholesale and pandemic on wholesalers' trading activities

	Mean	Median
On a scale of 1 to 10, how big of a problem is the re-location of the wholesale market to your vegetable trading currently?	7.3	8
On a scale of 1 (not a problem at all) to 10 (very big problem), how big of a problem is the COVID-19 pandemic to your vegetable trading currently?	4.2	4

Source: Own calculation based on the August 2021 vegetable value chain survey data.

5. FINDINGS – RETAIL LEVEL

5.1. Introduction

The in-person survey conducted in February 2020 included interviews with more than 440 retail outlets: supermarkets, fruit & vegetable grocery shops, micro-sellers, and ET Fruit stores (a government owned vegetable & fruit trading company). As noted in Sections 2.3 and 2.4, the survey team successfully interviewed 210 retailer outlets in March 2021 and 174 outlets in August 2021. In this chapter, we report on our findings from these interviews. As much as possible, we compare the phone survey data collected in March and August 2021 to the in-person data collected in February 2020. We do so by restricting the February-2020 sample to 174 retailers that were interviewed in both March and August 2021 survey rounds.

In Section 5.2, we look at the retailers who had stopped trading vegetables between February 2020 and March 2021, and between March and August 2021. In Section 5.3, we report on the number of workers employed by the retailers. In Section 5.4, we assess how retailers procure their products and report on key sales numbers. In Section 5.5, we use the March 2021 data to discuss how the retail sector had changed since the pandemic began. Finally, in Section 5.6, we discuss the retailers' main concerns regarding their vegetable trading activities.

5.2. Retailer turnover

Between February 2020 and March 2021, about 10 percent (20 out of 210) of the retailers had quit trading vegetables. Table 5.1 shows that the reasons for quitting the business during this period varied across the respondents and no single reason emerges as the clear dominant one. Illness or death in the family was given as the reason for quitting by 5 respondents out of the 20 who reported quitting the business. Four out of 20 said that they quit because the business was not profitable for them. Between March and August 2021, an additional 12 retailers left their vegetable retail business and similar reasons emerged here again as the reason for their departures (Table 5.2).

We also specifically asked if the reason to quit trading vegetables was linked to the COVID-19 pandemic. Out of the 32 traders that quit since February 2020, only 4 responded that the pandemic was the main factor for quitting, 9 responded at it was a factor while 19 responded that the pandemic played no role in their decision to quit. Seventeen out of the 32 traders that quit trading vegetables since February 2020 reported that they plan to return to vegetable trading in the next 12 months.

Table 5.1: Reasons for quitting vegetable trading since February 2020

Reason	N	%
Illness or death in the family	5	25
Business was not profitable	4	20
Found better business opportunity	2	10
Retired	1	5
Difficulty to get enough vegetable supplies or other inputs	1	5
Moved out of Addis Ababa	1	5
Lack of capital	1	5
No place to sell	1	5
Other personal reasons	4	20
Total	**20**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

Table 5.2: Reasons for quitting vegetable trading between March and August 2021

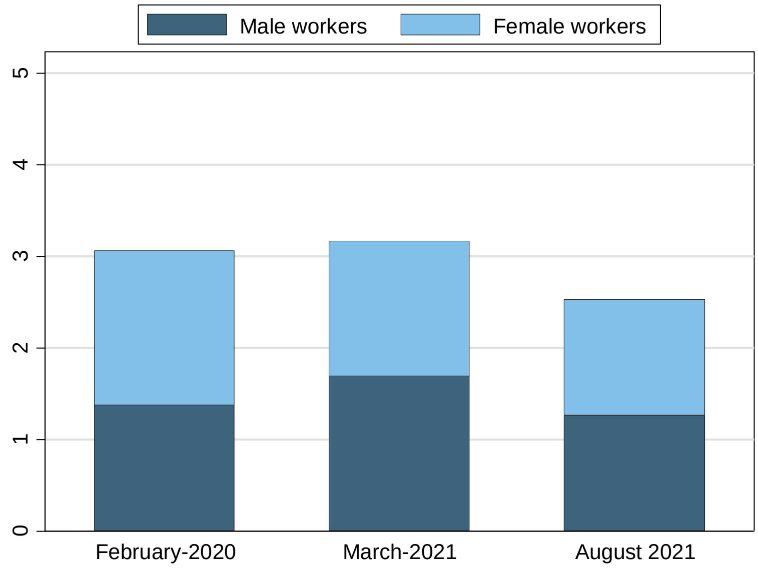
Reason	N	%
Illness or death in the family	2	16.7
Other personal reasons	3	25.0
Business was not profitable	3	25.0
Government mandated closure	1	8.3
Other reasons	3	25.0
Total	**12**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

5.3. Labor

Almost all retail outlets employ full time workers. The average retail outlet in our sample employed 3 full time workers in February 2020 with little change in March 2021 (Figure 5.1). In August, we see a slight decline in the average number of people employed by the retail traders. In all survey rounds, close to half of the workers are females. Hiring part time workers is somewhat less common. In February 2020, 5 percent of the retailers reported employing part time workers. In March and August 2021, 26 and 34 percent of the retail outlets did so, respectively.

Figure 5.1: Number of full-time workers hired by retailers, by gender and survey round



Note: N=162 retail traders in the three rounds. Source: Own calculation based on vegetable value chain survey data.

5.4. Procurement and sales

In all survey rounds, most retail outlets reported to have sold tomatoes and onions in the past 7 days (Table 5.3). The retail outlets that reported to have sold head cabbage and green pepper increased slightly between February 2020 and August 2021, from 57 to 63 percent for head cabbage and from 65 to 83 percent to green pepper. On the contrary, the number of outlets that reported to have sold Ethiopian kale declined from 27 to 17 percent during the same period.

Table 5.3: Vegetable types sold by retailers, by survey round

Vegetable	Feb-20	Mar-21	Aug-21
Tomato	87.0	90.7	90.7
Onion	85.2	90.1	94.4
Head cabbage	57.1	61.7	63.0
Green pepper	65.4	80.2	83.3
Ethiopian kale	27.2	21.9	17.3

Note: N=162 retail traders in the three rounds.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

We asked retailers to estimate the amount of each vegetable that they sold during the past 7 days. The mean sales for tomato increased by 100 percent between February 2020 and March 2021, and by about 86 percent between February 2020 and August 2021. Similarly, the mean sales of onion increased by 43 and 50 percent during the same period, respectively (Table 5.4). However, medians – that are less sensitive to extreme values – indicate considerably more modest changes or no changes, over the same periods. For instance, the median quantity of tomatoes sold in February 2020 was 0.5 quintals, 0.6 quintals in March 2021 and 0.5 quintals in August 2021.

Overall, looking at the median figures it seems that the amount sold mostly increased or remained the same in March and August 2021 when compared to February 2020.

Table 5.4: Quantity sold, by survey round

		February 2020		March 2021		August 2021	
Vegetable	Unit	mean	median	mean	median	mean	median
Tomato	quintals	0.63	0.50	1.26	0.58	1.17	0.50
Onion	quintals	0.96	0.50	1.37	0.50	1.44	0.45
Cabbage	quintals	0.26	0.15	0.32	0.20	0.24	0.15
Green pepper	quintals	0.10	0.04	0.10	0.04	0.14	0.05
Ethiopian kale	bags	1.36	0.90	0.74	0.50	0.87	0.50

Note: N=162 retail traders in the three rounds.
Source: Own calculation based on the February 2020, March 2021, and August 2021vegetable value chain survey data.

Table 5.5 shows that the mean and median number of daily customers that visited these retail shops to buy vegetables. We see an increase in the number of customers in 2021 since February 2020. The average number of customers in August 2021 was 9.7 per day (median=7) and 8.7 (median=5) in March 2021 compared to 6.5 customers per day (median = 5) in February 2020. The results further show that differences in the number customers by type of vegetables and in number of customers across survey rounds for all vegetable types. More customers visited the retail outlets to buy tomato and onions that the other vegetables. While the number of median customers doubled for tomato, onions, and cabbage between February 2020 and August 2021, we see a 50—percent increment for green pepper and Ethiopia kale during the same period.

Table 5.5 Number of customers per day, by survey round

	February 2020		March 2021		August 2021	
Vegetable	mean	median	mean	median	mean	median
Tomato	8.3	5	10.2	7	11.5	10
Onion	7.8	5	10.9	7	12.1	10
Cabbage	3.3	2	4.4	4	5.6	5
Green pepper	6	4	8	5	8.0	6
Ethiopian kale	5	3.5	8.3	5	9.6	6
All	**6.5**	**5**	**8.7**	**5**	**9.7**	**7**

Note: N=162 retail traders in the three rounds.
Source: Own calculation based on the February 2020, March 2021, and August 2021vegetable value chain survey data.

When procuring supplies, retailers make 1-2 purchases per week with little changes across survey rounds. The purchase frequency for Ethiopian kale is slightly higher, possibly due to its relatively more perishable nature (Table 5.6). Supplies are largely procured from wholesale markets located in Addis (Table 5.7).

Table 5.6: Number of purchases by the retailer per week, by survey round

	February 2020		March 2021		August 2021	
Vegetable	**mean**	**median**	**mean**	**median**	**mean**	**median**
Tomato	1.8	1	1.8	1	1.7	1
Onion	1.5	1	1.3	1	1.4	1
Cabbage	1.3	1	1.3	1	1.3	1
Green pepper	1.5	1	1.6	1	1.6	1
Ethiopian kale	2.2	2	3.2	2	2.8	2
All	**1.6**	**1**	**1.6**	**1**	**1.6**	**1**

Note: N=162 retail traders in the three rounds.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

Table 5.7: Procurement places, by survey round

	Tomato (%)	Onion (%)	Head cabbage (%)	Green pepper (%)	Ethiopian kale (%)
February 2020					
Wholesale market in Addis	83.7	81.2	90.2	81.9	59.5
ET fruit	2.1	2.9	0.0	0.0	0.0
Another place in Addis	9.2	9.4	6.5	13.3	33.3
Outside Addis	1.4	2.2	0.0	0.0	0.0
At the retailer's shop	3.6	4.4	3.3	4.8	7.1
Total	**100**	**100**	**100**	**100**	**100**
March 2021					
Wholesale market in Addis	78.7	80.2	84.8	84.4	62.9
Supermarkets	0.7	0.0	0.0	0.8	0.0
ET fruit	1.4	1.5	0.0	0.0	0.0
Another place in Addis	12.1	11.0	12.0	10.2	31.4
Outside Addis	3.6	2.9	0.0	0.8	2.9
At the retailer's shop	3.6	4.4	3.3	3.9	2.9
Total	**100**	**100**	**100**	**100**	**100**
August 2021					
Wholesale market in Addis	83.7	80.1	86.3	84.4	44.4
ET fruit	0.7	2.0	0.0	0.0	0.0
Merkato	7.5	8.6	6.9	8.9	37.0
Gerji	2.0	2.6	3.9	3.0	7.4
Another place in Addis	2.7	4.0	2.9	1.5	7.4
Outside Addis	1.4	2.0	0.0	0.7	3.7
At the retailer's shop	2.0	0.7	0.0	1.5	0.0
Total	**100**	**100**	**100**	**100**	**100**

Note: N=162 retail traders in the three rounds.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

In February 2020, virtually all supplies were procured from the vegetable wholesale market ("Atkilt Tera") located in Piazza (Table 5.8). Due to the COVID-19 pandemic, the vegetable wholesale market was temporarily relocated to a nearby sports ground (Jan Meda) where it operated for 5 months. In January 2021, the wholesale market was permanently moved to the newly established Lafto Vegetable & Fruit Market Centre in the Haile Garment area, in the outskirts of Addis

Ababa. In March 2021, all traders were not yet procuring from Haile Garment: only about 65 percent of the tomato, onion, head cabbage and green pepper retail outlets sourced their supplies from Haile Garment. In August 2021, the percentage of retailers that procured the four vegetables from the Hailer Garment market increased to about 75 percent. Meanwhile, Piazza remained an important procurement location for about 13 percent of the retail traders selling tomatoes, onions, head cabbage and green pepper in March 2021. The role of the Piazza market even increased overtime and it was the place of procurement for about 18 percent of retailers in August 2021. Moreover, Ethiopian kale is largely procured from other areas of Addis Ababa.

Mindful of these responses, in the August-2021 round, we asked respondents which market they thought is the main wholesale market in Addis Ababa for the vegetable they trade in. Despite that the wholesale market officially moved to Haile Garment in January 2021, in August 2021 a quarter of the retailers still considered Piazza as the main wholesale market in Addis Ababa (Table 5.9).

Table 5.8: Procurement locations in Addis Ababa, by survey round

Location	Tomato (%)	Onion (%)	Head cabbage (%)	Green pepper (%)	Ethiopian kale (%)
February 2020					
Piazza	91.3	89.1	95.2	90.2	71.9
Kotebe	0.8	0.8	1.2	1.1	3.1
Kera	0.0	1.7	0.0	0.0	0.0
Saris	1.6	0.8	1.2	3.3	12.5
Other	6.4	7.6	2.4	5.4	12.5
Total	**100**	**100**	**100**	**100**	**100**
March 2021					
Piazza	13.5	11.9	12.8	14.8	36.4
Kotebe	0.0	0.0	1.3	0.0	0.0
Kera	2.7	3.7	3.9	3.7	4.6
Saris	2.7	0.9	2.6	0.9	9.1
Haile Garment	65.8	67.0	65.4	63.9	22.7
Jan Meda	0.9	0.9	0.0	0.9	0.0
Other	14.4	15.6	14.1	15.7	27.3
Total	**100**	**100**	**100**	**100**	**100**
August 2021					
Piazza	17.9	18.2	15.9	19.3	41.6
Kotebe	1.6	0.8	2.3	1.8	16.7
Kera	0.8	0.8	1.1	0.9	0.0
Saris	2.4	1.7	2.3	1.8	8.3
Haile Garment	73.2	75.2	73.9	72.8	33.3
Other	4.1	3.3	4.6	3.5	0.0
Total	**100**	**100**	**100**	**100**	**100**

Note: N=162 retail traders in the three rounds.
Source: Own calculation based on the February 2020, March 2021, and August 2021 vegetable value chain survey data.

Table 5.9: Retailers perception on the main wholesale market in Addis

	Number	Percentage
Haile Garment	113	69.8
Piazza	40	24.7
Saris	3	1.9
Kotebe (02)	2	1.2
Merkato	2	1.2
Don't know	2	1.2
Total	**162**	**100**

Note: N=162 retail traders.
Source: Own calculation based on the August 2021 vegetable value chain survey data.

5.5. Changes in retail trading business and COVID-19 precautionary measures

In March 2021, nearly two-thirds of the retailers reported that there is less choice with respect to transporters from wholesale markets compared to the situation in February 2020 (Table 5.10). Nearly 80 percent of retailers who reported a decrease in choice of transporters, said that the change was due to the re-location of the wholesale market (Table 5.11), while 19 percent said it was due to the COVID-19 pandemic. Similarly, 75 percent of the retailers said that the cost of transporting vegetables from the wholesale market had increased since February 2020 (Table 5.12). More than 70 percent said this change was due to the re-location of the market and 26 percent blamed the pandemic (Table 5.13).

Table 5.10: "Compared to February 2020, is there more or less choice now with respect to transporters from wholesale markets?"

	N	%
Much less	37	19.5
Less	82	43.2
Same	63	33.2
More	6	3.2
Much more	2	1.1
Total	**190**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

Table 5.11: Reasons for the decreased choice wirth respect to transporter from wholesale markets

	N	%
COVID-19 pandemic	23	19.3
Re-location of the wholesale market	94	79.0
Other reason	2	1.7
Total	**119**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

Table 5.12: "Compared to February 2020, has the cost of transport from wholesale markets increased or decreased?"

Response	N	%
Decreased a lot	0	0.0
Decreased	3	1.6
No change	45	23.7
Increased	80	42.1
Increased a lot	62	33
Total	**190**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

Table 5.13: Reasons for the increased cost of transport from wholesale markets

Response	N	%
COVID-19 pandemic	37	26.1
Re-location of the wholesale market	101	71.1
Increased fuel price	4	2.8
Total	**142**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

We also asked retailers to compare the quantity of vegetables sold in March 2021 to the amount sold in February 2020. Nearly 75 percent said that the quantities sold had declined since February 2020 (Table 5.14). The cited reasons for this decline were less demand for vegetables in Addis Ababa (36 % of respondents who reported a decline in turnover), increased in vegetable prices (17 %), re-location of the wholesale market (22 %), COVID-19 pandemic (12 %) or that the market has been taken over by street vendors (9 %) (Table 5.15). However, these qualitative reports are not in line with the quantitative data that showed how the quantity sold remained stable or slightly increased between February 2020 and March 2021 (see Section 5.5).[20]

Table 5.14: "Compared to February 2020, do you have more or less turnover (quantity of vegetables sold) now?

Response	N	%
Much less	40	21.1
Less	101	53.2
Same	32	16.8
More	9	4.7
Much more	8	4.2
Total	**190**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

[20] Similarly, Hirvonen, de Brauw, and Abate (2021) find that while majority of the households in Addis Ababa reported income shocks during the pandemic in 2020, the actual household consumption levels remained fairly stable or slightly increased. Interestingly, food security and household consumption levels did not markedly differ between households that reported subjective income shocks and households that did not. The results reported here and in Hirvonen, Brauw, and Abate cast serious doubt about the validity of the answers to these types of subjective questions that are common in COVID-19 phone surveys.

Table 5.15: Reasons for decreased turnover

Reason	N	%
COVID-19 pandemic	17	12.1
Re-location of the wholesale market	31	22.0
Less demand for vegetables in Addis Ababa	51	36.2
Less supply of vegetables in rural area	2	1.4
Street vendors took over the market	13	9.2
Vegetable prices increased	24	17.0
Other reason	3	2.1
Total	**141**	**100**

Source: Own calculation based on the March 2021 vegetable value chain survey data.

In March 2021, respondents were asked about the precautions taken to minimize the risk of contracting COVID-19. About 98 percent reported using facemasks when conducting business. Meanwhile, nearly 20 percent reported to have been using gloves while 12 percent said that they are actively disinfecting their shop. More than 15 percent said that they are reducing the number of hours of operation because of the COVID-19 risk. Finally, nearly 40 percent of the retailers believed that consumption or contact with raw vegetables is linked to a greater risk of COVID-19 infection.

5.6. Retailers concerns regarding their business

In the August-2021 survey, we asked retailers to state their main concern regarding their vegetable trading activities. As Table 5.14 shows, about two-thirds of them reported volatility of vegetable prices as their main concern. Similarly, the main concern of the other two-third of retailers was high prices of vegetables. About 15 percent of the retailers responded that the re-location of the wholesale markets as their main concern, while about 7 percent complained about the limited demand for vegetables in Addis Ababa.

Table 5.16: Retailers' main concern regarding their vegetable trading activities

Main concern	Number	Percentage
Vegetable prices fluctuating a lot	55	34.0
Vegetable prices too high	53	32.7
Re-location of the wholesale market in Addis Ababa	24	14.8
Limited demand for vegetables in Addis Ababa	12	7.4
Vegetables supply shortage	6	3.7
Perishability of the vegetables	3	1.9
COVID-19 pandemic	2	1.2
Limited availability of workers	1	0.6
Poor road conditions	1	0.6
No concerns	2	1.2
Other specify	3	1.9
Total	**162**	**100**

Note: N=162 retail traders. Source: Own calculation based on the August 2021 vegetable value chain survey data.

To further understand the severity of the concern regarding the relocation of the wholesale market to the retailers' business, we asked them to use 1 (not a problem at all) to 10 (very big problem) scale. On average, the retail traders in our sample responded 7.8 (median 9) out of 10, implying that they considered the relocation of the market as a serious problem to their business (Table 5.15). Similarly, respondents were asked to use the same scale to measure the impact of the COVID-19 pandemic to their retail activities. The mean is 4.1 (median 4) out of 10, implying that the retail traders perceived the pandemic being somewhat less of a concern that the relocation of the market.

Table 5.17: The severity of the relocation of the wholesale and pandemic on retailers' trading activities

	Mean	Median
On a scale of 1 (not a problem at all) to 10 (very big problem), how big of a problem is the re-location of the wholesale market to your vegetable trading currently?	7.8	9
On a scale of 1(not a problem at all) to 10 (very big problem), how big of a problem is the COVID-19 pandemic to your vegetable trading currently?	4.1	4

Note: N=162 retail traders. Source: Own calculation based on the August 2021 vegetable value chain survey data.

6. FINDINGS – ENTIRE VALUE CHAIN

6.1. Introduction

The cascading survey approach that collects simultaneous data across all levels of the value chain permits us to assess how prices and marketing margins are formed along the value chain and how they have changed before and during the pandemic. The results from this analysis are reported in Section 6.2. Moreover, the March-2021 survey instrument asked farmers, wholesaler, and retailers to estimate the share of produce lost after harvest and during trading. In Section 6.3, we pool these data to assess the total share of produce lost in the value chain before reaching consumers.

6.2. Vegetable prices and margins

In this section, we study vegetable price formation along the value chain before and during the pandemic. To do so, we use the price data we collected at all levels of the value chain. The price modules remained the same across the survey rounds permitting us to assess how farmgate prices as well as wholesale and retail margins changed in the last 12 months. At each level of the value chain, we asked the respondents to estimate the price of the vegetables with different quality characteristics in their locality or shop at the time of the survey. In total, we have 15,636 price observations for tomatoes, onions, green pepper, and cabbage.[21]

To analyze price formation before and during the pandemic, we follow the linear regression approach used in Hirvonen, Mohammed, et al. (2021). Specifically, we regress the price of the vegetable observed at the different levels of the value chain on a set of binary variables capturing the level of the value chain and then interact these with binary variables capturing the survey rounds (for more details, please see Hirvonen, Mohammed, et al. (2021)).

The full regression results are reported in Table A1 in the Appendix and summarized in Figure 6.1. The figure shows the farm gate prices and trader margins for each vegetable type and by survey round in terms of birr per kg (Figure 6.1a) and in terms of percentages of the final consumer

[21] In the 2021 survey rounds, we did not collect price data for Ethiopian kale because the use of units used in the markets were difficult to reliably convert to kilograms, such as small bunches, large bunches, and bags.

price (Figure 6.1b). Of note is that the farm gate prices and margins are in gross terms and therefore, they do not inform us about the net-profits that the value chain actors received. In Figure 6.1a, the total length of the bar gives the final price of the vegetable paid by the consumers in Addis Ababa at the time of the survey.

Figure 6.1a shows how retail prices of tomato increased steadily between February 2020 and March 2021 but then declined in August 2021.[22] In informal discussions, many farmers attributed this drop in tomato prices to excess production.

As also documented in Hirvonen, Mohammed, et al. (2021), onion prices increased considerably in 2020, at least partly because of the sudden stop in imported onions from Sudan. In our informal discussions with farmers in March 2021, many noted to have allocated more land to onions as a response to the rapid price hike in 2020. This was also verified by our data that documents a substantial increase in the share of farmers growing onions in March 2021 when compared to the share in February 2020 (see Section 3.4). Based on the price data reported here, this switch did not seem to have paid off. The average farm gate prices between May 2020 and March 2021 decreased by 53 percent. At the same time the final consumer price of onions fell by 37 percent. The other reason for the onion price collapse cited by the farmers relates to the instability and conflict in some parts of the country. According to the farmers that we interviewed, Tigray region and Wollega areas were among the destinations for their onion during this time of the year, but due to security issues, onions could not be transported to the markets in these areas. In August 2021, we see that the retail prices of onion are up again, nearly at the same level as in May 2020.

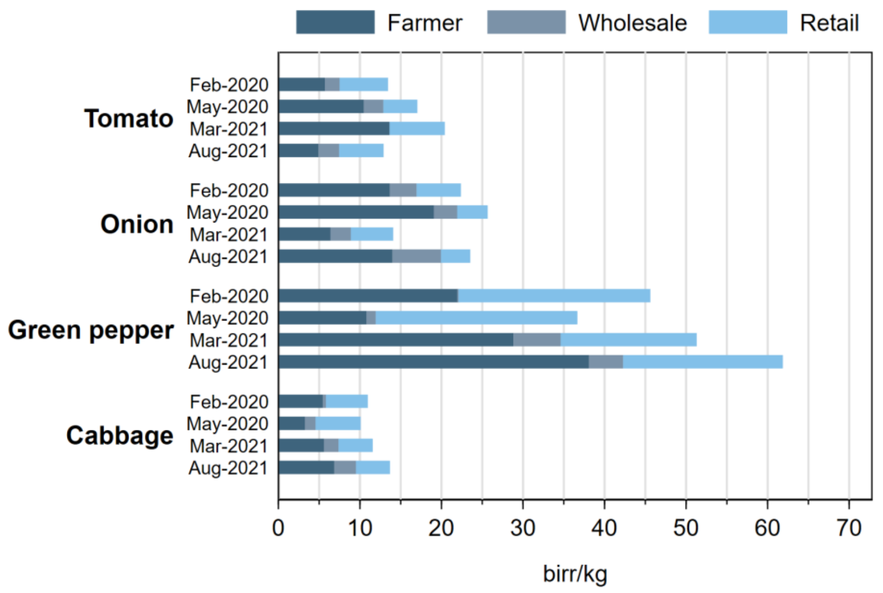
Figure 6.1a also shows how green pepper prices fluctuated wildly across the survey rounds. These price trends warrant further research, but we suspect that part of the increases observed in the March-2021 and August-2021 surveys are due to temporary and seasonal increases in demand; March-2021 survey occurred in the Lent and the August-2021 survey round during another smaller Orthodox Ethiopian fasting period. During fasting, demand for green pepper tends to increase. Meanwhile, the variation in head cabbage prices is relatively more modest to the other vegetables studied here.

Figure 6.1b shows the prices and margins as the percentage of the final consumer price in Addis. In general, we see that the wholesale margins are relatively small compared to the retail margins and to the farm gate prices. Moreover, the share of the farmgate price and retail margin of the final consumer price vary substantially between vegetable types. There is also important variation across survey rounds. A general observation from combining the information in Figure 6.1a and 6.1b is that the final consumer prices and the share of the farm gate prices tend to move in lockstep, suggesting that most of the price variation observed at the retail level originates from the farm gate.

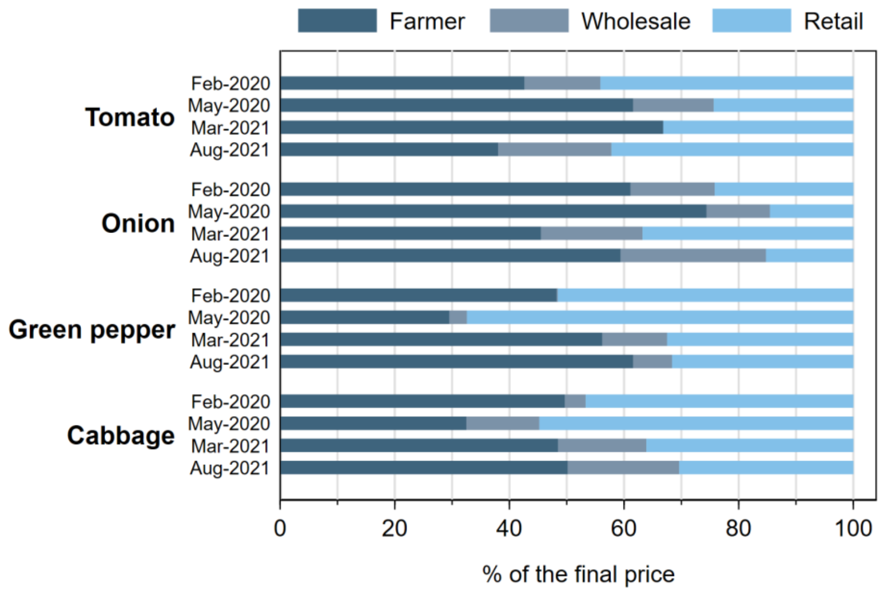
[22] In the case of tomato, the regression estimate for the wholesale margin in March-2021 is negative. Same is true for green pepper wholesale margin in February-2020. We set both margins to zero in Figure 6.1.

Figure 6.1: Vegetable price structure before and during the pandemic, by vegetable type

(a) Prices and margins in birr/kg



(b) Margins as percentages of the final price



6.3. Post-harvest losses

We also attempted to get a sense of post-harvest losses along the vegetable value chain. First, focusing on their largest plot, in the March-2021 survey we asked farmers to estimate the percent of the total harvest that they tried to sell but were not able to during the last irrigation season. These responses are summarized in the first two columns of Table 6.1. Majority of the farmers in our sample do not report to have experienced any losses. Consequently, the estimated average post-harvest losses at the farm gate are relatively small, ranging between 0.5 percent for head cabbage and 3.4 for Ethiopian kale.

Second, in the same survey, we asked wholesale traders to estimate the share of vegetables that was lost during trading (that could not be sold anymore, and that they had to throw away) in the past 7 days. These questions were asked both in February 2020 and March 2021 survey rounds. The reported estimates suggest that post-harvest losses are also relatively small for most vegetable types at the wholesale level (Wholesalers columns in Table 6.1). In March 2021, the smallest estimated post-harvest losses at wholesale level are recorded for onions (0 %) and largest for head cabbage (8%). The estimates for February 2020 are not reported but they are very similar in terms of magnitude suggesting that the level of post-harvest losses at the wholesale level did not change substantially over the past 12 months. However, it is worth reminding that there are only 6 wholesalers per vegetable type. The small sample sizes mean that we should be cautious in drawing strong conclusions from these averages.

Finally, for each vegetable type, we asked retail traders to first estimate the amount they sold and the amount that they had to throw away in the past 7 days. The former amounts were reported in quintals and the latter in kilograms. Using the data from these responses we estimate the degree of post-harvest losses at the retail sector. The last two columns of Table 6.1 show that both the incidence and magnitude of average post-harvest losses are considerably higher at the retail level than in other levels. The average post-harvest losses at this level range between 7.5 percent for tomato and 1.6 percent for onions.

Table 6.1: Percentage of the produce lost after harvest, by vegetable type and value chain level

	Farmers (N= 276)		Wholesalers (N=30)		Retailers (N=190)	
Vegetable	% reporting any losses	mean loss (%)	% reporting any losses	mean loss (%)	% reporting any losses	mean loss (%)
Tomato	29	2.7	33	1.7	34	7.5
Onion	13	1.0	0	0.0	6	1.6
Green pepper	29	4.1	0	0.0	17	3.2
Head cabbage	16	0.5	100	8.3	19	3.4
Ethiopian kale	32	3.4	50	2.5	23	5.0

Source: Own calculation based on the March 2021 vegetable value chain survey data.

Using these post-harvest loss estimates at the different levels of the value chain, we can now estimate the total post-harvest loss across the whole value chain. For tomato, we estimated that for each 100 kg harvested, 2.7 kg is lost at the farm gate level. Put differently, 97.3 kg of the original tomatoes are handled by the wholesale sector. Only about 1.7 percent of the tomatoes gets lost at this level which amounts to 1.62 kg. Therefore, out of the original 100 kg of tomatoes, 95.7 kg arrives to the retail sector. We estimated that 7.5 percent is lost at the retail sector, meaning that 88.5 kg (95.7 kg * 0.925) are sold to the customers. Comparing this final amount of 88.5 to the original 100 kg that was harvested, we estimate that the total post-harvest loss for tomatoes is 11.5 percent. Using the same approach, Figure 6.2 provides the post-harvest loss estimates for the whole value chain for each studied vegetable. Largest losses are estimated for tomato (11.5 %), head cabbage (11.8 %) and Ethiopia kale (10.5%) and lowest for green pepper (7.2 %) and onion (2.6 %). However, the main origin of these compounded losses varies substantially between vegetable types. For example, for tomatoes, substantial share of the total losses occurs at the retail level, while in the case of head cabbage, almost all of the total losses occur at the wholesale level. This type of variation has important implications for policies that aim to reduce post-harvest losses in this sector.

Figure 6.2: Estimated post-harvest losses along the whole value chain, by vegetable type

Source: Own calculation based on the March-2021 vegetable value chain survey data.

7. SUMMARY: THE IMPACT OF THE PANDEMIC ON THE VEGETABLE VALUE CHAIN

7.1. Very short-term findings

Our rapid assessment in the first weeks of the pandemic with the vegetable value chain actors showed worrying disruptive signs of the pandemic (Tamru, Hirvonen, & Minten, 2020). Demand for fruit and vegetables in Addis Ababa was on the decline, partly driven by a fear that COVID-19 infections were linked to consumption of raw vegetables. Because of the confusion around the imposed travel restrictions and fear of contracting the virus, traders were less willing to travel to production areas. At the farm level, producer prices were going down while inputs were not available, or their prices were on the rise, indicating a double whammy for the vegetable farmers.

7.2. Short term findings

Our vegetable value chain survey in May 2020 focused on analyzing changes in prices and marketing margins since February 2020 (Hirvonen, Mohammed, et al., 2021). At this point of the pandemic, we document large and heterogeneous retail price changes for different vegetables. For most vegetables, these changes are driven by the changes in farm gate prices, leading to winners and losers among local vegetable farmers due to pandemic-related international and regional trade disruptions. While traders and retailers do report about substantial hurdles in domestic trade, increases in marketing margins or transportation costs have not been the major contributor to overall changes in retail prices. In fact, we see that the marketing margins declined for half of the vegetables that we studied. In contrast to the widespread fears at the onset of the pandemic, these findings indicated relatively high resilience in the short-term of these domestic value chains during the pandemic in Ethiopia.

7.3. Longer term findings

In March and August 2021, our extensive phone survey data suggest that the disruption caused by the pandemic is, at best, minimal to the vegetable value chain.

Among vegetable farmers, access to credit, labor and extension services have not markedly changed since February 2020. The major concern at the farm gates relate to the limited access to inputs and their soaring prices. According to our data, prices of DAP and NPS have increased by more than 40 percent between February 2020 and March 2021, while price of urea increased by more than 50 percent during the same period.

At the midstream of the vegetable value chain, among the many pandemic related policy adjustments was the relocation of the wholesale vegetable market from crowded area in the city center to the outskirts of Addis Ababa. Most wholesale traders viewed that while the pandemic itself had a limited impact on their business activity, the re-location of the wholesale market had a considerably larger negative impact. Most wholesaler traders reported that they are trading less vegetables and have fewer clients to sell in March 2021 compared to the situation in February 2020. Almost all of these wholesaler traders identified the re-location of the vegetable wholesale market to the outskirts of Addis Ababa as the primary reason for the declined sales and clientele.

The urban vegetable retailers seem to have been relatively more affected by the pandemic than farmers and wholesalers, although many reported to have also been negatively affected by the relocation of the wholesale market. In March 2021, nearly two-thirds of the retailers reported that there is less choice with respect to transporters from wholesale markets compared to the situation in February 2020. Nearly 80 percent of retailers who reported a decrease in choice of transporters, said that the change was due to the re-location of the wholesale market, while 19 percent said it was due to the COVID-19 pandemic.

We further document considerable volatility in vegetable prices and marketing margins using four rounds of vegetable price data collected at all levels of the value chain. For instance, onion prices soared during the first months of the pandemic when imports from Sudan came to halt. Encouraged by these price increases, many farmers began allocating more land to onions. This, together with important markets being closed because of instability and conflict in some parts of the country, led to a considerable oversupply of onions in Addis Ababa which in turn resulted a sizable drop in farm gate and final consumer prices between May 2020 and February 2021. Combined with soaring input costs, these plummeting onion prices must have led to considerable losses among farmers. This price volatility was identified by many farmers, wholesalers and retailers as the most pressing concern to their farming or trading business.

Overall, it is unclear whether this documented volatility is linked to the pandemic. For example, our qualitative interviews conducted with the key stakeholders in the vegetable value chain in 2019 revealed that the industry is characterized by considerable volatility, even before the pandemic. Moreover, when asked to use 1 to 10 scale to rate the seriousness of the COVID-19 pandemic on their businesses, all actors in the vegetable value chains responded, on average less than 5 with farmers being the least concerned about the pandemic. However, the value chain might have been indirectly affected by pandemic-related changes, because of disruptions in regional and international trade due to COVID-19, causing some of the higher observed input costs (Koh & Baffes, 2020).

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APPENDIX

Table A1: Price regressions by vegetable type

	(1) Tomato	(2) Onion	(3) Green pepper	(4) Cabbage
Urban wholesale	1.780***	3.286***	0.045	0.397**
	(0.217)	(0.435)	(0.792)	(0.185)
Urban retail	7.708***	8.699***	23.553***	5.510***
	(0.184)	(0.420)	(0.636)	(0.169)
Urban wholesale X May 2020 survey	0.617**	-0.449	1.087	0.887***
	(0.267)	(0.488)	(0.920)	(0.189)
Urban retail X May 2020 survey	-1.166***	-2.126***	2.284***	1.291***
	(0.225)	(0.552)	(0.863)	(0.209)
May 2020 survey	4.753***	5.420***	-11.235***	-2.168***
	(0.125)	(0.213)	(0.546)	(0.113)
Urban wholesale X March 2021 survey	-4.926***	-0.794	5.747***	1.384***
	(0.322)	(0.580)	(1.138)	(0.188)
Urban retail X March 2021 survey	-4.085***	-1.034*	-1.096	0.444**
	(0.254)	(0.555)	(0.918)	(0.223)
March 2021 survey	7.905***	-7.266***	6.777***	0.164
	(0.139)	(0.124)	(0.650)	(0.106)
Urban wholesale X August 2021 survey	0.768**	2.686***	4.155***	2.260***
	(0.300)	(0.513)	(1.420)	(0.366)
Urban retail X August 2021 survey	0.278	0.859	0.214	1.299***
	(0.209)	(0.542)	(0.983)	(0.346)
August 2021 survey	-0.826***	0.301	16.033***	1.422***
	(0.106)	(0.202)	(0.652)	(0.271)
Observations	5443	5778	4402	3888
R^2	0.717	0.474	0.688	0.631
Farm gate price in February 2020 (birr/kg)	*5.7*	*13.7*	*22.1*	*5.4*

Note: heteroskedasticity robust standard errors in parentheses. Statistical significance indicated with: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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