TECHNICAL BRIEF

Center of Excellence: Achievements and Lessons Learned from Ethiopian Pharmaceuticals Supply Agency Hawassa Branch Warehouse in Ethiopia

Ethiopian Pharmaceuticals Supply Agency (EPSA), the organization in charge of supply chain management of public health commodities in Ethiopia, is committed to improving access to and equity of essential medicines and related health commodities. In recent years, EPSA has made significant progress. It expanded distribution networks to 19 subnational branches, increasing national coverage and direct delivery to public health facilities. Kitting of warehouses with material handling equipment (MHE) for storing commodities (forklifts, pallet racks, standard pallets) and transportation (forklifts, pallet trucks) improved warehousing and distribution operation efficiencies. However, a warehouse improvement project assessment conducted at all branches in 2017 revealed that challenges remained, including poor warehousing practices, storage conditions, and inventory management practices. These inefficiencies resulted in pharmaceutical waste and stock-out.

The Center of Excellence Model

The Revised Pharmaceuticals Supply Transformation Plan (2018–2020) aims to secure uninterrupted product availability and delivery of excellent customer service. This strategic plan identified four thematic areas in pharmaceutical supply management that call for excellence in:

- Pharmaceutical supply
- The financial management system
- Leadership and governance
- Supply chain systems capacity

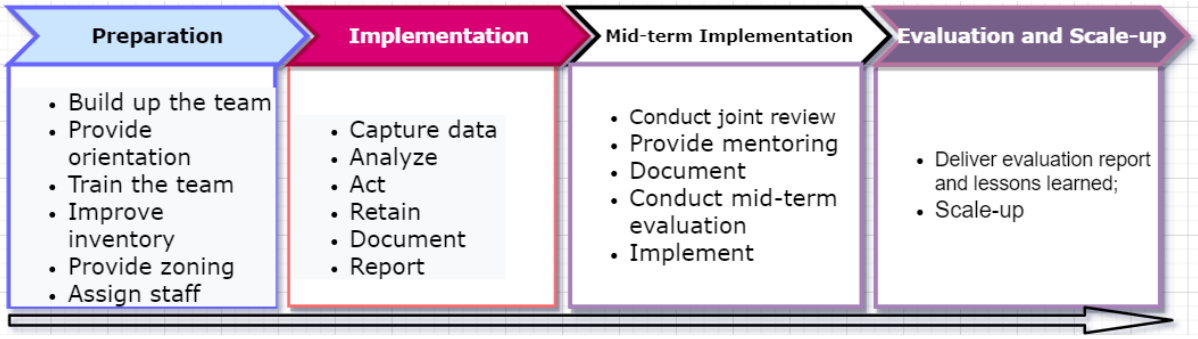
To realize the strategic objectives, EPSA collaborated with partners in developing packages of interventions on warehouse and inventory management. Called the Center of Excellence (CoE) initiative, this program has focused on improving product velocity while enhancing the current performance of people, processes, governance, and transparency by leveraging the existing infrastructure, persons, and systems. It was designed to accelerate the agency's change management process through continuous improvement of its warehouse and inventory management operations. Based on the proximity for close follow-up by the EPSA senior management team, EPSA with the support of the Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) implemented the initiative at its Adama branch—located about 59 miles (94km) from Addis Ababa—and central warehouses in Addis Ababa.

Post-implementation evaluation of this project at Adama showed remarkable improvement. However, the intervention process was not documented to share best practices, lessons learned, and challenges to support scale-up of the initiative to other branches. The GHSC-PSMproject supported documentation of improved business processes of the warehouse and inventory management operations and advocacy meetings for scale-up. The project then prepared a road map that included a

detailed implementation plan, with a schedule of basic activities to be performed sequentially for successful implementation.

With this preparation in place, and the Adama branch warehouse serving as a model for others, EPSA implemented scale-up in 17 EPSA branches across Ethiopia for six months.

Exhibit 1. CoE road map in action



Objectives and Methodology to Support Scale-up

The overall objective of the CoE model is to ensure improved warehouse operation and inventory management, improved product availability at all levels of the branch catchment, and ultimately, enhanced customer satisfaction. These goals will be achieved through the following activities:

- Ensure efficient warehouse operation through optimizing the infrastructure and MHE.
- Create a sustainable warehouse operation process by developing and implementing standardized warehouse operation processes and building staff capacity.
- Define health commodity storage methods (fixed and fluid location system) based on stock turnover trends in which fast-moving items are placed near dispatching areas.
- Improve inventory management systems by implementing a perpetual inventory counting system, maintaining continual replenishment, and conducting inventory analysis.
- Maintain physical integrity of health commodities during warehousing.
- Establish a monitoring and evaluation (M&E) system by implementing the EPSA M&E framework.

Based on lessons learned from the CoE piloted at Adama and major gaps identified in a 2017 comprehensive warehouse improvement project proposal, the following methodologies were used:

- Redesign internal warehouse layout and kit it out with MHE, including re-locating racks as appropriate.
- Provide continuous preventive and curative maintenance of MHE.
- Contextualize the supply chain maturity model and assess to identify and develop intervention plans.

- Conduct a series of advocacy and capacity-building activities such as a workshop to discuss the achievements at the Adama branch, a training and experience-sharing event, sensitization, and a CoE kickoff workshop.
- Provide intensive implementation and follow-up through defined performance measurement metrics.

Problem Statement

EPSA conducted pre-CoE implementation assessments at all branches using the Warehouse Quality and Competence quantitative assessment tool. The tool, which assesses 11 key areas of the Warehousing and Distribution operations, found that Hawassa hub's total score was 39 percent of the desired level (see Exhibit 2). Assessment findings also revealed that required warehouse and distribution elements are present, although not well defined or functioning as a coherent system.

Exhibit 2. Hawassa hub quality and competence score, January 2017

Category	As is	Desired score	Percent of desired level
1. Regulatory	4	11	36%
2. Warehouse and Buildings (Infrastructure)	18	41	44%
3. Site/Perimeter/Security	9	10	45%
4. Office and Administration Facilities	5	5	100%
5. Statutory Notices	0	4	0%
6. Handling and Storage	6	17	35%
7. Control of Schedule Substances	6	19	67%
8. Fire Protection Measures and Equipment	3	17	18%
9. Health and Safety	2	15	13%
10. Pest Control	0	3	0%
11. Cold Room and Equipment	4	6	67%
Score	57	148	39%

Overall, the branch had poor supply chain management practices, which resulted in poor storage conditions and inventory management, shortages and stock-outs of essential commodities, and waste. Some of the problems observed at Hawassa include poor inventory management with a significant discrepancy between physical inventory and system balance. The warehouse was also not organized for efficient warehouse operation. Compliance with standard operating procedures was poor, as was the practice of measuring operations performance.

Intervention and Key Findings of the CoE Implementation at Hawassa

The Hawassa branch administers 170 permanent and contract staff and serves a population of more than 8.5 million in the Southern Nations, Nationalities and People's (SNNP) Region and West Arsi zone of Oromia regional state. It distributes a wide range of health commodities essential medicines, medical equipment, medical supplies, vaccines, reagents) to 124 woreda health offices and 455 public health facilities. Of these facilities, 117 provide antiretroviral therapy (ART) to sites and private health facilities in the catchment area. Also, the branch serves as a coordinator for a southern cluster of EPSA branches (Negele Borena and Arba Minch).

Redesigning the warehouse layout and installation

The most important step in optimizing warehouse operation management is to modify the internal warehouse layout for proper storage and efficient stock flow through the warehouse. Warehouse design negatively impacts productivity when staff must travel through inefficient layouts or work in inadequately designated and marked areas. A good warehouse consists of enough space for the entire inventory and sufficient area for staff to work and maneuver. The CoE implementation at the EPSA Hawassa branch started with redesigning the existing warehouse internally to fit for easy operation of the warehouse activities and inventory management system. GHSC-PSM in collaboration with the Hawassa branch redesigned the internal layout and re-installed racks for implementing the CoE initiative.

Based on the 2017 warehouse improvement project proposal that GHSC-PSM developed for EPSA warehouses, the team reviewed areas proposed for major functions to optimize the warehouse space layout. The analysis suggested that the unracked area of the warehouse was not enough for the warehouse operation area, especially for receiving and dispatching activities. The team dismantled 240 pallet space areas in the receiving area and re-erected them at other locations where bulk products and pending dispatches were temporarily stocked.

Also, the branch team merged the old and new warehouses. This merger enabled the smooth flow of operation by increasing the warehouse operation area for receiving and dispatching. In turn, it enabled the branch to handle multiple operations simultaneously, improving picking cycle time. The new design also enabled creation of adequate office space, which accommodated 100 percent of the warehouse and inventory management staff. Having staff in proximity to products increases efficiency and operational control.

The team organized the warehouse into different functional areas where dedicated spaces were assigned for all equipment, such as forklifts and hand pallet trucks. These changes made the warehouse safer, more productive, and more professional looking.

Exhibit 3. Hawassa hub layout design, old

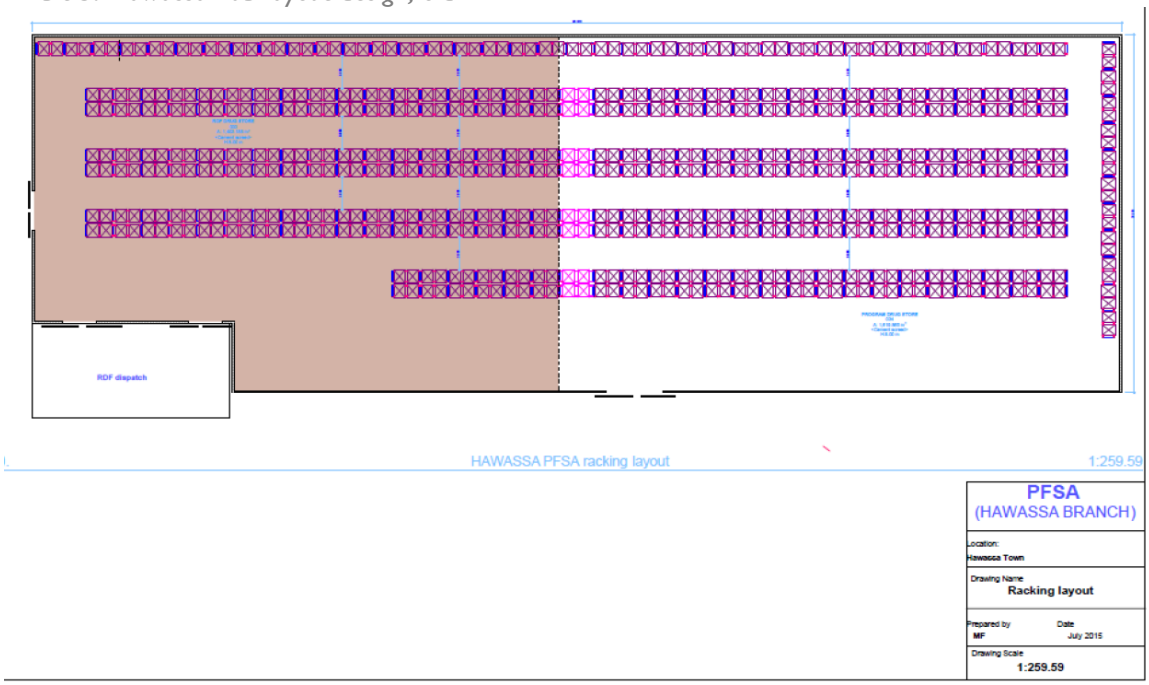
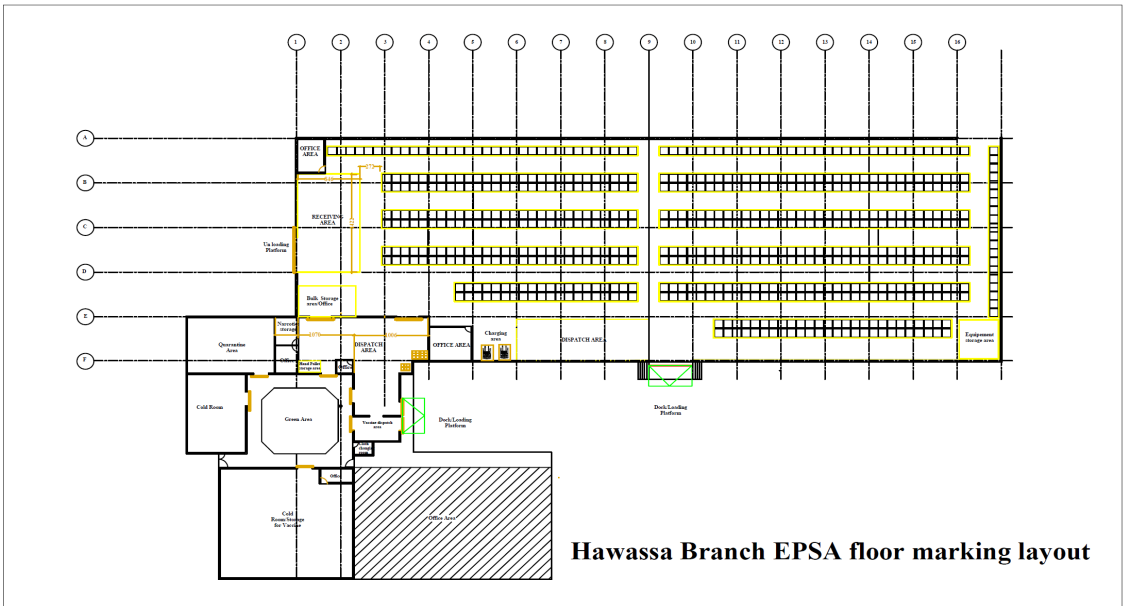


Exhibit 4. Revised/improved warehouse layout design

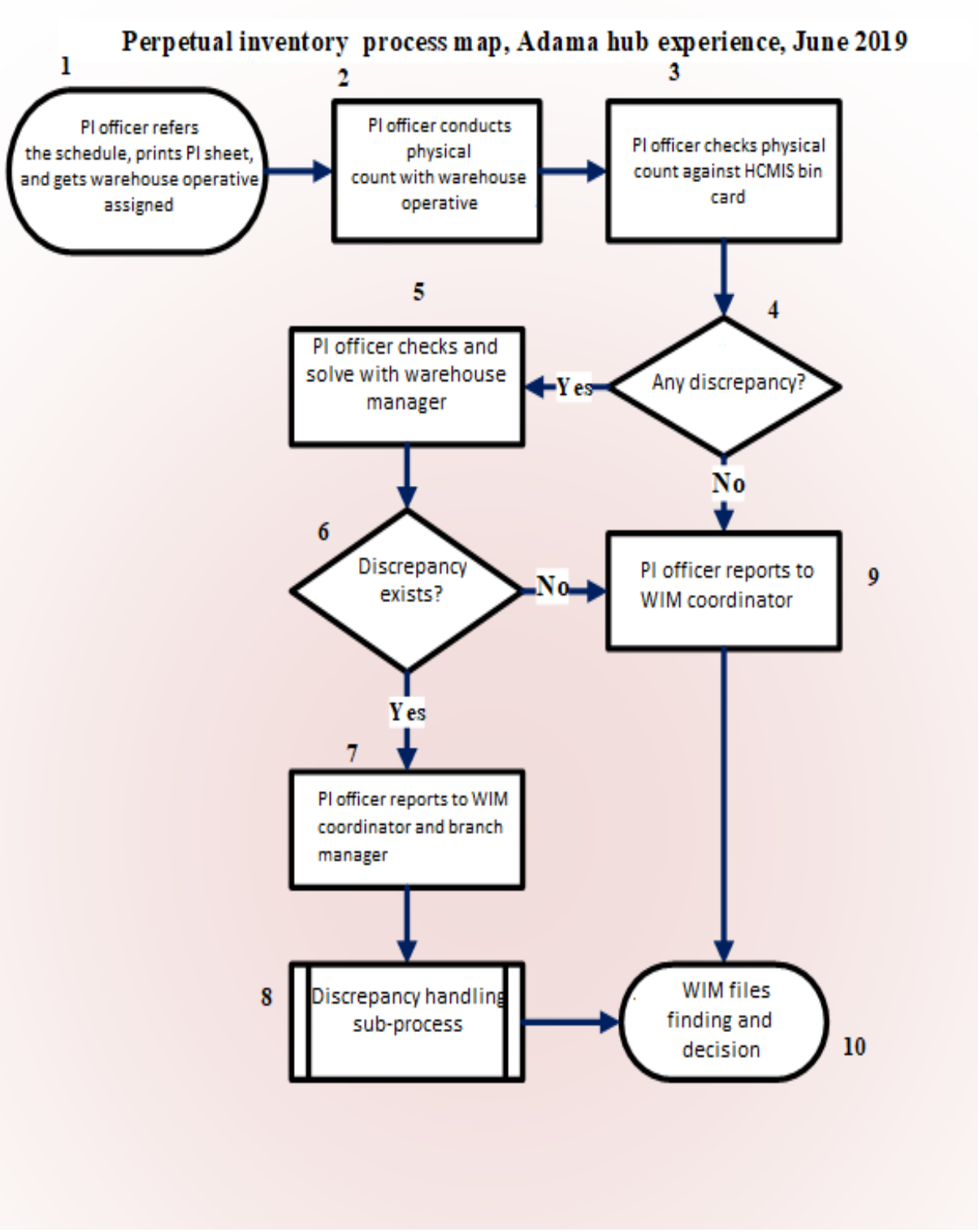


Implementing standard operating procedures

GHSC-PSM supported developing and implementing standard operating procedures (SOPs) and on-the-job training for 38 staff. Typical SOPs implemented for warehouses include procedures for receiving, product put-away, product picking, perpetual inventory taking, and order processing. Implementing these SOPs enabled the branch to perform its work by the standards.

Exhibit 5. Process flow map for picking and packing

Exhibit 6. Perpetual inventory process map, June 2019



Providing continuous follow-up and maintenance of material handling equipment

Material storage and handling equipment is crucial to warehouse operations, and inefficient methods should be replaced by throughput-oriented and efficient facilities. To facilitate the warehouse operation, GHSC-PSM provided regular preventive and curative maintenance of MHE training for operators, procured and replaced spare parts for reach truck and standby generators, and supplied hand pallet trucks. This support helped to ensure continuous and steady improvement of warehousing and timely distribution of commodities to the last mile with improved customer service.

Also, the branch received and installed wrapping machines to wrap products. This contributed to minimizing warehouse risk by fixing stored products on pallets. Wrapping products protected them from damage, dust, and moisture; improved product safety by improving commodity stability; and saved time during receiving through faster packaging, which ultimately made product handling more efficient. The time of wrapping of products on the pallet was reduced from 1.11 minutes (hand/manual wrapping) to 0.20 minutes by using a wrapping machine per pallet. The wrapping machine availability also facilitated the put-away process in the warehouse.

Exhibit 7. Forklift maintenance and wrapping machine installation

Optimizing stock management and speeding up order processing

With the continued support of the project, as part of the CoE implementation and improved inventory management, the Hawassa branch conducted an ABC/VEN/FSN analysis. The analysis included products categorized by value (ABC), transaction frequency (FSN: fast/slow/normal moving), and importance (VEN: vital/essential/ non-essential items). The branch team developed a product category matrix, which was eventually used to determine the branch's storage methods (fixed ground pick face and fluid storage areas at other parts of the warehouse).

Fixed ground pick face is an area of the warehouse location dedicated to specific items for picking dispatches. As the name indicates, these locations are found at the bottom (ground) of the racks.

Other pallet spaces (fluid storage area) were allocated as reservoir to store the bulk of the items from which replenishment to the fixed ground pick face is done.

Based on the product category matrix developed, the branch team revised the product storage zone and rearrangement to facilitate product traceability and overall warehouse operation. The system ensured an efficient warehouse storage method, putting fast-moving products in the front (near the dispatch area), followed by slow and non-moving products in the back. Fixed product location at pick face, based on the frequency of transaction, brought operational efficiency mainly by reducing the distance traveled by operators to pick a product and enabling picking of most items from the ground level, which reduced the use of reach trucks for most picking activity. Limiting the use of reach trucks to put away and replenish pick faces will reduce overworking, prolong equipment life, and reduce time taken picking and dispatching for efficient product delivery.

Based on the ABC/VEN/FSN analysis matrix, coupled with designed and implemented storage methods, more than 210 fast-moving commodities are picked from the ground level (fixed storage area). They include (1) revolving drug fund (RDF) products, essential health commodities procured with government budget and distributed to SDPs with low marginal profit, and (2) health program products, essential health commodities procured with donor funds and distributed to clients free of charge. As a result, the branch is institutionalizing efficient new practices. The ground pick face picking accuracy ranges from 97 percent to 100 percent. The overall percentage of items picked from the ground pick face is as high as 82 percent.

Exhibit 8. Process flow map, product location, and warning signs for action

Exhibit 9. Total distance travelled to issue the 10 items using the first dispatch table

sr.no	NAME OF THE ITEM	2011 issue frequency	In 2012 EFY			In 2011 EFY		
			PICK FACE location in 2012	Distance from Dispatch-1 (m)	Total distance covered to issue the item	LOCATION in 2011	Distance from Dispatch-1 (m)	Total distance covered to issue the item
1	CIPROFLOXACILLIN 500MG TAB	419	J-56-A	22.24	18,637.12	G-62-D	34.13	28,600.94
2	AMOXICILLIN 500MG CAPS	2,346	H-56-A	23.24	109,042.08	H-40-C	22.33	104,772.36
3	DOXICYCLIN 100MG CAPS	847	H-40-A	22.88	38,758.72	D-39-B	28.43	48,160.42
4	NORFLOXACILLIN 400MG TAB	407	H-42-A	24.88	20,252.32	F-64-D	39.26	31,957.64
5	CEFTRIAXONE 1GM PF INJECTION	1,335	H-52-A	29.23	78,044.10	A-47-D	47.3	126,291.00
6	FRUSEMIDE 40MG TAB	584	G-61-A	32.6	38,076.80	H-55-E	24.67	28,814.56
7	ALUMUNIU-H+MG TRICILICATE 500I	541	G-58-A	29.6	32,027.20	J-50-D	13.81	14,942.42
8	ALUMUNIU-H+MG TRICILICATE SUSI	939	H-41-A	23.88	44,846.64	F-66-B	41.26	77,486.28
9	TINIDAZOLE 500MG TAB	698	G-64-A	36.19	50,521.24	H-50-D	25.54	35,653.84
10	TETRACYCLIN 1% EYE OINTMENT	736	G-55-A	26.55	39,081.60	A-38-B	38.3	56,377.60
					469,287.82			553,057.06
	Total distance travelled				**469.3 KM**			**553.1 KM**

To justify efficiency gain in reducing picking time, the branch team:

- Randomly selected 10-line items
- Recorded their relative locations and frequency of issue in Ethiopian fiscal year (EFY) 2011 (FY 2019/20) i.e., before CoEto compare with 2012 performance (assuming issue patterns of an item are almost similar)
- Measured and analyzed total distances from dispatch tables to all the selected items

This analysis showed total distance saved in 2012 EFY (2019/20) to pick selected items as a result of conducting inventory analysis, setting ground pick face, and localizing items based on the frequency of transaction was 84km and 221km from Exhibits 9 and 10, respectively. Exhibit 10 shows the distance measured from the second dispatch table.

Exhibit 10. Total distance travelled to issue the 10 items using the second dispatch table

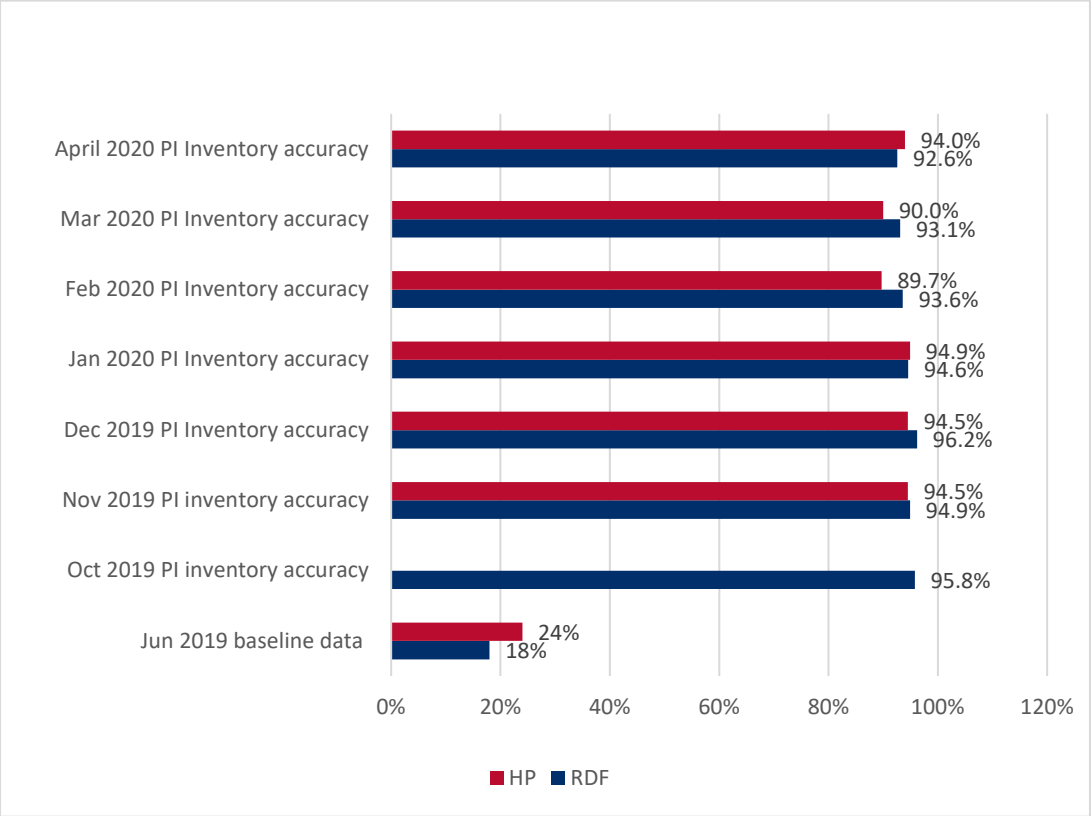
	NAME OF THE ITEM	2011 issue frequency	In 2012 EFY			In 2011 EFY		
			PICK FACE location in 2012	Distance from Dispatch 2	Total distance covered to issue the item (in M)	LOCATION in 2011	Distance from Dispatch 2	Total distance covered to issue the item (in M)
1	CIPROFLOXACILLIN 500MG TAB	419	J-56-A	12.32	10,324.16	G-62-D	7.68	6,435.84
2	AMOXICILLIN 500MG CAPS	2,346	H-56-A	13.32	62,497.44	H-40-C	34.68	162,718.56
3	DOXICYCLIN 100MG CAPS	847	H-40-A	34.99	59,273.06	D-39-B	48.67	82,446.98
4	NORFLOXACILLIN 400MG TAB	407	H-42-A	32.99	26,853.86	F-64-D	9.12	7,423.68
5	CEFTRIAXONE 1GM PF INJECTION	1,335	H-52-A	22.99	61,383.30	A-47-D	43.73	116,759.10
6	FRUSEMIDE 40MG TAB	584	G-61-A	8.77	10,243.36	H-55-E	13.99	16,340.32
7	ALUMUNIU-H+MG TRICILICATE 500I	541	G-58-A	11.77	12,735.14	J-50-D	18.93	20,482.26
8	ALUMUNIU-H+MG TRICILICATE SUSI	939	H-41-A	33.99	63,833.22	F-66-B	23.11	43,400.58
9	TINIDAZOLE 500MG TAB	698	G-64-A	11.77	16,430.92	H-50-D	23.5	32,806.00
10	TETRACYCLIN 1% EYE OINTMENT	736	G-55-A	14.77	21,741.44	A-38-B	52.73	77,618.56
					345,315.90			566,431.88
	Total distance travelled				**345.3 KM**			**566.4 KM**

The ground pick face setting resulted in reduced picking error, improved customer service, improved safety in picking, better inventory visibility, decreased warehouse turnaround cycle time, and improved on-time delivery. It also prevented false stock-outs and availability, as well as minimized waste due to expiry and damage. Data indicate that the ground pick face setting improved warehouse efficiency and productivity.

Implementing perpetual inventory practices

As part of the CoE implementation, the branch team took daily inventory based on a predetermined schedule per rack location. This enabled the hub to correct discrepancy promptly, which in turn improved inventory accuracy. Also, the team initiated routine monthly stock analysis practices, contributing to timely stock refilling and product redistribution, which avoids potential stockout and product waste.

Exhibit 11. Perpetual inventory accuracy trend for RDF and health program products



High inventory accuracy is important for a supply chain system to function properly. For the last year, the Hawassa branch recorded significant achievement in solving inventory accuracy-related challenges. As illustrated in Exhibit 11, the inventory accuracy of RDF products improved from 18 percent to 94 percent, and health program products improved from 24 percent to 93 percent in two years.

Institutionalizing warehouse performance measurement and staff motivation

Evaluation is critical to actualizing proper warehousing and inventory management. Some of the indicators that should be checked when measuring the success of the warehouse management are

the receiving, picking, inventory-taking, and put-away processes. For example, measuring the accuracy of the picking process can provide insights into warehouse performance.

Warehouse operation and productivity also improved through facilitating picking performance. As shown in Exhibit 12, the average picking time per line item decreased and the total number of line items picked increased, demonstrating improved productivity of the warehouse operation. The average picking time per line item is 1.14 minutes. Although the total number of line items picked is increased, the time required to pick an item is decreased.

Exhibit 12. At the beginning period, average picking time peritem at Hawassa

Week	Total line items picked	Total time spent (min)	Average picking time (min)
Week 1	354	653	1.84
Week 2	1,024	1,686	1.65
Week 3	3,540	5,856	1.65
Week 4	4,001	5,601	1.4
Total	8,919	12,796	1.44

Exhibit 13. Average picking time per line item trend (April 2019 to Dec 2019)

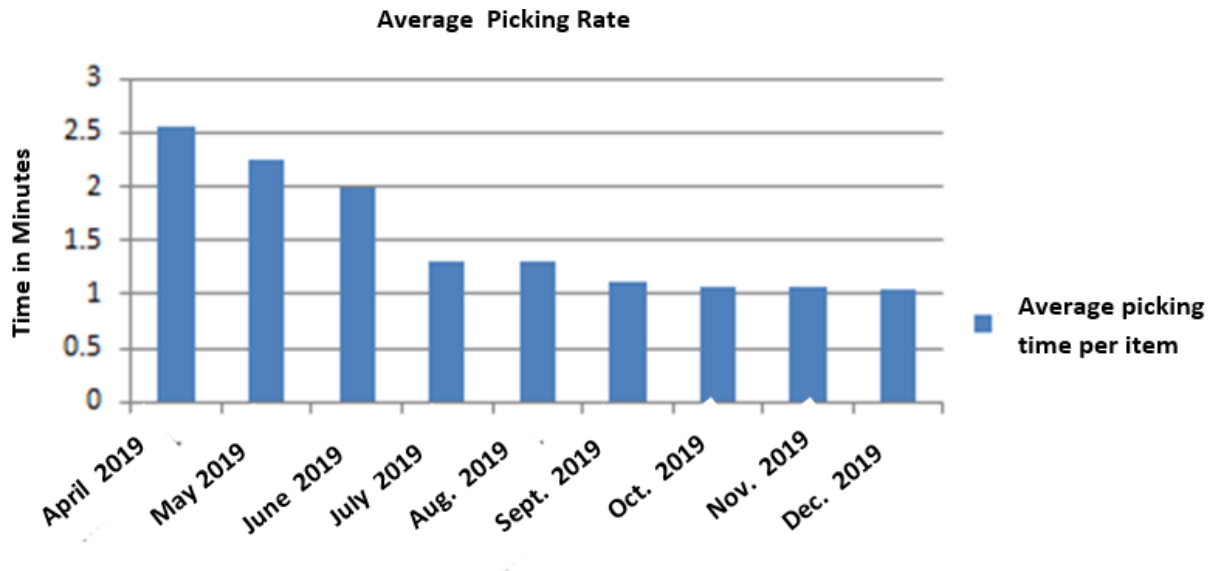


Exhibit 14. Average picking accuracy trend (April 2019 to Dec 2019)

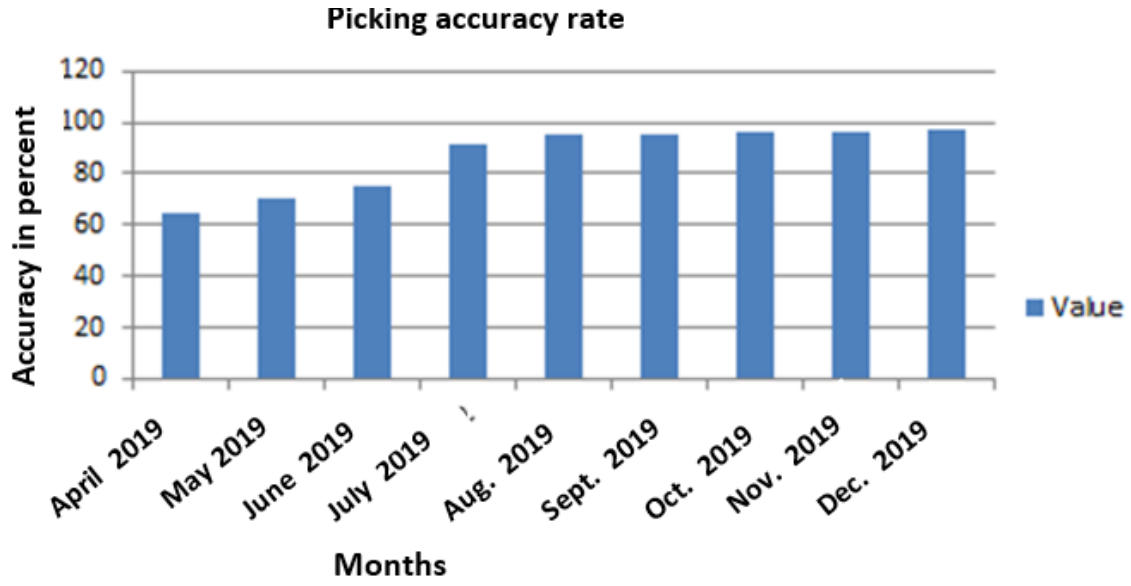
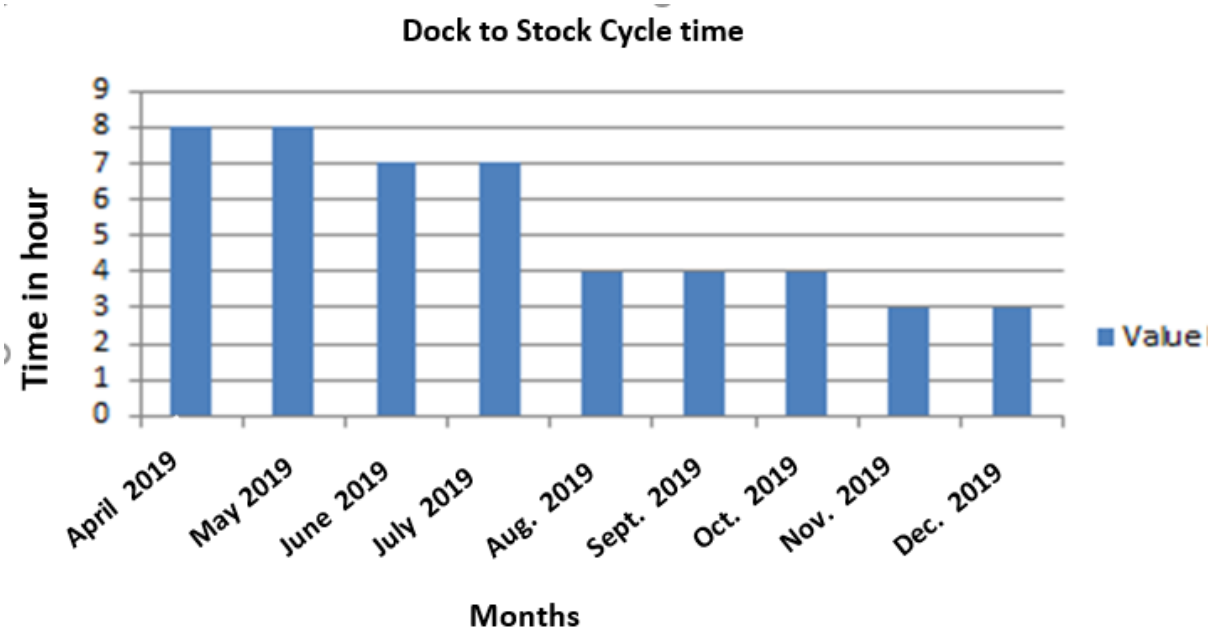


Exhibit 15. Dock to stock cycle time trend (April 2019 to Dec 2019)



The average picking accuracy of the Hawassa branch by four parameters (location, batch, expiry, and quantity) is 96.3 percent. Also, the Hawassa branch implemented EPSA's M&E framework to monitor overall performance. The branch team implemented 26 process-level indicators, 18 individual key performance indicators, and two corporate-level indicators.

Customer satisfaction is a key indicator that measures the responsiveness of any supply chain and thereby augments other indicators to estimate customer satisfaction at all levels. The EPSA Hawassa branch conducted self-internal customer satisfaction two times before and after CoE

implementation. Accordingly, satisfaction increased from the baseline of 55 percent to 70.1 percent. This improvement showed that CoE implementation (simplifying operations and creating favorable working conditions) has a direct impact on staff satisfaction.

Currently, the EPSA Hawassa branch is named "the Model CoE implementing branch." Central EPSA leadership is directing several visitors from EPSA branches and partner organizations to the Hawassa branch for experience sharing.

Conclusion and Implications

Warehousing is a complicated task, but it can be streamlined by implementing the CoE initiative. The Hawassa EPSA warehouse instituted the best industry standards and achieved several key results:

- Proper warehouse layouts and processes
- Efficient inventory management
- Continuous warehouse performance monitoring
- Speed-up of order processing
- Efficient use of material handling equipment

By applying these standards correctly and consistently, the Hawassa branch created a warehouse operation management system that is more efficient, accurate, and satisfactory for its clients.

Recommendations

To sustain the achievements made through effectively implementing the CoE initiative and enhance the overall efficiency of EPSA as an agency, the following recommendations should be considered for future investment:

- Conduct ongoing performance reviews, monitoring and evaluation, and continuous improvement aimed at sustainable organizational efficiency.
- Expand the lessons learned from Hawassa to all branches, such as regular perpetual inventory, warehouse layout/location designing, inventory analysis/categorization, and continuous MHE preventive and curative maintenance.