FARM TRANSFORMATION OF THE TOMATO VALUE CHAIN IN KENYA

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Abstract

The Kenyan tomato value chain represents a hallmark of agricultural transformation, characterized by a massive twelve-fold expansion in production volume between 1980 and 2022 to meet a five-fold increase in domestic consumption. This growth is not merely an increase in volume but a fundamental shift in structure, now organized into mature geographic clusters and sustained by a network of 234 wholesale markets and a rapidly densifying "hidden middle" of micro, small, and medium enterprises (MSMEs). Current findings indicate that the sector has transitioned into a highly commercialized ecosystem and immediate financial liquidity is the transactional norm. While the value chain serves as a massive engine for employment—particularly for women who dominate the trading nodes and youth who comprise the bulk of the casual labor force—significant infrastructure gaps, particularly in sanitation and water access within wholesale markets, remain. The findings point to the need to intensify infrastructure investments to ensure the long-term competitiveness of this symbiotic relationship between small-scale producers and MSMEs. Further, through public-private partnerships, the government can incentivize these established MSME ecosystems that represent a significant, untapped source of private sector capacity that could be mobilized to address the critical infrastructure deficits identified in the sector.

Keywords

Tomato value chain, Kenya, smallholder farmers, traders and wholesalers, market infrastructure, price seasonality, farm profitability

1 Introduction

1.1 Purpose of INCATA project

The INCATA: Linked Farms and Enterprises for Inclusive Agricultural Transformation in Africa and Asia project aims to understand the relationship between commercial small-scale producers (cSSPs) and micro, small, and medium enterprises (MSMEs) in the hidden middle of the agrifood value chain. It examines how these actors contribute to inclusive agricultural transformation through the following questions:

1. What kickstarts the dynamic of commercialization of SSPs and engagement with MSMEs in the hidden middle? How do some SSPs become commercial, how do some MSMEs get started, and how these two actors co-develop and nurture each other?
2. Which, how and why do some cSSPs and some MSMEs move along in the transformation process, while others don't?
3. To what degree does increasing commercialization and development of MSMEs translate into poverty reduction and women's economic empowerment? Who is included, and who doesn't get included or gets stuck at low levels of inclusion? How does inclusion accelerate the transformation?
4. What investments and policies have the potential to accelerate the symbiotic co-development of cSSPs and MSMEs and the inclusion effects of that dynamic?

These overarching questions are addressed by assessing the following aspects of the tomato value chain (VC):

a) Structure: What is the structure and growth of the VC (and its segments), with variation over differentiated zones/clusters?
   i. What is the spatial distribution (such as into production and consumption zones) of the VC segments, how has this changed over time and what are the drivers of this change?
   ii. Inclusion: What is the size and gender and age distribution over farms and firms in the VC segments and what accounts for these (such as distance from roads and cluster characteristics)?

b) Conduct: What is the commercial conduct of the various segments of the VC and what are its correlates?
   i. What is the structural pattern of intermediation of purchases and sales per segment actor, and what are their correlates/drivers? What do the results imply about disintermediation and use of third-party logistics (3PLS)?
   ii. What are the extra-intermediation relational patterns in transactions in purchases and sales among the segment actors, and what are their correlates/drivers? What are symbiotic behaviors such as advances, payment timing, information sharing, relational/regulation relations, and arrangement of logistics?
   iii. What are the technological correlates with the structural variables above (size, inclusion in the form of age and gender, and spatiality such as infrastructure access) and conduct variables (symbiotic relations and commercial behavior such as use of 3PLS and disintermediation), with technologies (of all segments, varieties) of interest such as fertilizer/pesticide/seed-led intensification and new varieties, irrigation use, and non-farming technology use such as digital, and credit.

c) Meta-conditioners of the above, which include 1) state investments like road/night lights; 2) non-state conditioners like conflict; 3) state and non-state variation over space and time in governance at municipal and state level; 4) resources variation: land quality, water access (lakes, rivers, not individual irrigation which is a technology).

1.1.1 Overview of the tomato value chain in Kenya

The horticulture sector is a vital component of Kenya's economy, contributing approximately 36% of the agricultural GDP. Production covers roughly 417,000 hectares, primarily managed by small-scale producers who are commercially oriented. This sector is considered to have immense potential for job creation and the improvement of household incomes. While production is largely driven by the private sector with support from civil society and development partners, the government's role is primarily restricted to policy and regulation. However, this oversight is mostly focused on the export market, leaving the domestic horticulture market largely informal with minimal regulatory enforcement.

Most of the horticultural production—about 95%—is sold within the domestic market. Of the total export value, flowers account for 72%, vegetables for 16%, and fruits for 12%. In terms of the total value of all horticultural production, flowers lead with about 38%, followed by fruits at 31% and exotic vegetables at 25% (Figure 1.1).

Figure 1.1: Share of crops in total value of horticulture production

Vegetables represent the largest share of domestically consumed horticulture, accounting for 46% of total quantity and over 31% of the total value of production. Within the exotic vegetable category, tomatoes are the dominant crop, representing 29% of the total production value. The tomato industry has seen a massive expansion between 1980 and 2022; consumption increased five-fold (from 3.5 to 16 kg per capita per year), while production rose twelve-fold, growing from 55,000 to over 600,000 tons. Despite this high domestic volume, international trade is negligible, with imports and exports making up only 2% of the output in 2022. Driven by strong domestic demand, tomatoes are the third largest in the fruit & vegetables category by production volume (TechnoServe, 2023).

We observe a general increasing trend in tomato production and consumption in Kenya during the last decade with a significant leap in 2020 (Figure 1.2).

Figure 1.2: Tomato supply and consumption in Kenya over time

Source: East African Data Portal, Food balance sheet, May 8, 2024

The key tomato producing areas in Kenya are as shown in Table 1.1, though current volumes indicate Kirinyaga, Kajiado, and Taita Taveta as the leading production areas.

Table 1.1: Tomato production, by county

County	Area (Ha)				Volume (MT)				% of total volume (2023)
	2020	**2021**	**2022**	**2023**	**2020**	**2021**	**2022**	**2023**	
Taita Taveta	3,515	3,546	2,358	2,369	71,077	104,028	69,177	59,258	11%
Machakos	2,022	2,641	2,953	4,043	21,407	29,932	31,568	48,639	9%
Kirinyaga	3,157	2,935	2,604	2,485	64,038	116,341	77,510	63,362	12%
Homa Bay	716	551	585	2,430	15,560	8,073	7,509	35,702	7%
Kajiado	3,033	1,681	1,740	1,790	62,510	32,330	31,910	34,100	6%
Baringo	0	0	0	1,220	0	0	0	35,268	7%
Trans Nzoia	762	785	938	1,002	14,149	19,463	24,735	25,271	5%
Narok	1,701	2,226	1,866	1,232	31,855	39,484	69,765	27,895	5%
Meru	549	626	537	623	14,632	18,877	16,547	19,277	4%
Laikipia	626	543	410	510	20,425	14,130	9,490	11,522	2%
Nakuru	549	328	362	448	19,821	10,612	10,499	11,601	2%
Siaya	1,227	1,741	1,954	1,797	13,496	26,932	27,491	10,936	2%
Kiambu	874	771	671	700	19,955	19,781	18,578	12,088	2%
Kitui	956	967	734	790	25,085	26,900	12,150	15,802	3%
Murang'a	1,330	1,392	1,355	1,349	27,543	31,795	31,442	10,252	2%
Others	10,470	10,149	9,265	7,893	551,752	187,989	178,246	115,848	22%
Total	31,487	30,882	28,331	30,681	973,305	686,667	616,617	536,821	100%

Source: Agriculture and Food Authority, 2024 Yearbook of Statistics

2 Methods/sampling for all segments micro, meso, and markets

2.1 Wholesale Markets

2.1.1 Sampling of wholesale markets

We used a multistage approach to identify wholesale markets (WMs) in the study areas. First, a rapid reconnaissance survey was conducted in 2024 during which the key tomato production and consumption areas, and the counties in which they are located, were identified. Tomatoes are mainly produced in the counties of Nakuru, Baringo, Kajiado, Narok, Machakos, Embu, Taita Taveta, Laikipia and Kirinyaga. Consumption areas comprise cities/towns in the counties of Uasin Gishu, Kisumu, Kisii, Busia, Mombasa, Kilifi and Nairobi, and some of the production areas. WMs

are found in both the production and consumption areas.

Next, the list of the wholesale markets was identified through a meso inventory process. The first step involved the research team visiting each county/city's largest/major tomato wholesale market which was identified during the rapid reconnaissance. The team then assembled key informants at the market for a group discussion. The key informants were selected to include representation from each category of actors in the market (i.e. market management committees, tomato wholesalers, brokers, transporters and loaders/off-loaders). The first ask to the key informants was for them to list all markets that had tomato wholesaling taking place in the county at different points in time (*now, 5 years ago* and *10 years ago*) and the reasons for the changes. They were asked to list both structured and unstructured (roadside) markets where any tomato wholesaling was taking place. After the listing of the wholesale markets, the key informants were asked to provide the number of urban traders (wholesalers, market-based brokers, farmer cum wholesalers[1]), transporters, and loaders/off-loaders in the main county/city's largest/major tomato wholesale market *now, 5 years ago* and *10 years ago*, by category of sizes where applicable.

After completing the group discussion in the main wholesale market in the county/city, the research team visited all the other listed wholesale markets and engaged with the key informants to validate the list of wholesale markets obtained from the main market and inquire about other markets that may have been missed out. This iterative process was continued in each market until no new markets were identified.

The inventory identified 236 tomato wholesale markets across 36 Kenyan counties. Market surveys followed in 234 of these due to logistical and access challenges in two markets: one had closed by the time the team returned for the survey, and in the second, respondents refused to be interviewed.

2.1.2 Survey method for the wholesale market survey

Data were collected through structured focus group discussions in each market. Focus groups were composed of stakeholders with extensive knowledge of market organization and history, including market committee members (e.g., chairpersons, treasurers), product/sector-level leaders (e.g., chairpersons of tomatoes and fish associations), long-established traders (both wholesalers and retailers), who included women and youth representatives. Data were collected by research assistants and enumerators using the SurveyCTO platform on tablets. The questionnaire captured information on market governance, operations & fees, management structures, infrastructure/facilities and location characteristics (rural or urban, and proximity to towns) trader composition & associations, seasonality in businesses, transport logistics, supporting services, and waste disposal.

[1] Farmer cum wholesaler sells own produced tomato in wholesale market; market-based brokers are traders sell on behalf of wholesalers at the wholesale market on commission.

2.2 Meso – production zone and consumption zone clusters

2.2.1 Sampling of meso production zone and consumption zone clusters

The areas for the meso study for the tomato VC were selected based on a rapid reconnaissance (RR) conducted in 2024, which identified production and consumption areas and the counties in which they are located. Production areas span the counties of Nakuru, Baringo, Kajiado, Narok, Machakos, Embu, Taita Taveta, Laikipia and Kirinyaga. The importance of these areas was confirmed by crosschecks with official statistics and key informant interviews with County Agriculture Officers. On this basis, three production zones or clusters were identified in the North, South and East (Table 2.1) and are shown as Clusters 1, 2 and 3, respectively in Figure 2.1.

Table 2.1: Production zones and sampled counties

Zone	Counties
North	Narok, Nakuru, Baringo, Laikipia
East	Mwea, Embu, Machakos
South	Kajiado, Taita Taveta

Source: Study Survey, 2024/25.

Figure 2.1: Tomato Production and Consumption Zones

Source: Study Survey, 2024/25

The key tomato consumption areas comprise major cities/towns across various counties, including the production areas. Three consumption zones were identified as *Consumption Primary, Consumption Secondary,* and *Consumption Other* as shown in Table 2.2.

Table 2.2: Consumption zones and sampled counties

Zone	Counties/Cities
Consumption Primary	Nairobi Metropolitan (Nairobi, Kiambu, Machakos and Kajiado)
Consumption Secondary	Nakuru, Eldoret, Kisumu, Mombasa
Consumption Other	Nandi, Kericho, Kilifi, Bomet, Nyamira, Kisii, Homa Bay, Migori, Trans-Nzoia, Bungoma, Kakamega, Vihiga, Siaya, Busia

The zones were grouped as follows: (a) Consumption primary: these are markets within the Nairobi metropolitan covering Nairobi, Kiambu, Machakos and Kajiado counties; (b) consumption secondary: these are markets located in various cities in Kenya: Nakuru, Kisumu, Mombasa and Eldoret; (c) Consumption Other: these are markets located in other towns in various counties that don't fall under a) and b) above.

The meso inventory was undertaken for most of the tomato VC actors as shown in Table 2.3.

Table 2.3: Actor type and main characteristics

Actor	Defining characteristic	Size category	Definition
Input suppliers (of seeds & agro-chemicals)	Level of operation	Small	Retailing only
		Medium	Retailing & wholesaling
		Large	Wholesaling only

Input suppliers (of seedlings)	Propagation and sale of tomato seedlings	Large Medium Small	Selling seedlings to farmers
Farmers	Total area of tomato production	Small	5 acres or less
		Medium	6-10 acres
		Large	>10 acres
Urban traders	Volume of tomato consignment handled in market at a time	Small	Probox load or less
		Medium	From canter load up to one lorry load
		Large	More than one lorry load
Transporters	Type/ number of transport vehicles	Micro	Bodaboda (motorcycle or bicycle)
		Small	Probox
		Medium	Canter or one lorry
		Large	More than one lorry
Processors			

Inventory of farmers, rural traders, farm-based graders, and input suppliers

The inventory of farmers, rural traders (i.e. farm-based brokers), farm-based graders, and input suppliers was collected through group discussions with key informants drawn from all tomato-producing villages in the Wards in each production County. The Wards where tomato production takes place in each county were identified during the RR and re-confirmed with the Ward Agricultural Officers (WAOs). Further, the villages where tomatoes are grown and where the group of key informants was selected from were identified with the help of the WAOs. The key informants included knowledgeable farmers (farmers with long experience in tomato farming), rural traders, members of water management committees (in irrigation schemes) and WAOs. Rural traders served as key informants due to their close ties with most tomato farmers in various villages and their function of either brokering sales to buyers or purchasing produce on-site directly from farmers.

Depending on the number of tomato-producing villages in a Ward, three to five farmers, one to three rural traders, one to two representatives from the water management committee (in irrigation schemes) and a Ward Agricultural Officer, were selected to join the group discussion as key informants.

The interview process for the meso inventory involved the following steps:

- First, the group of key informants was asked to state the number of farmers currently producing tomatoes (i.e. in the 2024 production year).
- Then, they were asked to categorize the farmers that are currently producing tomatoes by land size under tomato production. The categories agreed upon in the groups were as follows:
    - Small scale: 5 acres and less

    - Medium scale: 6–10 acres
    - Large scale: more than 10 acres
- The key informants were then asked to state the number of farmers that were producing tomatoes *5 years ago* and then *10 years ago*, in that order, by the above agreed upon categories.
- The group then discussed the reasons for the changes in the numbers of farmers over the years: *now, 5 years ago* and *10 years ago*.
- Next, the group discussed and provided information on the number of rural traders, farm-based graders and input suppliers, *now, 5 years ago* and *10 years ago,* and the reasons for the observed trends.
    - Input suppliers (of seeds & agro-chemicals) were categorized based on their level of operation: small (retailing only); medium (retailing and wholesaling); and large (wholesaling only)

Inventory of urban traders, transporters, and loaders/off-loaders

The inventory of these actors was done at the same time as that for the wholesale markets. For each of the identified markets, the group of key informants (that included representation from each category of actors in the market i.e. market management committees, wholesalers, brokers, transporters and loaders/off-loaders) was asked to provide the number of traders, transporters, and loaders/off-loaders in the markets *now, 5 years ago and 10 years ago*, by category of sizes where applicable, and explain the reasons for the changes in numbers over time.

The wholesalers were categorized based on the volume of tomato consignment they handled in the market at a time as follows:

- Small: Probox-load or less
- Medium: Canter-load to one lorry-load
- Large: Above one lorry load

Transporters were categorized based on the type and number of transport vehicles operated as follows:

- Micro: bodaboda (motorcycle or bicycle)
- Small: Probox
- Medium: Canter to one lorry load
- Large: More than one lorry load

Inventory of processors

The number of processors *now, 5 years ago* and *10 years ago,* was obtained through the group discussions with the key informants involving wholesalers, and through key informant interviews with County Agriculture officials, including WAOs, County Agribusiness Officers and Chief Officers in the agriculture departments. Key informant interviews covered questions on tomato processors that may have shut down over the years.

2.2.2 Survey method for the meso inventory survey

The inventory form (an excel sheet) captured the structure of each VC segment over time (i.e. number and size distribution of firms and farms in each VC segment, *now*, *5 years ago* and *10 years ago*) and the reasons for the change.

2.3 Micro level segments

2.3.1 Sampling of meso production zone and consumption zone clusters

Sampling for micro level segments of the VC for the stacked surveys was preceded and informed by the rapid reconnaissance (RR) and meso inventory processes. During the RR, the key tomato production and consumption areas, and the counties in which they are located, were identified. Tomatoes are mainly produced in the counties of Nakuru, Baringo, Kajiado, Narok, Machakos, Embu, Taita Taveta, Laikipia and Kirinyaga. Consumption areas, where tomato wholesale markets comprise of the major cities/towns in the counties of Uasin Gishu, Kisumu, Kisii, Busia, Mombasa, Kilifi and Nairobi, and some of the production areas. The importance of these production and consumption areas was confirmed by crosschecks with official statistics and key informant interviews with County Agriculture Officers.

On this basis, three production (North, South and East) and consumption (Consumption primary, Consumption Secondary, Consumption Other) zones were identified (see Table 2.1 and 2.2) and are shown as Clusters 1, 2 and 3, respectively in Figure 2.1.

The meso inventory process was key in identifying the lists of wholesale markets; the lists of, and the structure and growth of key actors in the main segments of the tomato VC over a period of 10 years (2014-2024). These lists and the identified production and consumption zones formed the basis for sampling for the stacked surveys as explained for each segment in the subsequent section.

Wholesale traders

Sampling of tomato wholesale traders for the stacked survey followed several steps. First, traders were divided into two groups; urban traders located in the universe of 234 markets with tomato wholesaling in 36 tomato producing and consuming counties, and rural traders located in 9 tomato producing counties. The sample size for urban traders was purposively set at 800 and that for rural traders at 100.

Urban traders

First, a listing was conducted of all urban tomato wholesale traders in the universe of 234 markets with tomato wholesaling across 37 counties[2], generating a population of 3,687 tomato wholesale traders. Counties with at least 2% of the total wholesale traders were then selected, resulting in 22 counties that accounted for 86% of wholesale traders. From these, a target sample of 800 wholesale

[2] The study excluded counties in the north and east (primarily pastoral) mainly because of insecurity concerns and because there is little tomato farming in those areas.

traders was proportionally allocated across the counties. Within each county, the sample was further distributed among the three markets with the highest number of wholesale traders to avoid excessive dispersion. This approach yielded 65 markets containing 1,802 wholesale traders, representing 49% of the total. Finally, tomato wholesale traders were randomly selected within each market, with sample sizes ranging from 4 to 47 per market.

Rural traders
Sampling of rural traders was carried out in wards selected for the household survey within tomato-producing counties. This approach was suitable because rural traders, often referred to as brokers, operate in production areas and link farmers to urban markets. A comprehensive listing exercise undertaken in 15 wards across seven counties identified a total of 291 rural traders. From this sampling frame, 100 traders were selected for inclusion in the study. Allocation of the sample across wards was proportional to the number of traders identified in each ward. Traders were randomly selected from the ward-level lists, with sample sizes ranging from 2 to 19 traders per ward.

Farmers

First, nine major production counties were identified, and within each county, key production areas (sub-counties/wards) were mapped during the rapid reconnaissance and meso inventory. Based on these data, production areas were purposively selected using the following criteria:

i. Cradle areas: The first, second, and third cradle areas where tomato production initially began before spreading to other regions in Kenya.
ii. Second-wave areas around the cradles: These are regions where tomato farming expanded outward from the initial cradles. Selection was guided by three factors:
    - Frequency of mention as a tomato source in urban markets during reconnaissance.
    - Estimated number of farmers from the meso inventory.
    - Distribution of farm sizes, with priority given to areas having more medium- and large-scale farmers, since their overall numbers were relatively small.
iii. Emerging areas in the southeast of Nairobi (Kajiado and Taita Taveta counties): These regions have seen recent expansion due to factors such as land availability, access to water extraction and irrigation technologies, and improved road infrastructure.

Based on these criteria, a comprehensive listing of tomato farmers was conducted in the selected areas, resulting in 3,019 farmers: 2,523 small-scale farmers (≤ 5 acres) and 496 medium & large-scale farmers (> 5 acres) spread across nine counties and 28 administrative wards.

Using a proportionate-to-size approach, the predetermined sample of 900 farmers was allocated across the 26 wards. Within each ward, the sample was further proportionally divided between small-scale and medium/large-scale farmers. Finally, random sampling was applied within each category in each ward, yielding a total of 753 small-scale farmers and 147 medium & large-scale

farmers.

Input suppliers

Sampling of tomato input suppliers proceeded as follows. First, a comprehensive listing of all input suppliers in the identified tomato production areas (sub-counties/wards) across the nine major production counties was conducted. These suppliers included agrovet (small input shops selling mainly chemicals, feed, and seeds) businesses and tomato seedling propagators/sellers. This exercise resulted in a list of 470 agrovets and 19 propagators. In addition, a separate listing was done for tomato seedling propagators located outside the main production areas, yielding 9 propagators. The identification of the input suppliers relied on information gathered during the rapid reconnaissance and meso inventory, complemented by snowballing through farmers and rural traders. From these lists, a sample of 400 agrovets and 15 propagators was randomly selected for the stacked survey.

2.3.2 Survey method for the micro level segment

Questionnaires were used to conduct face-to-face individual interviews with the selected micro-segment actors. The questionnaires were used to gather extensive and multi-dimensional data, ranging from the general characteristics of the actor to the structural characteristics of their business and the specific mechanics of their most recent transactions.

The questionnaires gathered data on the individuals and their businesses to understand who is participating in the tomato VC. This includes demographics, professional history (what actor did before entering the specific node and their motivations for this) and formality. Further, the survey focused on assets as tools of the trade and how businesses are funded. These include physical assets, capital and credit, and human resources. Another section of the questionnaire investigated the actor's broader business model outside of individual sales, comprising diversification, seasonality, and growth outlook. The survey detailed how actors acquire their stock, focusing on supplier details, logistics involved and transaction mechanics (price paid, payment forms and the timing of payment). Finally, the questionnaire looked at the output side of the business including product attributes, buyer profiles, and value-added services.

2.4 Ethics and informed consent

Ethical approval for the Tegemeo (Kenya) study was obtained from the Egerton University Institutional Scientific and Ethics Review Committee (EUISERC) (Approval No. EUISERC/APP/379/2025, dated 16 January 2025; application approval number EUISERC/APP/379/2024). In addition, a national research license was issued by Kenya's National Commission for Science, Technology and Innovation (NACOSTI) (License No. NACOSTI/P/25/416061; Ref No. 413802; date of issue 14 February 2025), authorizing Egerton University to conduct the research in the approved counties through 14 February 2026.

Informed consent was obtained from all participants prior to participation. Consent was obtained verbally, as approved by the ethics committee, and was documented by the study team at the time

of data collection. Participation was voluntary, participants could decline to answer any question or stop at any time, and all data were handled confidentially and analyzed in de-identified form.

3 Results: Wholesale markets

3.1 Structure: Spatial distribution, growth, and inclusion

3.1.1 Market characteristics

Results from Table 3.1 show that wholesale tomato markets are characterized by significant longevity, increasing operational intensity, and more pan-seasonal.

Table 3.1: Market characteristics

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption zones**	**Total**
Market activity/age									
Age of the market	33.7	50.8	51.9	48.5	33.7	34.2	43.3	40.9	43.5
Market has operated for less than 5 years (%)	0	8.3	0	4.7	0	0	4.4	3.3	3.7
Market has operated for 5> years but < 10 years (%)	40.0	0	5.6	7.8	10.5	23.1	7.7	9.8	9
Market was operating during low season 5 years ago (i.e. some tomato was delivered) (%)	90.0	93.8	94.7	93.5	87.0	72.2	88.9	86.4	89.3
Market was operating during low season 105 years ago (i.e. some tomato was delivered) (%)	60.0	92.2	89.5	88.2	*78.3*	72.2	76.8	76.4	81.1
Seasonality/days/hours									
Number of months the market operates now (mean)	6.6	7.0	8.8	7.4	8.0	8.6	7.6	7.8	7.6
Number of days a week the	5.8	6.1	6.1	6.1	7.0	5.5	6.0	6.1	6.1

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption zones**	**Total**
market operates now.(mean)									
Number of days a week the market operated 5 years ago (mean)	6.3	6.0	6.2	6.1	7.0	5.2	5.9	6.0	6.0
Number of days a week the market operated 10 years ago (mean)	7.0	6.0	6.1	6.1	6.3	5.5	5.8	5.8	5.9
Number of hours a day the market operates now (mean)									
Markets with flexible opening hours (%)	50.0	3.1	42.1	50.5	52.2	22.2	58.6	52.9	51.9
Markets with flexible closing hours (%)	70.0	50.0	42.1	50.5	60.9	44.4	58.6	57.1	54.5
Number of hours a day the market operated 5 years ago (mean)	14.7	14.2	14.2	14.3	14.6	13.0	14.3	14.1	14.2
Number of hours a day the market operated 5 years ago (mean)	15.1	15.4	18.0	16.0	14.4	13.6	14.4	14.3	15.0
Number of hours a day the market operated 10 years ago (mean)	15.0	15.5	18.4	16.1	13.3	13.3	14.1	13.8	14.8

The mean age of the markets is 43.5 years, with those in the Production South being older (51.9 years) than those in the Production North (33.7 years) and Consumption Primary (33.7 years) zones. However, there is significant variation in market age. 3.7% of all markets have operated for less than five years, and 9.1% have operated for between five and ten years. Notably, 40% of markets in the Production North cluster were established between five and ten years ago, indicating a recent surge in market activity in that region.

Markets were established through various means: by government (46%), entrepreneurs (10%), local communities (7%), by formalizing pre-existing markets (38%), splitting from original

markets (6%), or relocating to new sites (5%). The dominant role by the Government highlights heavy public sector involvement in market infrastructure.

The data show a trend toward markets becoming “pan-seasonal” - more active during the "low season" (periods of lower tomato delivery) over the last decade, with 81.1% of markets operating during the low season 10 years ago compared to 89.3% five years ago. Production South stands out for its pan-seasonality, with 89.5% of markets operating during the low season a decade ago, and a current mean operation of 8.8 months per year, the highest among all clusters.

Markets in Consumption Primary are the most active, operating 7 days a week while those in Consumption Secondary have the lowest weekly frequency at 5.5 days. However, over time, markets have shown a small increase in the days they operate per week, from 5.9 days ten years ago to 6.1 days currently. For markets that are not open 24/7, the mean daily operating hours have increased slightly from 14.8 hours ten years ago to 15.0 hours five years ago. Markets in the Production South cluster operate the longest daily hours, averaging 18.4 hours ten years ago. Approximately 51.9% of markets have flexible opening hours, and 54.5% have flexible closing hours. Flexibility is highest in the Production North (70% flexible closing) and lowest in the Secondary Consumption zones (22.2% flexible opening).

Across all markets surveyed, the average quantity of products delivered on a typical day is 39.1 tons during the high season and 16.1 tons during the low season (Table 3.2). Primary Consumption Zones handle the highest daily volumes by far, averaging 72.8 tons in the high season and 32.3 tons in the low season.

Table 3.2: Volume of product delivered on a typical day

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	All Consumption Zones	**Total**
N	10	64	19	93	23	18	95	136	229
Quantity (kg) delivered in a typical day in tons (high season)	22.3	33.9	18.3	29.4	72.8	42.9	39.6	45.7	39.1
Quantity (kg) delivered in a typical day in tons (low season)	11.4	11.4	7	10.5	32.3	18.7	17.2	20	16.1

% growth in daily quantity delivered (high season, 5 years)	0.6	1.5	1.8	1.5	0.6	1	2.8	2.2	1.9
% growth in daily quantity delivered (low season, 5 years)	0	1.8	2.1	1.7	0.5	0.9	1.3	1.2	1.4
% growth in daily quantity delivered (high season, 10 years) (mean)	0.9	5.6	6.7	5.5	2.3	1.3	4.3	3.6	4.4
% growth in daily quantity delivered (low season, 10 years)	0.1	4.6	6.7	4.7	1.3	2.4	2.4	2.2	3.3

Over the past decade, wholesale markets have seen steady increases in daily tomato delivery volumes, with low-season growth consistently trailing high-season gains—though both periods exhibit positive long-term trends. Short-term growth rates were 1.4% (low season) vs. 1.9% (high season), while long-term rates reached 3.3% (low) vs. 4.4% (high).

3.1.2 Tomato wholesalers

The distribution of tomato wholesalers is divided into production and consumption zones. As of 2025, the density of wholesalers is higher in production zones than in consumption zones. Production and consumption zones have a mean of 39.6 and 23.6 wholesalers per market, respectively (Table 3.3; Figure 3.1). Production East has the highest concentration, with an average of 46.9 wholesalers per market, while Consumption Primary leads this category with 29.3 wholesalers. This is expected since Production East comprises key production counties that have several major towns where wholesalers are found and Consumption Primary covers key consumption areas within the Nairobi Metropolitan with a higher number of markets and hence wholesalers.

Table 3.3: Number and share of wholesalers

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption Zones**	**Total**
Number of tomato wholesalers in the market in 2025	25.7	46.9	22	39.6	29.3	26.4	21.7	23.6	30.1
Share of tomato wholesalers in all wholesalers in 2025	42.8	51.5	52.7	50.8	65	49.7	30.1	38.6	43.6
Number of tomato wholesalers in the market in 2020	21.1	42.5	16.2	35.1	73.4	22.2	15.5	26.3	30
Share of tomato wholesalers in all wholesalers in 2020	61.4	53.6	48.6	53.3	61.1	29.7	30.1	35.5	43
Number of tomato wholesalers in the	17.1	28.7	14.1	24.8	59.5	14.3	12.3	20.9	22.5

market in 2015									
Share of tomato wholesalers in all wholesalers in 2015	43	35.5	39.1	36.8	44.5	23.8	26.1	29.1	32.4
% growth in the number of tomato wholesalers over the past 5 years	41.2	78.9	122.6	84.9	57.8	154	123.5	114.1	101.6
% growth in the number of tomato wholesalers over the past 10 years	230.5	162.4	271	196.6	108.8	368.7	223.3	220	210.8
Number of observations	10	64	19	93	23	18	95	136	229

Figure 3.1: Spatial distribution of wholesalers

Participation in the wholesale segment has grown dramatically over the past decade, with the total mean number of tomato wholesalers across all zones growing from 22.5 in 2015 to 30.1 in 2025. Over the past 10 years, the number of tomato wholesalers has seen a mean growth of 210.8%, with the most rapid growth occurring in Consumption Secondary (368.7%) and Production South (271.0%) zones and lowest in Consumption Primary (Figure 3.2). The share of tomato wholesalers compared to all wholesalers in the markets has also increased, rising from a total of 32.4% in 2015 to 43.6% in 2025 (Figure 3.1).

Figure 3.2: Growth in number of tomato wholesalers (2010-2025)

3.1.3 Tomato retailers

As of 2025, the average number of tomato retailers per market is notably higher in production areas, with a mean of 245 retailers per market compared to 182.4 in consumption zones. Production

East has the highest concentration with 269.2 retailers per market, while Consumption Secondary markets have significantly fewer retailers at 93.1 (Table 3.4; Figure 3.3).

Table 3.4: Number and share of tomato retailers

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption Zones**	**Total**
Number of tomato retailers in the market in 2025	124.6	269.2	220.7	245	205.9	93.1	193.7	182.4	207.8
Share of tomato retailers in all retailers in 2025	32.6	54.3	65.6	54.5	26.5	37	30.2	30.5	40.2
Number of tomato retailers in the market in 2020	119.7	186.3	174.1	177.9	272.7	56.8	130	145.2	158.6
Share of tomato retailers in all retailers in 2020	29.7	43.9	56.8	45.4	26.9	34.3	26	27.2	34.7
Number of tomato retailers in the market in 2015	106.6	134.7	147	135.1	233.8	73.2	92.3	115.1	123.5
Share of tomato retailers in all retailers in 2015	21.7	33.6	49.5	36	28.9	29.6	24.5	25.9	30.1
% growth in the number of tomato retailers over the past 5 years	26	85.5	72.2	77.2	40.5	205.4	109.6	109.5	96.1
% growth in the number of tomato retailers	176.9	751.4	225.7	581.6	158	228.4	292.4	261	389.2

over the past 10 year									
Number of observations	10	64	19	93	23	18	95	136	229

Figure 3.3: Number and share of retailers (2015-2025)

The tomato retail segment has also seen a massive expansion in both absolute numbers and its relative share of the market over the past decade. The total mean number of tomato retailers across all markets grew from 123.5 in 2015 to 207.8 in 2025, while the mean growth in the number of tomato retailers over the past 10 years is 389.2%. The highest growth occurred in the Production East zone, which saw a mean 10-year growth of 751.4% (WM Figure 3.3). The share of tomato retailers compared to all retailers in a market increased from a total mean of 30.1% in 2015 to 40.2% in 2025. By 2025, tomato retailers reached a dominant share of 65.6% in Production South markets and 54.3% in Production East.

3.1.4 Inclusion of women

Results indicate that women are central to the tomato value chain, although their participation levels vary by the specific role they play in the market. As of 2025, retailing is the most female-dominated segment, with women making up a total mean of 81.1% of all retailers (Table 3.5 and Figure 3.4). Further, women represent a significant majority of wholesalers, with a total mean participation of 66.2%. For the farmer-wholesalers segment, participation is almost equally split between men and women, with a total mean of 49.9% being female.

Table 3.5: Female participation in tomato wholesaling and retailing

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption Zones**	**Total**
% of female wholesalers in the market	76.2	62.6	31.4	57.7	49.3	67.4	78.5	72.1	66.2
% of female retailers in the market	75.1	81.9	72.7	79.3	76.4	78.5	84.3	82.3	81.1
% of female farmer-wholesalers in the market	70.8	46.1	14.8	42.7	37.7	53.3	60.3	55.3	49.9
% change in female wholesalers (5 years)	1	5.1	9.9	5.7	4.5	4.7	-0.5	1	2.9
% change in female retailers (5 years)	4.6	0.2	3	0.4	1.2	-2.5	0.7	0.4	0.4
% change in female farmer-wholesalers (5 years)	3.6	2.2	4.4	2.8	0.6	-0.4	-0.9	-0.6	0.9
% change in female wholesalers (10 years)	-0.8	10.4	13.2	10.2	7	1	2.1	2.8	5.9
% change in female retailers (10 years)	6.7	0.9	6.4	(1.6	2.2	-0.5	0.6	0.7	1.1

% change in female farmer-wholesalers (10 years)	6.7	4.2	6.9	4.9	-4.2	-1.2	-1.4	1.9	1.1
Number of observations	10	64	19	93	23	18	95	136	229

Figure 3.4: Percentage of women in wholesale and retail segments

There are stark differences in gender participation across the production and consumption zones. The highest concentration of female wholesalers is found in the Consumption Other zone (78.5%) and Production North (76.2%). Female retail participation is also highest in the Consumption Other zone at 84.3%. The Production South stands out for having the lowest female participation in the wholesale and farmer-wholesale roles. In this region, women make up only 31.4% of wholesalers and just 14.8% of farmer-wholesalers. However, female participation in retailing in this zone remains relatively high at 72.7%. The Production North area has the highest percentage of female farmer-wholesalers at 70.8%, which is significantly higher than any other cluster.

Further, results show that the gender composition of these roles has shifted over the last decade, with female participation growing more rapidly in the wholesale segment; the share of female wholesalers grew by a mean of 5.9% over the last 10 years, particularly in the Production South (+13.2%) and Production East (+10.4%) zones (Figure 3.5). On the other hand, the gender balance in the retail segment has been more stable, showing a mean growth of only 1.1% over 10 years. Notably, the share of female retailers decreased by 5.7% in the Production North cluster during this period.

Figure 3.5: Percentage growth in number of female traders over the past 10 years

3.2 Conduct: Governance and services

3.2.1 Infrastructure in the markets

Wholesale markets exhibit heterogeneous infrastructure access and quality across key amenities (sanitation, water, electricity, security), with some clusters well-equipped and others facing critical gaps. High levels of security and electrical connectivity coexist with a critical, widespread deficit in basic sanitation and significant regional disparities in water access (Table 3.6). Electricity is relatively widespread and reliable in the markets where it is available. On average, 79.5% of markets are connected to the electrical grid, and in markets with electricity, it is available for an average of 22.2 hours per day. Markets in the Production South and Consumption Secondary zones report the highest reliability, averaging 24 hours of electricity per day.

Table 3.6: Market infrastructure

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption Zones**	**Total**
Market has improved	0.5	0.6	0.4	0.5	0.8	0.7	0.6	0.7	0.6

flush/pour-flush toilets (%)									
Market has hand wash stations near toilets (%)	0.7	0.6	0.6	0.6	0.9	0.9	0.7	0.8	0.7
Trader toilet ratio in the market	153.6	139.1	103.5	132.8	186.6	94	152.5	150.1	142.9
Market has no water (%)	20	18.8	57.9	26.9	4.3	27.8	31	26.2	26.5
Market has pipe borne water (%)	70	78.1	42.1	69.9	73.9	44.4	54	56	61.5
Market has electricity from the grid (%)	50	82.8	94.7	81.7	78.3	77.8	78	78	79.5
Average hrs./ day market has electricity (conditional mean)	21.6	20.8	24	21.6	23.3	24	22.2	22.6	22.2
Market has security (%)	60	95.3	100	92.5	95.7	88.9	94	93.6	93.2

The most severe infrastructure deficit is the near-total lack of improved sanitation and hygiene facilities. Although 87% of markets have toilets, only 0.6% have improved flush or pour-flush toilets; only 0.7% have hand wash stations near toilets and the trader-to-toilet ratio is 143 which signals severe sanitation inadequacy.

Water access disparities also exist. While pipe-borne water is available in 61.5% of markets, water access remains a significant secondary challenge due to regional disparities. About 26.5% of all markets have no water access at all, and this challenge is most acute in the Production South zone, where more than half of the markets (57.9%) report having no water access.

Security is nearly universal: with a total mean of 93.2%, security is the most accessible service across all clusters. It is particularly robust in the Production South cluster, where 100% of markets have security.

Regional disparities exist, with consumption regions consistently having better infrastructure than production regions across all indicators (Figure 3.6). Primary Consumption (Nairobi Metropolitan) leads in almost every category. Production regions lag significantly, especially in sanitation (toilets, handwash stations) and electricity with Production South with poorest infrastructure. Improved toilets and good sanitary infrastructure are markedly better in consumption zones.

Figure 3.6: Access to market infrastructure

3.2.2 Market governance

Overall, the governance and management of wholesale tomato markets are characterized by a dual-authority structure, specific entry requirements for wholesalers, and significant regional variation in trader costs (Table 3.7).

Table 3.7: Market governance

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption Zones**	**Total**
Who is responsible for the management of the market?									
Market authority/committee (%)	60	84.4	84.2	81.7	91.3	38.9	66.7	67.1	73
City/Municipality/county (%)	100	68.8	42.1	67.7	70	88.9	75.8	76.4	73
Governance Structure									
Market authority only (%)	0	21.9	42.1	23.6	30.4	5.6	11.1	13.6	17.6
Market authority & city/municipality/county (%)	60	62.5	42.1	58.1	60.8	33.3	55.6	53.6	55.4
city/municipality/county only (%)	40	6.3	0	8.6	8.7	55.6	20.2	22.9	17.2
Who decides if a wholesaler can trade in this market?									
City/Municipality/county (%)	10	32.8	5.3	24.7	30.4	27.8	24	25.6	25.2
Market authority/committee (%)	20	54.7	36.8	47.3	56.5	16.7	45	43.3	44.9
Trader association	0	4.7	10.5	5.4	30.4	11.1	6	10.6	8.5
Other	0	0	0	0	0	0	2	1.4	0.9
What are the requirements for trading in the market									
Join waiting list	0	1.6	0	1.1	0	0	0	0	0.4
Be recommended by existing member	0	3.1	0	2.2	13	0	0	2.8	2.6
Pay association membership fee	0	7.8	5.3	6.5	17.4	0	19	16.3	12.4
Purchase stall/space in market	20	46.9	0	34.4	21.7	22.2	29	27	30
Purchase trade license	0	0	0	0	4.3	0	3	2.8	1.7
New entrants not allowed	0	0	0	0	21.7	5.6	2	5.7	3.4
Approval by market managers/committee	10	9.4	10.5	9.7	8.7	5.6	13	11.3	10.7
Allocated	0	1.6	0	1.1	0	0	3	2.1	1.7
Approval by county government	0	0	0	0	0	5.6	1	1.4	0.9
Pay county/market fees	10	0	5.3	2.2	4.3	0	1	1.4	1.7
Agree to adhere to market rules and regulations	0	9.4	31.6	12.9	17.4	5.6	2	5	8.1
Annual fee for a trader operating in this market	428.6	368.6		378.4	681.8	439.1	743.4	696.6	590.5

The responsibility for managing these markets is shared primarily between local government bodies and dedicated market committees. Both market authorities/committees and City/

Municipality/county governments are responsible for management in 73.0% of markets. The most common governance arrangement is a combination of a market authority and the city/municipality/county, which exists in 55.4% of all markets.

Market authorities/committees hold the most influence in deciding entry into 44.9% of markets (if a wholesaler can trade in a market) compared to 25.2% for local governments. While the influence of trader associations is lower (8.5%), they are significantly more powerful in Consumption Primary zones, where they decide wholesaler entry in 30.4% of markets.

Becoming a trader in these markets involves various physical, administrative, social, and financial prerequisites, with purchasing a stall or space being the most common requirement (30.0% of markets). Other requirements include payment of an association membership fee (12%); traders to formally agree to adhere to market rules (8.1%); recommendation by an existing member (2.6%); approval by market managers or committees (10.7%); formal approval by the county government (0.9%); purchase of a specific trade license (1.7%) overall. In a few cases, markets were described as closed (3.4%) implying that new entrants are explicitly not allowed, while in fewer cases one is put on a waiting list (0.4%). Traders are also required to pay an annual trade fee, averaging Ksh 590.5 across all surveyed wholesale markets. However, the fee is higher (Ksh 696.6) in markets located in consumption clusters.

3.2.3. Waste and waste management

On average, a wholesale market generates 2.4 tons of waste per day, with consumption zones producing significantly more waste than production zones (3.3 versus 1.1 tons) (Table 3.8). Plastic accounts for 11.2% of generated waste. This implies that 88.8% of the waste is composed of other materials (perhaps a dominant share being organic waste).

Table 3.8: Waste and waste management

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other	**All Consumption Zones**	**Total**
How much waste is generated on a typical day (tons)	1.5	1.2	0.7	1.1	3.6	14.5	1.4	3.3	2.4
What share of waste generated is plastic	6.4	6.6	3.5	6	6.1	16.6	16.4	14.7	11.2
How is waste handled in market?									
Removed from the market periodically (brought elsewhere)	90	75	42.1	69.9	95.7	83.3	91	90.9	82.5
burnt at or near the market—Open burning	10	25	57.9	30.1	0	5.6	8	6.4	15.8
Incinerated at/near market	0	0	0	0	0	0	1	0.7	0.4
How often is the waste removed from the market/burnt?									
Daily	10	17.2	52.6	23.7	17.4	11.1	18	17	19.7
Weekly	10	23.4	5.3	18.3	52.2	22.2	34	35.4	28.6
Monthly	20	10.9	0	9.7	4.3	11.1	5	5.7	7.3
Twice per week	40	6.3	5.3	9.7	8.7	11.1	6	7.1	8.1
Several times per week	0	6.3	10.5	6.5	4.3	5.6	2	2.8	4.3
Other	20	28.1	26.3	26.8	4.3	33.3	34	29.1	28.2

Markets primarily manage waste through removal or burning, though methods differ by region. The most common method is removing waste from the market to be disposed of elsewhere, occurring in 82.5% of markets. Approximately 15.8% of markets use open burning at or near the site, while incineration is an extremely rare practice, utilized in only 0.4% of markets.

The frequency of waste removal or burning is inconsistent across the different markets. Weekly disposal is the most common (28.6% of markets), while 19.7% of markets handle waste daily, 8.1% of markets dispose of waste twice weekly, 7.3% of markets manage waste monthly and a significant portion (28.2%) use unspecified frequencies.

3.3 Ancillary operations in the tomato value chain

Allied businesses—ranging from input shops to financial services—are a major component of the wholesale tomato market ecosystem. The average wholesale market supports 4.7 different types of allied businesses, and across all regions, there is a total mean of 108 businesses per market (Table 3.9). There is a significant difference in the number of businesses between consumption and production clusters. Consumption zones are primary hubs (have a higher density) for allied services, averaging 132.4 businesses per market, compared to 1.3 businesses per market in the production zones.

Table 3.9: Allied businesses

	Production North	Production East	Production South	**All production zones**	Consumption Primary	Consumption Secondary	Consumption Other		**All Consumption Zones**
Total types of allied businesses in the market	3.3	3.9	6.2	4.3	4	5	5.2	5	4.7
Total number of allied businesses in the market (mean)	54.5	70.5	83.2	71.3	229.9	112.2	113.4	132.4	108
Upstream:									
Agricultural input shops (mean)	13.3	3.9	3.9	4.9	7.8	4.6	6.3	6.2	5.8
Agricultural machinery shops (mean)		1	1	1	1		2	1.8	1.5
Borewell drilling businesses (mean)			1	1		1	1	1	1
Midstream/downstream									
Private cold storage businesses (mean)					1.5	1.3	1.3	1.3	1.3
Package sellers(mean)	4.6	9.9	6.7	8.4	6.4	4.8	6.9	6.7	7.3
Transport logistics(mean)	4	3.3	3	3.3		3.7	4.4	4.4	4.2
ATMs (mean)	5	1		2	4.7	1.3	3.1	3	2.8
Bank branches (mean)	4	1		1.8	5	1	3.8	3.8	3.3
Number of observations	10	64	19	95	23	18	99	138	233

Upstream businesses comprise of agricultural input shops (5.8 per market) that are concentrated in the production zones; agricultural machinery (1.5) and borewell drilling businesses (1.0), which have a very limited presence across all zones. Midstream and downstream

businesses include sellers of packaging materials (7.3 per market), transport logistics (4.2), ATMs (2.8), bank branches (3.3), private cold storage (1.3). These results indicate that markets function as an important hub for several services and that cold storage is currently the rarest infrastructure within the tomato wholesale market ecosystem.

The number of services has grown over time (Table 3.10), indicating that growth is not just about horizontal expansion (new markets), but perhaps more powerfully about vertical deepening (richer ecosystems around existing markets). This densification is a key source of long-term competitiveness and innovation.

Table 3.10: Growth in allied businesses

Type of business/service	2015	2025	Change in number (%)
Number of markets	210	234	
Upstream			
Agricultural input shops	153	588	284
Agricultural machinery shops	4	16	300
Borewell drilling businesses	1	3	200
Midstream/downstream			
Private cold storage businesses	0	22	-
Package sellers	487	1030	111
Transport logistics	42	164	290
Bank branches	77	53	-31
ATMs	63	67	6

3.4 Drivers of growth in wholesale market ecosystem

3.4.1 Growth in daily volume of tomato traded

Regression results in Table 3.11 indicate that governance and economic factors have influenced market expansion over a 10-year period. During the high season, the primary driver for volume growth is the type of market governance. Markets regulated by traders or a management committee of traders are significantly and positively associated with growth in volumes. This suggests that self-governance or trader-led management is more effective at facilitating increased trade volume during peak periods than other forms of regulation.

Table 3.11: Regression analysis on growth in daily volume of tomato traded

	(1)	(2)

Variable	Growth in volumes: High season (10 year)	Growth in volumes: Low season (10 year)
Number of wholesalers in 2015	-0.00	0.00
	(0.00)	(0.00)
Number of retailers in 2015	-0.00	0.00
	(0.00)	(0.00)
Number of businesses in market (10 years)	0.00	-0.01
	(0.02)	(0.01)
Total number of days of operation (tomato, high season, 10 years)	-0.00	
	(0.03)	
Market association has any female member	1.95	-0.15
	(1.65)	(2.21)
Market regulated by any government/government related body	-0.96	-0.15
	(1.62)	(0.95)
Market regulated by traders/management committee by traders	3.77*	3.52
	(2.07)	(2.14)
Mean distance to the nearest all weather road	-0.31	-0.56
	(0.95)	(0.48)
Mean distance to the nearest town of population 50,000 or more	-0.01	0.00
	(0.03)	(0.02)
Proportion of markets that have direct electricity from the grid	-5.04	-1.91
	(3.05)	(1.98)
Proportion of markets with piped water supply	-2.61	3.46
	(3.18)	3.93)
Proportion of markets with public borehole water	1.22	-0.02
	(1.33)	(1.62)
Log county nightlight (2015)	-1.20	-2.24**
	(1.31)	(0.95)
Log county conflicts (2015)	-0.26	0.09
	(1.46)	(1.08)
Log county GDP (2015)	-1.33	4.18
	(6.37)	(4.01)
Log county population (2019)	2.81	-0.11
	(5.01)	(3.16)
Total number of days of operation (tomato, low season 10 years ago)		0.03
		(0.02)
Constant	-20.35	-52.39**

	(26.40)	(21.08)
Observations	142	130
R-squared	0.07	0.11
Standard errors clustered at county level		
Robust standard errors in parenthesis		
***p<0.01, **p<0.05, *p<0.1		

The low season growth analysis highlights different significant factors, particularly related to regional development. There is a statistically significant negative association between log county nightlight (a common proxy for economic development/urbanization) and volume growth during the low season. This suggests that markets in areas with lower nightlight intensity (potentially more rural or emerging areas) may be experiencing faster growth in low-season volumes compared to highly developed urban centers. Surprisingly, some factors often assumed to drive growth were not significant: infrastructure, economic indicators (county GDP, population) and initial market size. Note that these latter are here modeled as correlates of growth (not establishment or performance); it is probable that the reason infrastructure and local incomes and population are not growth drivers is that they are factors in a market being already developed and mature, not at an early stage where the market is getting going.

Additionally, the negative significance of nightlights in the low season indicates that market pan-seasonality and growth during off-peak times are currently expanding more rapidly in less developed or more rural areas, as one would expect.

3.4.2 Growth of women's participation in tomato trade

Results show that several factors including infrastructural, security and governance have influenced the participation of women in wholesale tomato markets over a 10-year period during high and low seasons.

Factors that are significantly associated with a growth in the share of female traders are: (i) water infrastructure-- the presence of a public piped water supply (during the high season); (ii) access to grid electricity (during the low season); (iii) conflicts at the start of the 10-year period—a significant driver in both seasons--- could imply that female participation in these market roles may increase as a livelihood strategy in unstable regions; (iv) initial/historical retailer density (in 2015) during the low season (Table 3.12).

Table 3.12: Change in share of female traders

Variable	(1) Growth in volumes: High season (10y)	(2) Growth in volumes: Low season (10y)
Number of wholesalers in 2015	-0.02***	-0.00***
	(0.00)	(0.00)
Number of retailers in 2015	0.00	0.00*
	(0.00)	(0.00)
Number of businesses in market (10 years)	-0.04	-0.01
	(0.02)	(0.02)
Total number of days of operation (tomato, high season, 10 years)	-0.10***	-0.01
	(0.03)	(0.02)
Market association has any female member	2.81	-1.28
	(2.74)	(2.37)
Market regulated by any government/government related body	-4.23	-0.17
	(3.20)	(1.58)
Market regulated by traders/management committee by traders	2.42	-4.18**
	(2.47)	(1.94)
Mean distance to the nearest all weather road	1.47	-0.82
	(1.05)	(0.73)
Mean distance to the nearest town of population 50,000 or more	0.06	0.02
	(0.05)	(0.03)
Proportion of markets that have direct electricity from the grid	0.04	2.52*
	(3.40)	(1.40)
Proportion of markets with piped water supply	4.56**	1.95
	(2.04)	(2.70)
Proportion of markets with public borehole water	0.24	0.15
	(2.34)	(2.07)
Log county nightlight (2015)	-1.60	0.66
	(1.52)	(0.98)
Log county conflicts (2015)	3.39*	2.43***
	(1.78)	(0.84)
Log county GDP (2015)	8.18	-5.83
	(6.22)	(3.45)
Log county population (2019)	-5.53	3.31
	(5.31)	(2.95)
Constant	-17.96	23.35

Variable	(1) Growth in volumes: High season (10y)	(2) Growth in volumes: Low season (10y)
	(53.32)	(25.16)
Observations	164	167
R-squared	0.20	0.13
Standard errors clustered at county level		
Robust standard errors in parenthesis		
***p<0.01, **p<0.05, *p<0.1		

Conversely, conditions that appear to hinder the growth of the female share of traders or are associated with a decline include: (i) initial/historical wholesaler density (in both seasons)---markets that were already major wholesale hubs a decade ago have seen a relative decrease in female participation growth compared to smaller or newer markets; (ii) operating intensity-- total number of days the market operates (high season)-- may create barriers to entry or retention for female traders; (iii) trader-led governance (low season)---trader-led regulation might not inherently favor gender inclusion during off-peak periods, yet are positive for volume growth.

Market membership, economic indicators, and geographic distance didn't impact the change in female trader share.

3.4.3 Growth in infrastructure

Factors that significantly influence whether a wholesale tomato market possesses **cold storage** range from the market's historical size to its governance structure and geographic connectivity (Table 3.13). The likelihood of a market having cold storage rises with: (i) historical retailer density--markets with a long-standing, large retail base are more likely to develop cold storage infrastructure; (ii) existence of structured governance--both forms of formal market regulation (government-related agency and trader-led management committee); (iii) gender inclusion--where market association has a female member. Conversely, a longer distance from a reliable road lowers the probability of having cold storage. We note that factors like market size/activity (historical wholesaler density, number of allied businesses), macro indicators (nightlights, county GDP, population) and proximity to urban centers are not significant in determining cold storage presence. These findings underscore that cold storage is currently a rare and specialized service—with only 9 private businesses identified across all surveyed markets—that requires specific governance and logistical conditions to emerge. Moreover, tomato traders told us that they do not need cold storage as the product is moved quickly.

Table 3.13: Probability of having infrastructure

	(1)	(2)	(3)
Variable	Cold storage (Probit)	Public piped water (Probit)	Grid electricity (Probit)
Number of wholesalers in 2015	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)
Number of retailers in 2015	0.00***	0.00**	0.00
	(0.00)	(0.00)	(0.00)
Number of businesses in market (10 years)	-0.01	0.01**	0.00
	(0.01)	(0.00)	(0.00)
Total number of days of operation (tomato, high season, 10 years)	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Market association has any female member	0.64*	0.79**	0.00
	(0.34)	(0.35)	(0.33)
Market regulated by any government/government related body	0.64**	0.78**	-0.46
	(0.27)	(0.33)	(0.29)
Market regulated by traders/management committee by traders	1.04**	0.50*	0.13
	(0.38)	(0.29)	(0.28)
Mean distance to the nearest all weather road	-1.42**	-0.22	-0.11
	(1.65)	(0.19)	(0.14)
Mean distance to the nearest town of population 50,000 or more	0.00	-0.00	-0.00
	(0.01)	(0.00)	(0.01)
Proportion of markets that have direct electricity from the grid	0.20		
	(0.22)		
Log county nightlight (2015)	0.27	0.25	-0.16
	(0.22)	(0.18)	(0.17)
Log county conflicts (2015)	0.22	0.56**	0.22
	(0.32)	(0.27)	(0.16)
Log county GDP (2015)	-0.54	-1.26*	0.48
	(0.90)	(0.66)	(0.62)
Log county population (2019)	-0.08	0.5	-0.58
	(0.80)	(0.61)	(0.51)
Constant	6.28	5.89	2.58
	(8.62)	(6.39)	(4.72)
Observations	170	170	170
Standard errors clustered at county level			
Robust standard errors in parenthesis			
***p<0.01, **p<0.05, *p<0.1			

Factors that increase the likelihood of a wholesale market having **public piped water** include historical retailer density, allied business growth, structured governance, gender inclusion (presence of female members in a market association) and conflict (Table 3.13). On the other hand, economic development (county GDP) appears to constrain the probability of having piped water. These results suggest that larger, more commercially diverse markets with structured governance are more likely to have piped water infrastructure. Further, though the causal mechanism is not clear, it may be the case that conflict is a "meta-conditioner" of infrastructure. This implies that regional instability is a structural factor—much like state investments in roads or nightlights—that fundamentally shapes how a market develops its infrastructure. In conflict-affected regions, markets may undergo different developmental trajectories, perhaps becoming prioritized for specific humanitarian or state-led water projects to ensure the resilience of local food systems (may be targeted for specific post-conflict reconstruction programs or NGO interventions focused on water and sanitation as a means of stabilization).

Unlike the results for cold storage or piped water, where factors like retailer density or governance were significant, the likelihood of a market having **grid electricity** appears to be independent of the specific market-level and county-level variables included in the model. However, previous results indicate high prevalence and reliability of grid electricity (Table 3.6).

3.4.4 Growth in wholesalers, retailers and allied businesses

Table 3.14 presents key factors influencing **wholesaler growth** over the 10-year period. Positive drivers include county GDP (2015), indicating faster growth in higher-GDP counties; market regulation by government or related bodies; and women's inclusion in leadership. Negative factors are county population, county nightlight intensity (a proxy for urbanization, suggesting faster growth in less developed rural areas), and initial 2015 market size (implying a saturation effect in larger markets). Infrastructure and geographic factors showed no significant impact.

Table 3.14: Growth in number of traders and allied businesses over 10 year period

	(1)	(2)	(3)
Variable	Growth in number of wholesalers	Growth in number of retailers	Growth in number of allied businesses
Number of wholesalers in 2015	-0.00***	-0.00	-0.00
	(0.00)	(0.00)	(0.00)
Number of retailers in 2015	0.00	-0.00***	-0.00
	(0.00)	(0.00)	(0.00)
Number of businesses in market (10 years)	-0.01	-0.01**	-0.07***
	(0.00)	(0.00)	(0.02)
Total number of days of operation (tomato, high season, 10 years)	-0.01	-0.00	0.00

	(0.00)	(0.00)	(0.02)
Market association has any female member	0.76***	1.07****	1.64
	(0.28)	(0.51)	(2.00)
Market regulated by any government/government related body	0.79***	0.17	5.27*
	(0.26)	(0.55)	(2.94)
Market regulated by traders/management committee by traders	-0.02	0.38	-0.99
	(0.41)	(0.52)	(2.09)
Mean distance to the nearest all weather road	-0.02	0.13	-0.58
	(0.13)	(0.12)	(0.61)
Mean distance to the nearest town of population 50,000 or more	-0.00	-0.01	0.04*
	(0.01)	(0.01)	(0.03)
Proportion of markets that have direct electricity from the grid	-0.11	-0.16	2.05
	(0.47)	(0.54)	(1.63)
Proportion of markets with public piped water supply	0.27	-0.95	-9.56
	(0.35)	(0.58)	(5.74)
Proportion of markets with public borehole water	-0.04	0.16	3.31
	(0.39)	(0.46)	3.25)
Log county nightlight (2015)	-0.73***	-0.32	0.19
	(0.26)	(0.29)	(0.91)
Log county conflicts (2015)	0.07	-0.63	1.36
	(0.14)	(0.42)	(1.34)
Log county GDP (2015)	2.87***	0.25	0.38
	(0.92)	(1.61)	(3.52)
Log county population (2019)	-2.20*	0.95	-0.14
	(0.83)	(1.81)	(3.00)
Constant	-3.50	-14.66*	2.07
	(8.55)	(7.68)	(23.00)
Observations	164	167	149
Standard errors clustered at county level			
Robust standard errors in parenthesis			
***p<0.01, **p<0.05, *p<0.1			

The only factor that positively influenced the growth in number of **retailers** was inclusion of women in market leadership, while initial retailer density and market business diversity constrained it—likely due to a saturation effect. These findings indicate that wholesaler growth correlates with regional GDP and formal oversight, whereas retailer growth is more sensitive to gender-inclusive governance and initial market size, favoring smaller, inclusive markets over large, established hubs.

The significant drivers of growth of **allied businesses** include formal government oversight, remoteness from urban centers and initial business density (saturation effect).

4 Results: Meso inventory

4.1 Introduction: waves of diffusion of tomato clusters in Kenya

The meso sample and survey methods were discussed in an earlier chapter. In this chapter we present survey findings. The data sources for the meso section are as follows: (1) review/analysis of secondary data on where production zones are and in them how tomato production and farm density differ over counties or districts; (2) rapid reconnaissance in rural and urban areas in the production zones and in key consumption areas in particular primary and secondary cities in the country; (3) "meso inventory/survey" in rural and urban counties in production zones in Kenya with recall over 1 decade (2014, 2019, 2024);

The recent-historical context is derived here from production data in the zones and from our findings from our rapid reconnaissance of the production zones. There has been a rapid development over the past several decades of tomato farming and related value chains segments (input supply, trading, and logistics, primarily) in a diffusion of clusters. The cluster formation was "spontaneous" (by emergence and agglomeration of the actors of their own decision and accord, and not managed, directed, or directly supported or acted on by the government or NGOs or donor projects). This occurred in several waves.

The first wave involved the formation in the 1970s/1980s of 3 "cradle" clusters in a triangle close to (100-150km) and around Nairobi as the center and the "consumption magnet". Tomato farming started in the 1970s/1980s in three clusters close to the early "consumption magnet" of Nairobi in central Kenya (Figure 1). These three included: (1) Kabazi/Subukia 150km NW of Nairobi; (2) Mwea East & West (100km NE of Nairobi); (3) Naroosura (100km SW of Nairobi). Kabazi started with an anchor investment of tomato processing plant (a typical way that tomato clusters start early in various countries); the Mwea and Naroosura clusters started as fresh tomato; all evolved into also having fresh (not processing variety) tomatoes.

Tomato farming "spontaneous clusters" (not set up by outside firms or government) started in those cradle areas driven by pull factors (that were later important also in the second wave cluster). These included: (1) well-watered, good soil, available land areas; (2) near good roads connecting to consumption centers and production area towns with wholesale markets; (3) the early clusters were near to early main consumption cities (especially Nairobi) in central Kenya; (4) farmers in the area climbed the value ladder from lower value crops, e.g. maize, into higher profit tomatoes; (5) farmers including from outside the cluster areas obtained land especially by renting farmland.

These clusters grew very quickly over 1990s-to present with many farmers shifting or entering and traders and input suppliers clustering into those areas; the tomatoes were then moved by VCs (value chains) actors led by rural and urban traders and transporters mainly at first to major cities (Nairobi and Mombasa) then towns around Kenya and border countries of Uganda and Tanzania.

The second wave featured the formation of 21 more "spontaneous clusters" around the initial 3 "cradle" clusters and a fourth "epicenter" in the Southeast in a rough line from Nairobi to Mombasa. Leading to clusters formed about 50-100km around the original 3 clusters and into the southeast toward Mombasa, along river and big roads, for example: (1) Rumuruti in East Rift Valley; (2) Molo River in Central Rift Valley; (3) Kajiado in South Rift Valley

The three cradles and the waves from them are shown in the map below.

Pull factors for clusters forming beyond the initial 3 clusters include the following: (1) huge growth of fresh tomato demand due to population growth and increasing urbanization; (2) investments by rural and urban people; rural investors are sometimes from earlier clusters who move into new areas and urban investors entering tomato production; the investment includes land rental.

Push factors to either reduce growing in early clusters or just move to new areas: (1) water access reduction in early clusters (e.g., reduced access to river water downstream); (2) increase in land costs in early clusters (due to increase of farmers and land use changes due to urbanization); (3) early intensification led to disease/pest density and declining soil fertility thus increasing outlays for chemicals and fertilizer; (4) land fragmentation, resulting in declining farmland sizes

Pull factors to form new clusters outside cradle triangle of first wave clusters (mainly into rift valley areas in crescent from southwest to northwest of central Kenya). Three specific pull factors have drawn farmers to invest in new areas outside the original clusters.

First, there has been "new water" access in the new areas: (1) from rehabilitated irrigation schemes (that used to produce seed maize and rice); (2) from water sold by irrigation scheme rice farmers by tubes and canals to new tomato farmers; (3) from putting in irrigation pumps and digging new wells; (4) from accessing water from rivers and dams using pumps s (e.g., like in Molo River).

Second, there has been "new land" access: (1) from land laws making community land into farm parcels (e.g., Kajiado area); from improved roads making arable land more accessible; from land rental markets; from investments by incumbent farmers, from in-migrants from other clusters, from city people; from forest and bushland Fourth, land access was a very important driver in Kenya. The share of tomato land rented is 64% in the North, 60% in the East, and 67% in the South. This is a far higher rate of farmland rental than overall in Kenya.

In-migration is a driver of the clusters, and is linked to the access of land via rental. In the rapid reconnaissance it was emphasized that many persons came from outside the cluster and even the zone from other places in Kenya to rent land and grow tomatoes given its

profitability. A concomitant driver is thus in-migration to the cluster zones. The in-migration is not just from around Kenya, as there is also in-migration from Tanzania such as into Kajiado in the southern (3rd) zone. Migrants came with experience and skills in tomato growing and marketing. Some of the in-migrants were previously farmers, farm managers, farm workers, and traders in other areas.

Third, there has been "new demand" access: (1) from growth of small towns into big towns and smaller cities due to population growth and devolution, and growth of demand for tomatoes in medium to large consumption cities (e.g., Eldoret in north Rift Valley) in new areas beyond Nairobi and Mombasa (radiation out of tomato demand from major cities); (2) from diet shift to use more tomato due to increased urbanization); (3) from improved roads and huge increase in transport vehicles (small and large) to link to new demand; (4) from a (very small as share in total output) import demand from Uganda and Tanzania

Fourth, there has been "new technology": (1) availability of new varieties (such as hybrid, determinate, disease resistant); (2) availability of imported (from China) pumps and power generators; (3) availability of imported agrochemicals (imported and locally produced); (4) technological knowledge from early entrants and input companies.

Fifth, various "change agents" played roles in cluster formation (outside the government). These included traders and input suppliers bringing capital and new seeds; and spillovers from other clusters (such as the famous flower cluster in Naivasha, Kenya giving rise to seedlings clusters first for flowers then for tomatoes).

Kajiado is a good example of a recent but fast going cluster in the southern production zone. It was traditionally pastoral land, then was converted to farms recently. Entrants in the area could find water (good water table near surface so farmers can excavate well easily, springs and rivers) and access to land (with regulations change shifting it from communal to ownable/rentable). There was then an ingress of urban small and medium investors and farmers from other rural areas/clusters and even a substantial inflow of Tanzania in-migrants.

4.2 Nature and diffusion of the tomato clusters

a) The clusters are "spontaneous", not set up by government or NGOs or companies

In general, there are two types of clusters in developing regions, government-established and managed, and spontaneous clusters. The tomato clusters in Kenya are only of the spontaneous type. The Kenya clusters are the main production areas of tomato that can be depicted as mini-clusters in meta-clusters which are the production zones where tomato production concentrates along with the concomitant presence of Hidden Middle MSMEs and production zone wholesale markets in urban and rural areas.

The production zones or meta-clusters are collections of counties. No one county makes up a cluster; for instance, the Northern production zone (cluster 1 in the map below) comprises 5 counties, while the southern production zone (cluster 3) has 2 counties. In the counties, there are pockets that are key tomato production areas. The study identified sub-counties that are key production areas that could be sub-counties or even smaller administrative areas (e.g., location) within a sub-county where tomato is a key crop. Thus, the three zones indicated on the map are the three clusters, and within each, there are scattered areas that are the key tomato growing areas.

(b) The cluster concentrations or zones have diffused over space and time in waves in a dynamic way.

First, the geographic concentrations (with presence of a diffusion of clusters) are shown as three zones with lines drawn around their approximate de facto borders on the map below. The map shows that tomato production (with accompanying hidden middle MSME spontaneous agglomerations as well as public and private wholesale markets) spread in three main zones.

The first zone is shown as a rectangle in the center-west of Kenya, which we call production zone 1 or cluster group 1 in the map. This zone started production earliest, centered around Nakuru city (which as a city of only a few hundred thousand 20-30 years ago and is now a city of 1 million) several decades ago. Within the zone we show in red the cradle/s where tomato farming first started; the yellow areas are local clusters that formed after the cradle, as a "second wave." The second wave clusters were sometimes formed by the pioneer farmers in the cradle to go seek areas with cheaper land or more water access; the clusters were also formed by farmers and MSMEs incumbents in the area and by in-migrants from other rural areas and urban areas.

The second zone is shown as a near-circle centered to the Northeast of Nairobi, centered approximately on Kirinyaga. This group of clusters emerged 10-15 years ago. These were formerly mainly irrigated rice zones and the tomato production sprang up from water access from the irrigation (such as in pipes stretched from rice farms and rivers) and from dense road access to the Nairobi market. The yellow shows the second wave clusters that emanated from the Kirinyaga cradle.

The third is shown as an oblong circle southeast of Nairobi. While the above two zones are mainly in the dense highlands, the southeast zone is in a flatter area further from cities, with easier access to land but further (and thus with much higher transport costs) to urban markets. The Kenya study rapid reconnaissance found that much of this zone is composed of clusters that formed from farmers coming down from the other two zones as land became tight, as well as new in-migrants and to a lesser extent than in the other zones, local incumbents.

c) Each cluster tends to sell far and wide, not just within the meta cluster or production zone, but around the country in long supply chains.

While the production zones in the map that encase the diffuse clusters are more or less anchored by a city, the clusters in these zones do not just sell to the local consumption areas but rather also sell vegetables at a rather long distance across the state or country to other cities and rural areas.

A second figure/map illustrates the long supply chains that have developed (spontaneously, operated by the MSMEs of the Hidden Middle, especially traders and logistics) from the production area clusters to consumption areas, mainly city markets. The dense sets of green and yellow lines show the supply chain lines from the various clusters in the three zones to the urban consumption areas (but also to rural areas). Green is sourcing by markets in consumption zones, and yellow is sourcing by markets in production zones.

One notes the length of the lines, that criss-cross Kenya. This is far from the short supply chains thought usually to characterize vegetable supply chains in Africa; and it also varies from the image of just peri-urban vegetable production around cities that characterized the literature and debate some decades ago.

4.3 The rapid growth of farm output and numbers of MSMEs in the clusters (from meso survey findings)

The meso tables below (Tables 8 to 8.13) include the inventory of farms and MSMEs changing over the decade in the three production zones, and a table showing yield changes (Table 8.14). Four sets of points emerge.

Table 8.6: Structural change in tomato clusters over 10 years: wholesale markets

Clusters	Markets		
	Total number		
Production North			
First cradle (Nakuru-Subukia/Kabazi) and second wave	**2024**	**2019**	**2014**
Laikipia	3	3	3
Nyandarua	5	5	5
Nakuru	1	1	1
Baringo	1	1	1
Narok	1	1	1
Total	**11**	**11**	**11**

Production East			
Second cradle (Kirinyaga - Mwea) and second wave			
Machakos	12	11	11
Murang'a	12	12	12
Meru	10	10	10
Kitui	8	8	8
Embu	6	6	6
Makueni	5	5	5
Nyeri	5	5	5
Kirinyaga	3	3	3
Tharaka Nithi	2	2	2
Isiolo	1	1	1
Total	**64**	**63**	**63**
Production South			
Second wave around second cradle in Southeast of Nairobi			
Makueni	**8**	**8**	**8**
Kitui	7	7	7
Taita Taveta	5	5	5
Total	**20**	**20**	**20**
Primary Consumption (Nairobi Metropolitan)			
Kiambu	14	14	14
Nairobi	8	8	8
Kajiado	2	2	2
Machakos	2	2	2
Total	**26**	**26**	**26**
Secondary Consumption			
Kisumu	6	6	6
Uasin Gishu	13	13	13
Mombasa	1	1	1

Total	**20**	**20**	**20**
Other consumption areas (Major towns and surrounding areas)			
Kisii	15	15	15
Bomet	12	12	12
Kericho	12	12	12
Nandi	8	8	8
Nyamira	8	8	8
Bungoma	7	7	7
Siaya	7	7	7
Trans-nzoia	5	5	5
Vihiga	5	5	5
Busia	5	4	4
Migori	4	4	4
Kakamega	4	4	4
Homa bay	2	2	2
Kilifi	1	1	1
Total	**95**	**94**	**94**
ALL	**236**	**234**	**234**

First, for farms, there has been rapid growth of tomato output of the clusters in a decade, but a decline in farm numbers, and a process of concentration over farms. The details of the aforementioned tables show that the fastest growth in volume came in the Southern zone clusters which coincided with increased average farm size due to more accessible land, and the slowest growth in output and decline in numbers in the zone 1 cradle areas which had pressures of land access and crop disease. Overall farmer numbers declined over the three zones from around 31,000 to 11,000.

Table 8.1: Structural change in tomato clusters over 10 years: farmers

Cluster	Farmers											
	Total number			Share of small in total number			Share of medium in total number			Share of large in total number		
Production North	**2024**	**2019**	**2014**	2024	2019	2014	2024	2019	2014	2024	2019	2014

First cradle (Nakuru-Subukia/Kabazi)	**260**	**340**	**850**	**100%**	**82%**	**76%**	**0%**	**3%**	**6%**	**0%**	**15%**	**18%**
Second wave around first cradle												
Narok (Township)	374	198	109	75%	73%	54%	23%	26%	46%	2%	1%	0%
Laikipia (Marmanet)	329	2,606	9,292	95%	92%	97%	5%	7%	2%	1%	1%	1%
Narok (Mosiro)	310	420	200	97%	95%	75%	3%	5%	25%	0%	0%	0%
Nakuru (Solai & Rongai)	285	107	57	86%	92%	88%	10%	8%	5%	7%	9%	7%
Baringo (Marigat)	220	135	51	100%	99%	100%	0%	0%	0%	0%	1%	0%
Laikipia (Salama)	184	79	225	54%	63%	58%	25%	23%	33%	21%	14%	9%
Narok (Siana)	134	42	-	100%	100%	0%	0%	0%	0%	0%	0%	0%
Narok (Melili)	122	163	216	60%	54%	50%	30%	31%	30%	10%	15%	20%
Laikipia (Sosian)	113	74	39	77%	95%	87%	20%	5%	8%	3%	0%	5%
Elgeyo Marakwet	69	47	38	99%	100%	100%	0%	0%	0%	1%	0%	0%
Laikipia (Rumuruti)	37	108	40	89%	64%	75%	5%	28%	25%	5%	8%	0%
Baringo (Barwessa)	31	8	-	100%	100%	0%	0%	0%	0%	0%	0%	0%
Baringo (Mogotio)	24	7	-	88%	86%	0%	0%	0%	0%	13%	14%	0%
Total- Second wave around first cradle	**2,232**	**3,994**	**10,267**	**85%**	**89%**	**94%**	**11%**	**9%**	**5%**	**4%**	**2%**	**1%**
Total- Production North	**2,492**	**4,334**	**11,117**	**87%**	**89%**	**93%**	**10%**	**9%**	**5%**	**4%**	**3%**	**3%**
Production East												
Second cradle (Kirinyaga-Mwea)	**741**	**988**	**1639**	**92%**	**91%**	**90%**	**8%**	**8%**	**8%**	**0%**	**2%**	**3%**
Second wave around second cradle												
Embu (Mwea)	430	191	172	78%	60%	65%	13%	27%	28%	9%	13%	7%
Machakos (Ekalakala)	252	130	13	60%	62%	54%	28%	27%	31%	12%	12%	15%
Embu (Kagaari)	100	100	61	100%	100%	100%	0%	0%	0%	0%	0%	0%
Machakos (Ndalani)	67	10	0	61%	90%	0%	30%	10%	0%	9%	0%	0%
Embu (Kyeni South)	53	46	41	100%	100%	100%	0%	0%	0%	0%	0%	0%
Machakos (Mbiuni)	43	28	33	67%	100%	100%	16%	0%	0%	16%	0%	0%
Embu (Makima)	41	40	105	100%	75%	62%	0%	25%	29%	0%	0%	10%

Machakos (Wamunyu)	40	25	28	33%	100%	93%	55%	0%	7%	13%	0%	0%
Machakos (Masinga)	32	37	31	100%	100%	100%	0%	0%	0%	0%	0%	0%
Embu (Mbeti South)	8	8	8	100%	100%	100%	0%	0%	0%	0%	0%	0%
Total -Second wave around second cradle	**1,066**	**615**	**492**	**76%**	**78%**	**78%**	**16%**	**16%**	**17%**	**8%**	**7%**	**5%**
Total- Production East	**1,807**	**1,603**	**2,131**	**82%**	**86%**	**87%**	**13%**	**11%**	**10%**	**5%**	**3%**	**3%**
Production South												
Second wave around second cradle in Southeast of Nairobi												
Kajiado												
Imbirikani/Eselekei	4,900	8,170	13,490	67%	67%	54%	23%	21%	31%	9%	11%	15%
Rombo	1,055	1,450	1,941	82%	93%	97%	13%	6%	3%	4%	1%	0%
Imaroro	230	220	243	64%	61%	60%	26%	30%	34%	10%	9%	7%
Kimana	105	145	100	67%	90%	100%	5%	0%	0%	29%	10%	0%
Kenyewa-poka	55	41	27	18%	24%	19%	36%	39%	44%	45%	37%	37%
Total	**6,345**	**10,026**	**15,801**	**69%**	**71%**	**60%**	**22%**	**19%**	**27%**	**9%**	**10%**	**13%**
Taita Taveta												
Chala	360	338	470	92%	91%	87%	5%	7%	13%	3%	2%	0%
Bomeni	99	186	320	98%	99%	100%	2%	1%	0%	0%	0%	0%
Mboghoni	63	66	66	78%	94%	100%	22%	6%	0%	0%	0%	0%
Mata	56	292	670	71%	98%	100%	27%	2%	0%	2%	0%	0%
Mahoo	41	135	295	100%	100%	100%	0%	0%	0%	0%	0%	0%
Total	**619**	**1,017**	**1,821**	**90%**	**96%**	**97%**	**8%**	**4%**	**3%**	**2%**	**1%**	**0%**
Total - Production South	**6,964**	**11,043**	**17,622**	**71%**	**73%**	**64%**	**20%**	**18%**	**25%**	**8%**	**9%**	**12%**
ALL	**11,263**	**16,980**	**30,870**	**76%**	**78%**	**76%**	**17%**	**15%**	**16%**	**7%**	**7%**	**8%**

Table 8.2: Structural change in tomato clusters over 10 years: Production Volumes

Cluster	Production volume			
	Total volume (metric tons)	Share of small in total volume	Share of medium in total volume	Share of large in total volume

	2024	2019	2014	2024	2019	2014	2024	2019	2014	2024%	2019	2014
First cradle (Subukia/Kabazi)	**23,858**	**21,280**	**35,400**	**26%**	**21%**	**22%**	**0%**	**11%**	**17%**	**74%**	**68%**	**61%**
Second wave around first cradle												
Laikipia (Salama)	35,968	11,490	31,080	17%	26%	25%	37%	42%	58%	46%	32%	17%
Narok (Township)	25,600	14,580	9,232	44%	48%	31%	48%	49%	69%	8%	3%	0%
Nakuru (Solai & Rongai)	21,254	11,312	1,536	28%	55%	39%	35%	19%	23%	37%	25%	38%
Narok (Mosiro)	13,440	22,000	13,600	89%	87%	53%	11%	13%	47%	0%	0%	0%
Baringo (Marigat)	12,150	3,480	460	97%	92%	100%	0%	0%	0%	3%	8%	0%
Narok (Melili)	11,128	17,124	23,312	26%	25%	22%	48%	42%	36%	26%	34%	42%
Laikipia (Marmanet)	8,436	46,190	26,472	30%	21%	48%	39%	56%	30%	31%	24%	22%
Laikipia (Sosian)	8,422	1,540	1,372	15%	45%	25%	69%	55%	37%	16%	0%	38%
Elgeyo Marakwet	3,996	1,128	342	92%	100%	100%	0%	0%	0%	8%	0%	0%
Baringo (Mogotio)	2,106	288	0	54%	50%		0%	0%	!	46%	50%	
Laikipia (Rumuruti)	1,880	9,960	1,980	26%	7%	15%	27%	63%	85%	47%	30%	0%
Baringo (Barwessa)	1,674	192	0	100%	100%		0%	0%		0%	0%	
Total - Second wave around first cradle	**146,054**	**139,284**	**109,386**	**42%**	**40%**	**34%**	**34%**	**41%**	**45%**	**25%**	**20%**	**20%**
Total - Production North	**169,912**	**160,564**	**144,786**	**39%**	**37%**	**31%**	**29%**	**37%**	**38%**	**31%**	**26%**	**30%**
Second cradle (Kirinyaga - Mwea)	**39,636**	**49,056**	**85,350**	**62%**	**55%**	**52%**	**38%**	**33%**	**31%**	**0%**	**36%**	**58%**
Second wave around second cradle												
Embu (Mwea)	40,532	21,404	15,018	30%	16%	22%	33%	47%	55%	38%	37%	23%
Machakos (Ekalakala)	40,272	16,160	0	14%	15%		42%	55%		45%	30%	
Embu (Kagaari)	3,600	3,000	1,220	100%	100%	100%	0%	0%	0%	0%	0%	0%
Machakos (Ndalani)	9,876	526	0	15%	51%		49%	49%		36%	0%	
Embu (Kyeni South)	1,908	1,380	820	100%	100%	100%	0%	0%	0%	0%	0%	0%
Machakos (Mbiuni)	6,924	840	330	15%	100%	100%	24%	0%	0%	61%	0%	0%
Embu (Makima)	1,476	2,820	8,740	100%	32%	15%	0%	68%	58%	0%	0%	27%
Machakos (Wamunyu)	8,748	750	644	5%	100%	40%	60%	0%	60%	34%	0%	0%
Machakos (Masinga)	1,152	1,110	310	100%	100%	100%	0%	0%	0%	0%	0%	0%

Narok (Siana)	5,360	2,016	0	100%	100%		0%	0%		0%	0%	
Embu (Mbeti South)	288	240	160	100%	100%	100%	0%	0%	0%	0%	0%	0%
Total- Second wave around second cradle	**120,136**	**50,246**	**27,242**	**29%**	**33%**	**28%**	**35%**	**42%**	**50%**	**37%**	**25%**	**21%**
Total - Production East	**159,772**	**99,302**	**112,592**	**37%**	**44%**	**46%**	**36%**	**38%**	**36%**	**28%**	**19%**	**19%**
Production South **Second wave around second cradle in Southeast of Nairobi**												
Kajiado												
Imbirikani/Eselenkei	184,820	164,340	169,120	39%	39%	36%	41%	42%	40%	19%	19%	24%
Rombo	77,460	62,380	63,296	60%	76%	88%	26%	17%	11%	14%	7%	1%
Imaroro	21,420	19,900	20,080	35%	30%	30%	40%	46%	52%	25%	24%	18%
Kimana	12,920	9,840	2,400	39%	63%	100%	6%	0%	0%	56%	37%	0%
Kenyewa-poka	9,380	6,320	4,016	5%	8%	6%	31%	35%	38%	64%	57%	56%
Total	**306,000**	**262,780**	**258,912**	**43%**	**47%**	**48%**	**35%**	**35%**	**33%**	**21%**	**18%**	**18%**
Taita Taveta												
Chala	15,856	24,136	16,802	42%	61%	44%	17%	17%	56%	41%	22%	0%
Bomeni	2,228	9,152	5,760	87%	97%	100%	13%	3%	0%	0%	0%	0%
Mboghoni	2,996	3,616	1,188	33%	82%	100%	67%	18%	0%	0%	0%	0%
Mata	3,680	15,176	12,060	22%	91%	100%	59%	5%	0%	20%	4%	0%
Mahoo	820	6,480	5,310	100%	100%	100%	0%	0%	0%	0%	0%	0%
Total	**25,580**	**58,560**	**41,120**	**44%**	**80%**	**77%**	**28%**	**10%**	**23%**	**28%**	**10%**	**0%**
Total - Production South	**331,580**	**321,340**	**300,032**	**43%**	**53%**	**52%**	**35%**	**30%**	**32%**	**22%**	**17%**	**16%**
ALL	**661,264**	**581,206**	**557,410**	**41%**	**47%**	**46%**	**34%**	**33%**	**34%**	**26%**	**20%**	**20%**

By sharp contrast, the volume increased a stunning 100,000 tons from 557,000 to 661,000 for the set of clusters. The share of small farmers in the total numbers of farms stayed at around 76%, but their share of total farm output declined from 46% to 41%, and the share of medium and larger farms (averaging 4 and 7 hectares, respectively) climbed from 54 to 59%.

Yield growth was a stunning and important part of the rise of overall volumes (of 100,000 tons) despite the reduction of total land under tomatoes from 16,000 ha to 10,000 ha (in the meso table annex). The yield in tons per ha for the overall sample rose from 16 to 32 tons

per ha. This can be compared with 5-10 tons on average in Nigeria. The yields of all strata grew fast, but large farms grew to larger yields: small, from 14 to 28 tons, medium from 20 to 35, and large, from 19 to 37.

Table 8.11. Structural change in tomato clusters over 10 years: Average yields (tons/ha)

Cluster	Average yield (tons/ha)			Small scale yield (tons/ha)			Medium scale yield (ton/ha)			Large scale yield (tons/ha)		
	'24	'19	'14	'24	'19	'14	'24	'19	'14	'24	'19	'14
Production Zone North (2024, 2019, 2014)												
First cradle (Subukia/Kabazi)	36	27	15	30	20	15		30	15	40	30	15
Second wave around first cradle												
Laikipia (Marmanet)	43	34	27	37	25	25	44	37	30	49	37	30
Nakuru (Solai & Rongai)	36	23	15	30	20	15	40	30	15	40	30	15
Baringo (Marigat)	33	15	11	33	15	11				33	15	
Laikipia (Salama)	45	33	28	37	25	25	44	37	30	49	37	30
Laikipia (Sosian)	44	30	28	37	25	25	44	37	30	49		30
Elgeyo Marakwet	33	15	11	33	15	11				33		
Laikipia (Rumuruti)	44	36	29	37	25	25	44	37	30	49	37	
Baringo (Barwessa)	33	15		33	15							
Baringo (Mogotio)	33	15		33	15					33	15	
Narok (Maji Moto/Naroosura)	26	21	15	25	20	15	30	25	20	30	25	20
Narok (Township)	27	22	18	25	20	15	30	25	20	30	25	
Narok (Mosiro)	25	20	17	25	20	15	30	25	20			
Narok (Siana)	25	20		25	20							
Narok (Melili)	28	23	18	25	20	15	30	25	20	30	25	20
Total	33	14	9	28	7	6	36	21	13	42	24	13
Total-Production Zone North	**33**	**15**	**11**	**28**	**8**	**7**	**36**	**21**	**13**	**41**	**26**	**14**
Production Zone East (2024, 2019, 2014)												
Second cradle (Kirinyaga - Mwea)	47	40	29	44	37	25	52	44	37		44	37
Second wave around second cradle												

Embu (Mwea)	48	39	28	44	37	25	49	40	30	49	40	30
Machakos (Ekalakala)	49	39		44	37		49	40		49	40	
Embu (Kagaari)	44	37	25	44	37	25						
Machakos (Ndalani)	49	38		44	37		49	40		49		
Embu (Kyeni South)	44	37	25	44	37	25						
Machakos (Mbiuni)	49	37	25	44	37	25	49			49		
Embu (Makima)	44	39	29	44	37	25		40	30			30
Machakos (Wamunyu)	49	37	27	44	37	25	49		30	49		
Machakos (Masinga)	44	37	25	44	37	25						
Embu (Mbeti South)	44	37	25	44	37	25						
Total	48	39	28	44	37	25	49	40	30	49	40	30
Total-Production Zone East	**48**	**39**	**29**	**44**	**37**	**25**	**50**	**42**	**34**	**49**	**41**	**35**
Production Zone South (2024, 2019, 2014) Second wave southeast of 2nd cradle southeast of Nairobi												
Kajiado												
Imbirikani/Eselenkei	27	23	18	25	20	15	30	25	20	30	25	20
Rombo	26	21	15	25	20	15	30	25	20	30	25	20
Imaroro	28	23	18	25	20	15	30	25	20	30	25	20
Kimana	28	21	15	25	20	15	30			30	25	
Kenyewa-poka	29	24	19	25	20	15	30	25	20	30	25	20
Total	27	22	17	25	20	15	30	25	20	30	25	20
Taita Taveta												
Chala	27	21	17	25	20	15	30	25	20	30	25	
Bomeni	25	20	15	25	20	15	30	25				
Mboghoni	28	20	15	25	20	15	30	25				
Mata	28	20	15	25	20	15	30	25		30		
Mahoo	25	20	15	25	20	15						
Total	27	20	16	25	20	15	30	25	20	30	25	
Total-Production Zone South	**27**	**22**	**17**	**25**	**20**	**15**	**30**	**25**	**20**	**30**	**25**	**20**
ALL	32	22	16	28	18	14	35	26	20	37	27	19

Table 8.12. Structural change in tomato clusters over 10 years: Total land size (ha)

Cluster	Total land (ha)			Land of small scale (ha)			Land of medium scale (ha)			Land of large scale (ha)		
	2024	2019	2014	2024	2019	2014	2024	2019	2014	2024	2019	2014
Production Zone North (2024, 2019, 2014)												
First cradle (Subukia/Kabazi)	328	397	1194	105	113	263	0	40	202	223	243	728
Second wave around first cradle												
Laikipia (Marmanet)	98	687	489	34	192	255	37	348	136	27	147	98
Nakuru (Solai & Rongai)	294	244	52	99	159	20	94	36	12	101	49	19
Baringo (Marigat)	182	117	21	177	108	21	0	0	0	5	10	0
Laikipia (Salama)	399	175	550	81	61	158	149	66	304	169	49	89
Laikipia (Sosian)	96	25	24	18	14	7	65	11	8	13	0	9
Elgeyo Marakwet	60	38	15	55	38	15	0	0	0	5	0	0
Laikipia (Rumuruti)	21	139	34	7	14	6	6	85	28	9	40	0
Baringo (Barwessa)	25	6	0	25	6	0	0	0	0	0	0	0
Baringo (Mogotio)	32	10	0	17	5	0	0	0	0	15	5	0
Narok (Maji Moto/Naroosura)	176	345	997	140	260	877	24	71	97	12	15	23
Narok (Township)	469	330	257	227	176	96	206	144	162	36	10	0
Narok (Mosiro)	267	542	405	243	486	243	24	57	162	0	0	0
Narok (Siana)	108	51	0	108	51	0	0	0	0	0	0	0
Narok (Melili)	197	368	633	59	107	173	90	144	210	49	117	249
Total	2425	3078	3478	1290	1675	1871	695	963	1120	440	440	487
Total-Production Zone North	2753	3475	4672	1395	1789	2134	695	1004	1322	663	683	1216
Production Zone East (2024, 2019, 2014)												
Second cradle (Kirinyaga - Mwea)	421	612	1449	276	363	894	146	185	351	0	65	204
Second wave around second cradle												
Embu (Mwea)	424	274	264	136	46	67	134	126	139	154	101	58
Machakos (Ekalakala)	414	206	0	62	32	0	170	113	0	182	61	0
Embu (Kagaari)	40	40	25	40	40	25	0	0	0	0	0	0

Machakos (Ndalani)	102	7	0	17	4	0	49	3	0	36	0	0
Embu (Kyeni South)	21	19	17	21	19	17	0	0	0	0	0	0
Machakos (Mbiuni)	71	11	7	12	11	7	17	0	0	42	0	0
Embu (Makima)	17	36	152	17	12	26	0	24	85	0	0	40
Machakos (Wamunyu)	89	10	12	5	10	5	53	0	6	30	0	0
Machakos (Masinga)	13	15	6	13	15	6	0	0	0	0	0	0
Embu (Mbeti South)	3	3	3	3	3	3	0	0	0	0	0	0
Total	1194	622	485	326	193	156	422	267	230	445	162	99
Total-Production Zone East	1615	1234	1935	602	556	1051	568	452	582	445	227	303
Production Zone South (2024, 2019, 2014)												
Second wave southeast of 2nd cradle southeast of Nairobi												
Kajiado												
Imbirikani/Eselenkei	3361	3648	4791	1467	1615	2056	1287	1402	1716	607	631	1020
Rombo	1463	1501	2070	941	1196	1875	340	218	178	182	87	17
Imaroro	386	433	558	152	152	202	146	184	265	89	97	91
Kimana	235	231	81	101	158	81	12	0	0	121	73	0
Kenyewa-poka	160	130	104	10	12	8	49	45	39	101	73	57
Total	5605	5944	7604	2671	3132	4222	1833	1850	2198	1101	962	1184
Taita Taveta												
Chala	290	502	487	134	373	248	46	81	239	109	49	0
Bomeni	44	230	194	39	223	194	5	6	0	0	0	0
Mboghoni	54	88	40	20	75	40	34	13	0	0	0	0
Mata	65	365	407	16	348	407	36	16	0	12	0	0
Mahoo	17	164	179	17	164	179	0	0	0	0	0	0
Total	469	1349	1307	226	1184	1068	121	117	239	121	49	0
Total-Production Zone South	6074	7292	8911	2897	4316	5290	1955	1966	2437	1222	1010	1184
ALL	10442	12001	15518	4894	6660	8475	3218	3422	4341	2330	1919	2702

Table 8.13. Structural change in tomato clusters over 10 years: Average land size per farm (ha)

Cluster	Average land size per farm (Ha)			Average land of small scale (Ha)			Average land of medium scale (Ha)			Average land of large scale (Ha)		
	2024	2019	2014	2024	2019	2014	2024	2019	2014	2024	2019	2014
Production Zone North (2024, 2019, 2014)												
First cradle (Subukia/Kabazi)	1	1	1	0	0	0		4	4		5	5
Second wave around first cradle												
Laikipia (Marmanet)	1	1	0	0	0	0	3	3	3	4	4	4
Nakuru (Solai & Rongai)	1	2	1	0	2	0	3	4	4	5	5	5
Baringo (Marigat)	1	1	0	1	1	0				5	5	
Laikipia (Salama)	2	2	2	1	1	1	3	4	4	4	4	4
Laikipia (Sosian)	1	0	1	0	0	0	3	3	3	4		4
Elgeyo Marakwet	1	1	0	1	1	0				5		
Laikipia (Rumuruti)	1	1	1	0	0	0	3	3	3	4	4	
Baringo (Barwessa)	1	1		1	1							
Baringo (Mogotio)	1	1		1	1					5	5	
Narok (Maji Moto/Naroosura)	1	1	2	1	1	2	2	3	3	4	5	6
Narok (Township)	1	2	2	1	1	2	2	3	3	4	5	
Narok (Mosiro)	1	1	2	1	1	2	2	3	3			
Narok (Siana)	1	1		1	1							
Narok (Melili)	2	2	3	1	1	2	2	3	3	4	5	6
Total	1	1	1	1	1	1	3	3	3	4	5	5
Total-Production Zone North	1	1	1	1	1	1	3	3	3	7	5	5

Production Zone East (2024, 2019, 2014)												
Second cradle (Kirinyaga - Mwea)	1	1	1	0	0	1	2	2	3		4	5
Second wave around second cradle												
Embu (Mwea)	1	1	2	0	0	1	2	2	3	4	4	5
Machakos (Ekalakala)	2	2	0	0	0	0	2	3	0	6	4	0
Embu (Kagaari)	0	0	0	0	0	0						
Machakos (Ndalani)	2	1		0	0		2	3		6		
Embu (Kyeni South)	0	0	0	0	0	0						
Machakos (Mbiuni)	2	0	0	0	0	0	2			6		
Embu (Makima)	0	1	1	0	0	0		2	3			4
Machakos (Wamunyu)	2	0	0	0	0	0	2		3	6		
Machakos (Masinga)	0	0	0	0	0	0						
Embu (Mbeti South)	0	0	0	0	0	0						
Total	1	1	1	0	0	0	2	3	3	5	4	4
Total-Production Zone East	1	1	1	0	0	1	2	3	3	5	4	5
Production Zone South (2024, 2019, 2014)												
Second wave southeast of 2nd cradle southeast of Nairobi												
Kajiado												
Imbirikani/Eselenkei	2	2	2	1	1	2	2	3	3	4	5	6
Rombo	1	1	2	1	1	2	2	3	3	4	5	6
Imaroro	2	2	3	1	1	2	2	3	3	4	5	6
Kimana	2	2	2	1	1	2	2			4	5	
Kenyewa-poka	3	3	4	1	1	2	2	3	3	4	5	6

Total	2	2	2	1	1	2	2	3	3	4	5	6
Taita Taveta												
Chala	1	1	1	0	1	1	2	3	4	12	8	
Bomeni	0	1	1	0	1	1	2	3				
Mboghoni	1	1	1	0	1	1	2	3				
Mata	1	1	1	0	1	1	2	3		12		
Mahoo	0	1	1	0	1	1						
Total	1	1	1	0	1	1	2	3	4	12	8	
Total-Production Zone South	1	2	2	1	1	1	2	3	3	4	5	6
ALL	1	1	1	1	1	1	2	3	3	5	5	5

Table 8.14. Land size and yields, by production and consumption zones.

Cluster		Year	Production Zone North (2024, 2019, 2014)		Production Zone East (2024, 2019, 2014)		Production Zone South (2024, 2019, 2014)	ALL
			First cradle (Subukia/Kabazi)	Second wave around first cradle	Second cradle (Kirinyaga - Mwea)	Second wave around second cradle	Second wave southeast of 2nd cradle southeast of Nairobi	
Land size (Ha) 1000s ha	Total land (ha)	**'24**	0.3	2.8	0.4	1.6	6.1	10
		'19	0.4	3.5	0.6	1.2	7.3	12
		'14	1.2	4.7	1.4	1.9	8.9	16
	Small scale (ha)	**'24**	0.1	1.4	0.3	0.6	2.9	5
		'19	0.1	1.8	0.4	0.6	4.3	7
		'14	0.3	2.1	0.9	1.1	5.3	9
	Medium scale (ha)	**'24**	0	0.7	0.1	0.6	2	3
		'19	0.004	1	0.2	0.5	2	3
		'14	0.2	1.3	0.4	0.6	2.4	4
	Large scale (ha)	**'24**	0.2	0.7	0	0.4	1.2	2
		'19	0.2	0.7	0.1	0.2	1	2
		'14	0.7	1.2	0.2	0.3	1.2	3
Average land size per farm (Ha)	Average land size (Ha)	**'24**	1	1	1	1	1	1
		'19	1	1	1	1	2	1
		'14	1	1	1	1	2	1
	Average land small scale	**'24**	0	1	0	0	1	1
		'19	0	1	0	0	1	1
		'14	0	1	1	0	1	1
	Average land medium scale	**'24**		3	2	2	2	2
		'19	4	3	2	3	3	3
		'14	4	3	3	3	3	3
	Average land large scale	**'24**		4		5	4	5
		'19	5	5	4	4	5	5
		'14	5	5	5	4	6	5
Yield (tons/ha)	Total yield	**'24**	36	33	47	48	27	32
		'19	27	15	40	39	22	22
		'14	15	11	29	29	17	16
	Small scale farms	**'24**	30	28	44	44	25	28
		'19	20	8	37	37	20	18
		'14	15	7	25	25	15	14
	Medium scale farms	**'24**		36	52	50	30	35
		'19	30	21	44	42	25	26
		'14	15	13	37	34	20	20
		'24	40	41		49	30	37

Large scale yield farms	'19	30	26	44	41	25		27
	'14	15	14	37	35	20		19

Second, the counterpart of the substantial rise in tomato output in the Kenyan clusters, combined with the emergence of fast growth in the southern zone and thus longer supply chains, gave rise to (and was facilitated by a large increase in MSMEs in the Hidden Middle: from 6371 to 11,935 MSMEs, +87% in 10 years! The breakdown by segment was that the numbers of:

(1) input suppliers rose from 279 to 773, +177%

Table 8.3: Structural change in tomato clusters over 10 years: Input suppliers

Clusters	Input suppliers											
	Total number			Share of small in total number			Share of medium in total number			Share of large in total number		
	2024	**2019**	**2014**	2024	2019	2014	2024	2019	2014	2024	2019	2014
Production North												
First cradle (Nakuru-Subukia/Kabazi)	**25**	**11**	**4**	**100%**	**100%**	**100%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Second wave around first cradle												
Narok (Township)	97	39	21	90%	90%	86%	10%	10%	14%	0%	0%	0%
Narok (Siana)	95	39	21	89%	90%	86%	11%	10%	14%	0%	0%	0%
Narok (Mosiro)	30	20	15	100%	100%	100%	0%	0%	0%	0%	0%	0%
Nakuru (Soin)	24	7	12	100%	100%	100%	0%	0%	0%	0%	0%	0%
Narok (Maji moto/Naroosura)	18	10	10	100%	100%	100%	0%	0%	0%	0%	0%	0%
Laikipia (Rumuruti)	15	4	1	100%	100%	100%	0%	0%	0%	0%	0%	0%
Laikipia (Nyahururu)	15	15	13	67%	67%	62%	33%	33%	38%	0%	0%	0%
Nakuru (Mosop)	8	5	6	100%	100%	100%	0%	0%	0%	0%	0%	0%
Baringo (Marigat)	7	5	6	86%	100%	100%	14%	0%	0%	0%	0%	0%
Baringo (Barwessa)	7	1	1	86%	100%	100%	0%	0%	0%	14%	0%	0%
Laikipia (Sipiri)	7	4	3	100%	100%	100%	0%	0%	0%	0%	0%	0%
Elgeyo Marakwet (Soy North)	6	1	0	100%	100%	0%	0%	0%	0%	0%	0%	0%
Laikipia (Kinamba)	5	8	14	100%	100%	100%	0%	0%	0%	0%	0%	0%
Laikipia (Ol Moran)	4	1	1	100%	100%	100%	0%	0%	0%	0%	0%	0%
Nakuru (Visoi)	3	1	1	100%	100%	100%	0%	0%	0%	0%	0%	0%
Baringo (Mogotio)	3	1	2	100%	100%	100%	0%	0%	0%	0%	0%	0%
Narok (Ildamat)	3	0	0	100%	0%	0%	0%	0%	0%	0%	0%	0%
Laikipia (Salama)	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Laikipia (Karandi)	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total- Second wave around first cradle	**347**	**161**	**127**	92%	92%	91%	7%	8%	9%	0%	0%	0%
Total- Production North	**372**	**172**	**131**	**93%**	**92%**	**92%**	**7%**	**8%**	**8%**	**0%**	**0%**	**0%**
Production East												
Second cradle (Kirinyaga - Mwea)	**129**	**79**	**53**	**98%**	**96%**	**94%**	**0%**	**0%**	**0%**	**2%**	**4%**	**6%**
Second wave around second cradle												

Machakos (Matuu)	35	23	8	91%	96%	88%	9%	4%	13%	0%	0%	0%
Embu (Makima)	15	8	3	100%	100%	100%	0%	0%	0%	0%	0%	0%
Embu (Mavuria)	15	6	5	100%	100%	100%	0%	0%	0%	0%	0%	0%
Machakos (Wamunyu)	14	9	9	100%	100%	100%	0%	0%	0%	0%	0%	0%
Embu (Kyeni South)	10	5	3	100%	100%	100%	0%	0%	0%	0%	0%	0%
Machakos (Ekalakala)	10	1	0	80%	100%	0%	20%	0%	0%	0%	0%	0%
Embu (Kagaari South)	8	0	0	100%	0%	0%	0%	0%	0%	0%	0%	0%
Machakos (Masinga)	6	4	0	100%	100%	0%	0%	0%	0%	0%	0%	0%
Machakos (Kabaa)	5	3	1	100%	100%	100%	0%	0%	0%	0%	0%	0%
Embu (Mwea)	4	3	2	100%	100%	100%	0%	0%	0%	0%	0%	0%
Embu (Mbeti South)	4	1	1	100%	100%	100%	0%	0%	0%	0%	0%	0%
Total - Second wave around second cradle	**126**	**63**	**32**	**96%**	**98%**	**97%**	**4%**	**2%**	**3%**	**0%**	**0%**	**0%**
Total - Production East	**255**	**142**	**85**	**97%**	**97%**	**95%**	**2%**	**1%**	**1%**	**1%**	**2%**	**4%**
Production South												
Second wave around second cradle in Southeast of Nairobi												
Kajiado												
Rombo	21	23	21	100%	100%	100%	0%	0%	0%	0%	0%	0%
Kimana	17	12	14	88%	67%	57%	12%	33%	43%	0%	0%	0%
Imaroro	13	7	4	100%	100%	100%	0%	0%	0%	0%	0%	0%
Kuku	8	7	4	100%	100%	100%	0%	0%	0%	0%	0%	0%
Esimiti	7	6	3	100%	100%	100%	0%	0%	0%	0%	0%	0%
Total	**66**	**55**	**46**	**97%**	**93%**	**87%**	**3%**	**7%**	**13%**	**0%**	**0%**	**0%**
Taita Taveta												
Mata	21	8	4	95%	88%	100%	5%	13%	0%	0%	0%	0%
Mahoo	19	12	4	95%	92%	100%	5%	8%	0%	0%	0%	0%
Mboghoni	16	11	4	94%	91%	100%	6%	9%	0%	0%	0%	0%
Bomeni	15	12	4	93%	92%	100%	7%	8%	0%	0%	0%	0%
Chala	9	3	1	100%	100%	100%	0%	0%	0%	0%	0%	0%
Total	**80**	**46**	**17**	**95%**	**91%**	**100%**	**5%**	**9%**	**0%**	**0%**	**0%**	**0%**
Total- Production South	**146**	**101**	**63**	**96%**	**92%**	**90%**	**4%**	**9%**	**11%**	**0%**	**0%**	**0%**
ALL	**773**	**415**	**279**	**95%**	**94%**	**92%**	**5%**	**5%**	**6%**	**1%**	**1%**	**1%**

(2) rural assemblers/village traders: 647 to 746, +15%

Table 8.4: Structural change in tomato clusters over 10 years: rural assemblers

Clusters	Rural Assemblers		
	Total number		
	2024	**2019**	**2014**
Production North			
First cradle (Nakuru-Subukia/Kabazi)	**30**	**5**	**0**
Second wave around first cradle			
Laikipia (Rumuruti)	60	20	10
Laikipia (Marmanet)	30	12	5
Baringo (Marigat)	20	7	1

Nakuru (Visoi)	12	2	0
Baringo (Emining)	10	4	0
Elgeyo Marakwet	10	2	0
Laikipia (Salama)	10	8	15
Narok (Melili)	7	10	12
Narok (Township)	5	3	0
Narok (Ildamat)	5	12	15
Narok (Mosiro)	3	10	0
Nakuru (Solai & Rongai)	2	5	0
Baringo (Barwessa)	2	0	0
Laikipia (Sosian)	2	1	0
Narok (Siana)	1	0	0
Nakuru (Mosop)	0	0	0
Total- Second wave around first cradle	**179**	**96**	**58**
Total -Production North	**209**	**101**	**58**
Production East			
Second cradle (Kirinyaga - Mwea)	**130**	**195**	**259**
Second wave around second cradle			
Embu (Makima)	43	25	15
Machakos (Ekalakala)	35	5	0
Embu (Mwea)	33	15	11
Embu (Kagaari)	23	10	5
Embu (Kyeni South)	20	15	10
Machakos (Wamunyu)	7	2	2
Machakos (Ndalani)	3	0	0
Total- Second wave around second cradle	**164**	**72**	**43**
Total -Production East	**294**	**267**	**302**
Production South **Second wave around second cradle in Southeast of Nairobi**			
Kajiado			
Imbirikani serengei	80	40	20
Rombo	74	69	76
Kimana	30	17	65
Imaroro	5	3	2
Total	189	129	163
Taita Taveta			
Bomeni	20	30	30
Chala	16	10	4
Mata	10	30	50
Mahoo	3	6	30
Ndalani	3	0	0
Mboghoni	2	5	10
Total	54	81	124
Total - Production South	**243**	**210**	**287**
ALL	**746**	**578**	**647**

(3) wholesalers, 3000 to 5300, +77%

Table 8.7: Structural change in tomato clusters over 10 years: wholesalers

Clusters	Wholesalers														
	Total number			Share of small in total number			Share of medium in total number			Share of total in total number			Share of Wholesaler cum farmers in total number		
	2024	2019	2014	2024	2019	2014	2024	2019	2014	2024	2019	2014	2024	2019	2014
Production North															
First cradle (Nakuru-Subukia/Kabazi) and second wave															
Nakuru	383	462	180	48%	39%	50%	47%	39%	50%	0%	0%	0%	5%	22%	0%
Nyandarua	74	52	27	96%	100%	100%	3%	0%	0%	1%	0%	0%	0%	0%	0%
Laikipia	44	30	30	68%	77%	77%	5%	10%	0%	5%	0%	0%	23%	13%	23%
Baringo	13	15	5	100%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Narok	10	1	0	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	**524**	**560**	**242**	**59%**	**49%**	**60%**	**35%**	**33%**	**37%**	**1%**	**0%**	**0%**	**6%**	**19%**	**3%**
Production East															
Second cradle (Kirinyaga - Mwea) and second wave															
Kirinyaga	791	493	156	82%	91%	86%	2%	2%	0%	1%	2%	1%	15%	5%	13%
Meru	285	183	156	79%	86%	93%	16%	13%	5%	0%	0%	0%	5%	2%	2%
Kitui	194	94	39	55%	57%	59%	13%	29%	28%	23%	13%	13%	9%	1%	0%
Machakos	155	96	97	79%	73%	72%	3%	11%	8%	0%	0%	1%	18%	16%	19%
Murang'a	148	135	168	84%	93%	98%	10%	2%	2%	0%	1%	0%	6%	4%	0%
Embu	146	64	33	73%	77%	79%	1%	2%	15%	0%	0%	0%	26%	22%	6%
Isiolo	130	240	120	75%	83%	67%	2%	0%	0%	0%	0%	0%	23%	17%	33%
Makueni	82	28	37	61%	46%	22%	15%	7%	8%	4%	0%	3%	21%	46%	68%
Nyeri	48	87	94	52%	52%	46%	27%	14%	12%	2%	0%	0%	19%	34%	43%
Tharaka Nithi	35	43	32	86%	86%	78%	0%	0%	0%	0%	0%	0%	14%	14%	22%
Total	**2,014**	**1,463**	**932**	**76%**	**82%**	**77%**	**7%**	**6%**	**5%**	**3%**	**1%**	**1%**	**14%**	**10%**	**17%**
Production South															
Second wave around second cradle in Southeast of Nairobi															
Makueni	254	144	122	64%	63%	76%	4%	0%	0%	0%	0%	0%	32%	37%	24%
Taita taveta	208	269	379	90%	83%	84%	7%	15%	14%	0%	0%	0%	2%	3%	2%

Kitui	76	41	17	76%	73%	53%	4%	5%	29%	0%	0%	0%	20%	22%	18%
Total	**538**	**454**	**518**	**76%**	**76%**	**81%**	**5%**	**9%**	**11%**	**0%**	**0%**	**0%**	**19%**	**15%**	**8%**
Primary Consumption (Nairobi Metropolitan)															
Kiambu	204	194	100	50%	48%	42%	24%	22%	41%	23%	26%	15%	3%	3%	3%
Nairobi	142	155	142	1%	10%	0%	83%	73%	65%	3%	1%	4%	13%	16%	31%
Machakos	25	19	15	24%	32%	40%	16%	32%	20%	0%	0%	0%	60%	37%	40%
Kajiado	13	28	41	15%	29%	7%	62%	61%	85%	0%	0%	0%	23%	11%	7%
Total	**384**	**396**	**298**	**29%**	**31%**	**17%**	**47%**	**45%**	**58%**	**13%**	**13%**	**7%**	**11%**	**10%**	**19%**
Secondary Consumption															
Uasin Gishu	190	81	101	88%	78%	46%	12%	22%	54%	0%	0%	0%	0%	0%	0%
Kisumu	122	138	121	59%	64%	54%	40%	36%	41%	0%	0%	0%	0%	0%	0%
Mombasa	25	40	50	0%	0%	0%	60%	75%	60%	40%	25%	40%	0%	0%	0%
Total	**337**	**259**	**272**	**71%**	**58%**	**41%**	**26%**	**38%**	**50%**	**3%**	**4%**	**7%**	**0%**	**0%**	**0%**
Other consumption areas (Major towns and surrounding areas)															
Kisii	285	240	195	72%	70%	71%	28%	30%	29%	0%	0%	0%	0%	0%	0%
Kericho	229	99	58	98%	94%	90%	0%	0%	2%	0%	0%	0%	2%	6%	9%
Bungoma	211	149	78	25%	29%	18%	69%	71%	82%	5%	0%	0%	1%	0%	0%
Trans-nzoia	145	120	102	36%	30%	6%	1%	13%	50%	55%	42%	20%	8%	15%	25%
Bomet	133	51	6	95%	92%	100%	2%	8%	0%	0%	0%	0%	2%	0%	0%
Nyamira	126	93	43	90%	74%	60%	6%	12%	19%	0%	0%	0%	4%	14%	21%
Busia	89	63	24	76%	92%	100%	24%	8%	0%	0%	0%	0%	0%	0%	0%
Nandi	86	63	19	93%	90%	63%	5%	6%	32%	0%	0%	0%	2%	3%	5%
Siaya	80	86	95	65%	62%	24%	34%	35%	71%	0%	0%	0%	1%	1%	5%
Vihiga	53	32	45	53%	63%	40%	45%	38%	60%	2%	0%	0%	0%	0%	0%
Kakamega	42	33	22	7%	9%	23%	81%	88%	73%	12%	0%	0%	0%	3%	5%
Migori	27	25	9	52%	28%	22%	48%	72%	78%	0%	0%	0%	0%	0%	0%
Homa bay	14	12	11	93%	83%	45%	36%	17%	18%	0%	0%	0%	7%	0%	0%
Kilifi	13	10	10	23%	0%	0%	77%	10%	10%	0%	0%	0%	0%	0%	0%

Total	**1,533**	**1,076**	**717**	**67%**	**62%**	**46%**	**24%**	**30%**	**44%**	**6%**	**5%**	**3%**	**2%**	**4%**	**6%**
ALL	**5,330**	**4,208**	**2,979**	**68%**	**65%**	**60%**	**19%**	**22%**	**27%**	**4%**	**3%**	**2%**	**9%**	**10%**	**10%**

(4) market-based brokers: 805 to 1597, +98%

Table 8.8: Structural change in tomato clusters over 10 years: Market-based brokers

Clusters	Market-based brokers		
	Total number		
	2024	2019	2014
Production North ***First cradle (Nakuru-Subukia/Kabazi) and second wave***			
Nakuru	180	150	100
Nyandarua	0	0	0
Laikipia	0	0	0
Baringo	0	0	0
Narok	3	0	0
Total	**183**	**150**	**100**
Production East ***Second cradle (Kirinyaga - Mwea) and second wave***			
Kirinyaga	600	250	220
Machakos	18	26	27
Embu	25	12	9
Kitui	10	5	0
Makueni	13	12	13
Tharaka Nithi	0	0	0
Nyeri	0	0	0
Isiolo	0	0	0
Meru	5	2	0
Murang'a	0	0	0
Total	**671**	**307**	**269**
Production South **Second wave around second cradle in Southeast of Nairobi**			
Makueni	35	3	0
Taita Taveta	0	0	0
Kitui	0	0	0
Total	**35**	**3**	**0**
Primary Consumption (Nairobi Metropolitan)			
Nairobi	205	153	84
Kajiado	10	32	29
Kiambu	0	0	0
Machakos	0	0	0
Total	**215**	**185**	**113**
Secondary Consumption			

Kisumu	11	9	9
Mombasa	5	5	12
Uasin Gishu	0	0	0
Total	**16**	**14**	**21**
Other consumption areas (Major towns and surrounding areas)			
Kisii	200	176	234
Kericho	119	46	14
Bungoma	45	20	10
Bomet	39	11	0
Busia	24	2	0
Nyamira	15	6	3
Homa Bay	14	8	13
Siaya	12	19	7
Migori	9	18	7
Kilifi	0	0	0
Trans-nzoia	0	7	14
Kakamega	0	0	0
Vihiga	0	0	0
Total	**477**	**313**	**302**
ALL	**1,597**	**972**	**805**

(5) transporters (3PLS), 1640 to 3519, +115%

Table 8.10. Structural change in tomato clusters over 10 years: transporters (Third Party Logistics, 3PLS)

Clusters	Transporters														
	Total number			Share of micro in total number			Share of small in total number			Share of medium in total number			Share of large in total number		
	2024	**2019**	**2014**	**2024**	**2019**	**2014**	**2024**	**2019**	**2014**	**2024**	**2019**	**2014**	**2024**	**2019**	**2014**
Production North															
First cradle (Nakuru-Subukia/Kabazi) and second wave															
Nakuru	218	297	105	0%	0%	0%	93%	95%	86%	0%	0%	0%	7%	5%	14%
Nyandarua	62	42	42	8%	12%	12%	82%	86%	86%	10%	0%	0%	0%	2%	2%
Laikipia	14	13	8	0%	0%	0%	29%	31%	100%	71%	69%	0%	0%	0%	0%
Baringo	13	15	5	0%	0%	0%	100%	100%	100%	0%	0%	0%	0%	0%	0%
Narok	4	0	0	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Total	**311**	**367**	**160**	**2%**	**1%**	**3%**	**88%**	**92%**	**87%**	**5%**	**2%**	**0%**	**5%**	**4%**	**10%**
Production East															
Second cradle (Kirinyaga - Mwea) and second wave															
Kirinyaga	527	143	147	88%	79%	97%	9%	13%	3%	3%	4%	0%	0%	4%	0%
Kitui	192	117	74	20%	0%	0%	46%	67%	78%	16%	29%	20%	18%	4%	1%
Embu	158	53	29	40%	9%	0%	59%	89%	83%	1%	2%	17%	0%	0%	0%

Meru	151	64	31	15%	31%	48%	84%	64%	42%	1%	5%	10%	0%	0%	0%
Murang'a	127	111	131	48%	36%	16%	40%	61%	79%	12%	3%	5%	0%	0%	0%
Isiolo	92	30	5	54%	67%	100%	43%	33%	0%	2%	0%	0%	0%	0%	0%
Machakos	75	33	10	40%	24%	40%	59%	61%	20%	1%	15%	0%	0%	0%	40%
Makueni	59	23	15	7%	9%	0%	81%	74%	87%	12%	17%	13%	0%	0%	0%
Nyeri	53	56	43	9%	45%	60%	64%	36%	9%	26%	20%	30%	0%	0%	0%
Tharaka Nithi	15	20	20	80%	90%	95%	20%	10%	5%	0%	0%	0%	0%	0%	0%
Total	**1,449**	**650**	**505**	**52%**	**39%**	**46%**	**40%**	**49%**	**44%**	**6%**	**10%**	**9%**	**2%**	**2%**	**1%**
Production South															
Second wave around second cradle in Southeast of Nairobi															
Makueni	152	27	43	41%	93%	88%	53%	7%	12%	7%	0%	0%	0%	0%	0%
Kitui	61	32	14	16%	25%	14%	82%	69%	50%	2%	6%	36%	0%	0%	0%
Taita taveta	51	54	50	67%	69%	72%	29%	17%	12%	4%	15%	16%	0%	0%	0%
Total	**264**	**113**	**107**	**40%**	**62%**	**71%**	**55%**	**29%**	**17%**	**5%**	**9%**	**12%**	**0%**	**0%**	**0%**
Primary Consumption (Nairobi Metropolitan)															
Kiambu	218	190	103	18%	6%	5%	45%	55%	48%	37%	39%	48%	0%	0%	0%
Nairobi	72	89	98	0%	0%	0%	31%	38%	32%	69%	62%	68%	0%	0%	0%
Machakos	11	12	9	0%	0%	0%	64%	50%	67%	36%	50%	33%	0%	0%	0%
Kajiado	8	29	37	0%	0%	0%	38%	38%	8%	63%	62%	92%	0%	0%	0%
Total	**309**	**320**	**247**	**13%**	**4%**	**2%**	**42%**	**48%**	**36%**	**45%**	**48%**	**62%**	**0%**	**0%**	**0%**
Secondary Consumption															
Kisumu	93	108	91	0%	0%	0%	94%	94%	92%	0%	0%	0%	6%	6%	8%
Uasin Gishu	221	89	105	0%	0%	0%	100%	100%	100%	0%	0%	0%	0%	0%	0%
Mombasa	15	12	20	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%
Total	**329**	**209**	**216**	0%	0%	0%	94%	91%	88%	0%	0%	0%	6%	9%	13%
Other consumption areas (Major towns and surrounding areas)															
Kisii	284	226	191	0%	0%	0%	100%	100%	100%	0%	0%	0%	0%	0%	0%
Trans-nzoia	134	51	29	83%	31%	28%	11%	45%	17%	1%	10%	14%	5%	14%	41%
Kitui	133	68	48	4%	7%	4%	62%	57%	71%	13%	32%	25%	22%	3%	0%
Bungoma	93	55	25	58%	65%	44%	15%	16%	8%	20%	18%	48%	6%	0%	0%
Siaya	76	73	43	42%	18%	47%	14%	26%	12%	39%	55%	42%	4%	1%	0%
Vihiga	51	30	30	0%	0%	0%	55%	67%	60%	43%	33%	40%	2%	0%	0%
Nandi	30	15	6	0%	0%	0%	93%	87%	100%	7%	13%	0%	0%	0%	0%
Kakamega	27	22	22	0%	5%	5%	11%	14%	23%	63%	82%	73%	26%	0%	0%
Busia	10	1	1	0%	0%	0%	0%	0%	0%	100%	100%	100%	0%	0%	0%

Busia	10	1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	100 %	100 %	100 %
Kilifi	9	9	9	0%	0%	0%	0%	0%	0%	0%	0%	0%	100 %	100 %	100 %
Bomet	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Kericho	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Nyamira	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	**857**	**551**	**405**	**23 %**	**13 %**	**10%**	**54%**	**64%**	**66%**	**14%**	**20%**	**19%**	**8%**	**4%**	**5%**
ALL	**3,519**	**2,210**	**1,640**	**31 %**	**19 %**	**22%**	**54%**	**63%**	**56%**	**11%**	**16%**	**17%**	**4%**	**3%**	**4%**

Third, services complementary to the Hidden Middle were present in large numbers and developed rapidly in the Kenya tomato clusters. Graders (who worked for farmers and traders) rose from 7733 to 8121. Market based loaders soared from 1808 to 3160 in the decade. This meant an increase in employment of these complementary service workers from 9541 to 11,281.

Table 8.5: Structural change in tomato clusters over 10 years: rural tomato graders (working for farmers and traders in transactions)

Clusters	Tomato graders		
	Total number		
	2024	**2019**	**2014**
Production North			
First cradle (Nakuru-Subukia/Kabazi)	**10**	**-**	**-**
Second wave around first cradle		-	-
Laikipia (Marmanet)	5,000	5,000	5,000
Laikipia (Rumuruti)	200	80	10
Baringo (Marigat)	100	50	18
Baringo (Emining)	50	10	-
Laikipia (Salama)	50	30	70
Elgeyo Marakwet (Soy North)	30	10	-
Narok (Siana)	30	8	0
Narok (Maji moto/Naroosura)	29	38	50
Nakuru (Visoi)	20	10	-
Narok (Mosiro)	15	40	50
Narok (Melili)	12	17	20
Narok (Ildamat)	10	16	24
Nakuru (Rongai/Soin)	6	6	-
Laikipia (Sosian)	6	6	-
Total-Second wave around first cradle	**5,558**	**5,321**	**5,242**
Total-Production North	**5,568**	**5,321**	**5,242**
Production East			
Second cradle (Kirinyaga - Mwea)	**474**	**975**	**1,258**
Second wave around second cradle			
Embu (Mwea)	150	100	60
Machakos (Ekalakala)	50	10	0
Machakos (Wamunyu)	30	20	0

Machakos (Mbiuni)	25	14	0
Embu (Kagaari)	23	10	0
Embu (Makima)	20	20	20
Machakos (Masinga Central)	15	8	5
Embu (Mbeti South)	12	12	12
Embu (Kyeni South)	10	5	1
Machakos (Ndalani)	3	0	0
Total-Second wave around second cradle	**338**	**199**	**98**
Total-Production East	**812**	**1,174**	**1,356**
Production South			
Second wave around second cradle in Southeast of Nairobi			
Kajiado			
Kimana	700	300	200
Rombo	500	620	600
Imbirikani serenegi	400	250	100
Imaroro	30	15	10
Total	**1,630**	**1,185**	**910**
Taita Taveta			
Mata	50	100	100
Chala	32	40	60
Mboghoni	20	25	25
Bomeni	8	15	20
Mahoo	1	40	20
Total	**111**	**220**	**225**
Total - Production South	**1,741**	**1,405**	**1,135**
ALL	**8,121**	**7,900**	**7,733**

Table 8.9: Structural change in tomato clusters over 10 years: market-based loaders

Clusters	Market-based loaders		
	Total number		
	2024	2019	2014
Production North			
First cradle (Nakuru-Subukia/Kabazi) and second wave			
Nakuru	50	50	50
Nyandarua	31	26	6
Laikipia	16	16	16
Narok	8	0	0
Baringo	0	0	0
Total	**105**	**92**	**72**
Production East			
Second cradle (Kirinyaga - Mwea) and second wave			
Kirinyaga	608	388	214
Kitui	145	76	58
Murang'a	138	123	121

Meru	109	53	42
Machakos	103	51	39
Embu	88	35	34
Isiolo	60	70	70
Makueni	57	20	11
Nyeri	37	43	35
Tharaka Nithi	17	15	15
Total	**1,362**	**874**	**639**
Production South			
Second wave around second cradle in Southeast of Nairobi			
Makueni	117	30	16
Taita Taveta	88	90	78
Kitui	43	13	7
Total	**248**	**133**	**101**
Primary Consumption (Nairobi Metropolitan)			
Kiambu	211	155	144
Nairobi	100	108	150
Machakos	40	14	11
Kajiado	20	46	51
Total	**371**	**323**	**356**
Secondary Consumption			
Kisumu	108	99	89
Mombasa	56	56	56
Uasin Gishu	20	30	30
Total	**184**	**185**	**175**
Other consumption areas (Major towns and surrounding areas)			
Kisii	241	249	149
Busia	134	38	16
Bungoma	130	77	53
Siaya	93	71	23
Kakamega	69	38	41
Trans-nzoia	53	40	42
Vihiga	47	28	37
Kilifi	45	45	45
Migori	36	46	18
Nandi	20	25	29
Homa Bay	19	15	12
Bomet	3	6	0
Kericho	0	0	0
Nyamira	0	0	0
Total	**890**	**678**	**465**
ALL	**3,160**	**2,285**	**1,808**

Fourth, the table shows that decline in farm numbers and rise in tomato output was experienced at similar percentage levels across all three production clusters. The main difference was the change

in strata composition, with the South Zone experiencing a more rapid increase in the share of volume to larger farms, reflecting the great access to land in that zone.

Fifth, the table shows that there was roughly similar growth (and intense growth as shown above) in the off-farm segments in the three zones.

Sixth, there was rapid growth in the off-farm MSMEs in particular wholesalers and transporters in the consumption zones, which is consonant with the big increase in output and thus consumption over the 10 years.

4.4 Inclusion and technology correlates of the rise of the tomato clusters

a) Inclusion

The clusters' inclusion story is mixed, but with a net positive inclusion effect on employment. From the meso survey data we showed above that the numbers of farms fell over time in the clusters; the share of small farms stayed steady at 76% but their numbers went from 24,000 to 8000, so 16,000 small farms exited. On the farm side that is a big exclusion effect.

However, two inclusion forces were at work in the tomato sector in the Kenya clusters. On the one hand, the output rose 100,000 tons overall; and the tomato farm sector did not significantly change its mechanization rates over that decade: by our survey year, 81% of the farms used tractors to prepare the soil; yet 73% also hired labor for that; 99% hired for planting, 99% for weeding, 99% for fertilizer and pesticide application, and 69% for staking and pruning. Thus per ton there was little to no shedding of labor over time and the labor employment rose and was very substantial on farms. With 11,000 farms producing 661,000 tons of tomatoes, and supposing labor use of some 10 workers (own and hired) per average farm, this means around 110,000 persons employed on the tomato farms.

We already noted that hidden middle MSMEs increased to 12,000; the latter roughly each employ about 6 persons (own and hired), so that comes to 72,000 as a very conservative estimate. Note that the tables show that the majority of the Hidden Middle MSMEs are small firms. Complementary service rural workers to 11,000. This means the hidden middle firms employ at least 83,000 people.

The above provides the stunning employment figure of these Kenya tomato clusters at around 200,000 persons, as a conservative estimate – a strong employment generator.

Women and youth are important in this employment. Women constitute 66% of wholesalers and 81% of retailers; 50% are farmer-wholesalers. Traders employ youth who constitute 60% of their salaried employees and 50% of their casual workers. For input suppliers, youth constitute 71% of their salaried workers and 73% of their casual workers.

(b) There is a correlation (and apparently two-way causality) among technology upgrading and cluster formation (including farmer entry).

In Kenya, there is widespread use of intensification technologies in the tomato clusters. In production zones 2 and 3, half the farms have irrigation (not just rainfed); 97% use irrigation to complement rainfed sources; 100% use inorganic fertilizer, 97% organic; 97% use hybrid seeds or purchased seedlings; 100% use pesticides; 81% of farmers use tractors for land preparation.

5 Results: Input suppliers

5.1 Structure: Spatial distribution, growth, and inclusion

5.1.1 General characteristics

Women represent a slight majority of the traders, making up 53% of the total across all production zones (Table 5.1). Youth (15-24 years) represent a small portion of the trader population at 8% overall, with their presence being highest in the South zone (15%). The traders are highly literate; 99% and 67% have finished at least primary and secondary education, respectively. On average, traders have 9 years of experience since starting their businesses. The North production zone features the most established traders with an average of 11 years, while the South has the newest entrants with an average of 6 years.

Table 5.1: Characteristics of input suppliers

General characteristics	Production North	Production East	Production South	Total
N	160	188	66	414
Gender (% women)	51	56	50	53
Youth (% 15-24 years old)	6	9	15	8
Education: % at least finished primary	99	99	97	99
Education: % at least finished secondary	79	62	52	67
Experience (years since business started)	11	8	6	9
Formality: Enterprise has any certification? (% yes)	100	99	100	100
If yes, number of certifications	4	3	3	3
Specialized in tomato trading	9	5	14	8

Only a small minority of these traders—8% overall—are specialized specifically in tomato inputs selling. The rest sell a broader range of agricultural inputs.

There is a very high level of enterprise formality, as 100% of traders overall reported having at least one certification for their enterprise and on average, these businesses hold 3 different certifications.

Nearly half (47%) of all traders were farmers before entering the input supply business, and this is more prevalent in the South zone and the East zone, whereas it is slightly lower in the North (Figure 5.1). A large portion of sellers transitioned from salaried roles, including former agricultural officers (11%). Prior experience in trading is less common than farming or salaried work, representing 19% of sellers overall. A significant proportion of sellers come from other diverse professional backgrounds, accounting for 35% overall.

Figure 5.1: Background of input sellers

5.1.2 Asset ownership

The startup capital requirements for the input traders averaged only Ksh 32,219, around 250 USD (Table 5.2).

Table 5.2: Asset ownership

Asset	Production North	Production East	Production South	Total
N	160	188	66	414
Share of traders that know their source of startup capital	57	65	70	63
Share that need to pay start-up costs	73	72	83	74
If needed to pay start-up costs: Total cost paid to meet initial requirements	36,561	30,879	26,293	32,219
Number of branches	10	9	3	9
Member of input seller association	11	7	12	9
Number stall & shop	0	0	0	0
Mobile phone				
Smartphone (% having)	72	81	82	78

Computer (% having)	46	34	32	38
Generator and/or solar panel (% having)	7	9	3	7
CCTV system (% having)	30	19	17	23
Refrigerator (% having)	7	7	6	7
Online presence (% having)	21	18	15	19
Number of years with online presence (if has online presence)	4	2	2	3
Took a loan in the last 12 months to invest in input supply or to operate (% of firms)	26	23	15	23
Employment				
Hired any **salaried** worker (%)	58	52	45	53
Number of salaried workers, if hired	12	4	2	7
Hired any **casual** worker (%)	22	10	12	15
Number of casual workers, hired	26	2	1	15
Hired **unpaid family** worker (%)	53	70	68	63
Number of unpaid family workers, if hired	1	1	0	1

Nearly all input sellers just self-financed their startup investment: own funds accounting for 91% of traders starting with that source (Figure 5.2). Other sources including formal loans, social networks and Government subsidies, NGOs, and philanthropic organizations serve as secondary support primarily in the North and East zones.

Figure 5.2: Sources of startup capital

Input traders own a range of assets, including vehicles such as cars, lorries, and vans (Figure 5.3). Other assets include smartphones (78% ownership), computers (38%), CCTV systems (23%), refrigerators (7%), and generators and/or solar panels (7%).

Figure 5.3: Vehicle ownership

On average, input suppliers have 9 branches, with traders in the North zone averaging 10 branches, while those in the South zone average only 3 branches. Participation in formal networks is relatively low, as only 9% of traders are members of an input seller association.

Only 40% of all traders utilize digital record keeping, with majority of traders (71%) relying on physical record books (Figure 5.4). Only 19% of traders have an online presence, and on average they have maintained it for 3 years.

Figure 5.4: Method of record keeping

Only a quarter of input sellers rely on external financing, with 23% having taken loans in the last 12 months to invest in input supply or operations (Figure 5.5). Commercial banks are the most common source of credit, utilized by 36% of firms, followed by SACCOs and ROSCAs, mobile loans, social networks (friends, family, and neighbors) agrochemical and seed companies, and microfinance institutions. While commercial banks and SACCOs are the primary lenders for the North and East zones, traders in the South zone rely much more heavily on credit provided directly by agrochemical and seed companies. This may be because these companies provide tailored supplier financing that overcomes collateral and risk barriers involved in seasonal input trade.

Figure 5.5: Sources of loan

Most (63%) firms use family labor, using on average 1 unpaid family member (Figure 5.6). 53% hire salaried staff; conditional on that, they employ 7 employees on average though this is heavily skewed by the North zone, which averages 12 salaried workers per firm hiring salaried workers. Only 15% of firms hire casual workers. However, for the few firms that do hire casuals, the number is high, averaging 15 workers per firm. The North production zone is the dominant employer across all hired labor categories, hiring on average 12 salaried and 26 casual workers per firm.

Figure 5.6: Number and type of workers hired

Among firms that hire salaried workers, the average number of salaried youth workers is 5, while those hiring casual workers employ 11 youths. The North zone is particularly inclusive, with firms who hire any casual workers hiring an average of 17 youths. Firms with salaried staff employ an average of 4 women and in the North zone, this figure rises to 7. In the unpaid family labor category, firms typically involve 1 woman and no youth.

Overall, the data indicates that while family participation is a baseline across the industry, the North zone operates at a much larger scale of employment, providing most salaried and casual jobs for women and youth in the sector.

5.2 Conduct

5.2.1 Business Operations

Input sellers stock a wide range of products, averaging five inputs or services—with North zone traders being slightly more diversified at six. Agrochemicals dominate (sold by 94% of suppliers), followed by fertilizers and non-tomato seeds/seedlings (Figure 5.7). While agrochemicals and fertilizers form the core business, 50% of input suppliers also sell equipment, hormones/growth promoters, and tomato seeds/seedlings (50% of traders).

Figure 5.7: Products traded by input sellers

Provision of private extension services is rare, with only 10% of traders offering them but North zone firms are more active at 19%—versus 4-5% elsewhere. However, those 19% in the North who provide extension reach an average of 197 customers, compared to 577 in the South zone.

Input sellers also provide a range of secondary services but the adoption rates for most of these services are very low, with AI/veterinary services being the most common "other" service provided and is offered by only 5% of traders (Figure 5.8). Others include linking farmers to traders (by 1.9% of traders), custom tomato seedling supplies (1.4%), soil testing and specialized services (0.5%), and mechanized land preparation (0.2%). All other services including cold storage for tomatoes are simply non-existent.

Figure 5.8: Other services provided by input sellers

Only 11% of firms act as official dealers or representatives for agricultural companies that supply seeds or seedlings, and 10% other types of inputs. For those who do act as dealers, 38% receive bonuses or incentives for reaching specific sales targets. By contrast, 60% of input sellers have participated in fairs organized by agricultural input companies.

During the most recent high season, the highest **volume of client traffic** on a typical day was driven by extension services for those few (19%) of input sellers that offer those services (13 customers), followed by seeds and seedlings other than tomato (11 customers) and inputs for animal production (10 customers) (Figure 5.9). Products such as agricultural equipment and growth promoters also saw significant daily traffic, while tomato seeds/seedlings consistently saw the lowest volume at an average of 1.7 customers per day. A comparison between the typical day when businesses started and the most recent high season indicates that client traffic has remained remarkably stable across almost all categories. The number of customers for tomato seeds, extension services, animal production inputs

and growth promoters has remained nearly identical since the businesses began. Slight variations were observed for agrochemicals (decrease) and fertilizer (increase). However, significant contraction was in the East production zone, where daily traffic for agricultural equipment dropped significantly from an average of 19 customers at the start to 9 in the last high season.

Figure 5.9: Number of customers served on a typical day

Results on the share of sales value on a typical day show a high degree of portfolio stability over time (Figure 5.10). For instance, "other seeds and seedlings" remain the highest value contributor at 14%, while "inputs for animal production" (10%) and "agrochemicals" (5%) and tomato seeds have seen no change in their overall share. For those (few) firms offering extension, extension services (13%) were established as the primary value drivers at the business's inception and continue to hold that position. The most significant shift occurred in the South production zone, where the share of sales value for fertilizers dropped from 9% at the start of the business to 4% currently, while it remained stable in the other zones.

Figure 5.10: Share of value of input sales on a typical day

These businesses have shown little growth or diversification since inception. While 67% of firms express a desire to expand in the next five years, these results suggest that the scale of daily customer interactions per product has reached a plateau for a given firm rather than showing rapid upward growth. Yet the meso inventory in the section above showed remarkable expansion in the number of input suppliers in the three clusters, rising from 279 to 773, +177% in just 10 years. So while a given firm tends to not expand fast, the number of input sellers has. Further, although about two-thirds of the firms expect to expand their businesses in the next five years, they face several hurdles to expansion: high operational costs (cited by 50% of firms); market dynamics (slow demand growth and competition); regulatory and tax burdens and unfavorable governmental policies (Figure 5.11). These can be summarized as internal financial pressures and external market pressures, with regulatory issues playing a more substantial role for traders in the North zone.

Figure 5.11: Challenges in business expansion

Input sellers selling on credit is limited from the perspective of coverage of farmers. Overall, 67% of firms sell inputs on credit and among those that offer credit, the average number of buyers who received it is 38 (Table 5.3). There is significant regional variation, with the North zone reporting many buyers who received inputs on credit (64) compared to 28 and 9 in the East and South zones, respectively.

Table 5.3: Services provided by input suppliers

	Production North	Production East	Production South	Total
N	160	188	66	414
Number of inputs/services offered	6	5	5	5
Number of customers receiving extension services from this shop, if provides extension services	137	30	577	197
Input shop is a dealer or representative for any company (% of firms)				
For seeds/seedlings	13	7	15	11
For other inputs	12	7	11	10
Participating in farmers fairs organized by ag input companies (% of firms)	56	63	61	60
Receiving bonuses or incentives for reaching sales targets (% of firms)	36	40	38	38
Number of operating months of the year	12	12	12	12
Expecting to expand business in the next 5 years (% of firms)	74	63	64	67
Offered advice to buyer about input purchase (% of firms)	33	32	46	35
Sold inputs on credit (% of firms)	64	69	70	67
Number of buyers who received credit, from firms that sold inputs on credit	64	28	9	38

Two findings show that while two-thirds of firms offer some customers credit, it is given to few clients per firm. On the one hand, the average over zones of number of customers getting credit is 34 per firm; compare that with an average of about 15 customers per day coming into the shops; even with a number of those repeat customers (as below we show a customer buys many times a year from the same shop) the share of farmers buying on credit from input suppliers is limited.

On the other hand, selling on credit is rare. 94% of all recent sales were paid for fully at time of sale, with minimal use of installments/partial advance payment (0.5%) and full credit sales (0.7%) (Figure 5.14). For the small fraction of sales not paid in full immediately, the repayment window averages just 7 days. While previous results showed that 67% of firms offer credit to some of their customers, the "most recent sale" data reveals that advance payment is the actual standard for most daily transactions.

Figure 5.14: Schedule of payment for the most recent sale

5.2.2 Acquisition of products

Input sellers seldom buy their stock on credit from seed companies. In terms of **procurement and inventory management**, 23% of firms purchase seeds from companies on credit, paying after 22 days on average (Table A1). Firms in the North get the longest credit period (26 days), while those in the East zone pay sooner (13 days). There has been a contraction in the number of seed varieties stocked since inception, from 3 to 1.5. Supplier diversity remains stable at about 2 companies initially and at 1.8 currently.

Input seller buying seedlings on credit from seed propagators is uncommon (10% of firms). The overall average number of varieties stocked across all zones has remained stable at 4. However, in the North production zone, there has been a significant increase in the diversity of seedlings offered, starting from 4 varieties and rising to 8. Conversely, seedling variety has decreased in the East and South zones. Across all surveyed firms, the average number of seedling source companies has increased from 2 to 3, but has doubled in the North zone, decreased in the South and remained stable in the East zone.

5.2.3 Sale of products

Non-tomato farmers (i.e. farmers who produced other crops/livestock) dominated recent sales of input suppliers at 78%, versus 13% to tomato farmers (Figure 5.12), despite the input sellers being in tomato areas.

Figure 5.12: Customer type during the most recent sale

Figure 5.13: Type of product sold in the most recent transaction

Input sellers are overwhelmingly only retailers (to farmers), and rarely act as wholesalers to other input sellers (0.9% to ag-input suppliers; 0.2% to village stores), confirming these firms function almost exclusively as retailers to individual farmers.

Across all production zones, input suppliers have sold to their most recent customer 41 times over the past year (Table 5.4). This suggests that the relationship between input suppliers and their clients—the majority of whom are general crop and livestock farmers—is characterized by consistent, ongoing transactions rather than one-off or seasonal purchases. Further, it indicates a high level of repeat business and customer loyalty within the sector. On average, 77% of all buyers in the most recent transactions were located within the same county as the supplier.

Table 5.4: Transaction details

	Production North	Production East	Production South	Total
N	160	188	66	414
Frequency of selling to the same customer in the past 12 months	46	40	33	41
Buyer located in the same county (%)	73	79	80	77
Total value of this most recent sale (KES)	4,530	4,163	13,131	5,734
Duration (days) for payment to be received in full, if not paid in full	4	9	6	7

6 Results: Tomato traders

6.1 Structure: Spatial distribution, growth, and inclusion

6.1.1 General characteristics

We interviewed 903 output traders, including (1) wholesalers who buy tomatoes, take ownership, and resell; and (2) brokers who match buyers and sellers for a commission without owning the produce. Wholesalers make up 86% of the sample (Table 6.1).

Table 6.1. General characteristics

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
Gender (% women)	65	3	72	58	64	81	12	68	31	67
Youth (% 15-24 years old)	1	0	1	1	1	1	0	1	0	1
Education: % at least primary	81	93	79	74	78	77	83	84	81	84

Education: % at least secondary	9	17	6	9	7	6	12	10	12	10
Experience (years since business started)	12	10	12	12	12	12	11	11	17	11
Specialization AT PRESENT (% none (No other job))	31	23	34	27	32	34	24	30	44	31
% trading is major household income source	92	87	90	92	90	91	89	94	94	94

Women account for 65% of all traders. They are especially concentrated among wholesalers: 81% of wholesalers in production zones (PZ) and 68% in consumption zones (CZ) are women. Women are much less represented among brokers, at 12% of brokers in PZ and 31% in CZ. Youth participation (15-24 years) is negligible: only 1% of the sample, and only among wholesalers.

Education levels are modest. Overall, 81% have completed at least primary education. Among wholesalers, 77% in PZ and 84% in CZ have at least primary; brokers are similar (83% in PZ and 81% in CZ). Secondary completion is low (9% overall): 6% and 10% among wholesalers in PZ and CZ, and 12% among brokers in both zones.

Average experience in tomato trade is 12 years. Wholesalers average 12 years in PZ and 11 in CZ; brokers average 11 years in PZ and 17 years in CZ.

About 31% of respondents are specialized, meaning they have no other employment outside tomato trading/brokering. Specialization among wholesalers is 34% in PZ and 30% in CZ. Brokers show a marked zonal difference: 24% specialized in PZ versus 44% in CZ. Tomato trading is the major source of household income for 92% of traders, with similar shares for wholesalers and brokers (PZ: 91% wholesalers, 89% brokers; CZ: 94% for both).

The sector is overwhelmingly informal: only 1% report having any license or registration, implying 99% operate unregistered (Figure 6.1). Among the small group with certification, the most common is a County Business Permit (90% of those certified). A Registration/Certificate of Incorporation is held by 10%, and KRA PIN and health permits are each held by 10%.

Figure 6.1: Formality of trading business and type of certification

Traders' backgrounds differ by role. Retailing is a more common prior activity for wholesalers (39% in CZ) than brokers (as low as 4% in PZ). Brokers in PZ are more likely to have a background in agricultural wage labor (21%) than traders overall in the same zone (12%). Prior engagement in other agricultural enterprises is also higher among PZ brokers (32%) than PZ wholesalers (22%).

Figure 6.2: Background of traders

Figure 6.3 shows the main reasons for entering tomato trade:

Figure 6.3: Reason for starting tomato trading business

- Lucrative opportunity (78% overall), though lower for brokers in CZ (50%).
- Prior experience working for a trader or learning from a family member (21% overall), especially common for brokers in CZ (62%).
- Last resort (13% overall).
- Selling surplus or diversifying farming (9% overall).

Role and zone patterns are clear. In CZ, 80% of wholesalers cite "lucrative opportunity" versus 50% of brokers, while 62% of brokers cite apprenticeship or family learning versus 23% of wholesalers. In PZ, "last resort" is higher for wholesalers (17%) than brokers (11%). These patterns suggest wholesalers are more often driven by a commercial opportunity, while brokers in CZ frequently enter through mentorship and inherited networks or skills. The relatively high "last resort" share among PZ wholesalers points to entry driven by limited local alternatives for some at the production end.

6.1.2 Assets

In the high season, traders handle an average of 3 tons of tomatoes per day (Table 6.2). Volumes vary sharply by zone, sub-zone, and role. In PZ, average volumes are 4 tons, but Production North and South are much higher (11 and 8 tons) than Production East (2 tons). In CZ, averages are 3 tons. Brokers consistently handle far larger volumes than wholesalers: in PZ, 13 tons versus 1 ton; in CZ, 12 tons versus 2 tons. Brokers are fewer in number but move the largest volumes in peak periods.

Table 6.2: Asset ownership

Asset	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
Average tons per trader of tomatoes on typical day in high season	3	11	2	8	4	1	13	2	12	3
Average tons per trader of tomatoes on typical day in low season	1	4	1	3	1	0	5	1	6	1
Total cost paid to meet initial requirements	22,738	56	8,785	9,774	8,449	9,445	5,417	37,446	7,525	36,408
Number of off-market points operated by trader	1	0	1	1	1	1	0	1	1	1
Member of trader associations in the market (%)	67	37	66	50	60	66	41	73	94	74
Number stalls or shops	1.3	1	1.4	1.5	1.4	1.4	1	1.2	1	1.2
Number godowns/warehouse	1							1		1
Mobile phone										
% having smartphone	73	70	67	67	67	68	63	79	81	79
% basic m phone	49	60	46	54	49	46	57	49	63	49
Computer (% having)	0.7	0	0.3	0.9	0.5	0.6	0	0.9	0	0.9
Generator and/or solar panel (% having)	26	43	20	30	25	21	36	28	31	28
CCTV system (% having)	0.7	0	0.3	0	0.2	0.3	0	0.7	13	1.1
Plastic crates	75	23	86	55	74	87	34	76	69	76

Asset	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
Wooden crates	48	7	40	41	38	44	19	59	25	58
Tents / umbrellas	25	10	37	8	27	35	4	22	25	22
Record keeping										
% digital record keeping	0.1	0	0	0	0	0	0	0.2	0	0.2
% in my head	48	73	66	51	63	61	68	34	38	34
% record book	52	27	34	49	37	39	32	66	63	66
Online presence (% having)	8	23	5	16	9	6	20	6	19	6
Number of years with online presence	4	3	6	4	4	4	5	3	1.7	3
Took a loan in the last 12 months to invest in business (% of firms)	63	20	63	64	60	70	30	67	50	66
Currently tomato farming	12	37	12	17	15	11	28	9	6	9

In the low season, volumes fall by about two-thirds, from 3 to 1 ton per trader on average, with similar proportional declines in PZ and CZ. Production North still leads but drops from 11 tons to 4 tons. Overall, low-season volumes decline about 60-70% for most actors.

Startup costs are low. The average total cost to meet initial requirements is Ksh 22,738, roughly comparable to the gross revenue for 1 ton of tomatoes (and traders sell about 3 tons per day). Startup costs are nearly four times higher in CZ than in PZ, driven mainly by wholesalers. In CZ, wholesalers report average startup costs of Ksh 37,446, while brokers report only Ksh 7,525. Within PZ, wholesalers also face higher startup costs (Ksh 9,445) than brokers (Ksh 5,417). This suggests that entering urban consumption markets requires more initial capital than starting near production.

Traders own few physical facilities. The average number of stalls owned is 1.3, slightly higher in PZ than CZ; Production South has the highest average (1.5). Wholesalers own more facilities than brokers in both zones. Only 3.2% operate from off-market locations (about 1 site each), and just 0.22% own a godown or warehouse (about 1 each).

Mobile connectivity is widespread. Overall, 73% own a smartphone and 49% own a basic phone. Computers and CCTV are almost nonexistent (0.7%). About 26% own a generator and/or solar panel. Many own basic trading equipment: 75% plastic crates, 48% wooden crates, and 25% tents/umbrellas. Two-thirds (67%) are members of a traders' association.

Use of online tools remains limited (8%), with brokers as the main adopters, particularly in Production North. Record-keeping is split between physical record books (52%) and mental tracking (48%), with digital methods almost absent. Traders in CZ are more likely to keep written records than those in PZ.

Start-up capital is mainly self-financed. Savings from farming or other businesses are the dominant source (58% overall), higher in CZ (63%) than PZ (51%) (Figure 6.4). Informal borrowing accounts for 19% of start-up finance, while formal credit is rare (2-3%). Income from previous or concurrent employment matters for 17% overall, especially in PZ (21%) and among CZ brokers (27%). Overall, entry relies on personal savings and informal networks rather than institutions.

Figure 6.4: Source of startup capital

Vehicle ownership reflects transport roles. Motorcycles are most common (19%), followed by commercial vehicles (vans, lorries, pick-ups) at 15% (Figure 6.5.1). Commercial vehicles are concentrated in CZ and owned mainly by wholesalers, while motorcycles are highest among PZ brokers (49%). Bicycles and donkeys/oxen appear almost only in PZ, consistent with first-mile transport needs.

Figure 6.5.1: Types of vehicles owned

Access to credit for business investment is common: 63% took a loan in the last 12 months (Table 6.2), slightly higher in CZ (66%) than PZ (60%). In both zones, wholesalers borrow more than brokers (70% versus 30%). Loan sources are primarily community-based: SACCOs, ROSCAs, and other informal groups make up 37% of loans, especially for PZ wholesalers and CZ brokers. Friends, family, and neighbors account for 15% and are particularly important for brokers (21% in PZ and 25% in CZ) (Figure 6.5.2). Peer-to-peer lending within the sector is 13% overall and is highest among PZ brokers (21%). Mobile loans are used by 9%. Formal lenders remain secondary: 14% banks and 13% microfinance institutions.

Figure 6.5.2: Source of borrowed funds

Hiring relies heavily on casual labor (52% overall), with unpaid family work also common (13%) and few salaried employees (4%) (Figures 6.6 and 6.7). Casual hiring is much higher in CZ (64%) than PZ (40%). Youth under 35 account for 50% of casual labor, 60% of salaried labor, and 64% of unpaid family labor.

Figure 6.6: Type of workers hired by traders

Figure 6.7: Number and type of workers hired

6.2 Conduct

6.2.1 Business operations

In the high season, 31% of traders sell other products alongside tomatoes (Figure 6.8), mainly fruits and other vegetables (60% and 65% of traders at wholesale and retail levels, respectively). Even among diversified traders, tomatoes remain dominant: tomatoes account for 70% of total fruit and vegetable wholesale sales, including 77% among PZ brokers, and 83% of tomatoes are sold at wholesale level (Table 6.3).

Figure 6.8: Other products apart from tomatoes sold during high season

Table 6.3: Tomato business operations

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
Percentage selling other products apart from tomatoes high season	31	47	31	31	32	33	31	30	0	29
Percentage of tomatoes in total fruits and vegetables in	70	68	68	76	70	68	77	70		70

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
wholesale sales, in high season										
Percentage of tomato trading in wholesale (instead of retail which is the complement) - High season	83	100	79	90	84	79	99	82	97	83
Percentage selling other products apart from tomatoes in low season	29	30	30	32	30	32	25	29	0	28
If yes, What else sell?										
% traders selling fruits other veg wholesale	63	4	60	84	66	64	74	59		59
% fruits and other veg retail	69	1.1	72	57	63	79	4	74		74
% other food items other than fv wholesale	12	3	14	24	18	16	26	5		5
% other food items other than fv retail	16	1.1	21	11	17	20	7	15		15
% non food items wholesale	1.9	0	1.1	3	1.5	0.9	4	2		2
% non food items retail	5	0	6	5	5	7	0	4		4

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
Percentage of tomatoes in total fruit and vegetable in wholesale sales, during low season, if selling other products	62	67	61	62	61	57	77	62		62
Percentage of tomato trading in wholesale (instead of retail which is the complement) - Low season	79	100	75	84	79	73	98	78	96	79
Share of traders that operate all year	10	23	16	3	13	13	13	7	19	8
Average number of months	7	8	7	7	7	7	7	7	8	7
Share that do in dry season	99	100	99	97	98	98	98	99	100	99
Share that operate in rainy season	98	100	98	97	98	98	98	99	100	99
% expecting to expand business in the next 5 years	57	67	57	46	55	55	57	58	56	58
% expecting to SAME business in the next 5 years	8	0	6	10	7	8	4	9	13	9
% expecting to CONTRACT business in the next 5 years	24	23	24	30	25	25	25	24	19	23

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
% expecting to SHUTDOWN business in the next 5 years	6	3	6	7	6	5	9	6	6	6
% don't know what to do in the next 5 years	6	7	7	7	7	8	6	4	6	4

In the low season, 29% sell additional goods. Fruits and other vegetables remain the main add-ons (63% and 69% at wholesale and retail levels). Tomatoes still dominate but less so: they account for 62% of total fruit and vegetable wholesale sales, and 79% of tomatoes are sold at wholesale level (Table 6.3). This suggests diversification rates change little, but diversified traders rely more on non-tomato items when tomato supply is low.

Overall optimism is high: 57% expect to expand their business within five years, led by Production North (67%). Among those planning expansion, the main constraints are intense competition (79%), slow demand growth (45%), high operating costs (29%), and supply and reliability problems (Figure 6.9).

Figure 6.9: Challenges faced by traders considering expansion

6.2.2 Acquisition of tomatoes

The average lot purchased is about 3 tons. Nearly all traders report receiving the expected quality (98%), and reported damage at procurement averages 2% (Table 6.4).

Table 6.4: Tomato purchases

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
What was bought										
Quantity of tomato bought (kg)	3,059	3,051	4,759	2,626	4,102	4,211	3,789	2,022	4,273	2,100
Quality of tomato the same as expected when received (%)	98	97	99	98	98	98	99	97	100	97
Percentage of tomato damaged when procured	2	4	1.7	3	3	3	3	1.6	0.8	1.6
When bought/got (if broker)										
What kind of supplier (other trader, farmer, etc.)										
Male supplier (%)	82	97	77	85	81	76	93	84	75	83
Where was tomato loaded prior to delivery own county (%)	41	80	82	78	81	77	83	6	6	6
Other county share %	59	20	18	22	22	24	17	94	94	94
Linked by broker/trader (%)	26	7	2	17	6	8	1.8	46	0	44
If used 3PLS:										
How many people shared	1.1	0	0.3	0.7	0.4	0.5	0	1.8	0	1.8
Amount spent on transport cost	3,611	32	504	688	516	690	17	6,690	0	6,457

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
Forward haul/backhaul any goods (%)	2	10	1	3	2	1.6	4	2	6	2
Percentage that held goods in storage after purchase	5	0	3	1.9	3	4	0	7	0	6
If held in storage: Number of days in store	2		1.7	3	1.9			2		2
If held in storage: Amount paid as storage fee	1.8		1.6	1.5	1.5	1.5		1.9		1.9
% traders that organized transport	49	0	36	60	39	51	6	59	0	57
Price paid to supplier (KES/KG) in thousands	40	34	56	31	48	51	39	32	29	32
Form of payment										
(%) Hard cash	56	57	73	52	67	73	48	47	38	47
(%) Mobile money	62	93	39	61	48	38	78	75	88	75
(%) Bank transfer	2	3	0.7	5	1.9	0	7	2	0	2
(%) Cheque	0	0	0	0	0	0	0	0	0	0
Trader had loan outstanding to the supplier	3	0	4	1.9	3	4	0.9	2	0	2
Fees/tax/cess:										
Broker/agent fee share where paid any fee	39	0	5	23	9	12	0.9	69	0	67

	All sample	Production North	Production East	Production South	All PZ	PZ	PZ	CZ	CZ	All CZ
					Total	Wholesaler	Broker	Wholesaler	Broker	Total
N	903	30	296	115	441	332	109	446	16	462
Conditional on paid fee, how much paid	995		439	441	440	444	300	1,064		1,064
Bribes/unofficial fees share who paid any	24	0	5	5	4	6	0	43	0	42
Conditional on paid bribe, how much paid	421		215	120	189	189		442		442
Wages paid to driver & driver assistant, if paid any (%)	13	0	3	0	2	3	0	24	0	23
Amount paid, if paid driver & driver assistant	1,735		978		978	978		1,800		1,800
Loading & unloading fees (rowtotal share who paid any)	51	0	48	66	49	59	21	53	31	52
Amount paid on loading & unloading fees, if paid any	1,392		452	1,063	660	313	3,419	1,985	3,850	2,024

Direct sourcing from farmers is common, contrary to a common view that brokers dominate sourcing. Overall, 77% source directly from farmers (Figure 6.10). Wholesalers especially rely on farmers: 81% in CZ and 63% in PZ report farmers as their main source.

Figure 6.10: Entity or type of supplier

Supply chains are often long-distance. Half of traders source within the same county, a practice concentrated in PZ (83%). In CZ, only 19% source within the same county, indicating heavy cross-county trade. Urban and rural markets are the most common sourcing hubs

(18% and 16% of traders, respectively), with some zonal variation (Table 6.4; Figure 6.11). Sourcing from off-market locations is uncommon.

Figure 6.11: Type of market where the supplier is based in

Phone calls dominate contact with suppliers. Communication via agents or brokers is a meaningful secondary channel, while digital and marketing apps are negligible (Figure 6.12). Supplier choice is driven mainly by quality (59%), followed by availability (32%) and relationship-based factors: trusted person (26%) and being linked by a broker or trader (26%) (Figure 6.13).

Figure 6.12: Means used by trader to contact the supplier before the purchase

Figure 6.13: Reason trader chose to purchase from supplier

Advances are extremely rare: 0.3% provide cash advances and 0.1% provide inputs. Payment timing aligns with this: 87% pay fully upon receipt (Figure 6.14), and only 3% report any outstanding loan to a supplier (Table 6.4). Payments rely on mobile money (62%) and cash (56%), typically for immediate settlement (Table 6.4).

Figure 6.14: Timing of payment for the recent transaction

Most traders procure directly from farmers (78%), both in PZ (85%) and CZ (72%), and 55% arrange purchases specifically from production areas, particularly wholesalers in CZ. About 13% of transactions involve a broker organizing acquisition (Figure 6.15). Sellers rarely deliver to traders, so buyers typically arrange transport. Traders use third-party logistics about twice as often as their own vehicles (Figure 6.16).

Figure 6.15: Arrangement for acquisition of tomatoes

Figure 6.16: Method of delivering tomatoes

6.2.3 Sale of tomatoes

Recent sales are dominated by mixed-color lots (43%), followed by red tomatoes (32%) (Table A2). Medium-sized tomatoes account for 46% of transactions, with many mixed-size lots. Variety is diverse but concentrated: Ansal F1 (37%) and Big Rock F1 (18%)

dominate, while 19% of traders do not know the variety. Ansal F1 is most common in Production East and Big Rock F1 in Production South.

Retailers are the main buyers, representing 77% of recent completed sales, followed by urban wholesalers (13%) (Figure 6.17). Urban wholesalers are the dominant partners for brokers in PZ (75% of their sales), consistent with brokers facilitating bulk movement from production areas to major urban hubs. Wholesalers, and nearly all traders in CZ, sell mainly to retailers who likely supply final consumers.

Figure 6.17: Entity or type of buyer of recent completed sale

Sales geography is mostly local in consumption markets but not in production markets. Overall, 69% sold to buyers in the same county. In CZ, 88% sold within the same county. In PZ, only 49% sold within county. Within PZ, 57% of wholesalers sell locally versus 24% of brokers, and 76% of PZ brokers sell across county lines, consistent with long-distance movement toward urban buyers.

Advance contact by buyers is common but uneven: 40% report being contacted before the sale, rising to 79% for PZ brokers (Table A2). When buyers contact sellers in advance, communication is almost always by phone (92%), with minimal use of digital-social or marketing apps. Many transactions remain spot, especially in CZ, but PZ brokers play a stronger coordination role.

Few sellers provide logistical services beyond the sale. Only 4% provide transport to buyers. The most common support is supplying crates or packing materials (27%), especially among CZ wholesalers (34%). Most sellers do nothing to prepare lots (55%), but those who do focus on quality control: 26% grade tomatoes and 26% remove damaged items. Storage for buyers is rare (3%), implying rapid turnover with limited holding capacity.

Payments for sales rely on cash (64%) and mobile money (50%), with banking methods nearly absent. Most sales are paid in full at the point of transaction (63%), but credit remains important (23% of recent sales). Partial advance payments make up about 14.5% of transactions, while full advance payments are very rare (1.1%).

7 Results: Tomato producers

7.1 Structure

This chapter reports results from the tomato producer survey across three production zones (PZ1 North, PZ2 East, PZ3 South). For reference, producer characteristics are summarized in Tables 7.1–7.4; land, assets, and finance in Table 7.5 and Tables 7.7–7.9; training in Table 7.10; seasonality and specialization in Tables 7.11–7.12; production practices in Tables 7.13–7.17; input sourcing, logistics, and prices in Tables 7.18–7.23 and Table A9; production cycles and constraints in Tables 7.24–7.26; marketing, information, and grading in Tables 7.27–7.31 and Figure 7.2; post-harvest losses in Table 7.32; and regression results in Tables 7.33–7.34. Labor patterns by gender are illustrated in Figure 7.1 and detailed in Table A3 and Table A4, while productivity by farm size is summarized in Figure 7.3 and Table A10.

7.1.1 Characteristics of producers

General characteristics

Tomato producers are relatively young and economically active. The household member responsible for tomato production is, on average, 41 years old, with PZ2 slightly older than PZ1 and PZ3 (Table 7.1). Women comprise 42% of tomato farmers (Table 7.1). Most farmers report primary or secondary education, with a smaller share reporting tertiary education and PZ2 tending to show higher attainment than PZ1 and PZ3 (Table 7.1). Farmers also report substantial experience in tomatoes: average involvement is 11 years (Table 7.2). Entry into tomatoes often builds on prior engagement in agriculture, though some farmers come from farm wage work, non-agricultural enterprises, or salaried employment (Table 7.2).

Table 7.1. Characteristics of the farmers

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Age	41	45	40	41
Gender (Female)	47	56	33	42
Education level				

None/not completed primary education	21	22	37	29
Completed primary education	42	49	40	42
Completed secondary education	40	31	29	32
Completed tertiary education	16	20	14	16
Vocational education	0	3	0	1
Adult education	0	0	0	0

NB: These are household members who were MAINLY responsible for the tomato production

Table 7.2. Years started farming tomatoes

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Years involved in tomato farming	9	12	11	11
Occupation prior to tomato farming				
Agricultural enterprise(s)	72	54	45	54
Wage employment (farm)/Farm kibarua	16	28	15	18
Non-agricultural enterprise(s)	18	19	11	15
Wage employment (non-farm)	5	20	17	15
Student	10	6	17	12
Salaried employment	10	10	10	10
Unemployed	0	0	3	1
Transport business	1	2	0	1
Self-employed	0	0	1	0
Tomato aggregation (Broker)	0	0	1	0
Livestock trading	0	0	0	0
Crops planted prior to tomato farming				
Cereals	88	79	51	70
Legumes	54	43	46	48
Vegetables other than tomato	51	34	27	37
Livestock farming	36	12	54	37
Fruits	10	21	4	10
Roots & tubers	6	20	5	9

Industrial crops	2	7	2	3
Herbs and spices	0	3	0	1

Livelihood activities

Agriculture remains the dominant livelihood activity, but non-farm engagement is significant and diversified. All farmers worked on the household farm in the past 12 months (Table 7.3). On average, individuals worked 10 months per year on the household farm.

Table 7.3. Livelihood activities

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Worked on the household farm	100	100	99	100
Farming work on a farm outside the household	15	18	39	28
Non-farm work	48	56	55	54
	(N=112)	(N=127)	(N=247)	(N=486)
Months worked in non-farm in the last 12 months	10	10	9	10
Years worked in any non-farm enterprise	8	8	7	8
	(N=36)	(N=41)	(N=173)	(N=250)
Months worked in any agricultural activity not on the household farm in the last 12 months	6	7	6	6
	(N=233)	(N=226)	(N=444)	(N=903)
Months worked on the household farm in the last 12 months	10	10	9	10
Category of non-farm work	(N=112)	(N=127)	(N=247)	(N=486)
Food processing	4	0	1	1
Non-Food manufacture	4	2	4	3
Construction	4	9	12	9
Transportation	11	14	16	14
Food trade (sale and purchase)	39	34	33	35
Non-Food trade (sales and purchase)	24	16	26	23
Personal Services	13	27	25	23
Education/ Health	9	3	7	7
Salaried employment	19	24	15	18

Domestic help	1	1	5	3

About 28% were engaged in farm work outside the household and 54% were engaged in non-farm work. In non-farm work, individuals worked on average of 10 months per year and an average experience in non-farm enterprise of 8 years. The most common non-farm activities were food trade (35%), non-food trade (23%), personal services (23%), salaried employment (18%) and transportation (14%)

Among individuals who reported working away from home, the average duration away was 1 month in the past 12 months, suggesting relatively limited temporary migration across regions.

Migration to start tomato production

Migration plays a moderate role in shaping the producer base. About 16% of farmers migrated to start tomato production, and the share is highest in PZ3 (Table 7.4). This aligns with qualitative evidence from rapid reconnaissance and the meso inventory that PZ3 represents a more recent and dynamic tomato cluster.

Table 7.4. Migrate to start tomato production

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Migrated to start tomato farming	12	10	22	16
Year of migration	2016	2019	2014	2015
Migrated from which county				
Makueni	0	9	30	21
Kajiado	3	4	18	13
Outside Kenya	0	0	18	11
Kirinyaga	3	35	2	7
Machakos	0	0	1	7
Baringo	24	0	0	5
Kiambu	0	4	6	5
Nakuru	21	0	0	4
Narok	14	0	2	4
Taita–Taveta	0	0	6	4
Meru	3	13	0	3
Nyandarua	0	4	3	3
Nyeri	7	13	0	3
Nairobi City	7	0	3	3
Laikipia	7	4	0	2
Kakamega	0	4	0	1

Bomet	7	0	0	1
Kwale	0	0	1	1
Mombasa	0	4	0	1
Murang'a	3	4	0	1

Migration patterns differ by zone and reinforce distinct cluster formation pathways. In PZ1, migration is largely intra-regional and concentrated in neighboring Rift Valley counties, consistent with short-distance mobility into an established production area. In PZ2, migrants predominantly originate from Central region counties, suggesting strong regional specialization and network-based movement into the eastern cluster. PZ3 shows the most diverse inflows, including a non-trivial share of migrants originating outside Kenya, consistent with PZ3 operating as a newer and more dynamic production frontier (Table 7.4).

7.1.2 Assets, land, and finance

Land access and specialization

Land access combines ownership and rental, indicating active land markets that support both entry and scaling. Table 7.5 shows that ownership is common, but renting is also widespread. Inheritance is an important channel for owned land, while purchase is also present (Table 7.5). The combination of ownership, renting, and informal information channels for rentals points to a locally embedded but functioning land rental market. This matters for commercialization because it allows households to allocate land toward tomatoes as the crop becomes more profitable and the cluster ecosystem deepens (Table 7.12).

Table 7.5. Land size, ownership and acquisition

	Production Zone North (PZ1)	Production Zone East (PZ2)	Production Zone South (PZ3)	All Sample
	(N=233)	(N=226)	(N=447)	(N=906)
Size of land accessed (hectare)	6	4	7	6
Gini	0.5	0.5	0.5	0.5
Percentage of farmers by land ownership				
Own	90	96	82	87
Rent	82	83	84	84
Year started owning	2010	2008	2013	2011
Year started renting	2019	2020	2020	2020

Currently renting	57	61	46	53
Land acquisition for land owned (only those who answered the question)	(N=122)	(N=133)	(N=182)	(N=437)
Inherited	78	76	72	74
Sharecropping	2	0	1	1
Borrowed	3	2	2	2
Gifted	0	2	9	4
Purchased	17	25	17	19
Squatting	1	0	2	1
How they learn about the availability of land to rent	(N=192)	(N=188)	(N=377)	(N=757)
Friends	59	72	72	69
Neighbours	55	53	53	54
Land brokers	6	10	12	10
Relatives	14	15	22	18
Approached by owner	3	3	5	4
Asked around from those owning land	2	3	9	6

Land under tomatoes averages about one acre, but inequality differs across zones: PZ2 shows higher concentration in tomato area than PZ1 and PZ3, suggesting a more uneven structure of production among tomato farmers (Table 7.5). Access to land combines ownership and rental at scale, and rental arrangements appear to have expanded recently, with many rentals starting around 2020 and information about rental availability circulating primarily through social networks (friends and neighbors) rather than formal brokers (Table 7.5). This supports the interpretation that active but locally embedded rental markets facilitate entry and scaling as tomato commercialization expands (Table 7.12).

Table 7.12.%age of (parcel) allocated to tomato cultivation

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Total land under cultivation (Ha)	2.8	3.1	1.9	2.7
Land area under tomato cultivation (Ha)	1.0	1.4	1.4	1.3

Land area under non-tomato cultivation (Ha)	1.9	1.7	1.0	1.4
Gini (Total land under cultivation (Ha))	0.6	0.7	0.5	0.6
Gini (Total land under tomato cultivation (Ha))	0.5	0.7	0.7	0.6
Gini (Total land under non-tomato cultivation (Ha))	0.7	0.7	0.6	0.7
Share of land area under tomato (total area under tomato divide by total cultivated area)	0.5	0.5	0.8	0.7

Start-up capital and finance

Tomato farming is mainly self-financed. Personal savings are the dominant source of finance (Table 7.7), complemented by livestock and crop sales. Formal finance and input credit are present but limited, implying that liquidity for production cycles is largely generated internally through savings and agricultural cashflows (Table 7.7).

Table 7.6. Source of startup capital

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Personal savings	55	85	60	65
Sale of Livestock/Livestock products	28	12	34	27
Sale of crop produce	44	29	16	27
Cash loans	9	22	8	12
Share cropping	0	0	12	6
Business loans from financial institutions (Banks/MFI/SACCOs)	3	1	5	4
Input on credit	1	0	3	2
Donation from relatives	2	3	1	2
Sales of assets	0	1	1	1

Equipment, vehicles, and digital tools

Across zones, producers rely mainly on basic tools and small-scale equipment, with limited ownership of mechanized assets. Hand tools are widespread: hoes are nearly universal (89% overall), especially in PZ1 (94%), while spades are common in PZ1–PZ2 (81–83%) but lower in PZ3 (63%). Axes are used by a majority in PZ3 (61%) and at moderate levels elsewhere (Table 7.7). Irrigation-related

equipment shows sharper zonal differences: pipes are widely owned in PZ1 and PZ2 (87–89%) but less in PZ3 (62%). More specialized irrigation tools are uncommon overall, though PZ3 reports some ownership of low-lift pumps (15%) and treadle pumps (6%) (Table 7.7). Animal traction is concentrated in PZ2, where 27% report animal-drawn ploughs, compared with near-zero levels in PZ1 and very low levels in PZ3. Other mechanized equipment (tractors, threshers/shellers, plows, rower pumps) is rare, and shallow tube wells are reported only by small shares (highest in PZ2 at 8%) (Table 7.7).

Table 7.7. Percentage of farmers owning equipment

N	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Hoe	94	85	88	89
Irrigation equipment (e.g. pipes)	87	89	62	76
Spade	81	83	63	73
Axe	52	45	61	55
Pesticide spray machine	48	52	35	43
Animal traction plough	0	27	4	9
Sickle	25	39	9	21
Low lift irrigation pump	0	0	15	7
Shovel	1	3	12	7
Shallow tube well	2	8	6	5
Treadle pump (e.g. Money maker)	0	0	6	3
Thresher/sheller	3	3	1	2
Tractor	2	2	1	1
Rower pump	0	0	2	1
Hand tube well	0	1	0	0
Plow	0	0	0	0

Transport assets are similarly concentrated in light vehicles. Motorcycles are the dominant motorized asset (59% overall), with the highest ownership in PZ2 (66%) and slightly lower rates in PZ1 and PZ3 (55–57%). Bicycles are less common (18%) but again highest in PZ2 (26%). Cars are owned by a small minority (11%), and ownership is lowest in PZ3 (7%). Handcarts are notable mainly in PZ2 (20%) and are nearly absent elsewhere, while ownership of vans, tuk-tuks, and pick-ups/lorries remains below 6%, and heavy trucks

and matatus are essentially nonexistent (Table 7.8). This pattern helps explain the strong reliance on hired transport services for both input procurement and output marketing documented elsewhere in the chapter.

Table 7.8.%age of farmers who own vehicles

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Motorcycle	55	66	57	59
Bicycle	12	26	17	18
Car	14	15	7	11
Handcarts	0	20	2	6
Probox (small van)	2	6	2	3
Tuk-Tuk (3-Wheeler)	0	1	3	2
7-ton lorry	1	3	1	1
Pick-up (1 ton)	1	4	0	1
3.5-ton lorry	0	0	0	0
5-ton lorry	0	0	0	0
10-ton lorry	1	0	0	0
12-ton lorry	0	0	0	0
14-ton lorry	0	0	0	0
18-ton lorry	0	0	0	0
Public vehicles (Matatu)	0	0	0	0

Digital access is high through phones, but ownership of higher-end devices is limited. Smartphone ownership is widespread (85% overall) and fairly even across zones (83–87%), while basic phones remain common (73%) and are especially prevalent in PZ3 (80%), suggesting continued reliance on simpler devices alongside smartphones. Computers are rare (5%), and CCTV ownership is negligible (1% overall, with only minor uptake in PZ2) (Table 7.9).

Table 7.9.%age of farmers who own digital devices

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Mobile phone (smart phone)	87	86	83	85
Mobile phone (basic)	67	66	80	73
Computer	5	7	4	5
CCTV system	1	3	0	1

Training

Training reaches less than half of farmers. Overall, 46% report receiving training, with higher coverage in PZ1 and PZ2 and lower in PZ3 (Table 7.10). Among those trained, agrodealers/input suppliers are the predominant source (87%), while peers (other farmers, friends, neighbors) and formal extension play secondary roles (Table 7.10). This highlights the importance of private-sector and informal advisory channels in shaping input decisions and agronomic practice.

Table 7.10. Training

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Percentage of farmers trained	57	58	33	46
By whom	N=132	N=131	N=149	N=412
Extension agent	22	15	19	18
Farmer group/cooperative	6	5	6	6
Other farmer/friend/neighbor/relative	31	18	32	27
Agrodealer/input supplier	85	93	83	87
Government/development agency project	6	2	9	6
Non-governmental Organization (NGO)	0	4	0	1

7.2. Conduct

7.2.1 Tomato production

Seasons of production and land allocation

Seasonal production patterns vary considerably across the three tomato production zones (North–PZ1, East–PZ2, and South–PZ3 (Table 7.11). Overall, most farmers produce during the short rains (67%)**,** followed by the long rains (62%)**,** while only a minority produce in both seasons (17%)**.** However, important regional contrasts emerge. In production zone north (PZ1), production is predominantly concentrated in the short rains (75%)**,** compared to 48% during the long rains. Only 12% of farmers cultivate tomatoes in both seasons. This suggests that tomato production in the North is strongly aligned with the short rainfall period.

Table 7.11. Years and seasons in tomato production

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Long rains	48	75	63	62
Short rains	75	77	58	67
Both long and short season	12	36	9	17

Production zone East (PZ2) exhibits the most diversified seasonal production pattern. A substantial share of farmers produce during the short rains (77%) and long rains (75%)**,** and notably, 36% cultivate tomatoes in both seasons, which is the highest proportion across all zones. This suggests possibly better access to irrigation or more favorable agro-ecological conditions.

In contrast, production zone South (PZ3) shows a different pattern. While 63% produce during the long rains and 58% during the short rains, only 9% engage in production across both seasons which is the lowest among the zones.

Tomato specialization has increased markedly over the past decade. Currently, 51% of parcels are allocated to tomatoes, with the highest share in PZ3 (64%), and only 4% of parcels report no tomato cultivation. Ten years ago, 27% of parcels had no tomatoes and only 6% were fully allocated to tomatoes; five years ago, 22% had no tomatoes and 12% were fully allocated. Partial allocation remains common, indicating continued diversification, but the overall trend points to expansion and intensification of tomato production, especially in PZ3.

Land endowments differ across zones. Average total cultivated land is 2.7 ha overall, highest in PZ2 (3.1 ha), followed by PZ1 (2.8 ha), and lowest in PZ3 (1.9 ha). Land distribution is unequal (overall Gini 0.6), with the highest inequality in PZ2 (0.7) and the lowest in PZ3 (0.5). Despite these differences, the absolute area under tomatoes is broadly similar across zones (1.3 ha overall): PZ3 allocates 1.4 ha, comparable to PZ2, while PZ1 allocates less (1.0 ha). Non-tomato land averages 1.4 ha, and is larger in PZ1 (1.9 ha) and PZ2 (1.7 ha) than in PZ3 (1.0 ha). As a result, PZ3 is the most specialized, allocating about 80% of cultivated land to tomatoes versus roughly 50% in PZ1 and PZ2, with high inequality in the tomato share (Gini 0.7).

Use of improved varieties, fertilizer and pesticides

Input adoption is near universal. Use of improved varieties and inorganic fertilizers is nearly universal, and pesticide use is widespread (Table 7.13). In contrast, organic fertilizer use is rare overall, though manure/compost use is more common and varies sharply by zone (Table 7.13). The near-universal adoption of modern inputs indicates that productivity differences across zones are likely driven by differences in intensity, quality, and local conditions rather than by whether farmers adopt inputs at all (Table 7.22; Table 7.33).

Table 7.13.%age of farmers who use improved varieties, fertilizer and pesticides by region

	Production Zone North (PZ1) (N=233)	Production Zone East (PZ2) (N=226)	Production Zone South (PZ3) (N=447)	All Sample (N=906)
Improved varieties	100	100	100	100
Organic fertiliser	4	2	3	3
Manure/compost	44	92	12	39
Inorganic fertiliser	100	100	100	100
Herbicides	17	8	6	9
Pesticides	100	100	100	100

Use of irrigation

Irrigation is nearly universal: 98% of tomato farmers irrigate (PZ1 99%, PZ3 98%, PZ2 95%) (Table 7.14). Methods differ sharply by zone. Overall, furrow (46%), pipes (40%), and flood (37%) dominate, while drip is negligible (<1%). PZ1 relies mainly on furrow irrigation (69%) with little flooding (6%). PZ2 is strongly pipe-based (70%) with minimal flooding (3%). PZ3 is the opposite, relying heavily on flood irrigation (69%) and using pipes less (27%) (Table 7.14).

Table 7.14.%age of farmers who irrigated and type of irrigation used

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Percentage of farmers who irrigated				
	99	95	99	98
Type of irrigation				
Furrow	65	40	40	46
Pipe	40	70	27	40
Flood	6	3	69	37
Drip	1	0	1	1
Manual (using watering can)	0	0	0	0

Water sources are also heterogeneous (Table 7.15). Rainfall is the most common source overall (69%), complemented by rivers (48%) and boreholes/wells (23%). PZ1 depends most on rainfall (94%) and rivers (73%) with little groundwater use (9%). PZ2 shows the most diversified mix, including rainfall (59%), rivers (36%), dams (23%), boreholes (16%), and irrigation schemes (19%). PZ3 relies less on rainfall (62%) and most on groundwater (33%), and it is the only zone reporting piped municipal/community water (8%). Distance to the main source is shortest in PZ2 (0.5 km), then PZ1 (0.9 km), and longest in PZ3 (1.2 km) (Table 7.15).

Table 7.15. Sources of water, distances to the water source and how it is moved

	Production Zone North N=233	Production Zone East N=226	Production Zone South N=447	All Sample N=906
Source of water				
Permanent pan/dam	3	23	0	7
Temporary pan/dam	4	5	2	3
Well,/ borehole	9	16	33	23
Rainfall	94	59	62	69
River	73	36	41	48
Stream	8	10	22	16
Irrigation scheme	4	19	6	9
Piped water (by municipal, company, community, etc.)	0	0	8	4
Lake	1	0	0	0

	Production Zone North	Production Zone East	Production Zone South	All Sample
Spring	1	0	0	0
Distances to the nearest source of water (KM)	0.9	0.5	1.2	1
Movement of water from main source to the parcel				
By a pipe with a pump directly from the water source	84	81	62	72
By a pipe with a pump from a tank/reservoir to a tank/reservoir	0	1	1	1
By a gravity pipe directly from the water source	9	4	8	7
A cement canal/furrow directly from the water source	1	0	9	5
A mud canal/furrow directly from the source	7	8	13	10
A mud canal/furrow from the reservoir	0	0	0	0
Flooding (i.e. No canal/furrow) directly from the water source	0	0	0	0
Carried using containers e.g. buckets to a tank/reservoir	0	0	0	0
By gravity pipe connected to cement canal/furrow receiving water directly	0	0	5	3
By gravity pipe connected to mud canal/furrow receiving water directly	0	1	2	2
Gravity pipe from reservoir receiving water from well/borehole pumped through pipes	0	0	0	0
Water application on the field				
Flooding with a pump	0	1	8	4
Intra field mud canal with a pump	1	11	8	7
Intra field cement canal with a pump	0	0	0	0
Intra field pipe drip irrigation with a pump	0	0	0	0
Flooding without a pump	18	0	41	25
Intra field mud canal without a pump	49	1	32	28
Intra field cement canal without a pump	2	0	3	2
Intra field pipe drip irrigation without a pump	0	0	0	0
Using pipe	30	82	8	32
Watering can	0	0	0	0
Type of pump used	*N=2*	*N=12*	*N=68*	*N=82*
Fuel driven pump with fuel motor	100	92	75	78
Electrical pump from line	0	8	7	7
Solar power pump	0	0	7	6

	Production Zone North	Production Zone East	Production Zone South	All Sample
LPG pump	0	0	19	16
Submersive electrical pump	0	0	1	1

Most farmers move water using pumped pipes (72%), especially in PZ1 and PZ2 (81–84%), while PZ3 combines pumped pipes (62%) with more canals and some gravity pipes. Field application mirrors these patterns: PZ2 applies water mainly via pipes (82%), PZ1 relies more on intra-field mud canals (49%), and PZ3 uses more non-pumped flooding and mud canals with limited pipe application (8%). Among pump users, fuel pumps dominate (78%), but PZ3 is the only zone reporting non-trivial use of solar (7%) and LPG pumps (19%) (Tables 7.14–7.15).

Labor use and gender and age composition

Tomato production is labor-intensive. Table 7.16 shows that nearly all farmers hire labor for core activities such as transplanting and weeding (both near-universal), fertilizer and pesticide application (also near-universal), irrigation, and harvesting. Some tasks show marked zonal variation, including nursery preparation and staking/pruning, indicating differences in crop management intensity (Table 7.16). Household labor remains important alongside hired labor. Table A3 and Table A4 show broad participation by both men and women within households, with some task specialization. Among hired labor, women and men both feature prominently, and Figure 7.1 illustrates gendered patterns across key activities. These patterns reinforce that tomato production is a significant rural employer and that female labor participation is substantial at the farm node.

Table 7.16. Farmers that hired labor

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Nursery preparation and management	12	2	31	19
Land preparation (ploughing, harrowing, ridging)	68	71	77	73
Planting/transplanting	99	100	99	99
Weeding-manual (1st, 2nd, …)	99	100	99	99
Fertilizer application	99	100	99	99
Herbicide application	19	8	7	10
Pesticide application	100	100	99	99
Staking and Pruning	94	99	40	69

Irrigation	99	96	96	97
Harvesting	100	100	91	95
Security	3	0	9	5
Supervision, management	0	0	6	3
Fencing	2	0	0	0

Figure 7.1: Number of hired men and women

Labor organization also differs across zones in ways that align with the seedling market structure. Nursery-related labor is much more common in PZ3 than PZ2, consistent with PZ3 farmers being more likely to establish their own nurseries in a zone that is farther from major propagator clusters, while staking and pruning intensity is higher in PZ1 and PZ2 than in PZ3, indicating different crop management regimes across clusters (Table 7.16; Table 7.19).

Use of machinery (own or rented/service)

Mechanization is concentrated in land preparation. Nearly all farmers prepare land before planting, and tractor use is the predominant method of land preparation (Table 7.17). Land preparation is also widely outsourced, consistent with farmers accessing hired tractor services (often with operator) through local service providers. Beyond land preparation, most operations remain manual, consistent with limited machinery ownership (Table 7.7) and the high hired labor shares in Table 7.16.

Table 7.17.%age of farmers who did land preparation and what they used

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Percentage of farmers who did land preparation	97	99	99	98
Equipment used for land preparation				
Hoe (jembe)	9	8	5	7
Tractor	89	59	90	82
Oxen/ Donkey	0	42	8	14

7.2.2 Purchase of inputs

Seedlings: an important input in tomato farming

In our rapid reconnaissance we learned that over the decade the purchase of seedlings (as a substitute for the risky and time-consuming task of planting tomato seeds by hand and waiting for germination under conditions that can be hot or dry or flooding). This demand coincided with a surge in supply of seedlings from clusters such as Naivasha that started as a flower cluster with seedlings and then tomato and other crop seedling propagators spread over the past decade mainly.

Seedlings are central and typically sourced through specialized channels. Propagators are the primary source of seedlings across zones (75% overall), with especially high reliance in PZ2 (91%) and PZ1 (82%), and lower reliance in PZ3 (64%) (Table 7.18), while agrodealers account for a smaller share. Most farmers purchase seedlings rather than producing them, and purchasing is especially common in PZ2 and PZ1; PZ3 shows a somewhat higher share of farmers who do not purchase seedlings (Table 7.19), consistent with the higher nursery labor reported in Table 7.16.

Table 7.18. Source of input

	Production Zone North (PZ1)	Production Zone East (PZ2)	Production Zone South (PZ3)	All Sample
Seeds/seedlings	*N=219*	*N=206*	*N=431*	*N=856*
Agro-dealer	20	9	19	16
Propagator	82	91	64	75
Own produced seed	1	2	6	4
Other farmer/ friend/ neighbor/relative	1	4	17	10
Organic Fertilizer	*N=8*	*N=5*	*N=13*	*N=26*
Agro-dealer	100	60	100	92
Other farmer/ friend/ neighbor/relative	0	20	0	4
Processor (with whom there was a formal contract)	0	20	0	4
Manure/compost	*N=97*	*N=190*	*N=51*	*N=338*
Agro-dealer	2	6	6	5
Open air market	0	1	0	0
Other farmer/ friend/ neighbor/relative	46	62	37	54

Own	49	42	61	47
Herbicides	*N=38*	*N=17*	*N=25*	*N=80*
Agro-dealer	100	100	100	100
Other farmer/ friend/ neighbor/ relative	3	0	0	1
Pesticides	*N=233*	*N=226*	*N=447*	*N=906*
Agro-dealer	100	100	99	100
Other farmer/ friend/ neighbor/ relative	0	0	2	1

Table 7.19. Where farmers obtained seeds/seedlings

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Seedling				
Purchased seedling	86	95	71	80
Established own nursery	12	7	31	21
Purchased own seeds and paid for the services of a propagator to plant	1	0	0	0
Seeds				
Purchase	99	98	88	93
Recycle	1	3	13	7
Received for free	0	1	3	2

Fertilizers and pesticides

Agrodealers dominate fertilizer and pesticide supply, reflecting the broader role of these MSMEs in both input provision and technical advice (Table 7.10; Table 7.22). Differences in quantities applied across zones suggest differences in fertility management and disease pressure, and they translate into different cost structures (Table 7.22; Table 7.23; Table A9).

Hired transport/3PLs to fetch inputs

Input logistics rely on a mix of own transport, hired services, and collective arrangements, with strong zonal differences. For seeds and seedlings, farmers split across own transport (28%), hired transport (28%), and farmer groups/cooperatives (35%), with little use of public transport (8%). PZ1 stands out for heavy reliance on hired transport (60%), indicating strong dependence on paid logistics

MSMEs. By contrast, PZ2 uses hired transport very little (8%) and instead relies mainly on groups/cooperatives (64%), while PZ3 sits in between (22% hired; 34% groups).

Table 7.20. Mode of transport

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Seeds/seedlings				
Own personal means	29	25	29	28
Hired transportation	60	8	22	28
Farmer group/cooperative	3	64	34	35
Public transport	8	3	11	8
Delivered by propagator/seller at a cost	1	0	5	2
Organic Fertilizer				
Own personal vehicle	56	50	50	51
Hired transportation	11	13	33	23
Public transport	33	0	17	17
Seller provided transport	0	38	0	9
Manure				
Own personal vehicle	47	47	56	48
Hired transportation	48	32	24	35
Seller provided transport	0	21	0	14
Public transport	4	0	21	3
Human labor to carry to the field	1	0	0	1
Inorganic fertilizer				
Own personal vehicle	59	77	49	62
Public transport	17	11	34	21
Hired transportation	24	42	17	17

For bulky inputs, patterns differ by input type and zone. About half of farmers use their own vehicles to move organic fertilizer (around 50% in each zone), but PZ3 relies much more on hired transport for organic fertilizer (33% vs 11–13% in PZ1–PZ2). PZ2 is distinct in that a sizeable share report seller-provided transport for organic fertilizer (38%), which is not observed in PZ1 or PZ3. Public transport for organic fertilizer is common in PZ1 (33%) and lower in PZ3 (17%), and not used in PZ2.

Manure transport is more diversified overall, split mainly between own vehicles (48%) and hired transport (35%). PZ1 uses hired transport almost as much as own transport (48% vs 47%). PZ2 again shows seller-provided transport (21%) alongside own (47%) and hired (32%). PZ3 relies more on own vehicles (56%) and public transport (21%) than the other zones.

Inorganic fertilizer is most often moved using own vehicles (62% overall), but secondary channels are important and zonal: PZ2 reports substantial hired transport (42%), PZ1 combines own transport with both hired (24%) and public transport (17%), and PZ3 relies more on public transport (34%) with lower use of hired transport (17%) and less use of own vehicles (49%). Overall, the results highlight that paid logistics services, collective procurement, and seller delivery each play meaningful roles, but with distinct "logistics models" across the three zones.

Does the farmer buy water for the farm?

Payment for irrigation water is not universal, but it is important in some zones. Table 7.21 shows that among irrigators, 38% report paying for water, and the share is notably higher in PZ3 (50%) than in PZ2 (30%) and PZ1 (9%). This implies that water access can shift from an agronomic issue to a cash cost, influencing seasonal production decisions and profitability (Table 7.11; Table 7.21).

Table 7.21.%age of farmers who paid for irrigation water and the total cost incurred

	Production Zone North (PZ1) N=219	Production Zone East (PZ2) N=206	Production Zone South (PZ3) N=431	All Sample N=856
Percentage of farmers who paid for irrigation water	9	30	50	38
Average cost for water used for irrigation	71	330	8,402	3,878

Quantity and price of inputs

Input use is intensive but differs markedly across zones. PZ3 reports much higher use of tomato seed (2.6 kg/ha) than PZ1 and PZ2 (0.3 kg/ha each), while seedling density is highest in PZ1 (28,015 seedlings/ha) compared with about 17,600–17,700 in PZ2–PZ3, consistent with a more transplant-based, closely spaced system in PZ1 (Table 7.22). Fertilizer application also varies: PZ2 is the most fertilizer-intensive, applying the highest organic fertilizer (342 kg/ha) and inorganic fertilizer (1,524 kg/ha), followed by PZ3 (163 and 1,111 kg/ha) and PZ1 (134 and 982 kg/ha). In contrast, manure/compost use is highest in PZ1 (6,210 kg/ha), above PZ3 (4,167) and PZ2 (3,272) (Table 7.22). Herbicide use is similar across zones (about 3–4 kg/L per ha), but pesticide use is highest in PZ3 (86 kg/L per ha) versus PZ2 (63) and PZ1 (51) (Table 7.22).

Table 7.22. Quantity of inputs used

	Production Zone North (PZ1)	Production Zone East (PZ2)	Production Zone South (PZ3)	All Sample
Tomato seeds (kg/ha)	0.3	0.3	2.6	2
Tomato seedlings (number/ha)	28,015	17,721	17,616	20,419
Organic fertiliser (kg/ha)	134	342	163	189
Inorganic fertiliser (kg/ha)	982	1,524	1,111	847
Manure/compost (kg/ha)	6,210	3,272	4,167	4,251
Herbicides (kg/L per ha)	3	4	4	4
Pesticides (kg/L per ha)	51	63	86	71

NB: Calculated only for farmers who indicated they used the input

Prices also show meaningful wedges (Table 7.23; Table A9). Tomato seed prices per kg are much higher in PZ1–PZ2 than in PZ3, consistent with differences in seed type and sourcing. Seedling prices are comparatively uniform (KES 4–6 per seedling, average ~KES 5), with PZ2 typically reporting the lowest price. Organic fertilizer prices vary little (roughly KES 59–69/kg; average ~KES 62/kg). By contrast, inorganic fertilizer and agrochemical prices can differ substantially by zone, especially in the detailed breakdown (Table A9), with notable dispersion for inorganic fertilizer and for pesticide/herbicide prices, implying that farmers in different zones face different cost structures even within an otherwise input-intensive production system.

Table 7.23. Price of inputs

	Production Zone North (PZ1)	Production Zone East (PZ2)	Production Zone South (PZ3)	All Sample
Tomato seeds (KES/kg)	205,192	272,857	126,025	148,496
Tomato seedlings (KES/seedling)	5	4	6	5
Organic fertiliser (KES/kg)	66	67	59	62
Inorganic fertiliser (KES/kg)	102	109	118	112
Manure/compost (KES /kg)	5	7	8	7
Herbicides (KES /kg)	1,629	1,541	1,798	1,663
Pesticides (KES/kg)	2,435	2,593	1,931	2,221

Tomato production and harvest

Production cycles and harvest patterns

Table 7.24 indicates that production is organized around cycles that vary by zone, with PZ1 and PZ2 more frequently reporting two production cycles in the last season than PZ3. Harvesting is repeated across multiple pickings, supporting cashflow but requiring consistent labor and market access (Table 7.24). Harvest stage is closely shaped by buyer requirements: tomatoes are commonly harvested at mixed colors (60%), while smaller shares are harvested fully ripe (21%) or half-ripe (19%), and buyers determine the preferred harvest stage in most cases (Table 7.26). This reinforces the tight coupling between production decisions and downstream market requirements, including timing of harvest labor and exposure to losses.

Table 7.24. Tomato production in the last season

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Number of production cycles for tomato in the last season.	2	2	1	2
Quantity harvested last season (tons)	39	91	127	95
Quantity harvested (first harvest) (tons)	1	6	11	7

Yield (kg/ha)	38	45	55	48

Table 7.26. Stage when the tomatoes were harvested

	Production Zone North (PZ1)	Production Zone East (PZ2)	Production Zone South (PZ3)	All Sample
Breaker stage (slight colour change)	1	0	0	0
Turning stage (half ripe/ blue band)	31	21	11	19
Full ripe stage	26	19	19	21
Mixed colours	41	61	69	60

Challenges during tomato production

Constraints are pronounced and multi-dimensional. Farmers most frequently cite pests and diseases, followed by low output prices and high input prices, alongside weather and market glut risks (Table 7.25). These reported constraints are consistent with the intensive input use observed (Table 7.13; Table 7.22) and the high degree of price dispersion across seasons and varieties (Figure 7.2).

Table 7.25. Challenges experienced during tomato production

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
High temperature	6	3	10	7
Excess rainfall	22	13	29	23
High humidity	4	0	6	4
Strong winds	1	0	7	4
Frostbite	31	31	24	28
High prices of inputs	55	64	41	50
Low tomato prices	44	71	57	57
Oversupply of tomato in the market	22	44	23	28
Limited water supply for irrigation	18	17	20	19
Wildlife invasion	12	4	34	21

Lack of access to credit	8	15	20	16
High incidence of pests and diseases	57	82	57	63
Low amount of rainfall	1	7	14	9
Market price fluctuations	1	8	0	2

Figure 7.2: Prices by season and varieties

Productivity of the farms

Productivity differs across zones and farm size categories. Small-scale farmers are the largest group in the sample, followed by medium- and large-scale farmers (Table A10). Figure 7.3 shows a clear geographic gradient, with PZ3 recording higher yields than PZ1 and PZ2 across size categories. Yield variability is larger among large-scale farms, suggesting that expansion can introduce management and coordination challenges. Overall, the descriptive patterns indicate that location-specific factors and water access interact with scale to shape productivity (Figure 7.3; Table A10; Table 7.33).

Figure 7.3: Tomato yields by farm size and production zones

Post-harvest losses and tomato downgrading

Post-harvest losses and downgrading are substantial. Table 7.32 shows that 35% of farmers report throwing away tomatoes (with higher incidence in PZ3), and that farmers also downgrade and divert tomatoes to alternative uses (including giving away produce and feeding animals). Reported discarded volumes are sizeable, reinforcing that losses are economically meaningful rather than marginal. These coping strategies signal the economic cost of perishability and market gluts, and reinforce the importance of grading practices and timely marketing (Table 7.31; Table 7.29; Table 7.32).

Table 7.32. Quantity and Price of tomato by quality (KES/KG)

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Percentage of farmers				

Throw away	31	33	38	35
Downgraded (reduce price) but sold as tomato for consumption (e.g. to food vendors or retailers or consumers)	11	4	8	8
Downgrade (reduce price) but sold/gave away as tomato for livestock feed	1	0	0	0
Downgrade (reduce price) but sold to other buyers for other uses (e.g. for compost, other industrial use, etc.)	0	0	1	0
Feed animals for free	19	18	9	14
Give away for free	19	38	15	22
Quantity (KG)				
Throw away	142	252	423	318
Downgraded (reduce price) but sold as tomato for consumption (e.g. to food vendors or retailers or consumers)	157	92	416	277
Downgrade (reduce price) but sold/gave away as tomato for livestock feed	115		200	143
Downgrade (reduce price) but sold to other buyers for other uses (e.g. for compost, other industrial use, etc.)	32		553	423
Feed animals for free	85	75	2,757	937
Give away for free	103	208	174	173
Price (KES/KG)				
Downgrade (reduce price) but sell as tomato for consumption (e.g. to food vendors or retailers or consumers)	23	13	16	18
Downgrade (reduce price) but sell/give away as tomato for livestock feed	8		5	7
Downgrade (reduce price) but sell to other buyers for other uses (e.g. for compost, industrial use etc.) *(Only 4 sold-1 from PZ1 and 3 from PZ3)*	34		30	31

7.2.3 Sale of tomatoes

Whom the farmers sold tomato to and for how long?

Marketing is dominated by sales to broker/wholesalers outside the community (Table 7.27), while rural assemblers and retailers account for smaller shares. Farmers report relatively stable buyer relationships (about three years on average) and most sales occur on-farm (around 90%), especially in PZ1 and PZ3, with market sales more common in PZ2 (Table 7.27). This indicates strong integration into wholesale-oriented distribution networks and continued reliance on intermediaries to assemble supply from dispersed farms.

Table 7.27. Whom the farmers sold tomato to and for how long?

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=447	All Sample N=906
Whom they sold to				
Rural assembler/ farm-based broker	13	26	24	22
Broker/wholesaler from outside the community	72	70	75	73
Food vendors/restaurants	2	0	1	1
Retailers	25	19	11	17
Other households in the community				
Years you have been selling to this buyer	3	3	3	3
Sell other products to this buyer	15	6	14	11
Location of sale	94	78	96	90
On farm	6	22	4	10
Market	13	26	24	22

Sale and consumption of tomato

Tomatoes are primarily a cash crop. Table 7.28 shows that the majority of output is sold and only a small share is consumed at home, reinforcing that welfare impacts depend largely on marketing outcomes and profitability rather than on own-consumption benefits.

Table 7.28. Sale and consumption of tomatoes from the first harvest

	Production Zone North (PZ1)	Production Zone East (PZ2)	Production Zone South (PZ3)	All Sample
Quantity sold (KG)	1,098	5,126	6,011	4,533
Quantity consumed at home (KG)	57	70	136	101
Proportion sold	85	85	84	84
Proportion consumed	5	5	4	4
Price of the tomato sold (KES/KG)	40	34	28	32
Number of days paid after the sale	0	0	0	0

Use of rented transport/3PLs to deliver the output

Transport is a key service linking farms to buyers and markets. Table 7.29 shows that many farmers organize logistics themselves but hire transport services to move produce, and reliance on hired transport is particularly high in PZ3. This dependence is consistent with limited ownership of larger vehicles (Table 7.8) and highlights the role of transport MSMEs in enabling commercialization.

Table 7.29. Rented transport/3PLS to deliver the output

	Production Zone North (PZ1) N=17	Production Zone East (PZ2) N=62	Production Zone South (PZ3) N=12	All Sample N=91
My own personal means	29	42	8	35
I moved it but I hired transportation	71	61	92	67
The buyer arranged the pick up	0	0	0	0

Market information, grading, and seasonal price variation

Most farmers report having price information before sale (Table 7.30), drawing on brokers, neighbors/other farmers, and traders, likely facilitated by widespread mobile phone ownership (Table 7.9). Grading is widely practiced: most farmers grade tomatoes before sale and sorting/grading is often done by workers hired by buyers (Table 7.31). Prices vary by season, variety, and zone; Figure 7.2 shows substantial price dispersion across varieties and across long and short rains. This dispersion interacts with input costs and pest/disease pressure to shape profitability and risk exposure (Table 7.25; Table 7.23; Table A9).

Table 7.30. Market information

	Production Zone North (PZ1) N=230	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=445	All Sample N=901
Farmers that had market price information for tomato before selling the tomato (%)	94	95	84	90
Source of price information (%)	N=217	N=214	N=376	N=807
Radio	0	1	0	0
Cooperative/farmer group	1	0	1	1

Traders	62	46	39	47
Neighbors/other farmers	45	69	69	63
Internet/ Mobile App	2	0	2	2
Broker	54	70	66	64

Table 7.31. Tomato grading

	Production Zone North (PZ1) N=233	Production Zone East (PZ2) N=226	Production Zone South (PZ3) N=446	All Sample N=905
Farmers who sorted and graded their tomatoes	96	100	97	97
Who sorted?				
Workers hired by buyer	79	55	87	74
Buyer	13	26	9	15
Yourself	7	20	5	10
Workers hired by self	6	6	12	9
Broker	2	0	0	1
Workers hired by broker	0	0	0	0
How did you grade your harvested tomato for sale				
By size	97	98	91	94
By colour	55	41	73	60
By Shape	27	6	22	19
By level of damage	38	46	62	59
Firmness of the surface	1	0	0	0

7.3. Performance

Yield on plot size, farming practice and input usage

Regression results show a negative and significant association between total plot size and yield in the full sample, consistent with lower yield per unit among larger plots. Yields are significantly higher for farmers who purchase seeds/seedlings, use more inorganic fertilizer, and employ more labor, indicating that market-sourced planting material and input and labor intensity are key correlates of productivity.

Access to water is central: ownership of a well or water pump has the largest positive and highly significant effect on yield. In contrast, ownership of irrigation equipment (e.g., pipes) is negatively and significantly associated with yield, possibly reflecting reverse causality or inefficient use. Training is also negatively and significantly associated with yield in the full sample (Table 7.33).

Table 7.33. Yield on plot size, farming practice and input usage

	All farms	Small farms	Medium farms	Large farms
Total plot size	-1.7***			
	(0.3)			
Farmer produced in both long and short rain seasons	-0.1	-3.5	5.1	-0.4
	(1.9)	(2.4)	(3.9)	(5.1)
Farmer used seeds/seedlings from purchase	5.3***	4.0	0.7	3.6
	(2.0)	(2.3)	(4.8)	(5.7)
Farmer used irrigation during land preparation	2.3	0.6	4.9	4.7
	(1.7)	(2.0)	(3.7)	(5.8)
Total quantity of inorganic fertilizer used (KG)	0.0***	0.0***	0.0***	0.0
	(0.0)	(0.0)	(0.0)	(0.0)
Total quantity of pesticides used (KG/L)	0.0	0.0	0.0	0.0**
	(0.0)	(0.0)	(0.0)	(0.0)
Total number of labors used for farming	0.1***	0.1***	0.1***	0.1**
	(0.0)	(0.0)	(0.0)	(0.0)
Farmer received any training	-4.3**	-3.3	-4.0	-3.1
	(1.7)	(1.9)	(3.5)	(5.1)
Farmer owns any draft animal	-0.9	1.1	-1.0	-3.0
	(1.9)	(2.1)	(4.8)	(5.9)
Farmer owns well or water pump	15.0***	16.2***	12.9***	14.0**
	(2.6)	(3.4)	(4.5)	(6.8)
Farmer owns irrigation equipment (e.g. pipe)	-6.1***	-7.1***	-3.5	0.8
	(2.1)	(2.3)	(4.5)	(6.8)
Intercept	25.0***	19.3***	12.0	9.8
	(2.5)	(2.7)	(6.7)	(9.5)
Number of observations	906	614	170	122

Adjusted R-squared	0.23	0.24	0.38	0.25
*** p<.01, ** p<.05				

Patterns by farm size are broadly consistent with some differences. Among small farms, fertilizer and labor remain strong positive predictors, and the yield gains associated with owning a well/pump are particularly large, while the irrigation equipment coefficient remains negative; purchased seeds are positive but not statistically significant. Among medium farms, fertilizer, labor, and well/pump ownership remain positive and significant, while other variables (including training) are not significant. Among large farms, fewer inputs are significant, but pesticide use becomes positively and significantly associated with yield, alongside labor and well/pump ownership, suggesting crop protection may be especially important at larger scales (Table 7.33).

Total labor on plot size, farming practice and input usage

For the full sample, total plot size is positively and significantly associated with total labor, confirming that larger cultivated area requires more workers. Input intensification is also labor-using: improved seed adoption, fertilizer use, and pesticide use are all positively associated with labor demand, suggesting complementarity between chemical inputs and labor. Training is positively associated with labor use, and ownership of irrigation equipment and water pumps is also linked to higher labor demand, consistent with irrigation enabling more intensive management and higher cropping intensity (Table 7.34).

Table 7.34. Total labor on plot size, farming practice and input usage

	All farms	Small farms	Medium farms	Large farms
Total plot size	0.0***			
	(0.0)			
Farmer produced in both long and short rain seasons	0.0	-8.8**	-29.7**	9.7
	(0.0)	(3.9)	(11.8)	(14.9)
Farmer used improved seed	0.0***	-10.5***	-13.1	0.2
	(0.0)	(3.9)	(9.6)	(13.6)
Farmer used irrigation during land preparation	0.0	5.7	22.5	-30.7**
	(0.0)	(4.0)	(15.4)	(15.0)
Total quantity of inorganic fertilizer used (KG)	0.0***	0.0***	0.0***	0.0
	(0.0)	(0.0)	(0.0)	(0.0)
Total quantity of pesticides used (KG/L)	0.0***	0.0	0.0	0.1
	(0.0)	(0.0)	(0.0)	(0.0)

Total number of labors used for farming	1.0***			
	(0.0)			
Farmer received any training	0.0**	-2.2	-11.3	0.2
	(0.0)	(3.6)	(10.1)	(16.1)
Farmer owns any draft animal	0.0	8.0**	-14.1	3.6
	(0.0)	(3.4)	(18.1)	(22.2)
Farmer owns well or water pump	0.0***	9.2	2.8	39.1
	(0.0)	(9.2)	(18.6)	(31.8)
Farmer owns irrigation equipment (e.g. pipe)	0.0**	11.5***	-2.8	43.5**
	(0.0)	(3.9)	(19.8)	(21.2)
Intercept	0.0	30.4***	83.3***	27.8
	(0.0)	(3.7)	(23.0)	(33.0)
Number of observations	906	614	170	122
Adjusted R-squared	1.00	0.09	0.18	0.09

*** p<.01, ** p<.05

Results differ somewhat by farm size. Among small farms, producing in both seasons is negatively associated with labor use, consistent with labor constraints, while irrigation equipment ownership is strongly positive. Improved seed is negative for small farms, suggesting it may be labor-saving in this group, and draft animal ownership is positively associated with labor. Among medium farms, producing in both seasons is also strongly negative, while fertilizer remains positive and significant. Among large farms, irrigation during land preparation is negatively associated with labor (suggesting substitution), but irrigation equipment ownership remains strongly positive, indicating irrigation systems are linked to higher overall labor demand (Table 7.34).

8 Summary of findings and conclusion

The development of tomato production clusters in Kenya is characterized by a massive twelve-fold expansion in production volume between 1980 and 2022, growing from 55,000 to over 600,000 tons to meet a five-fold increase in domestic consumption. This growth has been primarily driven by commercially oriented small-scale producers and is spatially organized around three distinct geographic clusters: the North (Narok, Nakuru, Baringo, Laikipia), the East (Mwea, Embu, Machakos), and the South (Kajiado, Taita Taveta).

These clusters evolved through a tiered expansion, beginning in "cradle" areas before radiating into "second-wave" regions due to pressures of land access and crop disease and pests in the cradles. Recently, "emerging areas" in the Southeast of Nairobi have seen rapid growth, facilitated by land availability and improved road infrastructure. This development is anchored by wholesale markets with an average longevity of 43.5 years, which have become increasingly resilient service hubs that now operate year-round, even during low-production seasons.

Further, the development of these clusters has been supported by substantial public sector investment, as the government was responsible for establishing 46% of all current market sites. This infrastructure facilitates massive daily trade volumes, averaging 39.1 tons per market during the high season and maintaining 16.1 tons even during low-production periods. Governance has evolved into a dual-authority structure where local governments and trader-led committees share management; notably, trader-led governance has proven more effective at driving volume growth and handling high-season surges than state regulation alone.

Tomato production has shifted toward high-intensity, technology-led systems supported by a symbiotic relationship with micro, small, and medium enterprises (MSMEs). Commercialization on the input side is nearly universal, as producers are deeply integrated into professional input markets, with 96% of farmers utilizing improved varieties and 97% applying fertilizers and 76% source seedlings from specialized propagators rather than establishing their own nurseries. Land access is primarily market-driven, with 65% of tomato plots acquired through active informal rental markets**.** Mechanization is now standard, with 81% of land preparation performed by tractors**,** while 97% of farmers utilize irrigation systems—predominantly powered by fuel-driven, LPG, or electric pumps—to sustain year-round production. MSMEs in the input segment act as critical financial intermediaries, with 67% of agrodealers offering credit to facilitate farmer intensification.

The output side of the value chain is highly commercialized, with 95% of total horticultural production sold in the domestic market and farmers selling approximately 86% of their initial harvests. Wholesaling dominates the trade, accounting for 83% of all tomato sales during the high season. The sector has experienced significant "vertical deepening," evidenced by a 210.8% increase in wholesalers and a 389.2% increase in retailers over the last decade. A notable trend is disintermediation, as 77% to 81% of traders now bypass multiple middle layers to source directly from farmers.

The structural transformation of the value chain is further evidenced by a dramatic increase in market participants. The "hidden middle" has undergone a profound "vertical deepening," where growth is defined by a richer ecosystem of services around existing markets rather than just geographic expansion. On average, each wholesale market now supports 108 allied businesses spanning 4.7 different service types. This includes a 284% increase in agricultural input shops and a 290% increase in transport logistics firms over the last decade. Beyond inputs, markets function as sophisticated hubs for packaging material sellers (averaging 7.3 per market), bank branches

(3.3), ATMs (2.8), and nascent private cold storage (1.3). This commercialization is further evidenced by disintermediation, and a reliance on third-party logistics (3PLs) to move bulk volumes flexibly from rural clusters to urban centers.

Transactional relationships between traders and producers are characterized by high liquidity and a lack of restrictive dependencies. Traders typically pay prices similar to other market buyers, and farmers reported being paid on the same day as the sale in all cases. Most traders (87%**)** pay fully upon receipt of the tomatoes, ensuring rapid cash flow. Furthermore, the sector operates without "tied" contracts; providing cash advances (0.3%) is extremely rare, suggesting that trade is driven by immediate market availability rather than long-term credit-dependent relationships.

The sector serves as an engine for inclusion. Women are the dominant actors in trade, constituting 65% of all traders and 81.1% of retailers. Youth inclusion is primarily concentrated in labor; while they own only 1% of trading enterprises and 8% of input shops, they constitute approximately 50% of casual labor, 60% of salaried staff, and 64% of unpaid family labor within these firms. On-farm, women provide the bulk of hired labor during the intensive harvesting phase, representing the largest segment of the workforce across all production clusters.

Smartphone ownership stands at 85% among producers and averages 73% to 79% among traders. Mobile phones are the primary logistical tool, with 92% of traders relying on phone calls to coordinate sourcing and transport. Financial transactions rely on a dual system, mobile money is the most prevalent form (used by 62% of traders), while hard cash remains a critical secondary medium utilized by 56% of the sector for instant settlement. In primary consumption zones like the Nairobi Metropolitan, mobile money usage rises to 75%, signaling that urban hubs are leading the transition toward a fully digital financial ecosystem.

The study concludes that Kenya’s tomato value chain has undergone a profound structural transformation driven by rising domestic demand and a massive expansion in production. This development is characterized by a shift from simple geographic expansion toward a vertical deepening of the sector, where mature production clusters have evolved into integrated, year-round service hubs.

Commercialization is now universal across the chain, evident in the transition to high-intensity, technology-led farming and the emergence of a sophisticated "hidden middle" that facilitates direct sourcing and specialized logistics. A powerful symbiosis has developed between commercially oriented producers and a dense network of micro, small, and medium enterprises (MSMEs), which together provide the inputs, credit, and transport necessary to sustain the subsector's growth.

Finally, the sector serves as a vital engine for inclusion, pulling women into dominant trading roles and youth into the labor market. Collectively, these findings confirm that the tomato value chain has matured into a resilient, market-linked system capable of driving inclusive agricultural transformation in Kenya.

To sustain the subsector's dynamic growth, policy interventions should focus on several key areas.

First, targeted investments in improved sanitation and water systems are required to address the severe deficits that threaten market efficiency.

Second, to manage the tension between market fees and service delivery in Kenya's tomato subsector, it is recommended that the government formalizes and empowers trader-led governance committees to take a more central role in fee reinvestment and infrastructure management, particularly water and sanitation.

Third, the government can strategically leverage the rapid growth of allied businesses to support public-private partnerships (PPPs) for the building and maintenance of market infrastructure. Furthermore, the government can use the growth of the hidden middle to encourage private investment in specialized infrastructure that the public sector has struggled to provide. For example, private cold storage is currently the rarest form of infrastructure, and the likelihood of a market developing such specialized facilities is positively correlated with the existence of structured, trader-led management. By creating policy frameworks that support PPPs, the state can incentivize these rapidly growing logistics and input firms to co-invest in high-value assets—such as cold chains, paved loading zones, and solar-powered water systems—thereby ensuring the long-term competitiveness and resilience of Kenya's tomato production clusters.

Competing interests

The authors report no potential competing interests.

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Data and software availability

Underlying data

Extended data

Data supporting the findings of this study are currently being cleaned and anonymized and will be deposited in RIMISP's Harvard Dataverse repository as soon as they are ready for public release. Until deposition is complete, the datasets are not yet available. The authors will update the preprint with the persistent repository link and citation upon release.

Competing interests

'No competing interests were disclosed'.

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