

# Pack 112, Item 2

# Type: Backgrounder

September 2019

# \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Backgrounder: Tomato marketing and transportation**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Introduction**

***Why is this subject important to listeners?***

Because farmers and processors who handle fresh tomatoes after harvest should know:

* The right time to harvest tomatoes for different markets.
* That it’s best to harvest tomatoes in the morning to avoid excessive heat.
* How to sort and grade tomatoes.
* How to package and store tomatoes to prevent them from spoiling.
* How to assign a fair price to tomatoes when marketing them.
* How to process tomatoes in the home to increase income.
* The right way to transport tomatoes to market to protect them.
* The target markets for fresh and processed tomatoes.

***What are some key facts?***

* Before farmers decide to grow tomatoes, they should do some research to determine if there is a fair and ready market for them that season and when necessary, consider working closely with other farmers in the community to stagger production.
* It is recommended that farmers cultivate improved tomato varieties with a longer shelf life.
* Fresh market tomatoes for consumers can be harvested at the red stage, while tomatoes for distant markets should be harvested at turning stage to avoid over- ripening and spoilage before reaching their final destination.
* Store tomatoes at 12 degrees Celsius and 86-90% relative humidity. (*Note: small-scale farmers who cannot afford to purchase equipment to measure relative humidity individually could purchase the equipment as a group*.)
* A Zero Energy Cooling Chamber can reduce temperature by 10-15⁰C and maintain humidity at 95%. This can increase tomato shelf life and retain quality.
* Tomatoes can be stored for 2-3 weeks at temperatures not lower than 10 degrees Celsius.
* During sorting, wash fruits by size, colour, and variety. Conduct sorting away from direct sunlight in a cool and clean environment.
* Grade after washing and arrange tomatoes in uniform categories according to size, appearance, and quality.
* Tomatoes are packed in cartons, plastic crates, sisal or bamboo baskets, customized wooden boxes, cardboard boxes, and wooden or cardboard crates.
* Add green leaves or banana leaves to pad packaging containers to cushion tomatoes from being crushed when packed.
* Whenever possible, transport tomatoes in refrigerated trucks. These minimize damage to tomatoes caused by road transport. If there is no refrigeration, cover vehicles with jute spreads or tarpaulins to reduce transpiration.\*
* Overloading tomatoes for transport can result in crushing of fruits and other mechanical injuries.
* There is a market for dried tomatoes, and farmers should not hesitate to dry their tomatoes in a hygienic way when markets are unavailable after harvest.
* There is a general perception that quality inputs are expensive. But quality inputs such as seeds, crop protection materials, etc. can increase yield, income, and resistance to diseases, and help farmers minimize the cost of production.

*For further information, see documents 2, 3. 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, and 20.*

***Predicted impact of climate change on marketing and transportation of tomatoes***

* High temperatures result in smaller-sized tomatoes that fetch low market prices.
* Increased temperatures will decrease tomato productivity.
* Rainfall during the wet season is often associated with floods that destroy and submerge tomato fields and other crops. Thus, it is important to stagger planting and input use by, for example, planting at two different times and thereby splitting input use, or by planting tomatoes in upland areas.
* Farmers in the Tabora region of western Tanzania have started growing tomatoes due to climate change challenges that made it difficult to sustainably grow staple crops.

*For further information, see documents 1, 4, and 9.*

***What are the big challenges with transporting and marketing tomatoes?***

* Farmers lack the knowledge of how to properly pack and transport tomatoes. The resulting damage and spoilage lowers market prices.
* Farmers produce tomatoes in the same season. This results in an oversupply (glut) in the market, which results in low prices.
* Lack of knowledge by farmers of how to fairly price their tomatoes for the market due in part to lack of production records
* Farmers growing tomatoes that are not needed in local markets.
* Farmers lack the knowledge of when to pick tomatoes for different uses, for example, tomatoes for processing or consumption.
* Farmers would like to avoid losses of fresh tomatoes due to spoilage, but don’t know how to process raw tomatoes after harvest.
* New farmers may not know the seasons that are best for planting their tomatoes to maximize their income.
* Farmers do not share costs in order to enjoy discounts and build economies of scale by fostering beneficial relationships with input suppliers or dealers. For example, in Katsina State, northern Nigeria, farmers collectively purchase truckloads of fertilizer directly from a fertilizer company.
* Farmers produce low quality tomatoes, resulting in short shelf life and lower market prices.

*For further information, see documents 2, 3, 6, 7, 8, 10, 12, 13, 14, 15, 16, 18, and 20.*

***Gender aspects of transporting and marketing tomatoes***

* In Mbeya, Tanzania, women dominate tomato sales because they are responsible for household food security, while men prefer not to be involved with tomato sales and marketing because it is so labour-intensive.
* In Kwara State, Nigeria, 70% of tomato sellers are women.
* In some African cultures, the expectation is that women remain in the home to handle household chores and do not market tomatoes or other produce.
* In some cases, religion or culture hinder women from mingling with men or being involved in mixed-gender activities such as production and marketing. However, women do engage more often in adding value, including small-scale processing and retailing of tomato products.

*For further information, see documents 19 and 20,*

**Key information about transporting and marketing tomatoes**

**Sorting**

After harvest, farmers should sort tomatoes to remove diseased, rotten, cracked, unattractive, discoloured, and pest-infested fruits. Sorting is done in a cool and shaded environment. The best tomatoes can be put in stackable plastic crates.

**Sorting and grading**

After harvesting tomatoes when firm and red, they are washed, sorted, and graded to meet the buyer’s requirements.

* Tomatoes are sorted to separate diseased, rotten, cracked, or “unattractive” tomatoes.
* Tomatoes are graded by size, colour, maturity, quality, uniformity, variety, and stage of ripening.
* Sort and grade in a cool and clean environment, and ensure that people sorting and grading ensure cleanliness by, for example, washing their hands and wearing clean clothes.
* An ideal cluster of tomatoes is well-shaped, uniform in size and colour, and with fruits free from diseases, blemishes, spray residues, and cracks.
* A crate of tomatoes can be washed in sodium bicarbonate (baking soda). Twenty grams per litre of water can be used to wash the tomatoes to minimize post-harvest rot.

Grading classes may vary by country. In some countries, there are four grade classes for tomatoes: class 1, 2, 3, plus the lowest class. The first three classes have no decay, foreign matter, foreign odours, insect damage, deformities, or injuries.

* **Class 1:** Tomatoes are at least 50 millimetres in diameter, fairly firm, not overripe, fairly uniform in size and colour, well-shaped, and attractive.
* **Class 2:** Tomatoes are at least 40 millimetres in diameter, reasonably firm, not overripe, attractive, and reasonably well-shaped and uniform in size and colour.
* **Class 3:** Tomatoes are at least 30 millimetres in diameter, are firm, attractive (no spots or skin damage), and have different sizes and colour.
* Tomatoes can also be graded into three weight classes. Small tomatoes are less than 100 grams, medium-sized tomatoes weigh 100 to 255 grams, and large tomatoes are over 255 grams. Local retailers use these grading classes when selling at local markets.

*For further information, see documents 5, 6, 10, 13, and 17.*

**Seasonal production**

To ensure a good financial return, farmers must carefully time their production and marketing. If many farmers mass produce in one season, there is a glut in the market and prices drop, which results in spoilage, waste, and financial losses. Therefore, it’s recommended that farmers stagger their production during the on-season to meet market and take advantage of the lean period to grow tomatoes (i.e., wet season production in Nigeria.)

**Greenhouse versus field**

* Farmers who grow tomatoes in greenhouses can more easily time their growing cycles than those who grow tomatoes in fields and must rely on rainwater.
* Greenhouse growers can grow all year round, and earn more than those who farm in open fields.
* In Kenya and Nigeria, greenhouse growers who have mature tomatoes at the onset of the rainy season earn more due to the scarcity of tomatoes in the market at that time, compared to those who rely on rains.
* Many smallholder farmers lack the initial capital or collateral to access loans needed to purchase and set up greenhouses.

**Packaging**

* Tomatoes can be packaged in cartons, sisal baskets, wooden boxes, and cardboard or plastic crates or boxes, and padded with banana leaves to cushion them from damage during transport. Packing in raffia baskets is highly discouraged as it contributes to post-harvest losses.

**Harvest to market**

* Tomatoes are ready to harvest 3-4 months after sowing, depending on the variety.
* After harvest, farmers sort and grade the tomatoes to meet the buyers’ standards and needs.
* Wash or wipe the tomatoes to ensure they are clean.
* Tomatoes can be stored in plastic crates in a well-fumigated room such as an evaporative cooling chamber, a cold room with temperatures of 10-15⁰C that maintains humidity at 95%. Farmer can choose to sell tomatoes at the farm gate to local buyers like middlemen, or they can transport them to the market. Aggregation and bulk selling give farmers greater bargaining power.

**Transport**

* Inappropriate modes of transportation result in tomato losses. When packaging materials do not immobilize fruits, excessive vibration or movement leads to losses during transport.
* Whenever possible, farmers should use refrigerated trucks to transport tomatoes. If they are unavailable, cover non-refrigerated trucks with jute spreads or tarpaulins to protect tomatoes from transpiration.
* Tomatoes can also be packed in wooden or plastic crates/lugs or cartons in trucks. Transporting tomatoes in returnable plastic crates reduces losses even on bad roads whereas overloading baskets on bad roads results in tomatoes falling off and being deformed during transit, reducing the quantity to be sold.
* Transport vehicles should be clean and well-maintained. They shouldn’t contain dripping or standing water, soil, odours, or debris.
* Vehicles used to transport animals or chemicals should not transport fresh produce.
* Examine vehicles for transporting tomatoes to ensure they are pest-free.
* Wash vehicles for transporting fresh produce with water at 60-71 degrees Celsius and sanitize with a food-grade sanitizer.
* Pack tomatoes to allow good air circulation between transport containers.
* Educate all workers on how to pack, handle, and transport tomatoes.

**Drying**

Drying is a basic form of processing. If farmers harvest more than they can market or consume, they can dry tomatoes to preserve them and minimize post-harvest losses. The best tomato varieties for drying are firm plum or paste varieties, for example, Roma and UC82B. Tomatoes can be sun-dried in the open air or artificially dried. Before drying, disinfect tomatoes by dipping them in boiling water for 1-2 minutes.

* *Open air drying:* Wash tomatoes, cut in halves or quarters, and place on clean tarpaulins or other flat surfaces with the cut side facing the sun—for example, trays on a raised surface and covered with plastic mesh. Plastic mesh, mosquito nets, or cotton muslin cloth prevents contamination by insects, dirt, and dust. Open-air drying takes 2-5 days when it’s windy and the air is not humid. The result is pieces of dark, red, leathery tomato with 15-20% moisture content. If dried further, moisture content is reduced to 5% and the dried, hard, brittle tomato pieces can be crushed to powder or flakes and used in soups and sauces. Tomatoes stored as powder or flakes will last for a long time without spoilage.
* *Artificial drying:* Solar-powered driers or driers powered by various fuels can be used to dry fresh tomatoes. Ensure that the temperature in driers does not exceed 65 degrees Celsius, as excessive heat interferes with the taste of the dried tomatoes.

**Processing**

Processing and packaging tomatoes reduces post-harvest losses and ensures that products last longer—up to a year—without spoilage. In homes, tomato pulp can be processed as a base for tomato juice, sauce, puree, and paste.

*Preparing tomato pulp*

* Make tomato pulp with ripe tomatoes only.
* Wash tomatoes and dip in boiling water for two minutes to kill harmful micro-organisms on skins.
* Pulp tomatoes with a pestle and mortar.
* Remove skin and seeds by straining through a coarse four-millimetre sieve and then a finer sieve with one-millimetre holes.
* Cold fill the pulp into clean, sterilized, hermetic glass bottles. You can add a little vegetable oil to improve the appearance of finished products.
* Pasteurize\* the pulp over a fire in a stainless steel or aluminum pan, stirring continuously to destroy micro-organisms and enzymes. After all the tomatoes are added and heated, let the mixture simmer for five minutes.
* Carefully arrange the finished products in a carton. The products have a shelf life of 1-2 years if unopened.

*Tomato pulp products*

You can make tomato juice by adding salt and lemon juice to tomato pulp. You can make tomato puree and highly concentrated tomato paste by boiling the pulp until water evaporates, constantly stirring to prevent burning. The resulting paste has a dark red colour, and salt can be added to taste. Pour the paste into a hermetic plastic container and cover with a lid for storage and sale

*For further information, see documents 2, 6, 7, 10, 12, 13, 14, 15, 16, 17, 18, and 20.*

**Pricing for the market**

Before planting tomatoes, farmers should:

* Calculate all expenses involved in tomato production to determine a fair and profitable selling price.
* Do research on market demand and supply for that planting season.
* Identify markets before growing tomatoes or while tomatoes are still growing by reaching out to offtakers or visiting markets.
* Determine their target market and their customers’ tastes, whether the tomatoes are sold in local markets, exported, or used in industrial-scale processing.
* Grow the varieties needed for their target market and enter pre-buying agreements with buyers to ensure guaranteed markets.

**Selling**

* Farmers who aggregate and sell their tomatoes collectively through village co-operatives or farmers’ groups have more bargaining power with buyers and typically earn more than farmers who sell as individuals.
* Aggregation allows farmers to sell their tomatoes in huge quantities at one time to large-scale buyers.
* Selling tomatoes as a group allows farmers to aggregate and arrange organized transport to the market.
* In Eritrea, farmers who grow tomatoes in the offseason during both frost and dry seasons have more bargaining power due to the scarcity of tomatoes in those periods. In Nigeria, off-season production takes place in the wet season and gives more bargaining power to farmers.
* Farmers who can transport their tomatoes to markets earn more than those who sell at the farm gate.

**Selling to middlemen**

***Advantages***

* Middlemen are vital to farmers who grow highly perishable produce like tomatoes since they help them access markets quickly.
* Middlemen or brokers link tomato farmers to buyers and sellers and negotiate selling prices, receiving a commission from farmers or buyers after the sale.
* Middlemen act as buyers after harvests.
* Middlemen can help reduce post-harvest losses by supporting farmers with required packaging materials such as reusable plastic crates.

***Disadvantages***

* Middlemen may collude and buy tomatoes at low prices at the farm gate from farmers who are uninformed about prices.
* Middlemen may collude with buyers to manipulate market prices so that farmers receive low prices.
* Middlemen buy tomatoes at low prices at the farm gate. Because farmers are desperate to sell them quickly before they spoil, they accept the prices middlemen offer.
* Middlemen may demand and receive high commissions that eat into farmers’ profits.

***Recordkeeping***

* Keeping written records of expenses helps farmers understand the cost of growing tomatoes so that they understand how to price them to make an adequate profit.
* Recordkeeping helps tomato farmers know whether they made a profit or loss.
* Records help farmers know how much money they received from their tomato enterprise.
* Written records help farmers make better decisions on the right time to grow tomatoes and where to buy and sell them.
* Recordkeeping helps farmers track the inputs they use to grow their tomatoes and their cost.

***Tracking market prices***

* Farmers should monitor weekly tomato prices to understand the transaction dynamics throughout the year and determine their production and sales.
* Farmers should visit or make phone calls to different markets before they harvest tomatoes in order to familiarize themselves with current prices.
* Farmers can take their tomatoes to aggregation centres for collective marketing. Collective marketing gives farmers greater bargaining power and better prices.
* Farmers can use mobile phone-powered marketing platforms to sell their tomatoes. These provide additional marketing opportunities and give farmers information about prevailing market prices.

*For further information, see documents 7, 8, 11, 13, 14, 15, and 20.*

***Definitions***

*Pasteurize:* The process of partially sterilizing produce, often through heat treatment, thus making the product safe for consumption and improving its shelf life.

*Transpiration*: The process through which moisture is carried through plants from roots to small pores on the undersides of leaves, where it changes to vapour and is released to the atmosphere. Transpiration is essentially evaporation of water from plant leaves.

***Where can I find other resources on this topic?***

*Documents*

1. Abou-Shleel, S.M., and El-Shirbeny, M. A., 2014. GIS Assessment of Climate Change Impacts on Tomato Crop in Egypt. *Global Journal of Environmental Research,* Vol. 8, No. 2: pages 26-34. <https://pdfs.semanticscholar.org/6d9b/570e5949f28a1d47b449bf14b9e0c3e9fe54.pdf> (569 KB).
2. Arah, I. K. et al, 2015. An Overview of Post-Harvest Losses in Tomato Production in Africa: Causes and Possible Prevention Strategies. *Journal of Biology, Agriculture and Healthcare*, Vol. 5, No. 16, pages 78-88. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.862.3331&rep=rep1&type=pdf> (2.42 MB).
3. Asgedom, S., et al, 2010. Opportunities and constraints of tomato production in Eritrea*. African Journal of Agricultural Research*, Vol. 6(4), pages 956-967. <https://core.ac.uk/download/pdf/29236529.pdf> (130 KB)
4. Azam, M., et al, 2017. Impact of climate change vulnerabilities on horticultural production. *Horticulture International Journal,* Vol. 1, No. 2, pages 45-47. <https://medcraveonline.com/HIJ/HIJ-01-00008.pdf> (428 KB).
5. Department of Agriculture, South Africa, undated. *Classes and grading requirements of tomatoes*. <http://webapps.daff.gov.za/AmisAdmin/upload/classes%20and%20grading%20requirements%20of%20tomatoes.pdf> (232 KB)
6. Department of Agriculture, Forestry and Fisheries (South Africa), undated. *Production guidelines for Tomato.* <https://www.nda.agric.za/docs/Brochures/ProdGuideTomato.pdf> (996 KB)
7. Dijkstra, T., and Magori, T. D., 1994. *Horticultural production and marketing in Kenya: Part 3: Taita Taveta District*. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.877.8211&rep=rep1&type=pdf> (2.43 MB).
8. Everaarts, A. P., de Putter, H., and Amon, W., 2011. *A survey of field vegetable production in Tanzania-Recommendations for improvement.* Wageningen UR. <http://edepot.wur.nl/195026> (4.5 MB).
9. Filho, W. L., et al, 2014. *Adapting African Agriculture to Climate Change: Transforming Rural Livelihoods.* <http://www.kalro.org/sites/default/files/ASSSS6th-SSSEA27th-Conference-Book.pdf> (6.9 MB).
10. Food and Agriculture Organization, 2017. *Tomato harvesting, sorting & packing*. <http://www.fao.org/3/a-i7517e.pdf> (569 KB).
11. Kahan, D., 2011. *Farm Business School-Training of Farmers Programme-South Asia Handbook.* Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific. <http://www.fao.org/3/i2137e/i2137e00.pdf> (1.94 MB).
12. Malekian, F., et al, undated. *Transportation of fresh produce: best practices to ensure on-farm food safety.* LSU Ag Center. <https://www.lsu.edu/agriculture/plant/extension/hcpl-publications/2_Pub.3442-TransportationofFreshProduce-BestPracticestoEnsureOn-FarmFoodSafety.pdf> (569 KB).
13. Monsanto Kenya, 2011. After the Harvest: Getting Tomatoes to Market. *Seed Time*, Volume 37, July-September 2011. <http://www.monsantoafrica.com/_pdfs/newsletters/seed_time_2011_july_sept.pdf> (1.09 MB).
14. Naika, S., et al, 2005. *Cultivation of tomato production, processing and marketing.* CTA Agrodok 17. <https://cgspace.cgiar.org/bitstream/handle/10568/52975/1296_PDF.pdf?sequence=4&isAllowed=y> (767 KB).
15. Ngaruko, D., and Mutayoba, V., 2018. Assessing tomato farming and marketing among smallholders in high potential agricultural areas of Tanzania*. International Journal of Economics, Commerce and Management* Vol. 6, No. 8, pages 577-590. <http://ijecm.co.uk/wp-content/uploads/2018/08/6838.pdf> (312 KB).
16. Njenga, P., Willilo, S., and Hine, J., 2015. *First Mile Transport Challenges for Smallholder Tomato Farmers along Ihimbo‐Itimbo Road, Kilolo District Tanzania: Final Report.* <http://www.research4cap.org/Library/Njenga-Willilo-Hine-IFRTD-2015-FirstMileTransportTomatoesTanzania-Final-AFCAP-Tan2015c-v160114.pdf> (996 KB)
17. Nyagumbo, C., et al, 2016. *Smallholder Horticultural Production and Business Trainer’s Manual.* NV Zimbabwe. <http://www.snv.org/public/cms/sites/default/files/explore/download/rarp_2016-horticulture-trainers-manual.pdf> (3.14 MB).
18. Robinson, E. J. Z., 2008. *Vegetables and their markets in Africa.* <https://warwick.ac.uk/research/priorities/foodsecurity/events/pastevents/vegetablemeeting/elizabeth_robinson.pdf> (2.09 MB).
19. Salau, S.A., and Salman, M.A., 2017. Economic analysis of tomato marketing in Ilorin metropolis, Kwara State, Nigeria*. Journal of Agricultural Sciences,* Vol. 62, No. 2, pages 179-191. <https://scindeks-clanci.ceon.rs/data/pdf/1450-8109/2017/1450-81091702179S.pdf> (241 KB).
20. Sanga, A., and Mgimba, C., 2016. An analysis of constraints that affect smallholder farmers in the marketing of tomatoes in Mbeya urban and peri-urban, Tanzania*. Imperial Journal of Interdisciplinary Research,* Vol. 1, No. 3, pages 603-611. <https://www.onlinejournal.in/IJIRV2I3/106.pdf> (312 KB).

## Acknowledgements

Contributed by: James Karuga, Agricultural journalist, Kenya

Reviewed by: Oloruntoyin Olorunfemi, Adedotun Adedoyin, and Hamisu Abdulrasheed Ibrahim, Technoserve Nigeria.

*This resource was produced with support from The Rockefeller Foundation through its YieldWise initiative.*