

BBA 29

Lack of Infrastructure & Inventory Management:

A Case of PASSCO



By:

Atif Hussain Mirani

01-111221-023

Abdullah Junaid Malik

01-111221-133

Bachelor of Business Administration

Supervisor:

Ms. Maria Iqbal

Marketing and Business Department

Bahria University Islamabad

Fall 2025

*Majors: SCM
S.No. 29*

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FINAL PROJECT APPROVAL SHEET

Open Defense Examination

Open Defense Date / /

Topic of Research: Lack of Infrastructure & Inventory Management: A Case of PASSCO

Names of Student(s):

Enroll #

• Atif Hussain Mirani

01-111221-023

• Abdullah Junaid Malik

01-111221-133

Class: Bachelor of Business Administration

Approved by:

Maria Iqbal

Supervisor

Qurat Ul Ain Waqar

Research Coordinator

Dr. Qazi Abdul Subhan

Head of Department

ABSTRACT

This study examines the operational challenges faced by the Pakistan Agricultural Storage and Services Corporation (PASSCO), with particular focus on inadequate infrastructure and manual inventory management systems. PASSCO plays a critical role in national food security through the procurement, storage, and distribution of wheat. However, outdated storage facilities and reliance on manual record-keeping have led to inefficiencies, delays, and post-harvest losses.

The study adopts a qualitative research design using interviews, on-site observations, and system analysis tools including SWOT and PESTEL analyses. Process flow diagrams were used to analyze existing operational procedures. The findings reveal significant gaps in storage monitoring, inventory accuracy, reporting efficiency, and coordination between regional offices and head office.

Based on the analysis, the study proposes practical recommendations including digital inventory systems, improved storage monitoring, and gradual infrastructure modernization. The research contributes by providing organization-specific insights and offers actionable recommendations to improve operational efficiency and strengthen food security management in Pakistan.

Dedication

This project is dedicated to our parents and families, whose continuous prayers, encouragement, and sacrifices have been the foundation of our academic journey. Their unwavering belief, patience, and support motivated us to complete this work with dedication and commitment.

Acknowledgement

We would like to express our sincere gratitude to Ms. Maria Iqbal, our project supervisor, for her continuous guidance, valuable suggestions, and constructive feedback throughout the completion of this Final Year Project. Her support played a critical role in shaping the direction of this research and ensuring its academic quality.

We are also highly thankful to the officials of Pakistan Agricultural Storage and Services Corporation (PASSCO) for their cooperation and support during data collection, field visits, and interviews. In particular, we would like to acknowledge Mr. Sharjeel Mehsud, Head of Human Resources at PASSCO Head Office, for facilitating coordination and providing valuable organizational insights. We are grateful to Mr. Iftikhar Iqbal, a senior officer at PASSCO, for sharing practical knowledge regarding operational procedures.

Our sincere appreciation is extended to Mr. Muhammad Umair, Zonal Head Hafizabad, for granting access to the godown facility and facilitating on-site inspection and observation. We also thank Mr. Khadim Hussain, Zonal Head Hyderabad, for his cooperation and for providing insights into regional storage and inventory practices. In addition, we acknowledge Mr. Waseem Khan, Supervisor at the Rawalpindi Liaison Office, for his support and for sharing information related to coordination and reporting processes.

We are also thankful to the faculty members of the Department of Management Sciences, Bahria University Islamabad, for providing the academic foundation and learning environment necessary for the successful completion of this research.

Finally, we would like to express our gratitude to our families and friends for their continuous encouragement and support throughout this academic journey.

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CHAPTER 1

1.1 Introduction

Pakistan Agricultural Storage and Services Corporation (PASSCO) is a state enterprise that deals with the provision of national food security by purchasing, storing, and distributing the major agricultural products especially wheat. The corporation is also a significant factor in ensuring prices are stable and being supportive to the farmers by buying the produce at prices announced by the government.

The issues regarding the efficiency of the operations of PASSCO in recent years were raised by the fact that the organization had old infrastructure and poor inventory management methods. These constraints have impacted on the organization to have sufficient reserves, minimize losses, and control its supply chain. This paper will examine these issues and provide suggestions of how these issues can be addressed.

1.2 Background of the Study

In the year 1973, PASSCO was formed under the jurisdiction of the Ministry of National Food Security and Research. It was established to oversee Pakistan food reserves, protect the interests of farmers and ensure steady supply of basic commodities in the nation. However, with time, the organization has experienced a number of structural and functional problems.

Most of the storage facilities at PASSCO are outdated and have no advanced technology in controlling the temperature, moisture and pests. Manual records keeping is still used in the inventory management process and this still tends to cause inaccuracy, delays and poor traceability. The weaknesses lead to post-harvest losses and poor stock movement and distribution.

As there has been the need to have transparency and efficiency within the government supply chain, there has been a need to review the current infrastructure and management systems at

PASSCO. Knowledge on these challenges can be used to determine those areas that need to be modernized and help to enhance food security systems in Pakistan.

1.3 Problem Statement

In spite of being an important entity in the national food reserves, PASSCO has been experiencing major challenges because of poor infrastructure and poor inventory management systems. The reliance on hand-based processes and the need for old-fashioned facilities lead to the delay in the operations, inaccuracy of records, and increasing losses after harvesting.

Thus the key issue which was found in this study is:

What are the impacts of infrastructure constraints and poor inventory management structures to the functioning effectiveness and food safety responsibility of PASSCO?

1.3.1 Research Gap

Despite extensive research on post-harvest losses and inventory inefficiencies in the agricultural sector of Pakistan, very limited academic work specifically examines the operational and system-level challenges faced by PASSCO. Existing studies address the issues at a general or policy level, without focusing on PASSCO's internal infrastructure limitations and manual inventory practices. This gap highlights the need for an organization-specific analysis, which this study aims to address.

1.4 Objectives of the Study

This Final Year Project (FYP) aims primarily at examining the effectiveness of the operation of the Pakistan Agricultural Storage and Services Corporation (PASSCO) regarding its infrastructure and the method used to manage its inventory. The research will attempt to identify the current inefficiencies, quantify their impact on performance, and come up with some realistic solutions to the performance.

The goals are planned by applying the SMART criteria Specific, Measurable, Attainable, Realistic, and Time-bound to make the goals clear and achievable in the entire research process.

1.4.1 Specific and Measurable Objectives (Diagnosis Stage)

1. To study the effects of the PASSCO current infrastructure, such as old storage and warehouse facilities on the quantifiable operational performance, such as losses after harvest, delays during handling, and usage of space.
2. To conduct research on inefficiency in the present inventory managing process due to the use of manual record-keeping, absence of automation, and irregular monitoring of stocks, by analyzing the recent operational and performance data.
3. To measure the current lead time of the delivery of an order to its fulfilment so that possible delay points and internal delays between the supply chain processes can be identified.

1.4.2 Attainable, Realistic, and Time-Bound Objectives (Solution and Evaluation Stage)

4. In order to come up with an applicable and realistic recommendations on how to enhance the efficiency of the inventory management and update the storage facilities within PASSCO, it is necessary to make sure that this is feasible in terms of resources, logistics, and organizational capacity.
5. To determine the anticipated results of the suggested enhancements, such as the reduction in the operating costs, reducing the length of delivery lead-time, increasing transportation reliability, and better warehouse usage, within a definite and attainable time span.

1.5 Scope and Limitation of the Study

1.5.1 Scope of the Study

The area of this Final Year Project (FYP) is well defined to make an analysis focused and realistic of the operational efficiency at the Pakistan Agricultural storage and services corporation (PASSCO).

The research is oriented on areas which directly affect the supply chain and core business processes of an organization and specifically the wheat storage and distribution. The discussion deals with two aspects.

1.5.1.1 Infrastructure Analysis:

Assessment of the current state of the physical storage facilities of PASSCO encompassing warehouses, silos, and storage depots regarding how they were adequate in technology to ensure the maintenance of appropriate temperature, moisture, and pest controls. The research also looks at the way infrastructure constraints cause post-harvest losses and inefficient operations.

1.5.1.2 Inventory Management Systems:

Analysis of the existing inventory management processes and documentation techniques applied by PASSCO to monitor, document, and maintain stocks of commodities. This involves the determination of weaknesses in manual processes, absence of digitalization, and poor application of data based decision making tools.

1.5.2 Limitation of the Study

The research boundaries are stipulated by the limitations of the study as the areas that are not to be analyzed at all.

1.5.2.1 Functional Limitation (Exclusions):

The project is limited to operational and supply chain processes and does not apply to the other organizational departments besides the research area specified. Particularly, this research does not take into consideration:

1. Money or monetary issues.
2. Human resource and administration functions.
3. Promotions or advertising.

1.5.2.2 Geographical Limitation:

Since time and resources are a constraint of an academic project, the data collection and analysis would be restricted to some of the areas of PASSCO operations, or some storage circles. As such, the results will be reflective of the selected regions as opposed to being comprehensive of all the operations of PASSCO throughout the nation.

1.5.2.3 Implementation Limitation:

This research is confined to strategy analysis and proposal formulation. It will not encompass the physical design, building, programming and live deployment of a modernized infrastructure or automated inventory management system.

1.5.2.4 Policy Limitation:

The study concentrates on internal operation inefficiency and does not seek to determine or measure the overall financial implications of national policy action like government pricing system or subsidies because these are not under the operational control of the organization

1.6 Justification of the Study

The case of the choice of the Final Year Project is anchored on a long-standing and real problem of operation that is witnessed in the Pakistan Agricultural Storage and Services Corporation (PASSCO). In the process of preliminary background research and informal interview with the staff members of PASSCO, it became apparent that the company still has two significant problems that directly impact its productivity incompetent infrastructure and poor inventory management procedures. Not only do these issues slow down the operation processes but also cause wastage of crops, losses in storage and delays in distributing the commodities of the country, which is a big concern in terms of derailing the national food security of Pakistan.

The reason why this topic was selected is that although the organization is important, and has been operating over the decades, these issues have not been properly tackled yet. Although fields like procurement and pricing policies have been given management consideration, infrastructure and inventory management have been left unaddressed despite its core role in the whole process of operation in PASSCO. These two aspects are not advanced, which demonstrates that the current management procedures and contemporary functioning demands share a significant gap that justifies the relevance and need of this study.

Initial analysis and interviews showed that most PASSCO storage facilities are still using manual systems in keeping records, documentation and tracking of stock. Such archaic operation is what causes data imprecision, misreporting, and ineffective coordination among the field offices and the head office. On the same note, the current infrastructure, old warehouses, inadequate temperature control, and inefficient handling systems also persist in causing losses of grain and inefficiency in storage activities. Lack of modern technology has made management to find it hard to make timely decisions or even to track the movement of stocks.

The study is therefore warranted as it will be dealing with a real and ongoing issue that has not been tackled by the management at PASSCO or by any prior study. It tries to bridge that gap by suggesting practical, modern, and technology-based improvements. The research is also consistent with the modern trend in the world and the country in terms of digital transformation and the incorporation of artificial intelligence (AI) into supply chain and

inventory management. The possible application of AI tools, including automated data analysis, predictive inventory systems, and real-time monitoring, can enhance accuracy and eliminate wastage and reinforce decision-making processes to a significant extent.

1.7 Resource Requirements and Budget

In this paper, the primary sources of information are the academic, technological and logistical materials needed to accomplish the project in an efficient manner within the stipulated time. The summary of the key resources and estimated needs is provided below.

Resource Type	Description
Human Resources	<p>The student researchers are under the guidance of the designated faculty member to undertake the project. It is the job of the students to complete the literature review, gather data, analyze it, and prepare the report. Frequent encounters with the supervisor will make sure that progress is being tracked and that all are of standard.</p>
Software Resources	<p>The report will be drafted with the help of Microsoft Office tools (Word, Excel and PowerPoint), data will be arranged in it, basic analysis will be carried out, and the final presentation slides will be created.</p>
Hardware Resources	<p>The documentation and analysis will be done with the help of a personal laptop or a computer. Report compilation and backup will also need printing, scanning and safe storage of data (via USB or cloud media).</p>

Financial / Other Costs

Minor expenses will be involved in printing, binding, and stationeries in the process of conducting the research. Other travel costs are supposed to be incurred in visiting the PASSCO Head Office in Lahore and selected PASSCO storage facilities in collecting and observing data. The students will be dealing with these costs on their own.

1.8 Project Schedule

The project will be done in a systematic and time-limited fashion throughout the semester. The plan is broken down into major steps, as there is a step-by-step order in the discussion of the topics, as well as the ultimate presentation. All the phases are synchronized with the school year and the mentor.

Phase	Activity Description	Expected Duration	Output / Deliverable
Phase 1	Topic Selection and Proposal Development – Selection of research topic, preliminary discussions with supervisor, proposal writing, and submission for approval.	Week 1 – Week 2	Approved project proposal
Phase 2	Early Research and Literature Review- Background information on PASSCO, analysis of literature about other research on infrastructure and inventory management and creation of research framework.	Week 3 – Week 4	Draft of literature review

Phase 3	Data Collection Planning and Field Visits – Coordination with PASSCO officials, scheduling and conducting visits to the Lahore Head Office and selected storage facilities for observational and secondary data.	Week 5 – Week 7	Collected field data and observational notes
Phase 4	Data Analysis and Findings Development – Analysis of collected data to identify key challenges in infrastructure and inventory management; preparation of findings and interpretation.	Week 8 – Week 10	Analysis results and interpretation

Phase 5	Report Writing and Supervisor Review – Compilation of results, integration of SWOT and PESTEL analyses, and incorporation of supervisor feedback into the report draft.	Week 11 – Week 12	Draft report ready for review
Phase 6	Final Report Submission and Presentation Preparation – Editing, formatting, printing, and submission of the final FYP report, followed by preparation for the final presentation or viva.	Week 13 – Week 14	Final printed report and presentation slides

CHAPTER 2: LITERATURE REVIEW

Introduction

This chapter discusses literature review and theoretical concepts that pertain to the issue of research. It pays attention to the aspect of infrastructure and inventory management as key operational efficiency determinants in the supply chains. This review aims to get insights about how previous studies have solved these problems within various organizational setups and the need to embrace current technology-driven systems particularly artificial intelligence (AI) in order to overcome these problems.

2.1 Concept of Infrastructure

The studies on grain storage always pull out the significance of physical infrastructure in maintaining the quality of the agricultural products. Research in Pakistan reveals that a significant part of the spoilage of wheat happens in the governmental warehouses because of the poor ventilation, the presence of moisture and pests, and the use of antique godowns (Bashir et al., 2018). The results of similar studies in other developing nations show that the risk of deterioration and losses approaches the highest with aging storage facilities, absence of environmental monitoring tools, and manual ways of inspection (Khan and Jadoon, 2021). These lessons indicate the same difficulties as those witnessed in the PASSCO storage facilities where environmental control systems and contemporary structural designs are minimal. The quality of infrastructure directly influences the quality of grain preservation and operational efficiency as is detailed in the literature.

2.2 Concept of Inventory Management

The use of inventory is said to be a major aspect of an efficient supply chain operation, and its efficiency will largely rely on the tools and systems applied to track and keep records. Studies have shown that most organizations working in the public sector use manual registers, physical logbooks, and paper records, which tend to lead to slow updates, errors in data and discrepancies between physical and recorded stocks (Faisal & Hussain, 2020). Articles dedicated to South Asian logistics also emphasize that manual inventory operations lead to operational bottlenecks, slow reporting, and decreased visibility in locations where the

storage takes place (Shrestha, 2019). These results are very much consistent with the problems identified in the PASSCO where record keeping of inventory movement is still done manually and this has led to inefficiencies and delays in day to day operations.

2.3 Related Studies on Infrastructure and Inventory Challenges

A number of researchers have delved into the problems of storage and inventory management in the grain system in the public sector. Our previous efforts on the losses of wheat in Punjab have established that the lack of moisture and temperature monitoring of the harvest is a significant factor causing post-harvest losses (Bashir et al., 2018). In other studies on the grain management in Pakistan by the public sector, it is highlighted that the weakness in the infrastructure remains because of the modernization lack and delay in the implementation of the new storage technologies (Khan and Jadoon, 2021).

Regarding inventory procedures, research indicates that manual record keeping creates discrepancies, slowness in reporting and poor coordination between the field offices and the headquarters (Faisal and Hussain, 2020). Further, researchers emphasize the global pattern of digitalization, and the IoT sensors, automation, along with real-time dashboards allow to enhance the accuracy and minimize the losses in the operations (Ahmed and Muzaffar, 2017; Muhammad and Sarker, 2022).

These patterns of the studies reflect the gaps that were observed in PASSCO in the interviews and observations, indicating that these issues are prevalent in government-run storage and supply chain organizations.

2.4 Research Gap

Whereas a lot of research has been conducted on the issues of wheat storage, post-harvest losses and manual inventory in Pakistan and other developing nations, there are very minimal academic studies that explicitly study the operational issues of PASSCO. The research literature that is available on the topic of agriculture sector in Pakistan talks about it in general terms without taking a closer look into the inner workings of the company, the constraints of the infrastructures, and the inventory options of PASSCO.

This is a gap in research due to the absence of organization-specific academic work. The current research paper aims at closing this gap through giving a dedicated analysis of PASSCO infrastructure and inventory system using both first-hand observation and interviews, SWOT and PESTEL analysis and system modelling software.

CHAPTER 3: METHODOLOGY

Introduction

This chapter describes the general procedure and ways followed to execute the research on infrastructure and inventory management issues at PASSCO. It explains the research design, data collection processes, and analysis tools employed in order to meet the goal of the research.

3.1 Research Design

The study is based on the qualitative and descriptive design because it is aimed at learning how challenges are practically applied to work in the real world and explaining the practical solutions instead of proving or disproving statistical hypotheses. The Research is a fusion of both primary and secondary sources, which are backed up by analytical techniques like the SWOT and PESTEL analysis.

3.2 Data Sources

- **Primary Data:**

Semi structured interviews with the chosen employees of PASSCO (warehouse employees, managers and officers at the Head Office at Lahore) will be used as the primary source of primary data. These interviews will assist in determining the major problems in the infrastructure, storage capacity, and inventory management.

- **Secondary Data:**

The secondary data will be collected using the official reports of PASSCO, government reports, research papers and online sources like FAO and Pakistan Ministry of National Food Security. This fact will be used to give perspective on the operations and challenges of the organization.

3.2.1 Data Analysis Techniques

The collected qualitative data from interviews and on-site observations were analyzed using thematic analysis. Key patterns related to infrastructure constraints, manual inventory practices, and reporting delays were identified and categorized. SWOT and PESTEL analyses were then applied to interpret internal and external operational factors. System flow diagrams were used to visually analyze process inefficiencies.

3.3 Research Tools

In order to analyze the data obtained, the following tools are going to be applied:

1. SWOT Analysis- to assess internal strengths, weakness, opportunity and threats associated with the infrastructure and inventory systems of PASSCO.
2. PESTEL Analysis - to investigate the external macro forces (Political, Economic, Social, Technological, Environmental, and Legal) that would affect the operations of PASSCO.

3.4 Sampling Technique

Purposive sampling will be employed in the study with the employees who are directly involved in storage, inventory, and logistics operations. The number of participants will be around 80 individuals based on PASSCO in Lahore Head Office and adjacent warehouse sites to give pertinent and valid information.

3.5 Ethical Considerations

Participants will be informed in giving consent to all the data collected. They will not be identified and the information will be utilized in the academic purposes. The study will uphold trust, openness, and sensitivity to the privacy of the subjects.

CHAPTER 4: ANALYSIS

4.1 Overview of the Existing PASSCO Operational System

PASSCO executes a vital national role in terms of food security by keeping food reserves of wheat. The majority of its operations are, however, paper-based. The use of manual documentation, the low level of technological utilization and obsolete storage conditions are also some of the factors that lead to inefficiency and challenges in operations.

This chapter examines the existing system of operations, describes how it was used to collect data, and presents needs of a new modernized solution. It also relates the previous SWOT and PESTEL analyses to the field findings as part of interviews and site visit.

4.2 Connection Between Organizational Findings and System Gaps

As identified in the SWOT analysis and PESTEL analysis in the previous chapters, the organization had several organizational weaknesses which included:

- the absence of digital infrastructure.
- Manual stock dealing
- Outdated storage practices
- Reporting delays

Environmental exposure risks are considered to be the key ones.

These gaps were later established by PASSCO staff during interviews and field visits. Officers indicated that stock register is handwritten, storage conditions are manually monitored and daily reports are usually submitted unofficially by use of WhatsApp. These

affirmations demonstrate that the vulnerabilities that were indicated in the organizational analysis are directly translated to the operational system.

4.3 Analysis of the Current System

The current system in place at PASSCO works in a number of key steps. The working of each component of the system and the areas of inefficiencies will be described below.

4.3.1 Procurement Process

- Wheat is sold to procurement centers by the farmers.
- There are manual inspection of weight and quality.
- The entries are made in physical registers.
- At this level, there is no computerized entry.

4.3.2 Storage Process

- Wheat is transported to godowns or hired.
- Monitoring of temperature, humidity and pest conditions is done manually.
- No auto environmental sensors or digital sensors.
- Moisture and poor ventilation are the main causes of losses through storage.

4.3.3 Inventory Updating

- Stock levels are updated manually in hand written registers.
- Position reports are prepared manually by officers on a daily basis.
- Reporting is done by regional offices to the Head Office.

- Some communication usually occurs via email or WhatsApp attachments.

4.3.4 Dispatch Process

- Manual issue of dispatch orders is done.
- Stock-out entries and gate passes are done manually.
- Vehicle movement cannot be monitored on real-time basis.
- Checking of dispatch quantities is completely based on manual checks.

4.3.5 Reporting Process

- Periodic summaries are prepared at the regional offices.
- In the Head Office, reports are consolidated in Excel.
- Human labor is needed to be accurate and fast.
- It does not have a central digital platform to pay attention to nationwide stock levels.

4.4 Diagrams

4.4.1 Process Flow Diagram

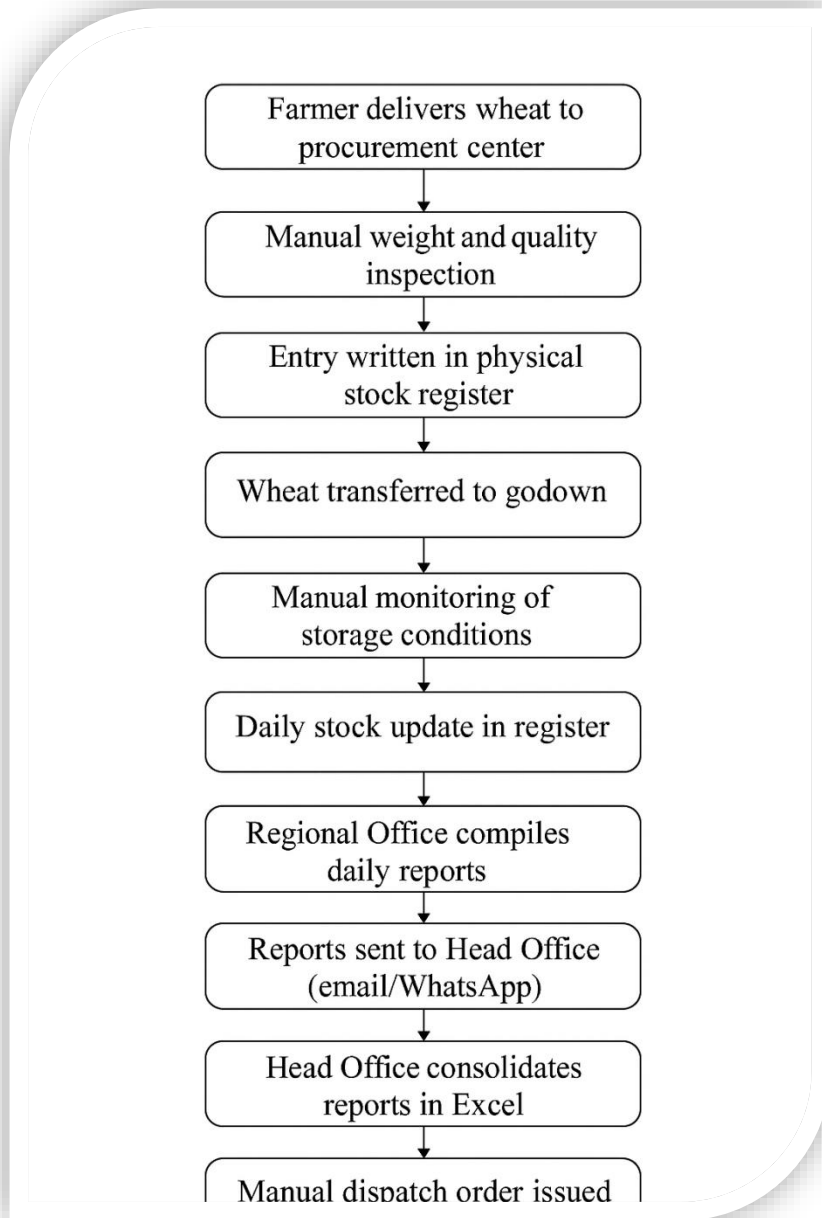


Figure 1

The wheat receiving process at PASSCO is staged at procurement centers or storage godowns once the consignments come in. Physical verification of the consignment is performed at this

point to check if the quantity that has been received matches the delivery documents. Quality inspection is also done by means of visuals and basic sampling techniques. After the verification, the quantity that has been received is recorded in stock registers that are physically available at the godown level.

This manual recording is very much dependent on the staff members personally and there is no system-based validation. Any delay or error that occurs at this initial stage will have a direct impact on the subsequent reporting and stock reconciliation. Due to the fact that the data is not uploaded in a centralized system, the real-time accessibility of the received stock is not possible from the zonal or head office levels.

4.4.2 DFD Level-0



Figure 2

4.4.3 Storage and Warehouse Monitoring

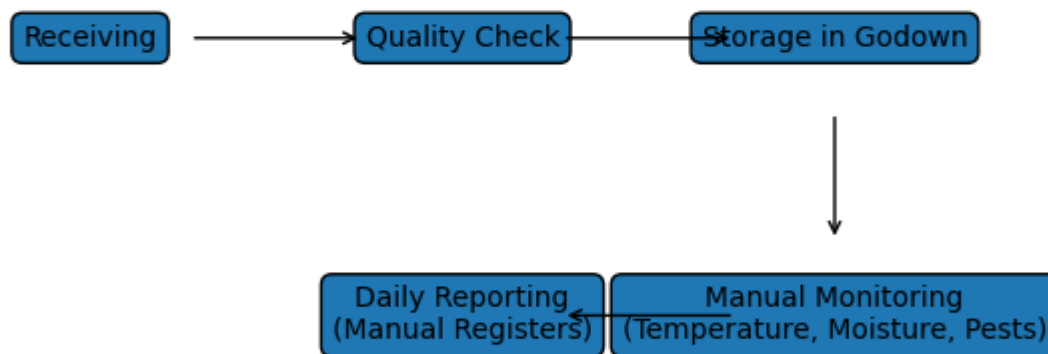


Figure 3

Wheat after receiving is kept in the storage godowns, which have been selected for the purpose, under the control of zonal staff. The observation of storage is mainly carried out by physical inspections performed from time to time. The warehouse staff visually check the condition of the storage area in terms of the presence of moisture, pest, and general cleanliness.

Nevertheless, because there are no temperature and humidity sensors, the environmental conditions are not constantly monitored. Consequently, there may be times when the quality of grain is exposed to the risk of which the storage room has no knowledge, until the damage that can be seen has occurred. Such an approach increases the likelihood of post-harvest losses, especially, during long storage periods and also bad weather conditions.

4.4.4 DFD Level-1 (Inventory Management Sub-Process)

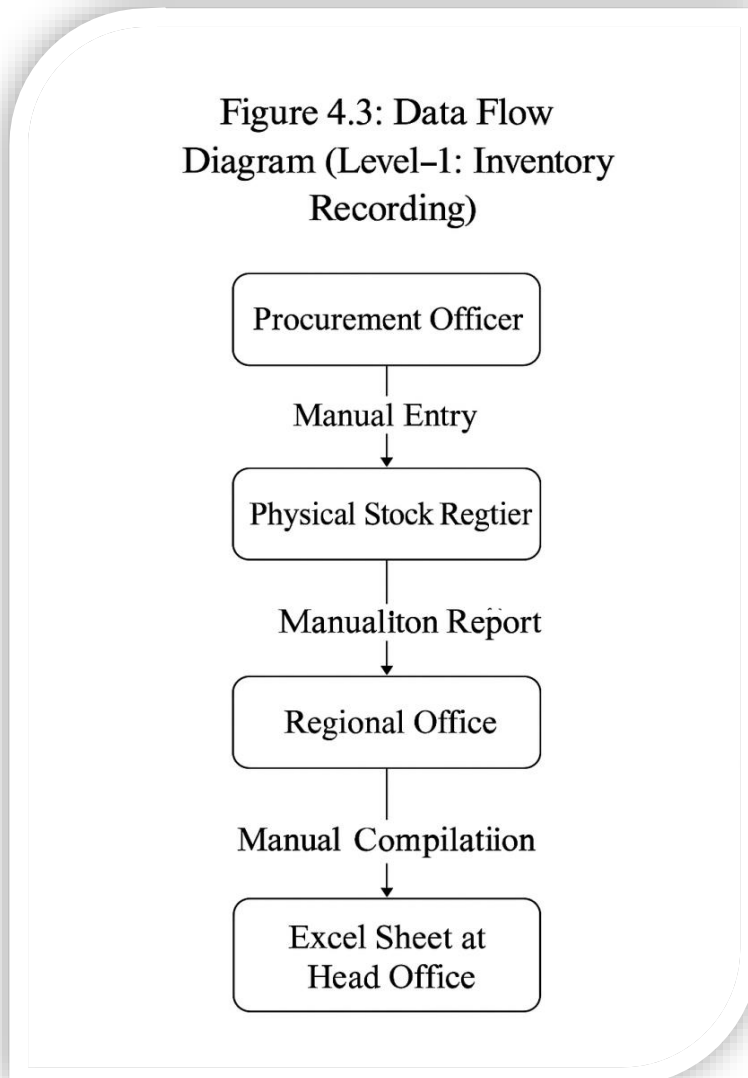


Figure 4

At the same time, the process of inventory updating at PASSCO means carrying out daily or periodical updates on physical stock registers. The stocks/records at this level are then used for the preparation of stock position reports that are manually created and sent to the zonal offices by the people responsible for the stock. Afterward, the zonal offices collect these reports once again before forwarding them to the head office.

This manual reporting process, which involves several levels, consumes much time and also has an increased likelihood of data inconsistencies. Since the reports are based on handwritten entries, therefore, the validation of the data becomes a very challenging task, and any discrepancies have to be physically checked by re-verifying the stocks. This impacts on the management's decision-making especially in terms of time and accuracy at the upper echelon of management.

4.4.5 Description of Feedback and Reconciliation Process

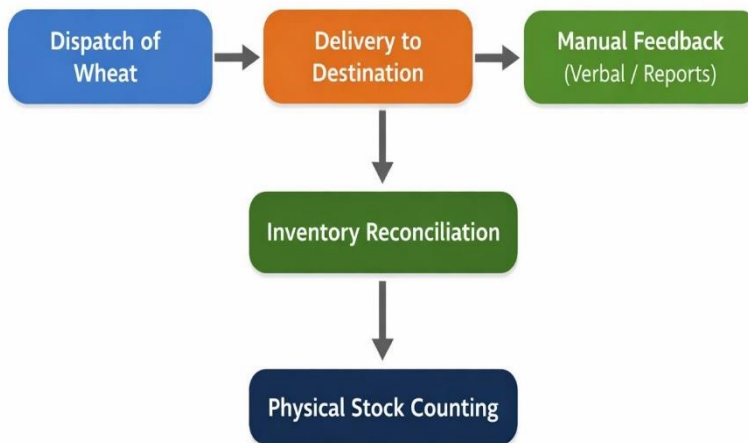


Figure 5

Once the goods are sent off, the confirmation of the delivery is brought back to the office through the manual reports and the verbal updates. Inventory reconciliation is done through the comparison of the dispatch records with the physical stock balances. This procedure is held from time to time and is mostly done by physically counting.

As a result of everything being done manually and the feedback being delayed, there are reconciliation issues which may be kept for a long time without being resolved. This has an impact on the accuracy of the inventory and additionally, it raises the amount of work for the warehouse staff, especially during the periods of intensified operations.

4.5 Case Descriptions

4.5.1 Use Case 1: Update Wheat Stock

The wheat receiving process at PASSCO is staged at procurement centers or storage godowns once the consignments come in. Physical verification of the consignment is performed at this point to check if the quantity that has been received matches the delivery documents. Quality inspection is also done by means of visuals and basic sampling techniques. After the verification, the quantity that has been received is recorded in stock registers that are physically available at the godown level.

This manual recording is very much dependent on the staff members personally and there is no system-based validation. Any delay or error that occurs at this initial stage will have a direct impact on the subsequent reporting and stock reconciliation. Due to the fact that the data is not uploaded in a centralized system, the real-time accessibility of the received stock is not possible from the zonal or head office levels

4.5.2 Use Case 2: Dispatch Wheat Stock

Wheat shipment is started only after getting the green signal from the main office or the higher authorities. After getting the go-ahead for shipment, the warehouse employees locally prepare the release orders, gate passes, and transport documents. The transport vehicles are loaded with wheat and the godown is handed over.

The absence of digital tracking makes it impossible to know the exact location of the consignment after it has left the warehouse. Delays or deviations in the route and differences in the quantity delivered can only be known after getting the confirmation from the receiver. It hampers a company's transparency in operations and jeopardizes transport reliability to some extent.

4.6 Facts and Data Gathered (Including Methods Used)

This section describes how all findings were collected and validated.

4.6.1 Interviews

The PASSCO staff operating at Rawalpindi Liaison was also interviewed.

Storage facilities, including office and selected. Key points shared include:

- Registers are the ones in which stock is updated by hand.

- The moisture level is monitored without the use of digital tools.
- WhatsApp is used to share reports because of delay and limited resources.
- These facts affirm the systemic inefficiency mentioned above.

4.6.2 On-Site Observations

- The following observations were important during visits:
- Godowns do not have automated systems.
- Registers were not computerized and were not backed up.
- Losses in storage are as a result of bad ventilation and moisture containment.
- Lateness in reporting was common.

4.6.3 Review of Documents and Online Sources

Sources used include:

- PASSCO official website
- Food Research articles (Chapter 2) Academic research articles.
- The inefficiencies associated with manual inventory systems and old-fashioned infrastructure are constantly mentioned in these sources.
- security reports by the government.

4.6.4 Academic Evidence

Research confirmed that supply chains that are run manually encounter:

- Higher losses
- Slow reporting
- Low accountability
- Poor warehouse control
- This is in line with the problems that PASSCO has.

4.6.5 Case Study Summary Table

Location	Type of Facility	Observation Focus	Key Issues Identified
Lahore Head Office	Administrative	Reporting & coordination	Manual consolidation, delayed reporting
Hafizabad Godown	Storage Facility	Inventory & storage	Moisture risk, manual registers
Hyderabad Godown	Storage Facility	Regional operations	Lack of monitoring tools
Rawalpindi Liaison Office	Coordination Office	Communication flow	Dependence on WhatsApp reports

4.7 Requirement Definitions and Specifications

In accordance with the gaps analyzed, the requirements of the improved system were the following.

4.7.1 Functional Requirements

- Digital stock entry system
- Automated stock ledger
- Real-time inventory updates
- Barcode/QR code tracking

- Temperature and humidity monitoring
- Automated dispatch module
- Real-time dashboard for HO and regions
- Alerts and notifications
- User access control
- Secure report generation

4.7.2 Non-Functional Requirements

- Security and data protection
- System reliability
- Ease of use
- Fast performance
- Scalability across PASSCO regions
- Mobile and desktop compatibility

4.7.3 System Specifications

Hardware:

- Tablets/mobiles
- Barcode scanners
- IoT sensors
- Server or cloud hosting

Software:

- Web-based inventory platform
- Database management system
- Dashboard and reporting module
- AI-based forecasting (future enhancement)

Networking:

- Reliable internet (4G/Wi-Fi)
- Secure VPN for HO–regional connectivity

4.8 Extended Analysis of Operational Bottlenecks and System Inefficiencies

The in-depth review of PASSCO's internal processes has brought to light numerous system-level issues that act as barriers collectively leading to a decrease in the entity's operating efficiency. Among the topmost problems, the report points to a heavy reliance on the manual recording of data that is carried out in all stages of the supply chain, hence the operational processes of the company, PASOCCO, are extensively documented.

Though manual procedures enable basic operational continuity, they considerably limit the accuracy, speed, and transparency of the process. Every stage is bound to using handwritten records, which consequently raises the likelihood of transcription errors, and the data may also not be available for some time.

Another significant problem is the one non-integration of the different operational units. The activities of Godowns, zonal offices, and the head office are consecutively timed, but not synchronized. Data is conveyed to the higher authorities through physical reports while being shared on a centralized platform is instant. Management's decision-making ability to effectively take care of the storage risks, given that the information is late, is compromised.

Inadequate facilities-related inefficiencies are additionally worsening issues that have already been raised. The traditional godown designs lack environmental control, thus the wheat kept there is susceptible to damage caused by moisture, temperature changes, and pests. Since there is no round-the-clock monitoring of these stores, the remedy is usually carried out after the damage is visible. This reaction increases post-harvest losses and lowers the reliability of storage facilities.

The in-depth review also points to a very severe issue of the system overburdening staff. The employees in the department are asked to do stock reconciliation, report preparation, and physical verification, among other things, which are monotonous manual tasks that require time and are repetitive in nature. These operations take up the time that can be saved for supervision, planning, and quality control. The personnel's interviews at PASSCO showed that during the peak periods, the workload pressure is one of the factors that may contribute to mistakes and oversight.

Moreover, the lack of data analytics prevents performance monitoring benchmarking. Without digitization of historical inventory and storage records, the trend analysis and forecasting are extremely difficult. Consequently, management's decision-making is grounded on delayed or incomplete information rather than real-time insights. This limits the ability of PASSCO to effectively optimize storage utilization, plan for dispatch schedules, and reduce operational costs.

To sum up, the broader analysis illustrates that the problems faced by PASSCO are not individual issues but rather the systems' interrelated weaknesses. The manual processes, worn-out facilities, and the minimal data integration that exist are the factors that collectively impede efficiency. Remedying these bottlenecks entails a move away from the use of traditional practices towards adopting a system-based approach that underlies the proposed changes in the next chapter.

Summary of the Chapter

This chapter discussed the current system at PASSCO through system analysis tools. The interview, observational, and document findings are valid as the system is old, wholly manual and inefficient. The proposed modernized system had requirements that were required to cater to operational, infrastructural and inventory related issues.

CHAPTER 5: IMPLEMENTATION OF RESULTS

Introduction

This chapter reveals the meaning of the results followed by the application of the findings received after the analysis. It determines the effectiveness of tools applied in the course of conducting the research and makes a practical recommendation concerning the enhancement of the current infrastructure and inventory management framework in PASSCO. The recommendations suggested can be made on the basis of the observed insights in the previous chapters in the SWOT and PESTEL analyses, interviews, on-site observations and system analysis modelling.

5.1 Effectiveness of the Tools Used for Analyzing the Data

The instruments chosen in this study were effective in establishing the essence of the operational and system related issues of PASSCO. Each tool made its own contribution to the knowledge of various aspects of the issue.

5.1.1 SWOT Analysis

The SWOT analysis was useful to note internal strengths and weaknesses particularly those associated with the manual processes, old-fashioned storage practice, and inefficient inventory handling. It also assisted in finding opportunities like digital transformation and better monitoring systems.

5.1.2 PESTEL Analysis

PESTEL enabled a better insight into the external environment. It showed that the operations of PASSCO are greatly impacted by the political choices, economic forces, and environmental factors. This is a critical tool in the identification of the fact that the problems

facing the organization are not solely internal but also have connections to the greater structural and regulatory processes.

5.1.3 Interviews with PASSCO Personnel

One of the best resources was the interviews. Interviews were conducted with five key personnel across different roles. These included warehouse staff, an inventory clerk, a quality control assistant, and two operational supervisors. Each interview provided first-hand insight into how daily inventory recording, storage monitoring, and reporting processes are carried out., They confirmed all assumptions that were discovered in SWOT and PESTEL. The officers gave first hand reports of manual reporting, dependence of stock registers, communication delays and challenges in monitoring storage conditions. These insights proved that the gaps that were identified are actual and operationally important.

5.1.4 On-Site Observations

On site monitoring of storage locations revealed physical conditions of warehouses, paper-based record keeping systems and environmental risks. This assisted in confirming the infrastructural loopholes and contributed to the conclusion that the modernization is required.

5.1.5 System Analysis Modelling (Process Flows)

The process flow diagrams assisted in visualizing the way of work movement in the PASSCO operational cycle. This tool was categorically a view of redundancy, delays, and absence of digital integration at every level. It gave a structural insight into the buildup of inefficiencies throughout the procurement, storage and dispatch stages.

5.1.6 Overall Effectiveness

On the whole, the analysis based on the qualitative (interviews, observation) and analytical (SWOT, PESTEL, flow modelling) tools offered a detailed and dependable insight into what operational gaps were present at PASSCO. Such tools in this case were suitable, pertinent, and required based on the research problem.

5.2 Proposed Changes and Recommendations for Implementation

There are some viable suggestions to offer PASSCO on the way of upgrading its existing system, basing on the analysis outcomes, as well as on the collected data. The recommendations are modernization, efficiency in operations and loss reduction.

1. Digital Inventory Management System

- PASSCO needs to shift to the centralized digital management system of registers instead of using handwriting. This system would:
- Reduce human error
- facilitate real time inventory control.
- Improve data accuracy
- Enhance quicker reporting to the Head Office.

2. Introduction of Temperature and Moisture Sensors

- After harvesting, by installing cheap IoT sensors in godowns, one can minimize losses. These devices would help:
- Observes moisture and temperature level.
- Send alerts where the conditions are not safe.
- Enhance preservation of grains and decrease on quality modification.

3. Modernization of Storage Infrastructure

- A number of PASSCO godowns need to be upgraded in terms of structure. Updating of facilities with:
- Better ventilation
- Sealed storage areas
- Pest-resistant materials^[11] would enhance the general storage conditions.

4. Automation of Dispatch and Reporting

- PASSCO ought to implement electronic payment of gate passes and dispatch logs. This will help:
 - Track vehicle movement
 - Proper recording of outgoing stock.
 - Minimize delays in dispatch approval.
 - Improve transparency

5. Gradual and Phased Implementation

- PASSCO cannot switch to an entirely digital system in a short amount of time. A staged tactic would be more realistic:
 - Phase 1: Digital zone reporting.
 - Phase 2: Introduction of sensors in high risk godowns.
 - Phase 3: Dashboard implementation in the center.
 - Phase 4: complete automation in all areas.

6. Strengthening Coordination Between Regions and HO

The miscommunication can be reduced by a centralized communication platform (rather than WhatsApp and telephone calls), better documentation is assured, and traceability is also enhanced.

5.3 Implementation Feasibility and Practical Considerations

The proposed enhancements at PASSCO, are judged to be practical, within the current organizational and operational framework. The recommendations are aimed at rescuing from the ditch of abandonment the current good practices which is why the resistance to change and the risk of the implementation are kept at a low level. The gradual system improvement allows PASSCO to shift from manual to semi-digital operations without any interruption of the routine work.

Operational-wise, the planned modifications may be put in effect step by step, starting from the godowns and zonal offices that are the busiest. By taking this phased route, the management can test out the working conditions, spot the difficulties, and make the necessary changes before the implementation on a larger scale. It also ensures that the staff members will have enough time for getting used to the new procedures and instruments.

Readiness of human resources plays a role of a decisive factor in the implementation success. As a matter of fact, the interviews with PASSCO employees revealed that the staff members know the basics of record-keeping and reporting. They can quickly get used to the improved inventory tracking and reporting methods provided that they receive a minimal training. This helps to save training costs and encourage the acceptance of the system.

As for the infrastructure-related changes, mainly for storage monitoring, they can be made consistent with the present buildings. Instead of building new godowns, it is more feasible and economical to upgrade the current storage through better monitoring and standard inspection routines. This way, the organization supports the best utilization of assets while at the same time keeping the financial burden to a minimum.

To sum up, the adoption of the suggested solutions is not only feasible but also sustainable. The emphasis on gradual improvement, the involvement of the employees, and the agreement with the current operations are the main factors that make it possible for PASSCO to adopt the proposed model realistically. All these points contribute to the project's credibility and its potential for actual implementation in the real world.

Summary

The tools employed in this research were assessed in this chapter and they proved effective in determining the weaknesses of PASSCO in its operations. These findings were definite in their revelation of the cause of inefficiency being in the manual work processes, old infrastructure and low uptake of technology. On the basis of these findings, practical recommendations were given to assist PASSCO in its system improvement. The following recommendations will minimize losses, improve transparency, improve efficiency in operations, and promote long-term modernization.

CHAPTER 6: LIMITATIONS, CONCLUSION AND RECOMMENDATIONS

6.1 Limitations of the Study

In the process of working on this Final Year Project, there were a number of constraints that were experienced and which included the depth and scope of the research. These restrictions did not eliminate the completion of the study, but affected the data collection and analysis level.

1. Time Constraints

The fact that it was a time-limited academic course limited the amount of visits, interviews, and thorough observations that could be done in several PASSCO zones. It should have taken a longer period to enable a wider data gathering and extensive testing of the system.

2. Limited Access to PASSCO Facilities

Being a government organization, some of the areas of operation were inaccessible based on the policies. In other instances, storage or records within the organization could only be viewed in parts and this restricted the level of verification.

3. Financial Limitations

The travelling costs were personally paid to be able to visit the Head Office of PASSCO in Lahore and some storage facilities. The budget acted as a constraint to the field visits and the possibility of gathering information in various areas.

4. Availability of Personnel

A few PASSCO employees were cooperative but lacked time since they were involved in their working activities. Due to this, the interviews were short and more often they were informal and this influenced the richness of the qualitative data.

5. Dependence on Secondary Data

Some of the operational like historical loss percentages or internal performance indicators were only available on a publicly available report and not direct organization data, which limited an analytical precision.

Despite these limitations, the study provides a reliable and realistic understanding of PASSCO's operational challenges.

6.2 Conclusion

This study has examined the operational inefficiencies of PASSCO, which is in regards to its infrastructure and system of inventory management. The SWOT analysis, PESTEL analysis, system modelling, field observations, and interviews arranged systematically revealed the evident gaps in the storage conditions, manual record keeping, reporting processes, and general monitoring of operations in the framework of the study.

The results reveal that the manual and outdated systems of PASSCO are major causes of delays, inaccurate reporting and post-harvest losses. These issues align with the current theory of supply chain which speaks of the significance of automation, maintaining control over the environment, and real-time inventory visibility in enhancing operational performance.

On the practical level, the analysis shows that PASSCO could significantly improve the efficiency by implementing digital inventory systems, environment-monitoring devices, and the advanced storage facility. AI-based forecasting can also be implemented to facilitate decision-making and minimize losses and enhance transparency.

On a policy level, the findings support the idea that the government-owned supply chain institutions should invest in modernization (technology-driven). Enhancement of the operational capacity of PASSCO is directly connected to the national food security and economic stability as well as to the increase in accountability of the state sector.

All in all, the research will conclude that the modernization of the infrastructure and the inventory system of PASSCO is not only advantageous but also necessary in enhancing the wheat reserves management in Pakistan

6.3 Recommendations

On the basis of the results and the gaps determined, the following recommendations can be offered regarding the further improvement of the system of operational activities at PASSCO:

1. Introduce a Centralized Digital Inventory Management System

Switching to a digitized centralized handwriting-free platform will make the stock visible in real-time, minimize errors, and accelerate inter-regional reporting.

2. Install Temperature and Moisture Monitoring Sensors

Low-cost IoT sensors must be put in place in all major warehouses to have continuous monitoring and automatic notifications to protect the stored grain and minimize losses after harvest.

3. Upgrade Storage Infrastructure

The PASSCO would need to progressively replace the conventional godowns with more restrained storage systems that are properly ventilated, sealed and pest control systems.

4. Implement Automated Dispatch and Tracking

The use of digital gate passes and GPS-based dispatch logs would enhance the accuracy of stocks and avoid delays in transportation and documentation.

5. Conduct Periodic Performance Audits

To track the improvement, introduce new risks, and make sure that the updated operational standards are adhered to, annual operational audits are to be introduced.

6. Future Research Opportunity for Students

- Future scholarly research can investigate:
- Stock movement predictive modelling.
- Advanced silos cost benefit analysis.

- Food security indicators are influenced by digitalization.
- The areas will assist in further refining the strategies on modernization of PASSCO.

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