Chapter 13

# DYNAMICS IN TEFF VALUE CHAINS

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The purpose of this chapter is to understand the changes that have been happening in the teff value chain in Ethiopia based on carefully fielded primary stacked surveys at different layers in the value chain.[1] This chapter uses the same data as in Chapter 11 and takes a dynamic angle on the teff sector, as was presented in Chapter 12. However, the scope of the analysis is much broader than in the previous market-focused chapter. In this chapter the dynamics are examined in detail, focusing closely on what exactly has been happening, beyond output markets, in technology adoption upstream in the value chain and downstream, at service delivery, competition, mixing teff with other cereals in the preparation of injera, and changes in the food service industry.

Since 2001, very rapid changes have been seen in various stages of the teff value chain. Upstream, quick adoption of new varieties is found, though from a low starting point, as well as an increasing use of chemical fertilizer, especially by those farmers living close to urban centers. Downstream, the milling sector is being transformed toward one-stop shops that provide different additional services and more efficient processing systems, as illustrated by the declining milling margins. Quality requirements are transforming throughout the chain, with an increasing trade in more expensive teff varieties. There is a notable smaller share of marketing costs in the final retail price, which indicates improvements in marketing efficiency. These rapid changes in the teff value chain seem to be driven by a number of factors, including public investments in agriculture (especially agricultural extension), income growth, urbanization, and improved communication and transport infrastructure.

1 This chapter is based on Minten et al. (2016). This is reprinted by permission of the publisher (Taylor & Francis Ltd, www.tandfonline.com).

## Data and Methodology

This chapter focuses on how the teff value chain is transforming. To develop a better understanding, data are used from major teff-producing areas and follow the value chain from these teff-producing areas to Addis Ababa, the capital of Ethiopia and, along with its metropolitan area, home to approximately 4 million people. To gather this information, interviews were conducted with key informants in the value chain in September and October 2012. This information was used to design questionnaires for each level in the value chain. These questionnaires were then fielded at the end of 2012 (November and December). The instruments deployed included surveys upstream in the value chain with 1,200 teff producers and communities, midstream with rural and urban wholesalers and truckers, and downstream with cereal shops, mills, and cooperative retail. A detailed overview of the dataset is given in Chapter 11. We rely on these datasets for this chapter given the high quality of the data collected, the specific information on teff, and the recall questions over a longer period that were included in these different instruments that allow us to assess dynamism in this sector.

An important factor in any food market is quality. The most widespread distinguishing quality property used in the teff value chain in Ethiopia relates to the color of the grain (see Chapter 3 for more details). The distinction between magna ("superwhite"), white, mixed, and red teff is widely used and well known by farmers as well as by traders, and therefore this color differentiator will be used as a measure for quality throughout this chapter. The quality of teff is often evaluated by its origin, and by a number of other factors too, such as physical appearance, impurities, aroma, texture, and nutritional quality, although these are often difficult to measure objectively.

## Teff Upstream in the Value Chain

### Changes

Table 13.1 shows the self-reported changes during 2001–2011 for the farmers who were part of the survey. Tillage frequency per season is on average high (4.4 times). As teff seeds are small, germination is hard in unbroken soil. Farmers have not changed their tilling behavior over time, despite recommendations by Ethiopia's Ministry of Agriculture to reduce tilling as well as a number of extension efforts for the no-tilling method (an improved method to better preserve soil structure). Broadcasting is the common method used for teff sowing. Seed rates with this method are high—on average between

**TABLE 13.1** Changes in production practices, 2001–2011

| Production practices | Unit | Number of observations | 10 years prior to survey* | At time of survey | T-test** | |
|---|---|---|---|---|---|---|
| | | | | | t-value | Pr(\|T\|>\|t\|) |
| **Traditional production factors** | | | | | | |
| Number of tillings | number | 1,200 | 4.0 | 4.4 | 11.78 | **0.00** |
| Seed use: | | | | | | |
| Red or black teff | kilograms per hectare | 380 | 46.9 | 48.7 | 3.92 | **0.00** |
| Mixed teff | kilograms per hectare | 141 | 44.3 | 45.0 | 1.91 | **0.06** |
| White teff | kilograms per hectare | 593 | 44.4 | 43.0 | –0.60 | 0.55 |
| Magna teff | kilograms per hectare | 91 | 44.4 | 41.9 | –0.24 | 0.81 |
| Number of weedings | number | 1,199 | 1.5 | 1.3 | –7.87 | **0.00** |
| **Modern inputs** | | | | | | |
| Adoption of improved seed | share (%) | 1,199 | 6.5 | 35.2 | –21.22 | **0.00** |
| Use of chemical fertilizer: | | | | | | |
| DAP | kilograms per hectare | 1,128 | 50.6 | 87.9 | 21.26 | **0.00** |
| urea | kilograms per hectare | 1,121 | 35.0 | 63.8 | 18.31 | **0.00** |
| Adoption of herbicides | share (%) | 1,197 | 31.0 | 62.9 | –22.52 | **0.00** |
| Adoption of pesticides | share (%) | 1,197 | 3.9 | 11.5 | –9.28 | **0.00** |
| **Type of teff** | | | | | | |
| Farmers' interviews: | | | | | | |
| Red teff | share (%) | 1,200 | 36.0 | 19.7 | –16.28 | **0.00** |
| Mixed teff | share (%) | 1,200 | 15.8 | 10.7 | –6.20 | **0.00** |
| White teff | share (%) | 1,200 | 42.6 | 54.9 | 10.54 | **0.00** |
| Magna teff | share (%) | 1,200 | 5.6 | 14.7 | 10.68 | **0.00** |
| Community focus group interviews: | | | | | | |
| Red teff | share (%) | 60 | 32.7 | 14.4 | –6.28 | **0.00** |
| Mixed teff | share (%) | 60 | 31.8 | 21.6 | –3.77 | **0.00** |
| White teff | share (%) | 60 | 26.5 | 40.2 | 3.62 | **0.00** |
| Magna teff | share (%) | 60 | 7.7 | 24.3 | 5.97 | **0.00** |

**Source:** Authors' calculations.

**Note:** * As correct weighing factors for the situation 10 years prior to the survey are unknown, the extrapolation factors at the time of the survey were used for 10 years prior to the survey as a best approximation. ** Significant values at the 5 percent level are highlighted in **bold**.

40 kilograms and 50 kilograms per hectare—and they have changed little over time. If anything, an increase of seed rates over time is seen. Teff weeding is a laborious task that is critical for teff productivity. A slight but significant decline has been found following the increased use of herbicide. Overall, little change is found over time in these production practices.

The second part of Table 13.1 reviews modern input use. The increasing use of herbicide (usually the 2-4-D herbicide) has helped to control the development of broadleaf weeds. A significant change in the number of teff farmers using herbicides has occurred, rising from 31 percent 10 years earlier to 63 percent at the time of the survey (Fufa et al. 2011). Pesticide use increased from 4 percent of the farmers to 11 percent. Ten years prior to the survey, 7 percent of teff farmers used improved teff seeds.[2] This had increased to 35 percent of the farmers at the time of the survey. The use of chemical fertilizer increased from 51 kilograms of DAP and 35 kilograms of urea per hectare 10 years before the survey to 88 and 64 kilograms, respectively, at the time of the survey, on average almost a doubling of the amount of fertilizer used.

Over time, large changes in the type of teff produced are observed—in particular, an increasing importance of magna and white teff at the expense of red and mixed teff. Reports from the farmers suggest that magna and white teff combined made up 49 percent 10 years before the survey. This had increased at the time of the interview to 70 percent, an increase of 21 percent. The share of red teff in production declined from 36 percent of total production to 20 percent. Similar changes were noted in focus group interviews at the kebele level (the bottom of Table 13.1). The majority of the red teff was grown for own consumption, explaining the lower shares of red teff in the commercial surplus compared to the production by farmers. The move away from growing red and mixed toward white and magna teff is significant in all cases, as shown by a t-test.

There are several reasons for the decline in the importance of red teff over time. First, the prices for red teff are significantly lower than for white teff, providing farmers an incentive to focus on white teff to increase their income. These higher prices of white teff seem to be driven by a number of factors, including lower conversion ratios of red teff for the production of injera.[3] Other factors include the longer shelf life of white teff injera (as confirmed by

2 This is in the perception of farmers, as it is often not clear after a couple of generations if varieties are improved or not.

3 Key informants indicated that 500 injeras can be made from 1 quintal of red teff. This compares to 600 to 700 injeras from white teff.

the majority of mills), indicating possible higher premiums for this trait, and the preferences of urban consumers for white teff if incomes allow.[4] Second, while red teff traditionally used to have higher productivity than white teff, this is now changing as high-performing white varieties (especially Quncho) have recently become available. However, only very few improved red varieties are currently available (Fufa et al. 2011).

## Adoption of Modern Inputs

With more modern inputs used in farming practices, more in-depth analysis is being undertaken to help improve understanding of this visible change. The adoption of improved seeds has spread quickly over the 10-year period studied, but it is especially the Quncho (DZ-Cr-387) variety that is now widely adopted in these major teff production zones.[5] The quick spread of Quncho is remarkable given that the variety was only released recently. The first farmers in the survey zone only adopted Quncho in 2010, three years prior to the survey. Teff farmers were questioned about their adoption of Quncho (Table 13.2), and 32 percent of the teff farmers stated that they used Quncho at some point. For those who used it, it was currently being used on 83 percent of the white teff area. There was a multitude of stated reasons for the adoption of Quncho, including higher yields, lower seed rates, longer straw, and stronger stem. As Quncho is a white teff, it fetches a significantly higher price than mixed or red teff, making it attractive for the farmer. The major reasons given for not using Quncho or improved seed at all, or for using less improved seed than desired, is the lack of supply. This is in contrast with chemical fertilizer, where a lack of cash is the most common constraint (Table 13.2).

Figure 13.1 shows how the adoption of modern inputs varies over the distance to Addis Ababa. Both panels show a clear spatial pattern. Households that are located near Addis Ababa are more readily adopting Quncho. While more than 40 percent of the teff area is planted with Quncho for close-by areas, this drops to almost 0 for the areas farthest out. This distance association likely indicates better access to improved varieties as well as better incentives for the adoption of such varieties. Figure 13.1 also shows the stated

4 There is, however, an increasing perception with richer customers that red teff has major health benefits (presumably because of higher iron content), and 65 percent of the retailers "agreed" or "strongly agreed" with the statement that "red teff is increasingly being bought by rich consumers who are concerned about their health."

5 Quncho is a combination of the magna quality DZ-01-196 and the white quality DZ-01-974. It seems to have been successful because it combines the preferred magna characteristics of the DZ-01-196 and better yield performance of DZ-01-974 (Fufa et al. 2011).

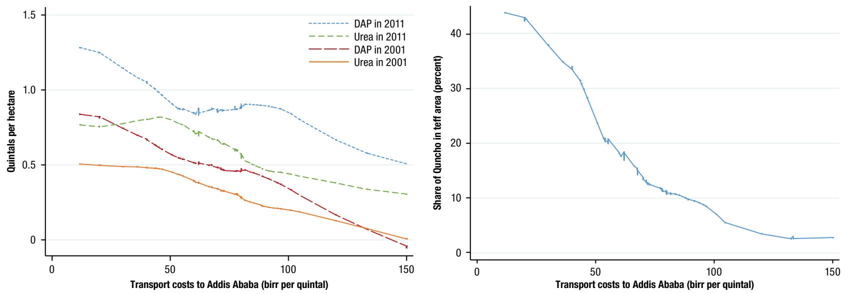
**TABLE 13.2** Statistics for takeup of Quncho and chemical fertilizer, 2001–2011

| Quncho statistics | Unit | Chemical fertilizer | Improved teff seed |
|---|---|---|---|
| **Household ever used Quncho** | % | n.a. | 32 |
| If yes: | | | |
| Household used Quncho in 2011/2012 (meher/belg 2011/2012) | % | n.a. | 76 |
| Number of years since the household used Quncho | number | n.a. | 2 |
| Part of white teff area where the household uses Quncho | % | n.a. | 83 |
| Perceived advantages of Quncho compared to other white teff varieties: | | | |
| Higher yield | % | n.a. | 89 |
| Lower seed rates | % | n.a. | 83 |
| Better price | % | n.a. | 91 |
| Straw is longer; there is more fodder | % | n.a. | 89 |
| Stem is stronger; there is less lodging* | % | n.a. | 87 |
| **Household used modern inputs in meher/belg 2011/2012** | % | 93 | 34 |
| For nonusers: | | | |
| Major reason for not using modern inputs: | | | |
| No need because soil is good enough | % | 22 | 0 |
| I don't know how to best apply them | % | 4 | 17 |
| I was unable to find them | % | 2 | 34 |
| The quality of modern inputs is not good | % | 0 | 3 |
| There is too much hassle/transaction costs to obtain modern inputs | % | 1 | 4 |
| Modern inputs are too expensive | % | 9 | 7 |
| I lack the money at the time of need | % | 33 | 12 |
| Lack of transportation | % | 0 | 0 |
| I am happy with the traditional seeds | % | n.a. | 15 |
| Other | % | 29 | 1 |
| **Farmers tried to buy modern inputs but could not obtain them** | % yes | 13 | 18 |
| For users: | | | |
| Farmer was able to buy as many modern inputs as desired | % yes | 69 | 75 |
| Reason for not buying as many modern inputs as desired | | | |
| I was unable to find more | % | 10 | 65 |
| There is too much hassle/transaction costs to obtain modern inputs | % | 5 | 19 |
| I lacked the money at the time of purchase | % | 85 | 16 |
| Lack of transportation | % | 0 | 0 |
| Other | % | 0 | 0 |

**Source:** Authors' calculations.

**Note:** n.a. = not applicable. * Lodging is the falling over of the plant stem at maturity, as it cannot support the weight of the grain formed.

**FIGURE 13.1** Chemical fertilizer use and Quncho adoption by distance to Addis Ababa




**Source:** Authors' calculations.

changes in adoption of chemical fertilizer per hectare and shows how more fertilizer use is especially prevalent in areas closer to Addis Ababa, indicating most intensification of agriculture—as measured through the increasing use of chemical fertilizers—is taking place in these well-connected areas. Such patterns are also seen in other settings (Reardon et al. 2012; Wiggins 2000).[6] The increasing use of fertilizer seems driven by the better access to fertilizers, incentives (through the higher relative prices of teff over time [Minten, Stifel, and Tamru 2012]), and the better knowledge of its use through efforts of extension agents (see later in the chapter).

To further understand what factors are driving adoption of modern inputs, a double hurdle regression model (Cragg 1971) is run. Modern input adoption at the plot level is used as a dependent variable along with plot and household characteristics and independent variables such as transport costs to the major market (that is, Addis Ababa) and to cooperatives. In such a setup, the "first hurdle" is used to estimate the factors associated with modern input use on a specific plot, while the "second hurdle" analyzes associates of the quantities of modern inputs used conditional on being used.[7] Table 13.3 illustrates the associates of the adoption of these new technologies.

The results of this model show that distance to Addis Ababa affects both the choice to adopt chemical fertilizers and improved seed as well as the

6 While the recommended rate of fertilizer use in teff production is 100 kilograms of DAP and 100 kilograms of urea per hectare (Kenea, Ayele, and Negatu 2001), a minority of farmers do this in practice.

7 Ricker-Gilbert, Jayne, and Chirwa (2011) argue that this is often the most appropriate way to model modern input use in Africa, especially given the large number of farmers who do not use modern inputs and consequently given the importance of modeling nonusers correctly in such situations.

**TABLE 13.3** Associates of Quncho and fertilizer adoption, 2011

| | | Chemical fertilizer | | Quncho | |
|---|---|---|---|---|---|
| | Unit | Coefficients | z-value* | Coefficients | z-value* |
| **Use (yes/no) of modern inputs** | | | | | |
| Transport costs to/from Addis Ababa | log(birr) | –0.51 | **–3.04** | –0.95 | **–9.88** |
| Distance to nearest cooperative | log(minutes) | –0.20 | **–2.68** | –0.13 | **–2.45** |
| **Characteristics of plot** | | | | | |
| Altitude | meters | 0.00 | **6.48** | 0.00 | 1.48 |
| Share red soil | share | –0.25 | –1.17 | –0.29 | **–1.73** |
| Share brown soil | share | –0.16 | –0.75 | 0.02 | 0.11 |
| Share black soil | share | –0.12 | –0.58 | –0.14 | –0.78 |
| Share flat land | share | 0.01 | 0.02 | 0.62 | 1.72 |
| Share slightly sloped land | share | –0.59 | **–1.69** | 0.04 | 0.10 |
| **Characteristics of household** | | | | | |
| Gender of head of household | male = 1 | –0.44 | –1.61 | –0.02 | –0.10 |
| Age of head of household in years | years | 0.00 | 0.21 | 0.00 | 0.15 |
| Education of head of household | years | 0.02 | **1.94** | 0.01 | **1.83** |
| Size of household | number | 0.00 | –0.11 | –0.03 | –1.35 |
| Household owns a mobile phone | yes = 1 | 0.68 | **3.94** | 0.37 | **3.56** |
| Household owns a donkey | yes = 1 | 0.67 | **5.39** | 0.31 | **2.95** |
| Total land owned | hectares | –0.01 | –0.20 | –0.12 | **–3.60** |
| Household received visit of extension agent in past two years | yes = 1 | 0.06 | 0.46 | 0.33 | **2.98** |
| Household is a member of the cooperative | yes = 1 | 0.19 | 1.53 | 0.21 | **2.14** |
| Household is a model farmer | yes = 1 | –0.05 | –0.35 | 0.18 | **1.78** |
| Intercept | | 0.96 | 0.97 | 2.18 | **2.99** |
| **Quantity used of modern inputs (kilogram for fertilizer; % of teff area for Quncho)** | | | | | |
| Transport costs to/from Addis Ababa | log(birr) | –49.52 | **–4.91** | 0.52 | 0.14 |
| Distance to nearest cooperative | log(minutes) | –16.31 | **–2.87** | –2.35 | –0.99 |
| **Characteristics of plot** | | | | | |
| Altitude | meters | 0.13 | **6.02** | –0.01 | –1.14 |
| Share red soil | share | –20.25 | –1.03 | 18.22 | **2.12** |
| Share brown soil | share | 50.26 | **2.58** | 4.52 | 0.58 |
| Share black soil | share | 16.17 | 0.93 | –9.63 | –1.38 |
| Share flat land | share | 81.80 | **2.26** | –12.76 | –0.82 |
| Share slightly sloped land | share | 45.20 | 1.19 | –7.83 | –0.46 |

| | Unit | Chemical fertilizer | | Quncho | |
|---|---|---|---|---|---|
| | | Coefficients | z-value* | Coefficients | z-value* |
| **Characteristics of household** | | | | | |
| Gender of head of household | male = 1 | –20.73 | –0.96 | 0.39 | 0.05 |
| Age of head of household in years | years | 0.83 | **2.21** | 0.31 | **2.04** |
| Education of head of household | years | 0.37 | 0.47 | 0.25 | 0.88 |
| Size of household | number | –7.70 | **–3.25** | –0.60 | –0.63 |
| Household owns a mobile phone | yes = 1 | 5.86 | 0.51 | –0.79 | –0.20 |
| Household owns a donkey | yes = 1 | 42.09 | **3.67** | –4.91 | –1.04 |
| Total land owned | hectares | –25.37 | **–6.21** | –3.35 | **–2.34** |
| Household received visit of extension agent in past two years | yes = 1 | 15.71 | 1.36 | 5.91 | 1.21 |
| Household is a member of the cooperative | yes = 1 | 31.29 | **2.90** | –2.22 | –0.54 |
| Household is a model farmer | yes = 1 | 22.04 | **2.03** | –16.74 | **–4.11** |
| Intercept | | 52.16 | 0.67 | 116.06 | **3.81** |
| Sigma | | 125.14 | **28.19** | 28.23 | **21.73** |
| Number of observations | | 1,197 | | 1,199 | |
| Wald chi2() | | 125.95 | | 217.64 | |
| Prob>chi2 | | 0.00 | | 0.00 | |
| **Average partial effect, APE (100 iterations)** | | | | | |
| Transport costs to/from Addis Ababa | log(birr) | –38.29 | **–6.06** | –17.26 | **–7.98** |
| Distance to nearest cooperative | log(minutes) | –13.16 | **–4.06** | –2.99 | **–3.07** |

**Source:** Authors' calculations.
**Note:** * z-values of coefficients that are significant at the 5 percent level are in **bold**.

quantity of chemical fertilizer applied. However, it does not significantly affect the quantity used of improved teff seed. To assess the magnitude of these effects, at the bottom of Table 13.3 the average partial effects (APE) of transport costs to Addis Ababa is recorded. These reflect the overall—including both the first and second hurdles—link with modern input use.[8] The highly significant result of 38 for the unconditional APE of transport costs on chemical fertilizer use indicates that a doubling of the transport costs to Addis Ababa reduces the fertilizer use by 38 kilograms per hectare. In the case of Quncho teff seeds, the share of the area planted declines by 17 percent, with a doubling of the transport costs to Addis Ababa. These links of transport costs from urban centers with the adoption of modern inputs are thus substantial.

8 Standard errors for the unconditional APE were obtained from bootstrapping the model with 100 repetitions.

Similar results are found for distances to cooperative unions, the often exclusive distributors of modern inputs. A doubling of the distance to cooperative unions reduces the fertilizer use by 13 kilograms per hectare and the share of teff area planted with Quncho by 3 percent.

## Teff Downstream in the Value Chain

### Service Delivery and Competition

Retailing of teff in Addis Ababa is mostly done by mills: they account for 70 percent of all the teff sold in Addis Ababa, while cereal shops and consumer cooperatives make up the remaining 18 percent and 9 percent respectively (Woldu et al. 2013). Over the period studied, several changes occurred in the procurement, processing, and milling of teff in Addis Ababa. First, traditionally mills only ground the teff grain; households typically would buy teff from a cereal shop or a market, take the teff home for cleaning, get the teff milled at the mill, and then prepare the injera at home (as is still commonly the case in smaller and less-developed towns as well as in rural areas). This traditional pattern has changed in Addis Ababa, with mills increasingly becoming one-stop shops. Most of them are now delivering different services, including sales of a wide range of cereals (and sometimes other products), cleaning of these cereals, plus transport services. In Table 13.4 unweighted averages are presented for the retail shops in the panel survey—that is, those that existed at the beginning of the period studied—as well as weighted averages for the complete sample at the time of the survey. Conversely, over time a large number of cereal shops have started adding milling and cleaning to the services they offer consumers.

Second, there seems to be increasing competition between retail outlets. Retail outlets were asked to estimate the number of mills and cereal shops that existed in the kebele ten years before and at the time of the survey. A significant increase is seen, from six to ten mills and three to four cereal shops per kebele (Table 13.4). While 30 percent of the retail shops stated that queuing was a problem 10 years prior to the survey, often because of the lack of mills, only 17 percent of the retail shops indicated that this was a problem at the time of the survey. The increasing competition is further confirmed through qualitative statements, with the majority of the urban retailers responding “strongly agreed” or “agreed” to the statement that the competition between mills has increased over time. The rapid emergence of teff retail shops is further illustrated by analyzing their start-up dates, with 50 percent of the mills being established five years previously.

Third, some retailers procure teff directly from rural areas and thereby cut out urban wholesale markets. However, this phenomenon is still rather rare. Using unweighted averages of the panel retail shops, it is estimated that 83 percent of the teff supplies are obtained on urban wholesale markets and few changes are seen over time. Direct rural procurement is especially undertaken by the larger retailers, as shown in the weighted averages of the procurement sources (Table 13.4). Using this latter method, it is estimated that 27 percent of the teff sold in Addis Ababa does not go through the urban wholesale markets. The investments in shop premises, mills, and stocks of cereals illustrate that some upscaling has been occurring in the downstream portion of the teff value chain, requiring relatively heavy capital investments for some retailers. The significance of these investments by retailers is shown in Table 13.1 (earlier in the chapter), by the higher value of their assets relative to those of other agents in the value chain.

### Mixing with Other Cereals

Teff is often and increasingly mixed with other cereals for the preparation of injera. The proportions of mixing with other cereals seem driven by preferences (often linked to the origin of consumers), prices of other cereals, as well as by changing conversion rates from flour to injera when mixed.[9] As seen in Table 13.4, mixing of teff with other cereals is on the rise. For example, while 22 percent of urban customers mixed teff with sorghum 10 years prior to the survey, this had increased to 26 percent at the time of the survey. Increases in the proportion of customers mixing teff with rice and with maize are equally seen as well: from 8 percent to 21 percent in the case of rice and from 8 percent to 12 percent in the case of maize. This mixing seems to explain the strong correlation of teff prices with other cereal prices that is typically seen as customers seemingly readily substitute in other cereals depending on relative price changes (Rashid 2011).

Table 13.5 shows to what extent poor consumers—as subjectively defined by the retail shop owner—consume different types of teff compared to the rich. While the rich consume almost exclusively *(text continued on page 340)*

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9 While the chapter authors are not aware of any research on this, this seems to be the common perception, as 60 percent of the retailers “agreed” or “strongly agreed” that “One can get more injera out of a quintal if teff is mixed with other cereals; the conversion rate is higher if teff is mixed with other cereals.”

**TABLE 13.4** Operational changes of the teff retail outlets since 2001

| | | Panel—unweighted | | | Paired T-test** | | Full sample | | Unpaired T-test** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 10 years ago versus now | | | | 10 years ago versus now | |
| | Unit | Number of observations | 10 years prior to survey | At survey | t-value | Pr(\|T\|>\|t\|) | Number of observations | At survey (weighted) | t-value | Pr(\|T\|>\|t\|) |
| **Technology and products sold per outlet** | | | | | | | | | | |
| Number of milling machines per outlet | number | 100 | 3.1 | 3.3 | 4.42 | **0.00** | 256 | 2.8 | –0.60 | 0.55 |
| Number of crops sold in outlet | number | 106 | 6.2 | 7.4 | 4.45 | **0.00** | 280 | 8.2 | 2.66 | **0.00** |
| **Services*** | | | | | | | | | | |
| Share of customers that get home delivery | % | 74 | 59.6 | 66.9 | 2.81 | **0.01** | 266 | 64.0 | 0.22 | 0.82 |
| Share of customers that clean at home | % | 96 | 29.9 | 21.2 | –3.69 | **0.00** | 250 | 15.6 | –3.18 | **0.00** |
| Share of customers that only come for milling | % | 93 | 30.1 | 25.4 | –2.55 | **0.01** | 245 | 17.6 | –2.21 | **0.02** |
| **Competition** | | | | | | | | | | |
| Number of mills in the kebele | number | 92 | 6.1 | 9.7 | 8.14 | **0.00** | 250 | 9.0 | 5.04 | **0.00** |
| Number of cereal shops in the kebele | number | 75 | 2.9 | 3.6 | 2.36 | **0.02** | 202 | 5.0 | 2.05 | **0.04** |
| Often queuing of consumers | % | 102 | 30.3 | 16.7 | –3.28 | **0.00** | 271 | 17.5 | –4.45 | **0.00** |
| **Procurement (share)*** | | | | | | | | | | |
| In Addis Ababa | % | 103 | 82.1 | 83.3 | 0.66 | 0.51 | 270 | 72.7 | 0.53 | 0.59 |
| Outside Addis Ababa on temporary markets | % | 104 | 11.8 | 10.0 | –1.26 | 0.21 | 270 | 10.2 | –1.45 | 0.15 |
| Outside Addis Ababa not on temporary markets | % | 103 | 6.0 | 6.4 | 0.35 | 0.72 | 270 | 17.2 | 1.08 | 0.28 |
| **% of teff consumers that mix teff with** | | | | | | | | | | |
| Sorghum | % | 101 | 22.1 | 25.5 | 1.40 | 0.16 | 269 | 25.2 | 1.52 | 0.13 |
| Rice | % | 101 | 8.0 | 21.2 | 6.61 | **0.00** | 269 | 20.1 | 6.10 | **0.00** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Wheat | % | 101 | 1.1 | 0.1 | −1.83 | 0.07 | 269 | 0.3 | −2.01 | **0.04** |
| Maize | % | 102 | 8.5 | 12.1 | 2.17 | **0.03** | 269 | 11.1 | 1.98 | **0.04** |
| Other cereals | % | 102 | 1.6 | 1.4 | −0.96 | 0.34 | 269 | 1.4 | 0.21 | 0.83 |

**Source:** Authors' calculations.

**Note:** * In full sample means, weighted by turnover of the retailer and therefore indicating shares for Addis Ababa. ** Significant values at the 5 percent level are highlighted in **bold**.

**TABLE 13.5** Mixing teff with other cereals, 2011/2012

| | | Consumers | | | Injera sellers | |
|---|---|---|---|---|---|---|
| | Unit | Poorest | Middle income | Richest | With fixed shops | Without fixed shops |
| Number of observations | number | 275 | 274 | 251 | 79 | 86 |
| **Type of teff bought*** | | | | | | |
| Magna | % | 3 | 11 | 58 | 9 | 2 |
| White | % | 12 | 50 | 31 | 47 | 21 |
| Mix | % | 62 | 32 | 4 | 42 | 75 |
| Red | % | 23 | 7 | 6 | 2 | 2 |
| Total | % | 100 | 100 | 100 | 100 | 100 |
| **Share of customers that mix teff with other cereals*** | % | 55 | 39 | 14 | 76 | 74 |
| **Typical composition of flour bought*** | | | | | | |
| Teff | % | 76 | 84 | 93 | 77 | 77 |
| Sorghum | % | 14 | 4 | 0 | 11 | 15 |
| Rice | % | 1 | 8 | 4 | 10 | 6 |
| Maize | % | 6 | 2 | 0 | 3 | 2 |
| Wheat | % | 0 | 0 | 0 | 0 | 0 |
| Other | % | 3 | 2 | 2 | 0 | 0 |
| Total | % | 100 | 100 | 100 | 100 | 100 |

**Source:** Authors' calculations.
**Note:** * weighted by turnover of the retailer and therefore indicating shares for Addis Ababa.

magna and white teff, the poor almost only eat red and mixed teff (see Chapter 2). The influence of income on mixing teff with other cereals is further shown by starkly different mixing patterns of rich versus poor customers. First, poor consumers mix teff more readily with other cereals: 55 percent of poor consumers mix cereals, compared with rich consumers, of whom only 14 percent mix teff with other cereals. Second, when cereals are mixed by richer and middle-income consumers, they mostly do so with rice, which has a price similar to white teff. This combination improves the whiteness and the flexibility of injera. Poorer consumers mix teff mostly with the cheaper sorghum and maize.

## Foodservice Industry

The foodservice sector is defined as those businesses, institutions, and companies responsible for any meal prepared outside the home. In the foodservice industry the injera sellers are especially important, as reported by urban retailers and wholesalers. While they represented about 15 percent and 8 percent—using unweighted averages—of sales 10 years prior to the survey, they now make up about 13 percent and 9 percent of total sales of retailers and wholesalers, respectively, indicating a slight shift in their procurement to wholesale markets (Table 13.6). It is estimated that about 20 percent of the teff sold in Addis Ababa is currently being marketed as prepared injera by injera sellers and that this share has changed little over time. Direct procurement from retailers by restaurants (4.5 percent), institutions (such as schools, universities, jails, army, and so on) (0.4 percent), and supermarkets (0.6 percent) is relatively less important. Table 13.6 further shows how the mills have become increasingly important over time, and how the share of customers who buy directly from wholesale markets has declined over the period 2001–2011, further confirming the increasing role of mills as one-stop retail shops.

Four different categories of injera sellers can be distinguished—that is, formal large injera wholesale companies (that usually sell branded products), informal injera wholesalers (that sell to schools and restaurants, for example), injera retailers with fixed shops (baltena shops—local shops that sell different kinds of traditional flour products, based on milled spices, pulses, cereals, and others), and injera retailers without fixed shops (microsellers or gulits). The injera retailers are the most important of all injera sellers, representing almost 90 percent of all injera sellers who buy cereals from retail shops. Injera sellers have different procurement patterns than direct consumers as they visit teff retail shops more frequently, negotiate lower prices, access credit more often, and more regularly mix teff with other cereals (Table 13.5).[10] The share of the large injera wholesale companies selling branded products is still rather small.

In short, in these urban settings and downstream in the value chain, an increasing willingness to pay for convenience is noted, in particular by the emergence of one-stop retail shops as well by the presence of a sizable food-service sector. Also, a diverse range of products is being offered, with innovative mixes of teff and other cereals being tried out. Below, the changes in marketing margins are further explored between the different layers in the value chain.

10 The table shows that injera sellers mix teff with other cereals in similar proportions to that of the poorest consumers. It is unclear how injera sellers market their product—for example, as unmixed teff injeras or as a mixed product. Further research is required.

**TABLE 13.6** Share of customers of urban wholesalers and retailers, 2011/2012

| | Panel—unweighted | | | Paired T-test** | | Full sample | | Unpaired T-test** | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 10 years ago versus now | | | | 10 years ago versus now | |
| | Number of observations | 10 years prior to survey (%) | At survey (%) | t-value | Pr (\|T\|>\|t\|) | Number of observations | At survey (weighted) (%) | t-value | Pr (\|T\|>\|t\|) |
| **Type of customers for wholesalers (share)** | | | | | | | | | |
| Wholesalers | 33 | 11.7 | 9.3 | –0.92 | 0.36 | 75 | 6.9 | –1.24 | 0.22 |
| Mills | 33 | 51.5 | 59.6 | 1.61 | 0.11 | 75 | 69.0 | 2.39 | **0.02** |
| Cereal shops | 33 | 8.5 | 8.6 | 0.05 | 0.96 | 75 | 8.2 | –0.09 | 0.92 |
| Cooperatives | 33 | 1.4 | 2.6 | 1.38 | 0.17 | 75 | 1.4 | 0.03 | 0.97 |
| Consumers | 33 | 13.0 | 5.9 | –2.56 | **0.01** | 75 | 4.1 | –3.25 | **0.00** |
| Injera wholesalers | 33 | 2.0 | 2.4 | 0.54 | 0.59 | 75 | 1.2 | –0.78 | 0.44 |
| Injera wholesale companies | 33 | 0.7 | 1.1 | 0.44 | 0.66 | 75 | 0.6 | –0.15 | 0.88 |
| Injera retailers with fixed shops | 33 | 4.9 | 4.7 | –0.33 | 0.74 | 75 | 4.7 | –0.05 | 0.96 |
| Injera retailers without shops | 33 | 0.9 | 0.7 | –0.30 | 0.76 | 75 | 1.7 | 0.51 | 0.61 |
| Institutions | 32 | 3.3 | 2.8 | –0.53 | 0.60 | 75 | 2.3 | –0.42 | 0.67 |
| Restaurants | 33 | 1.8 | 2.2 | 0.35 | 0.72 | 75 | 1.0 | –0.90 | 0.37 |
| Supermarkets | 33 | 0.2 | 0.2 | 0.00 | n.a. | 75 | 0.1 | –0.59 | 0.55 |
| Others | 33 | 0.0 | 0.0 | 0.00 | n.a. | 75 | 0.3 | 0.66 | 0.50 |
| Total | 33 | 100.0 | 100.0 | | | 75 | 100.0 | | |
| **Type of customers for retailers (share)*** | | | | | | | | | |
| Consumers | 103 | 80.4 | 82.5 | 1.46 | 0.14 | 277 | 81.2 | 2.58 | **0.01** |
| Injera wholesalers | 103 | 0.8 | 1.2 | 0.79 | 0.43 | 277 | 2.2 | 0.45 | 0.65 |
| Injera wholesale companies | 103 | 0.3 | 0.0 | –1.15 | 0.25 | 277 | 0.1 | –1.41 | 0.16 |
| Injera retailers with fixed shops | 103 | 4.7 | 4.8 | 0.05 | 0.96 | 277 | 4.4 | –1.71 | 0.09 |
| Injera retailers without shops | 103 | 8.7 | 7.0 | –2.28 | **0.02** | 277 | 5.3 | –2.10 | **0.04** |
| Institutions | 103 | 0.7 | 0.4 | –1.04 | 0.30 | 277 | 0.4 | –1.13 | 0.26 |
| Restaurants | 103 | 1.9 | 2.1 | 0.29 | 0.77 | 277 | 4.5 | –0.87 | 0.37 |
| Supermarkets | 103 | 0.0 | 0.0 | 0.00 | n.a. | 277 | 0.6 | 0.86 | 0.39 |
| Others | 103 | 0.0 | 0.2 | 1.00 | 0.32 | 277 | 0.7 | 0.27 | 0.79 |
| Total | 103 | 100.0 | 100.0 | | | 277 | 100.0 | | |

**Source:** Authors' calculations.

**Note:** n.a. = not applicable; * in full sample means, weighed by turnover of the retailer and therefore indicating shares for Addis Ababa; ** significant values at the 5 percent level are highlighted in **bold**.

## Marketing Margins

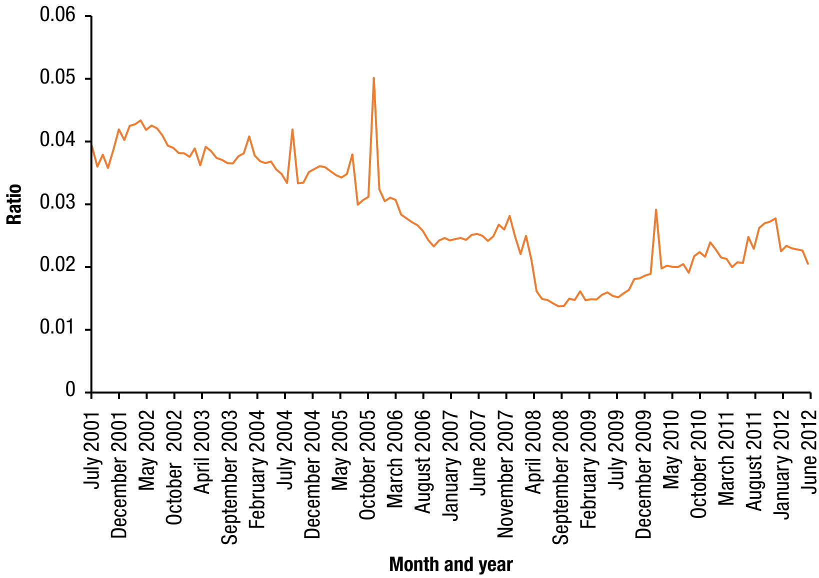
Monthly price series for teff have been collected over the period studied by Ethiopia's Central Statistical Agency (CSA) at the retail, producer, and milling level and by the Ethiopian Grain Trading Enterprise (EGTE) at the wholesale level. By comparing these prices, the evolution of urban-rural marketing, urban distribution, and processing margins over time can be analyzed. The increasing competition between mills, as mentioned by retailers, seems to have led to a significant reduction of the ratio of milling charges over teff retail prices over the period 2001–2012 (Figure 13.2). These margins have dropped on average to half the level of 10 years earlier.

By comparing wholesale to retail prices in Addis Ababa, a decrease of the share of urban retailers is observed in the final retail price over time (Figure 13.3). This was using producer price data from those five major production zones that were part of the producer survey. The share of urban retailers in final retail prices (using linear trend lines) declined from between 13 percent and 15 percent in 2001 to between 7 percent and 11 percent in 2011, depending on the type of teff. Using data from the trend line, the share of the producer in the final retail prices increased from a level of between 74 percent and 78 percent in 2001 to between 76 percent and 86 percent in 2011. Despite having the highest prices, white teff shows the lowest producer-to-retail ratio, indicating significantly higher marketing costs than other types of teff. Moreover, large variability of these margins is seen over time with a significant decrease in shares of wholesale and producer in final retail prices in 2009 and 2010. It is not immediately clear what has been driving this variability and these differences between different types of teff, thus further research appears necessary. Overall, despite large variability, the shares of urban-rural marketing, urban distribution, and milling in final retail prices have declined significantly over the 10-year period.

## Drivers for Change

From these investigations both notable and important changes have occurred in the teff value chain over the years. A number of drivers can be linked to this agricultural and food market transformation (for example, Reardon and Timmer 2007; Minot and Roy 2007). First, the public sector has played an active role at improving the delivery of modern agricultural inputs. In particular, the government has invested especially heavily in developing the spatial reach of agricultural extension in the country—Ethiopia now has one of

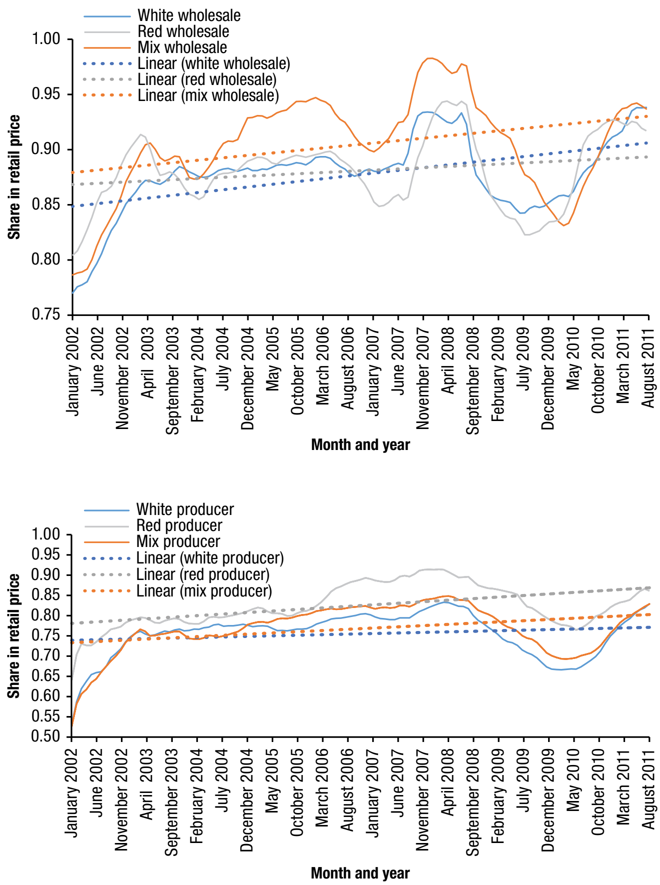
**FIGURE 13.2** The ratio of milling charges over (white) teff retail prices in Addis Ababa, 2001–2012




**Source:** Authors' calculations.

the lowest farmers-to-extension agent ratios in the world (Davis et al. 2010). The wide access to extension agents is illustrated in Table 13.7. Almost three-quarters of the surveyed farmers were visited by an extension agent in the two years prior to the survey, and a large share of farmers have been exposed to individual and community meetings, visits of demonstration plots, and visits to the government's office of agriculture to discuss teff-related issues over the twelve-month period before the survey. As a result, a high percentage of farmers became aware of recommended fertilizer use (50 percent) and improved technologies in teff (Table 13.7). Fertilizer delivery also has improved, and there are now fewer complaints about the lack of fertilizer, especially so in the more accessible zones, compared with 10 years earlier. The government has also invested in research and development. However, investments toward the development of better teff varieties have been limited. For example, Flaherty, Kelemework, and Kelemu (2010) show that investments in agricultural R&D declined by about 30 percent between 2002 and 2008. This study also found that the staff engaged in agricultural research in Ethiopia is among the least qualified in Africa, as measured in terms of postgraduate degrees.

**FIGURE 13.3 Share of producer and wholesale in final retail prices of teff in Addis Ababa (12-month moving average), 2002–2011**




**Source:** Authors' calculations.

Second, during the period 2001–2011 improved road and communication infrastructure has been provided (Chapter 12). Improved infrastructure has resulted in significant declines in transport costs and better connectivity of rural to urban areas (Schmidt and Kedir Jemal 2009). The increasing spread of mobile phones has presumably also led to important efficiency gains, as seen in a number of other countries (for example, Aker and Fafchamps 2011; Jensen 2007). While mobile phone connection only became available in Addis Ababa in the beginning of the 2000s, cell phone coverage is now widespread in rural areas. Consequently, the cell phone has been adopted by a large

**TABLE 13.7** Use of agricultural extension, 2011/2012

| | Unit | Mean (%) | Median | Standard deviation |
|---|---|---|---|---|
| **Contact extension agents** | | | | |
| Received a visit of an agricultural extension agent in the past two years | share (%) | 74.4 | n.a. | n.a. |
| Type of organization that provided the extension service: | | | | |
| NGO | share (%) | 4.7 | n.a. | n.a. |
| Government | share (%) | 95.3 | n.a. | n.a. |
| Private | share (%) | 0.0 | n.a. | n.a. |
| Other | share (%) | 0.0 | n.a. | n.a. |
| **In past 12 months** | | | | |
| Number of times that farmer talked individually with extension agent on teff issues | number | 2.3 | 2.00 | 4.0 |
| Number of times that farmer participated in a community meeting to discuss teff issues | number | 2.2 | 1.00 | 3.1 |
| Farmer visited a demonstration plot of teff | share (%) | 35.3 | n.a. | n.a. |
| Farmer visited a government office of agriculture and discussed teff issues | share (%) | 27.1 | n.a. | n.a. |
| **Farmer awareness of technologies** | | | | |
| Farmer knows the recommended fertilizer use on teff plots | share (%) | 50.4 | n.a. | n.a. |
| Farmers is aware of: | | | | |
| broadcasting at lower seed rates | share (%) | 91.5 | n.a. | n.a. |
| row planting of teff | share (%) | 77.9 | n.a. | n.a. |
| transplanting of teff | share (%) | 39.3 | n.a. | n.a. |
| 0 tillage of teff soils | share (%) | 10.4 | n.a. | n.a. |

**Source:** Authors' calculations.
**Note:** n.a. = not applicable.

number of value-chain agents with important implications for the way business is done in teff value chains.

Table 13.8 shows the extent to which telephones are now used in the teff value chain. Mobile phone penetration is quickly increasing with farmers in Ethiopia. However, it still remains low, with only 27 percent of the farming households in the survey area reporting that they own a phone. It is estimated that in 12 percent of the teff transactions undertaken by farmers, a phone was used to contact traders beforehand, and in 71 percent of these cases a price was agreed with the trader by phone. However, phone use is much more widespread with wholesalers and retailers. Almost all of the traders and retailers report

**TABLE 13.8** Farmers' use of (fixed and mobile) phones, 2011/2012

| | Unit | Farmers | Rural traders | Urban traders | Urban retailers |
|---|---|---|---|---|---|
| Owners of a phone | share (%) | 27 | 100 | 100 | 98 |
| Year since they own a phone | year | n.a. | 2006 | 2007 | 2008 |
| Used mobile phone in the last marketing transaction | share (%) | 12 | n.a. | 97 | 56 |
| If yes, agreed on a price with the trader by phone in the last transaction | share (%) | 71 | n.a. | 52 | 32 |
| Before using a mobile phone, they used a fixed phone | share (%) | n.a. | n.a. | 43 | 28 |
| Use of mobile phone: | | | | | |
| Use it to inform himself or transmit teff prices | share (%) | n.a. | 99 | 100 | 73 |
| Agree on prices (plus quantity/quality) with teff suppliers by phone | share (%) | n.a. | 52 | 85 | 40 |
| If yes, % of suppliers | share (%) | n.a. | 38 | 74 | 64 |
| Request a showup (without price agreements) with suppliers by phone | share (%) | n.a. | 35 | 36 | 10 |
| If yes, % of suppliers | share (%) | n.a. | 35 | 67 | 57 |
| Follow up on payments with teff suppliers by phone | share (%) | n.a. | 34 | 88 | 54 |
| If yes, % of suppliers | share (%) | n.a. | 40 | 74 | 78 |
| Agree on prices (plus quantity/quality) with teff clients per phone | share (%) | n.a. | 86 | 68 | 34 |
| If yes, % of clients | share (%) | n.a. | 80 | 54 | 30 |
| Follow up on payments with teff clients by phone | share (%) | n.a. | 87 | 95 | 40 |
| If yes, % of clients | share (%) | n.a. | 81 | 62 | 48 |

**Source:** Authors' calculations.

**Note:** n.a. = not applicable.

owning a phone and using it actively to conduct their business: 97 percent of the urban traders report having used a mobile phone in their last marketing transaction. This contrasts with only 56 percent of urban retailers. Table 13.8 illustrates that mobile phones are intensively used by these traders to obtain information about prices, to complete trade deals, and to follow up on payments.

Third, the urbanization and economically superior characteristics of teff have augmented demand in Addis Ababa, leading to economies of scale such as the use of larger trucks and therefore relatively lower transport costs (Minten, Stifel, and Tamru 2012). Assuming that the average urban consumption level of teff is as high as estimated in the national household survey (HICES) of 2004/2005, this implies a flow of approximately 250,000 metric tons of teff into Addis Ababa in 2012, for an approximate value of US$165 million—using the 2012 mixed teff wholesale prices of approximately 1,200 birr per quintal. With high population growth in urban areas (World Bank 2015) an increase in the quantity of teff traded to Addis Ababa is estimated at approximately 45 percent over the period 2001–2011. Unfortunately, however, no good data are available on this change. By assuming that average income grew by 30 percent over the period 2001–2011, this would have added another 32 percent to urban teff demand, using estimated income elasticities. Both factors combined have thus led to important changes for marketed teff surplus to Addis Ababa, possibly almost a doubling over the 10-year period studied.

Fourth, economic and income growth is often linked with higher opportunity costs of time, especially for women. As each step involved in the purchase of teff and the preparation of injera requires significant effort and time, this higher opportunity cost leads to increasing demand for prepared products in such settings (Kennedy and Reardon 1994; Reardon and Timmer 2007; Minot and Roy 2007) and gives an impetus toward the further take-off of ready-to-eat products delivered by the foodservice industry.

## Conclusion

Important changes have occurred in the teff value chain during the 10-year period studied, both at the production level and on the consumption side. Modern inputs are increasingly adopted in teff production. Quality and convenience demands are on the rise among teff consumers, and the teff marketing system is becoming more efficient. The changes upstream have especially transpired in those areas that are reasonably well connected to the city, illustrating the importance of market access and demand as drivers for rural and agricultural transformation (Wiggins 2000). Even though changes are happening, the transformation of the teff production and marketing systems is still at an early stage of agricultural development (for example, Reardon and Timmer 2007). At the production level, the number of farmers who use improved varieties is still low, the quantities of chemical fertilizers that are being used are still below the recommended levels, and mechanization, which is quickly happening in other emerging economies (for example, Yang et al. 2013; Binswanger 1986), is still mostly absent (see Chapter 6). In addition, very little vertical integration is observed as well as minimal coordination mechanisms between teff production and marketing. Midstream and downstream of the value chain, little evidence of upscaling of trade is seen, nor of modern retail or of branding, which are typically observable as agricultural market development gets under way (Reardon et al. 2012).

Despite the progress, there still exists a number of constraints that need to be addressed to facilitate further transformation in the upstream production portion of the teff value chain in Ethiopia. First, while the Quncho variety has quickly taken off, there is still plenty of room to further stimulate the development of the teff sector. For example, a major problem in teff cultivation is the problem of lodging of the crop, but lodging resistant varieties have not yet been developed. There has also been little attention in current breeding programs focused on taste preferences and downstream requirements (as, for example, shown in complaints on the drying out disadvantages of injera made with the improved white teff variety Quncho) as well as disease- and pest-resistant varieties. Furthermore, teff breeding has until now focused on conventional cross-breeding and selection techniques. More sophisticated breeding techniques that allow for a faster selection process are currently available and should best be employed to enhance availability of a larger portfolio of improved teff varieties to farmers (see Chapter 3).[11]

Second, besides improved seed development, little is currently known on the potential of other technologies to improve teff productivity. For example, studies at the farm level have been implemented to evaluate the potential of row planting and transplanting toward better productivity of teff (see Chapter 5).[12] On-station trials have also shown high responses to fertilizers that contain zinc and copper (Tareke 2011) as well as a good effect of minimal tillage methods (Habtegebriel, Singh, and Haile 2007), but no research beyond experimental settings has been conducted.

Third, despite the large importance of teff in the local food sector of Ethiopia, investments in research toward the development of improved agronomic practices have not been at appropriate levels.[13] The neglect of teff in

11 These include a technique of doubling the chromosome number of gametes at the first generation after crossing (known as gynogenesis based doubled haploid production) (Tareke 2011).

12 By reducing the high seeding rates common currently in teff production, by improving weeding practices, and thus by enhancing the nutrient uptake of teff plants, these technologies show great promise. However, they are currently underevaluated. On-station research indicates that the shift from broadcasting to row planting can reduce seeding rates by 90 percent. Lower planting densities result in increased tillering, much stronger stems, and increased grain yields (Tareke 2010).

13 This is illustrated by the fact that teff is not one of the targeted value chains in the government's Agricultural Growth Program (AGP)—the largest current investment program in the high-potential areas in the country. A number of reasons explain this. Attention on studies of teff by Ethiopian agricultural researchers was discouraged locally during the Derg period in the 1970s

research and development illustrates the importance of demand analysis and priority setting toward appropriate investments in agronomic R&D. Given the consumption patterns in Ethiopia, as well as high economic growth, it was and is expected that there will be a rapid increase in demand for teff and thus the payoffs to public investments in research and development to improve teff production in Ethiopia is likely to be high.

Fourth, while large investments in road improvements were made in the period 2001–2011—Ethiopia started from a low base—the country still has one of the lowest road densities in the world (von Braun and Olofinbiyi 2007). Similarly, while access to information is now widely available for traders and brokers, through the rapid development of the mobile phone network in the country over the past 10 years, penetration and use of mobile phones by Ethiopian farmers is still one of the lowest in Africa. Further investments in this area would thus be welcome. In this study, urban demand has been clearly shown to be a major factor driving rural change. While urbanization has been increasing in Ethiopia, the proportion of the Ethiopian population that resides in urban centers is still one of the lowest in Africa, possibly linked to rural land tenure rules that make rural-urban migration cumbersome.

Fifth, quality demands for teff are on the rise. However, uncertainty on quality rewards for sellers, as well as on the exact quality demands required from buyers, exists at all levels. This is shown by the lack of trust exhibited by farmers of teff traders, the difficulty of finding quality teff in urban areas unless retailers visit teff production zones individually and link directly with producers, and the mixing of teff with other cereals of which consumers are often not aware. Improved branding practices or vertical coordination could possibly take care of such coordination problems. It is thus expected that such practices will increase over time. This will especially be the case when consumers are willing to pay for assured quality teff and teff products, as branded products usually are significantly more expensive (Reardon et al. 2012; Minten, Reardon, and Sutradhar 2010). Further stimulation to expand a private modern retail sector—that is currently hardly involved in cereal trade (Woldu et al. 2013)—might possibly lead to better coordination toward quality assurance for teff consumers.

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and 1980s (Tareke 2011). Internationally, teff does not fit well within the agricultural research priorities of the international agricultural research institutes of CGIAR. The CGIAR institutes' work is typically closely linked with the NARS (National Agricultural Research System) in the development of better varieties and technologies and have seen significant successes over time (Spielman and Pandya-Lorch 2009). However, CGIAR research focuses on crops grown in a large number of countries. Consequently, to date, teff has been the subject of almost no research by the CGIAR.

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