ST. MARY UNIVERSITY
SCHOOL OF GRADUATE STUDIES
INSTITUTE OF QUALITY AND PRODUCTIVITY MANAGEMENT

EFFECTIVENESS OF INTEGRATED MANAGEMENT SYSTEM IN FOOD MANUFACTURING INDUSTRIES: THE CASE OF FAFA FOOD SHARE COMPANY

BY

MESFIN MENGISTU

ADDIS ABABA, ETHIOPIA
JUNE, 2018

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School of Graduate Studies
Institute of Quality and Productivity Management

Effectiveness of Integrated Management System in Food Manufacturing Industries: the Case of Fafa Food Share Company.

APPROVED BY BOARD OF EXAMINERS

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Dean, Graduate Studies	**Signature & Date**
_____	_____
Advisor	**Signature & Date**
_____	_____
External Examiner	**Signature & Date**
_____	_____
Internal Examiner	**Signature & Date**

DECLARATION

I, the undersigned, declare that this thesis is my original work; prepared under the guidance of Ato Mesfin T/Haimanot. All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

Name Signature

Mesfin Mengistu 

St. Mary's University, Addis Ababa, June, 2018

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ABBREVIATION

ABEA	Australian Business Excellence Award
BAB	British Assessment Bureau
BRC	British Retailer Consortium
BSI	British Standards Institution
CAC	Codex Alimentarious Commission
CARE	Cooperative for Assistance and Relief Everywhere
CCP	Critical Control Point
CSA	Central Statistics Authority
EMS	Environment Management System
EQA	Ethiopian Quality Award
FFMSC	Fafa Food Manufacturing Share Company
FMI(s)	Food Manufacturing Industry (ies)
FSMS	Food Safety Management System
FSS	Food Safety System
GHK	Good Housekeeping Practice
GHP	Good Hygiene Practice
GLP	Good Laboratory Practice
GMP	Good Manufacturing Practice
GSP	Good Storage Practice
GTP	Good Transport Practice
HACCP	Hazard Analysis Critical Control Point
hl	Hectoliter
HR	Human Resources
ICT	Information Communication Technology
IFS	International Food Standard
IMSs	Integrated Quality Management Systems
IMST	Integrated Management System Technique

IQMS	Integrated Quality Management System
ISO	International Organization for Standardization
MBNQA	Malcolm Baldrige National Quality Award
MSS	Management System Standard
MSs	Management Systems
Mt/Y	Metric Ton Per Year
NASA	National Aeronautics and Space Administration
OHSAS	Occupational Health Safety Assessment Series
oPRP	operational Prerequisite Program
PRP	Prerequisite Program
QFSMS	Quality and Food Safety Management System
QFST	Quality and Food Safety Team
QMS(s)	Quality Management System(s)
R & D	Research and Development
RII	Relative Importance Index
SABS	South Africa Bureau of Standards
SHEQ	Safety, Health and Environmental Quality
UK	United Kingdome
UKAS	United Kingdom Accreditation Service
UNHCR	United Nation Higher Commission for Refugee
WFP	World Food Programme

ABSTRACT

The research conducted into the effectiveness of IMS in Food Manufacturing Industries has identified that the case company has implemented IMS composed of ISO 9001 and IS0 22001 for more than four years period. It was also identified that the integration of the management systems was not at all levels of the organization - structure and activity level. Based on this, the satisfaction of employees on the implemented IMS was found to be in the range of medium to high.

Results have also shown that the process temperature and time control for Drum Drier CCP was out of control indicating that the temperature and time variations were out of the set upper and lower limit while for Probate Roaster and Fluid Bed Drier CCPs found to be in control indicating that the variations were within the set upper and lower limit. However, in all the three processes, C_P and C_{PK} were found to be less than one indicating, respectively, that the processes were not able to produce products as per the set specification and the distribution of temperature and time variations were not centered. Similarly, results were identified that the quantity of product return in terms of non-conforming (defective) from the distributed products for sale was small compared to the volume distributed. The trend of return products has also shown drastic fall in 2015 but again showed a smoothly rising trend starting 2016 and onwards. Herewith, the top ten contributing factors for IMS effectiveness were identified and ranked based on the scale and score obtained from the responses of respondents.

The objective of the research was identifying the effectiveness of IMS in food manufacturing industries in Ethiopia and the contributing factors for its effectiveness in meeting customer and regulatory requirements, international standards, effectiveness and efficiency in resource utilization, market competitiveness, income and profit maximization. Descriptive research methodology was used to conduct the research in which quantitative and qualitative research data were used from primary and secondary data sources. These requirements were not met to the expected level as the results of the research indicated.

Therefore, based on the research findings, recommendations were made to the case company in order to rectify the identified drawbacks.

Keywords: Integrated Management System, IMS, Effectiveness, ISO 9001 and ISO 22001, Food Manufacturing Industries.

CHAPTER ONE

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

This research report was compiled and presented in five chapters. Based on this, the first, second, third, fourth and fifth chapter presents, respectively, background and introduction, literature review, research methodology, result and discussion, summary, conclusion and recommendation. In addition, at the end of the research report references and annexes have been included.

1.2 Background of the Study

1.2.1 Food Manufacturing Industries in Ethiopia

The five year survey report of CSA has indicated that the total number of large and medium scale manufacturing industries in Ethiopia were 2,170 during the period 2006/2007 to 2010/2011 (CSA, 2012). As indicated, 40% (868), 24% (520), 18% (390) and 18% (392) of the manufacturing industries were located, respectively, in Addis Ababa, Oromia and Amhara while the remaining 18% (392) were located in other regional states and the city administration of Dire Dawa. In addition, it has been indicated that 31% (672), 8% (390) and 13% (282) of the industries, respectively, were under the classified categories of food products and beverages, non-metallic mineral products and furniture industries. Base on this, it has been possible to know that the total number of manufacturing industries engaged in food products and beverage in Ethiopia were 672 up until the period covered by the CSA survey report (CSA, 2012).

The overall contribution of the manufacturing industry to the national economy during the period 2006/2007 to 2010/2011 was a total of 35% of the national economy (CSA, 2012). Out of this 35% contribution, 33%, 8% and 5% of the value added, respectively, was contributed from food and beverages, non-metallic mineral products and from the chemical manufacturing industries as indicated by the same source.

On the other hand, the problems of the manufacturing industries in Ethiopia were shortages of raw materials and spare parts, low market demand and working capital, shortage of foreign

exchange, frequent machine failure, lack of adequate skills, problems related with employees, government rules & regulations and others (CSA, 2012).

However, the study didn't report any finding concerning the type of management system the manufacturing industries in Ethiopia had been implementing. It also didn't indicate whether the manufacturing industries in Ethiopia had been certified for implementing any of the standardized ISO based or other management system separately or in an integrated manner. In this regard, the annual ISO survey conducted in 2016 has indicated that the world level total food manufacturing industries certified for ISO 9001 was 31, 469; out of which 14'n of them were certified in Ethiopia and this had increased the food industries certified for ISO 9001in Ethiopia to a total of 99 (ISO, 2016). The same ISO's survey report has also indicated that the total worldwide food manufacturing industries certified for ISO 22001was 33, 049 out of which 4 of them were certified in Ethiopia and this had raised the number of food industries certified for ISO 22001 to a total of 74.

1.2.2 IMS Emergence, Definition and Its Importance

IMS was first emerged in literature two decades ago (Beechner & Koch, 1997 and Wilkinson & Dale, 1998). It has been defined by the British Standard as a management system which integrates all of an organization's systems and processes into one complete framework, enabling an organization to work as a single unit with unified objectives (BS PAS 99, 2012). Its importance is that it combines multiple management system standards, which an organization registered for, into one management system. It means that the management systems (MSs) could be developed, implemented, and maintained via one system with processes that cover each standard's requirements. The processes required for each separate standard for document control, internal audits, dealing with nonconformities, corrective actions, or management review would be integrated in order the requirements of each separate MS standard could be addressed without duplicating effort. Such management system could be one that simultaneously integrates the requirements of eg. ISO 9001, quality management system; and ISO 22001, food safety management system, standards as one system and which further adds other additional management systems through time as deemed necessary depending on the interest, nature, size and capacity of the specific company.

IMS has also been developed from reviewing the existing management tools and practices across operations and selecting best practices to establish one national management system manual which tied together all operations through the policy directives and integrating all Management System standards (Ben Bowering, 2009). This has avoided working with a number of separate existing management systems creating the possibility to work with one management system that commonly addressed the standards of all separate management systems in one MS system.

On the other hand, the simultaneous implementation of a number of separate MSS which included eg. ISO 9001, ISO 14001, OHSAS 18001, and also increasing other MSS as deemed necessary, has made companies to experience extra work and new challenges in implementing these separate Management Systems (Sai X. Z. and et al, 2010). The implementation of the separate management system has required all working procedures to be traceable and auditable. It has also demanded a lot of documentation, written procedures, checking, control forms and other paper work in order to meet satisfactory requirements. As a result, the importance of IMS has been advocated for handling the above mentioned three separate MSs in one management system and ensuring their alignments with the organization's strategy.

1.2.2.1 Approaches to IMS

General methodologies/guidelines were developed and put into operation in order to help the implementation of IMS in different manufacturing industries. The implementation of the methodologies/guidelines was that tailored to company's individual operating conditions and objectives. Some of such methodologies/guidelines include different theoretical models/approaches as López-Fresno P., 2010 summarized cross referencing the works of different authors as follows.

1. **Stepwise Approach**: Integration can be carried out in a stepwise manner where it proceeds from partial to full integration (Beckmerhagen, I. and et al, 2003).
2. **Integration at Various Hierarchical Levels**: Integration needs to cover activities at all hierarchical levels in the organization (Jørgensen, T. and et al, 2006).
3. **Integration Through a "TQM" Approach**: Use of integrated resources to achieve satisfaction of all stakeholders operating in a TQM (Wilkinson, G. and Dale, B., 2001).

4. **Enhancing the MS Standards**: Integration and enhancing of existing and prospective MS standards (Rocha, M. and et al, 2007).
5. **Systems Approach to Integration**: Business was viewed as a single amorphous system that changes its shape depending on prevalent stakeholders (Asif, M. and et al, 2010).
6. **Process Embedded Design of IMS**: IMS was designed around the core processes focusing on stakeholder requirements (Asif, M. and et al, 2009).

1.2.2.2 Reasons for Implementing IMS and Its Benefits

Food manufacturing industries had different motivational reasons to have IMS (Zeng S. and et al, 2010). The motivational reasons were that included external incentives which required the implementation of IMS such as the satisfaction of customer expectations, pressure from the government and competitors or regulations from the parent company. On the other hand, the reason was that separate use of individual function-specific MS had, in practice, disadvantages which hindered internal operations (Zeng, S. and et al, 2007). The disadvantages include, among others, increased management overhead, formation of subcultures in the company and a slower exchange of information. Avoiding these disadvantages has called for having IMS which integrated two or more MS and has used the related synergies as a facilitator of the remedial action (Santos, G. and et al, 2011). In line with this, Santos, G. and et al, 2011, have summarized and compiled reasons and benefits of IMS, which improved company's image and competitive advantages, cross referencing the work of different researchers as presented herein under.

1. **Integration of Internal Processes**: IMS has enabled to have easier and more effective operational procedures (Zeng, S. and et al, 2010).
2. **Communication & Motivation**: IMS has created improved communication and higher staff motivation (Karapetrovic, S. and Willborn, W., 1998).
3. **Costs**: IMS enabled to have reduced costs (Zeng, S. and et al, 2010).
4. **Documentation & Paperwork**: IMS has enabled to have uniform documentation, lower administrative effort (Zeng, S. and et al, 2011).
5. **Audit & Certification**: IMS has enabled to have integrated audit and reduced certification costs (Zutshi, A.; Sohal, A., 2005).

1.2.2.3 Challenges and Problems of IMS

Integration of different management systems had challenging processes due to different requirements were needed to be integrated. The justification was that every organization was structured individually, pursues certain goals and had different resources and initial conditions. Such a situation couldn't enable to develop a universal solution to implement IMS strategy. In connection with this, Rebelo, M. and et al, 2014, have summarized three categories of challenges and problems of IMS implementation cross referencing the work of different authors as presented herein under:

1) **Standards-Related Challenges and Problems**: include having different scope and structure of management system (MS), inadequate harmonization of standards and use of different models in the standards (Asif, M. and et al, (2009),
2) **External Challenges and Problems**: include lack of international standard, lack of government support, continuous change of regulations and guidelines, lack of support from certification bodies and lack of experienced consultants as indicated by Rebelo, M. and et al (2014),
3) **Internal Challenges and Problems**: include lack of qualified employees, low motivation or resistance of employees, lack of knowledge and understanding for integration, lack of resources, lack of strategic planning, inappropriate organizational culture and structure (Simon, A. and et al, 2014).

1.3 Statement of the Problem

Now a days, the importance of IMS in food manufacturing industries has become well known as a result of the companies were working in a changeable and competitive environment. This has required the food manufacturing companies shifting from implementing the existing traditional management systems such as result based management system, management by objectives, etc to implementing improved management systems which include award based system and ISO based management systems. As a result, the number of food manufacturing industries certified for ISO based management systems have shown increased trend year-after-year worldwide including in Ethiopia (ISO, 2016).

Based on this, the number of food manufacturing industries in Ethiopia which were certified for implementing ISO 9001, QMS and ISO 22001, FSMS, respectively, had been 99 and 74 up until 2016 (ISO, 2016). These two ISO based management systems have been implemented as an IMS where the two management system processes and standard requirements were implemented as one-system. As in the case of some manufacturing industries in Ethiopia, the ISO based MSs that were integrated have included ISO 14001, OHSAS 18001 and adding more as the case may be depending on the interest, nature, size and capacity of the specific food manufacturing industries (ISO, 2016).

Nevertheless, there had been no information whether the food manufacturing industries in Ethiopia have effectively integrated ISO 9001, QMS and ISO 22001, FSMS standards in such a way that the management systems (MSs) were developed, implemented, and maintained as a one system covering the processes and standard requirements of each MS. This is to mean that there was no information whether the processes required for each separate MS standard for document control, communication, monitoring & evaluation, internal audits, dealing with nonconformities, corrective actions and management review were effectively integrated to the extent that the requirements of each separate MS standard have been addressed without duplicating effort. There was also no available information whether the food manufacturing industries in Ethiopia have effectively met customers' needs and expectations, government statutory and regulatory requirements, quality and food safety requirements, reduced quality costs, customer complaints and product nonconformance throughout the entire processes of the raw material supply and product distribution chains of the food manufacturing company implementing IMS and thereby enhancing market competitiveness and profitability in a way that the factors contributed to the achievement of the effectiveness were articulated and prioritized. In addition, there was no available information as to what type of integration methods were used to integrate MSs, the type of challenges faced in the integration process and the benefit gained in implementing IMS.

Therefore, this has necessitated to undertake a single case study research considering a selected case company of food manufacturing industries; which has been implementing IMS composed of ISO 9001:2015 QMS and ISO 22001:2005 FSMS. The purpose of the case study research was to conduct an in-depth assessment on the effectiveness of the implemented IMS of the case company and to identify and prioritize the contributing factors helped towards effectiveness.

1.4 Significance

The significance of research includes the followings:

- ✓ It has identified how the implementation of IMS helped food manufacturing industries to meet both customer needs and expectations; and statutory and regulatory requirements as related to food quality and safety.
- ✓ It has identified how the implementation of IMS helped food manufacturing industries to reduce quality cost in food production processes.
- ✓ It has identified how the implementation of IMS helped food manufacturing industries to achieve continuous improvement and market competitiveness.
- ✓ It has identified how the implementation of IMS helped food manufacturing industries to identify the benefits and challenges and how challenges were resolved in a way that enabled food manufacturing industries maintain continuous improvement.
- ✓ It has identified the types of steps food manufacturing industries went on or the model food manufacturing industries used in order to implement IMS.

Accordingly, it has been assumed that the results of the case study research would help in indicating how far the implementation of IMS in food manufacturing sector of Ethiopia has become effective in general and in the case company in particular.

1.5. Research Questions

The research was conducted to give answer to the following research questions:

1. What level the implementation of IMS satisfied regulatory and customer requirements?
2. What level the implementation of IMS reduced customer complaints and quality costs?
3. What level the implemented of IMS achieved continuous improvement and market competitiveness?
4. What model or steps was used to integrate management systems?
5. What were the benefits and challenges of implementing and maintaining IMS and how the challenges were resolved?

1.6 Objectives of the Study

The general and specific objectives of the research were the followings:

1.6.1 General Objective

The general objective of the research was identifying and describing the effectiveness of the implemented IMS and the contributing factors for the effectiveness of IMS.

1.6.2 Specific Objectives

The specific objectives of research were the followings:

- To find out what level the IMS satisfied regulatory and customer requirements.
- To find out what level the IMS reduced complaints and quality costs.
- To find out what level the IMS achieved continuous improvement and market competitiveness.
- To find out the challenges faced and benefits obtained in implementing IMS and how the challenges were resolved and the IMS was maintained.
- To find out what model/steps adopted/used by FFMSC for implementing IMS.

1.7 Hypothesis

The research hypothesis was to test H_1 against H_o of the following two hypotheses:

H_1: There is effectiveness in meeting objectives and strategies in food manufacturing industries through implementing IMS.

H_o: There is no effectiveness in meeting objectives and strategies in food manufacturing industries through implementing IMS.

H_2: There are identifiable contributing factors for the effectiveness of IMS.

H_o: There are no identifiable contributing factors for the effectiveness of IMS.

1.8 Definition of Terms

Quality: The totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs (ISO 9000:2015).

Management: Coordinated activities to direct and control an organization (ISO 9000:2015).

Quality Management: Coordinated activities to direct and control an organization with regard to quality (ISO 9000:2015).

Quality Management System: Set of interrelated or interacting elements of an organization to establish policies and objectives, and processes to achieve those objectives with regard to quality (ISO 9000:2015).

Integrated Management System (IMS): Integrated management system (IMS) is defined as a management system that integrates all of an organization's systems and processes in to one complete framework, enabling an organization to work as a single unit with unified objectives (BS PAS 99, 2012).

Hazard Analysis Critical Control Point (HACCP): It is a food safety management system designed to ensure safe food production and packaging (ISO 22001:2005).

Effectiveness: Extent to which planned activities are realized and planned results are achieved (ISO 9001:2005).

Prerequisite Programs (PRP): Basic conditions of food safety and activities which are necessary to maintain a hygienic environment throughout the food chain suitable for the production, handling and provision of safe end products and safe food for human consumption (ISO 22001:2005).

Operational Prerequisite Programme (oPRP): oPRP is identified by the hazard analysis as essential in order to control the likelihood of introducing food safety hazards to and/or the contamination or proliferation of food safety hazards in the product(s) or in the processing environment (ISO 22001:2005).

Critical Control Point (CCP): food safety step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level (ISO 22001:2005).

Food Safety: Concept that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use (ISO 22001:2005).

Food Chain: sequence of the stages and operations involved in the production, processing, distribution, storage and handling of a food and its ingredients, from primary production to consumption (ISO 22001:2005).

1.9 Scope

The scope of the research was identifying the effectiveness of IMS and the contributing factors in food manufacturing sub-sector of Ethiopia through undertaking a single-case study research on a selected case company.

1.10 Limitation

The research had a limitation of being a single-case study research for it gave emphasis to in-depth study rather than to wider area coverage. As a result its focus has been on a selected food manufacturing industry rather than considering representative samples of the food manufacturing industries in Ethiopia. It has also a limitation for it has considered few technical staff of the case company only for questionnaire survey because of responding to the questionnaire was that required thorough knowledge on IMS and also skill of reading and understanding. This has required to sample from the existing few technical staff of the case company to respond to questionnaire despite the non-technical staff were also included in FGD and KII.

CHAPTER TWO

2. LITERATURE REVIEW

THEORETICAL

2.1 Quality Management System

Definition: QMS is a formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives (The Online Source of ASQ, 2018). The same source has also indicated that QMS is a set of internal rules which are a collection of policies, processes, documented procedures and records.

History of QMS: The history of quality was traced back to centuries in which craftsmen began organizing into unions called guilds (The Online Source of ASQ, 2018). Based on this, the early QMS was explained to start during the Industrial Revolution in which QMS was used as standards and controlled product and process outcomes. As explained by the Online Source of ASQ, best practices were needed to ensure quality results in which more people were made to work together to produce results in a way that enhanced the production quantities of the then manufacturing companies. Therefore, the Online Source of ASQ indicated that best practices for controlling product and process outcomes had been established and documented and these documented best practices had been turned into standard practices for QMSs.

Early Importance of QMS: ASQ has explained that quality had been increasingly important during the World War II (ASQ, 2018). The same source has also explained that the British Assessment Bureau (BAB) had been concurred with the notion that ISO 9000 series of standards were useful during World War II - the British Ministry of Defense sought to reduce mistakes and incidents in the manufacturing of ammunitions. ASQ has further explained that it was after World War II that the Japanese enjoyed the quality revolution, improving their reputation for shoddy exports by fully embracing the input of the American thinkers called Joseph M. Juran and P.W. Edwards Deming; shifting their focus from inspection to improving all organization processes through the people who employed in each organization.

Rise of QMS: The ASQ has indicated that the American response to the quality revolution in Japan gave birth to the concept of total quality management (TQM) - a method for quality management that emphasized not only statistics but approaches that embraced the entire organization. ASQ said it was in late 20th century that independent organizations had begun producing standards to assist the creation and implementation of QMS - the time in which the phrase "Total Quality Management" began to fall out of favor. In addition, it was said that QMS was begun to merge with the ideas of sustainability and transparency at the start of the 21st century. This was because of sustainability and transparency had been increasingly important to consumer satisfaction. In connection with this, John N. Martelize H. (2016) has mentioned cross referencing the work of BAB (2014) that ISO has established technical committee 176 for Quality management and quality assurance in 1979 and that it has published its first standard in 1987 in order to make the implementation of quality management system more standardized and systematized.

Implementation Process of QMS: The implementation of QMS in any company need to be specific to the product or service provided (The online Consultation Center of ISO 9001, 2017). This was for it was important to tailor QMS to the company's needs. Accordingly, it has been explained that some general guidelines was made in the form of ISO 9001 (QMS – Requirements), which were intended to help standardize how a QMS is designed. The aim was ensuring that the company does not miss elements of a good system during designing and implementation phase of the QMS.

Development of QMS: Richard R., Helen L., Werner E. (2015) indicated that the development of QMS was due to companies were in a fierce competition and under constant pressure to achieve cost savings and a lower consumption of resources. This means that there was a need to continuously adapt changing market and framework conditions that led to the development of QMSs. Similarly, López-Fresno P. (2010) explained that companies were facing diverse stakeholder needs and which were greatly increasing with the main focus on the satisfaction of customers and requiring the need to have a standardized MS. Zutshi, A., Sohal, A (2005) have supplemented the explanation of López-Fresno P. (2010) saying that the mentioned issue also apply to the expectations of employees, shareholders and society. As indicated by Zutshi, A.,

Sohal, A (2005), the complexity of these requirements had necessitated the importance of having a systematic approach with clear structures.

Approaches to Implementation of QMS: There were three practical approaches towards the implementation of QMS in organizations as suggested by Evelyn N. K. and Dr. Kenneth W. (2014) citing the work of Terziovski et al. (1999) and Singh (2003). These were the followings:

- The standard-based approach (e.g. the ISO 9000, ISO 22000 standards),
- The prize criteria approach (i.e. the various national and regional business excellence or quality awards such as the US Malcolm Baldrige National Quality Award (MBNQA), Australian Business Excellence Award (ABE) and EQA and,
- The elemental approach that consists of the many ideas promoted by consultants and experts in the area.

It was further indicated by Evelyn N. K. and Dr. Kenneth W. (2014) that more and more standards-based MS had been developed on frequent bases, which helped to focus and coordinate the achievement of objectives within an organization.

EMPIRICAL

2.2 Food Manufacturing Industries and QMS

Harrigan, W. F. (1993) and Van Der Spiegel, M. (2004), have mentioned that the important role of QMS implementation has been recognized by food manufacturing companies. As Van Der Spiegel (2004) said this was due to the high awareness of customers on the importance of food product quality and safety. He further explained that the food companies which produce safe and good quality product would survive and even win market competition.

Similarly, Van Der Spiegel, M. (2004), Psomas, E.L. and Fotopoulos, C.V. (2010), Harrigan,W.F. (1993) had explained that food manufacturing companies had become familiar with the various standards relating to quality assurance efforts, such as British Retailer Consortium (BRC), HACCP, and ISO 9001. They said, ISO 9001 is an international standard that is widely adopted by food manufacturing companies. In addition, they cited ISO (2008), Van den Heuvel, J., Koning, L., Bogers, Ad J. J. C., Berg, M., and Van Dijen, M. E. M. and Psomas,

E.L., Kafetzopoulos, D.P. and Fotopoulos, C.V. (2013), mentioning that the standard describes the requirements of a QMS that needs to be implemented consistently so that the companies can produce the products according to customers' requirements, achieve customer satisfaction, and achieve continual improvement on the effectiveness of their quality management system.

2.3 Food Manufacturing Industries and Food Safety Requirements

Ezra Tsegaye (2004), citing the online source of ChainsNet in www.agri-food.info, has mentioned that quality systems and standards used for general industrial application might not necessarily address food industry's unique requirements for food safety standard. As said, the specific requirements were arisen due to the increased number of people reported dead or ill from time to time as a result of the food processed by the industries. This was explained as necessitated the start of food safety requirements which its origin was from giving solution to the fear that astronauts got sick in space.

Jiehong Z. Jensen H. and JingLiang (2011) on their part said that over the last decade great attention has been paid to food safety/quality control due to the increase of food hazards such as the pesticide residue related diseases that occurred in China. As mentioned, the firms of Chinese vegetable industry have adopted a number of standards that had enhanced the safety of products and that had enabled the control of the chemical residue related to food hazards.

On the other hand, Jiehong Z. Jensen H. and JingLiang (2011) have indicated that Pillsbury Company together with the NASA and the US Army Natick Research and Development Laboratories have developed HACCP in the 1960's which was the most popular management system for food safety. As indicated HACCP was established to monitor and control each steps of food processing so that a preventive rather than an inspection oriented system was adapted to food manufacturing processes. As said by the same source, HACCP has been in use since 1960's in Pillsbury Company and it was in 1971 that the Pillsbury Company formally presented the HACCP for the general public. Accordingly, Jiehong Z. Jensen H. and JingLiang (2011) said the consideration for the wider application of HACCP in food industries was started since 1985 and in 1993, HACCP guidelines were recommended to food industries by CAC recognizing its importance and usefulness to quality control in food manufacturing processes. From here onwards, the ISO 22001:2005 was put into practice aiming at more coordinated and organized

food safety management system and involving within it the HACCP principles (ISO 22001:2005).

Referring to the work of (Turlejska and Pelzner 2003; Turlejska 2003), Stanisław Popek (2016) has indicated that the biggest advantages of the ISO 22000 standard which distinguished it from other similar BRC or IFS systems was its lack of a detailed list of requirements. He said, an enterprise with an implemented system of food safety management must prove the ability to control hazards to food safety in order to assure everyone that the food is safe during consumption by people and that it would not cause any health damage as per the establishments of the international ISO 22000 standards. He further said, the system based on the ISO 22000 standard was principally analogical to the QMS consistent with the ISO standard series 9001:2009. However, Stanisław have referred to the work of Wysokińska-Senkus 2008, Berdowski 2007 and Dzwolak 2007 stating that it had been advisable to integrate the ISO 9001:2009 and ISO 22001:2005 norms because of the ISO 22001:2005 norm didn't include certain crucial for the functioning of the company - the requirements resulting from the ISO 9001:2009 standard despite both had major consistency. The requirements which were there with ISO 9001:2009 but not with ISO 22001:2005 were indicated by Stanisław to include the followings.

- a process approach to management,
- announcing the customer`s requirements (the ISO 22000:2005 standard concentrates mainly on retaining health food safety),
- regulations concerning a process and processes of the contacts with a client,
- a product design,
- Production management (production planning, material service entrusted by a client).

2.4 Progress in IMS Design and Development

Roessler and Schlieter (2015) had developed a model-based design for establishing and maintaining an IMS. As indicated the development of the model was analyzing the content and structure of the requirements for ISO 9001, ISO 14001, ISO 50001 and OHSAS 18001 which enabled to identify four groups of requirement types mentioned as **identical, integrated, parallel or different**. Roessler and Schlieter have mentioned that grouping of the requirement

types has enabled to workout design templates that solved the problems of integration within a meta-model, which formed the basis for integration.

Hemanta K. D. (203) has mentioned the development of IMS, in Journal of Enterprise Information Management, through linking quantitative and qualitative decision parameters with a view to rank and optimize capital projects. He also explained the roles and impacts of the non-financial criteria combined with traditional financial criteria for decision-making and management processes in dynamic project environment.

Similarly, Min J. Z. (2015) has done research on how to align business objectives and IMS when integrating MSs comprised of Quality Management System (ISO 9001), Environmental Management System (ISO 14001) and Occupational Health and Safety Assessment Series (OHSAS 18001) and he has come up with the proposed model shown in the Figure 2 & 3.

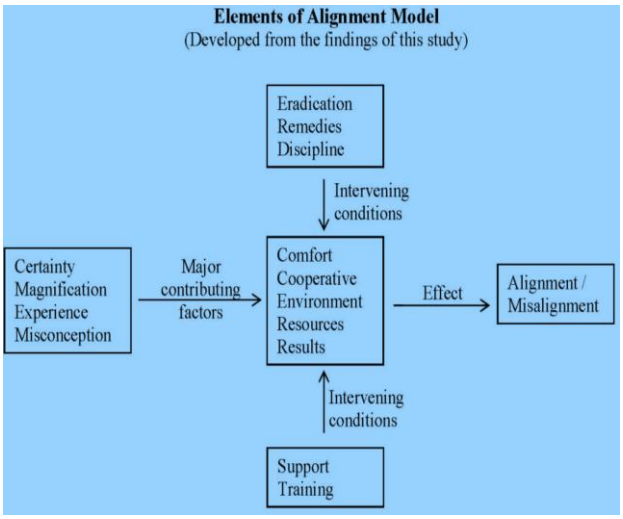

Figure 2 Elements of Alignment Model
Source: Min J. Z. (2015)

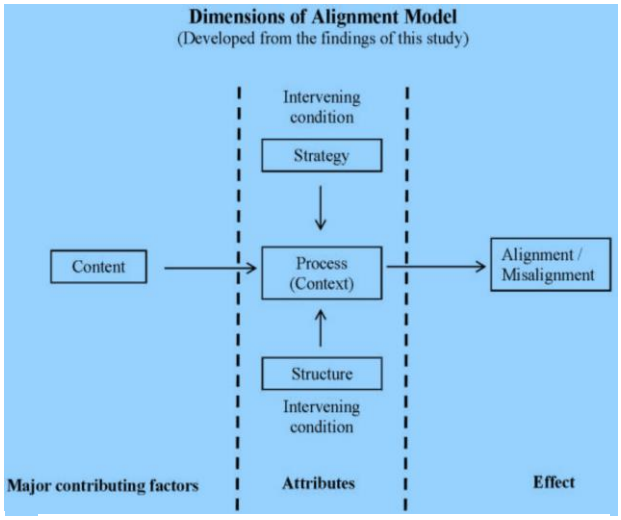

Figure 3 Dimension of Alignment Model
Source: Min J. Z. (2015)

2.5 Level of MS Integration

Karapetrovic and Jonker (2003) explained that improved understanding and common use of systems were the first step for integration. In line with this, Hemanta K. D. (203) has reflected the suggestion of Zeng et al. (2010) mentioning that the process of integration was started first with improving understanding and the shared use of systems. As Karapetrovic and Jonker said, aligning different management systems with business objectives and overall strategies of an organization was clearly the necessary criteria for effective integration. They further discussed

the integration of management systems to a level that enable to link the individual integrating MSs in which their individual independent characteristics wouldn't show up. They said, integration normally leads to a strong and comprehensive management system.

On the other hand, Katarína Č. (2015) has used characterized possibilities for the integration of ISO 9001 QMS, ISO 14001 EMS and ISO 18001 OHSAS through the identification of common elements and specific requirements of the integrating QMSs. He added that integration of the three MS was possible because of ISO 9001 and ISO 14001 standards were compatible and OHSAS 18001 specification was modelled on ISO 14001 and all the three have process oriented approach that considered the PDCA concept (Plan - Do - Check - Act). As he further indicated, these might have also integrated other standards such as: ISO 27001 (Information security), ISO 26000 (Social responsibility), ISO 31000 (Risk management), or different industry standards, ISO 50001 (Energy management), ISO 22000 (Food safety management systems), ISO 13485 (Medical devices), ISO/TS 16949 (Automotive quality management), etc., as well as internal standards developed by the companies themselves as far as the commonalities and specific requirements were well identified ahead. Considering the above mentioned modalities of MS integration, Katarína Č. (2015) has summarized the following IMS methods which were proposed by the Chartered Quality Institute of UK:

Conversion: It has been defined in such a way that if an organization had been already certificated for QMS, it means that it can build upon that by adding the necessary processes to cater for health, safety, environment and other requirements of MSS as deemed necessary to the organization (Katarína Č. 2015).

Merging systems: This was defined in such a way that if an organization had already more than one formal system – e.g. QMS and EMS – it means that the organization can merge the two systems first and then proceed to integrate other systems as it has begun their formalization. This has implied that the organization can merge documentation where it supports the same process. Otherwise, they appear as two separate systems unless the labels are removed and quality, safety and environment were no longer separated at the detail level (Katarína Č. 2015).

System engineering approach: It has been explained that this approach stated that whether an organization has an existing formal system or no formal system, it could adopt the system

engineering approach to management system development, i.e. design a system top-down to fulfil a specific objective in which common elements and specific requirements of the integrating MSs were well addressed. The benefits were that one coherent system could be built which served business needs and didn't tie the organization to a particular standard (Katarína Č. 2015).

Accordingly, Mihai D. and et al (2017) have reviewed and summarized the work of different authors who have conducted research into MS integration models and strategies which presented in table 1.

Table1. Review of different researchers work done on MS integration models and strategies

Focus Areas	Results	Authors
IMS implementation	Identified and analyzed different models of integration realizing a comparative study of those applied the quality–environment–health triad and safety management standards.	Olaru M., Maier D., Nicoara D. and Maier A. (2014)
Start of integration	Described the start of integration, its moments, and the functional and structural changes and their impact on the level of processes, documentation, staff behavior, reducing needed resources and losses, and improving company performance, and declares integration as a tool to reform company bureaucracy.	Asif M., Fisscher O.A. and Bruijn E.J. (2010)
Managerial system integration	Identified methodologies and approaches for managerial system integration such as: sequential, systemic, hierarchical, TQM, integrating augmented standards, and incorporation in processes. The level of control for integration was also defined in the system approach case (meta level, object level, intervention level) as well as its characteristics.	Bernardo M., Simon A., Tarí J. and JMolina-Azorín J.F. (2015)

Source: Mihai D. and et al (2017)

On the other hand, Alexandra S.I.V. (2012) has cross referenced Karaperovic and Willborn (1998b) mentioning that they defined three main elements of a standardized MSs which could be integrated at different levels – *goals, processes, and resources*. Alexandra also cross referenced Karapetrovic et al. (2006) indicating that an empirical study was conducted in order to study the extent of integration of these elements (*goals, processes, and resources*) and found that the

majority of companies had integrated them to a high extent. In addition, he also cross referenced Bernardo et al., 2010; Simon et al., 2011, 2012 and Bernardo et al., 2012 disclosing that these authors found same results as Karapetrovic in their sampled companies. Other than this, Karapetrovic and Casadesus (2009:537) have indicated that integrated management systems were principally developed on the basis of similarities and this was made possible through shared resources, unified organizational structure and combined work processes.

Mihai D. and et al (2017) have also cross reviewed the work of different authors that conducted research on levels of MS integration on different aspect areas despite it was explained that there was no consensus reached concerning the levels of MS integration even between papers with common authors as presented in table 2.

Table2. Review of different researchers work done on levels of MS integration

Reviewing Authors	Results of the Review
Bernardo M., Casadesus M., Karapetrovic S. and Heras I. (2009)	Recorded integration levels of IMSs identified by other authors framing them into four distinct levels: • Addition-merger integration, • Individual-combination integration, • Separated–aligned integration, • Harmonization–cooperation–amalgamation integration. Reviewers have indicated that the authors evaluated the degree of individual integration on processes, focusing the investigation on human resources and on documentation.
Bernardo M., Casadesus M., Karapetrovic S. and Heras I. (2010)	Identified three levels of integration: • Not integrated, • Partially integrated, and • Fully integrated.
Bernardo M., Marti S., Karapetrovic S. and Inaki H.(2012) Bernardo M., Casadesus M., Karapetrovic S. and Heras I. (2012)	Studied whether the degree of integration was influenced by the difficulties of implementation (such as related to standards, organization, resources, consultants, and certification bodies) or by the implementation order of the component standards.
Sampaio P., Saraiva P. and Domingues P. (2012)	Mentioned the integration steps proposed by BSI, namely *Combined*, *Integratable*, *Integrating and Integrated* and referred in the empirical study to five levels of integration.
Abad J., Dalmau I. and Vilajosana J. (2014)	Supported the three levels of integration, placed integration at the level of managerial processes and noted that obtaining a higher degree of integration was more difficult for large companies.

Source: Mihai D. and et al (2017)

2.6 Researches into MS Integration and the Methodologies Used

Assessment of the existing literatures showed that researches were carried out on different aspects of IMS; which tried to identify the effect and effectiveness of IMS on organizational performance, meeting customer and regulatory requirements related to quality and safe food production, increment of production, quality cost reduction, reduction of recalls and non-conformance, reduction of customer complaints, market competitiveness and profit maximization. Some of the research works have been summarized and presented in this study report in order to learn from and see the trend and progress of the research done into IMS and the methodologies used.

The reviewed research papers have shown that Mattheus J.V.H (2013) had conducted a qualitative case study research into the effect of IQMS on one of the South Africa's leading fish product manufacturer as a pre-implementation viability study to identify the effect of IQMS on fish product manufacturer and to determine whether such a system was compatible with the fishing industry as a whole. As indicated, QMS's were implemented by all leading fishing companies in South Africa and these systems have assisted them by increasing quality benefits and making the companies more productive and eco-friendly and also increased their profits. In addition, it has been indicated that some of these companies had implemented formal QMS's which were certified while some of them implemented systems developed by their own and which were informal systems and not been certified as a QMS.

Mattheus further indicated that the research methodologies used were in-depth investigations in the form of a case study using an experimental, descriptive and explorative design in order to determine the effect IQMS had on the fish product manufacturing company. Accordingly, he has indicated that the research data was collected using questionnaire, observation, assessing historical data and interview methodologies because of these were considered to be more expressive and appropriate for a qualitative case study research.

Fig. 4 Proposed Model of IMS as per PAS
Source: Marieta S. (2017)

Similarly, Marieta S. (2017) had carried out a research into two biscuit manufacturing plants in Bulgaria to define a model for creating an IMS for quality and food safety using the example of biscuit products manufacturing industries which their products were sold in 37 states and the range of their products were 180 different items manufactured on 11 production lines. Accordingly, Marieta proposed a model of IMS (Figure 4) which was worked out on the bases of the latest BSI model version PAS 99:2012. As said, the BSI model version PAS 99: 2012 had the broadest application and reference and it had no specific application as it only defines a common structure, which could be followed by all standards of management systems.

Mihai D. and et al (2017) on their part conducted a research that proposed a new instrument designed to evaluate and communicate the maturity achieved by an IMS to properly respond to the requirements of its reference standards in a consolidated manner. They indicated that they had used the methodology proposed by Domingues P., Sampaio P., Arezes P. (2015) in which transmutation in the RGB color space (red–green–blue) of the process audit results were achieved under each standard, followed by the analysis of the IMS characteristics with tools specific to the color space based on the affinities between the two domains. They said, the methodology had two main components: the development of an algorithm for the evaluation and visualization of the integration maturity within IMSs and the testing of the methodology within a company as a case study in order to provide a form of validation of the tool and highlights of its features. They said the approach was mainly to highlight the level of MS integration achieved on common requirements of the component standards and to determine the extent to which they work together as a whole considering two standardized MSs – ISO 9001:2008 and ISO 14001:2004 as a reference standard.

2.7 Findings of the Researches done into IMS

Richard R., Helen L. and Werner E. (2015) have indicated that they identified five problem categories in their research done into documentation and information aspects of IMS on the example of a plastics manufacturing. These were (1) Different objectives (2) concentration of responsibilities on a few people (3) limited information value of key figures (4) low synchronization of documents and (5) absence of a coherent information database. As said, three of the identified five problem categories were concerned with a particular relevance of

information and documentation either directly or indirectly. They explained, low synchronization of documents and absence of a coherent information database had directly indicated problems of being inconsistent and partially having redundant documentation while concentration of responsibilities on a few people had indicated the aspect of knowledge concentration on individuals and an impaired availability of information to third parties. These researchers said, their research findings were in line with the findings of the literature they assessed.

Similarly, Mihai D. and et al (2017) have explained that they conducted a case study research to determine the extent to which components of an IMS went beyond the individual functional parts and developed synergy and emergence properties specific for a complex adaptive system considering two standardized MSs – ISO 9001:2008 and ISO 14001:2004 and RGB (Red-Green-Blue) colors. As they said the percentage results of individual MS audit on fulfillment of requirements were converted to mathematically computed chromatographic color scale 0 to 255 measuring two different movements in the life cycle of the system chosen - the initial certification (recertification of the quality system and the integration of the environmental system to complete it) and the first surveillance of the IMS conducted after one year.

As they said the result indicated that the two primary colors - red and green- when there was high MSs integration chromatically inclined towards yellow–gold and when there was low MSs integration inclined towards black, because the blue color, associated with occupational health and safety, was missed in order to make simple the mathematical operation and it was included in all performed calculations and operations with a 0 value, which brought it closer to the black area of the palette. To this end, they said, the opportunity to test the proposed algorithm dynamically was obtained benefitting from the advantage of a smaller number of variables in motion, the QMS already being stable. They also mentioned the advantage of the new instrument (solution) they developed was that it has enabled an improved quantification and a fine discretization of the integration maturity assessment unlike the existing models which had a focus more on a qualitative-subjective approach that divided maturity into classes, levels or categories.

On the other hand, John N. and Martelize H. (2016) cross referenced the work of Karapetrovic and Casadesus (2009:537) indicating that IMS was relevant to conformity assessment activities

in ISO 9001certified organizations. In addition, it has been said that, apart from the focus on overall system integration and improvement, the study done by Karapetrovic and Casadesus had confirmed that IMS necessitated a unified problem solving approach through effective management reviews and internal audits. As further explained, the study also concluded that the impact of IMS on conformity assessment activities was evident through customer satisfaction surveys, better allocation and deployment of human and information resources.

2.8 Effectiveness of ISO 9001:2015 and ISO 22001:2005

Evangelos L., Angelos P. and Dimitrios P. (2012) mentioned that their research findings confirmed the dimensionality of the ISO 9001 effectiveness (evaluated by the degree of achievement of the standard's objectives, namely prevention of nonconformities, continuous improvement and customer satisfaction focus) and revealed its significant contribution to the performance of the service companies. They also said that the product/service quality and operational performance of the service companies were directly and significantly influenced by ISO 9001effectiveness. However, as they said, the financial performance was directly influenced only by operational performance, while the impact of ISO 9001 effectiveness was indirect through its significant correlation with the operational performance.

On the other hand, Evangelos L. and Dimitrios P. (2015) identified that the ISO 22000 certified dairy companies significantly outperformed the non-certified with regard to the HACCP Food Safety System (FSS) effectiveness, in other words to the degree to which the objectives of HACCP were achieved. They concluded that managers of dairy Small and Medium Enterprises (SMEs), taking the advantage of the structured organization and the documented procedures provided by the ISO 22000 standard, could increase the level of achieving the objectives of the HACCP FSS i.e. HACCP effectiveness. They concluded, in doing so, dairy SMEs could set the foundations to optimize the conditions under which safe food is provided, minimize the possibility of food non-conformities and scandals, increase market share and consequently withstand the current downturn.

2.9 Benefits and Challenges of Implementing IMS

Alexandra S**.,** 2012 has cross referenced the work of Zeng and et al. (2007) that indicated the internal and external challenges and benefits when firms implement IMS. As said, the internal factors include human resources, organizational structure, company culture; understanding and perception while the external factors include technical guidance, certification bodies, stakeholders and customers and the institutional environment. In addition, Alexandra S**. (**2012) has indicated that Zeng and et al (2011) identified the internal benefits that the enterprises obtained in implementing an IMS which specified as decreased paperwork, decreased management cost, decreased complexity of internal management, simplified certification process and facilitated continuous improvement.

On the other hand, the ASQ has mentioned that QMS helped to coordinate and direct an organization's activities in order to meet customer and regulatory requirements and improve their effectiveness and efficiency on a continuous basis. ASQ has also mentioned that QMS has served many purposes, including improving processes, reducing waste, lowering costs, facilitating and identifying training opportunities, engaging staff, setting organization-wide direction. To this end, ISO 9001:2015 which specified requirements for QMS was explained as it was the most prominent approach to QMS.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Research Approach and Design

The research was conducted using qualitative and quantitative research methodologies in which descriptive research design was used. Based on this, the specific research design was single-case study design that enabled to undertake an in-depth study into the research topic.

3.2 Selection of Case Company and the Objective

The case company selection was done considering the implementation of IMS composed of two ISO based management system standards. Based on this, the Fafa Food Manufacturing Share Company (FFMSC) was selected as a case company of the research for it has been implementing two ISO based management systems composed of ISO 9001:2015 QMS and ISO 22001: 2005 FSMS.

3.2.1 Description of the Case Company - FFMASC

FFMSC was one of the pioneer and leading food manufacturing industries in Ethiopia (FFMSC Website - www.faffafood.com).

Establishment of the case company: The case company was established in Addis Ababa, around Saris area in 1962 having its former name 'Fafa Food Manufacturing Industry' (www.faffafood.com and FFMSC Strategic Plan, 2012). As explained, its establishment was as an Ethio-Swedish joint venture. It was further explained that the establishment objective was to reduce the risk of malnutrition among children in Ethiopia by producing low-cost and high protein weaning food.

Initial Capacity and Improvement: The initial capacity of FFMSC was 400 Mt/Y (FFMSC Strategic Plan, 2012). As the same document explained, FFMSC has first expanded its capacity in 1974 with an outlay of Birr 4.2 million through the support of the Swedish Government in which the capacity was raised to 12,000 Mt/Y in order to meet the observed demand of the market. It was further explained that it has also been renovated and expanded for the second

time in 1984 with an outlay of Birr 4.4 million supported from the same funding source and the capacity was enhanced to 21,600 Mt/Y so that to meet the then further increasing demand of the market. The current production capacity of the factory was indicated as it is 23,000 MT/annum (FFMSC Strategic Plan, 2012).

Ownership: Up until 1984, the ownership of the case company was under the government of Ethiopia (FFMSC Strategic Plan, 2012). However, it was indicated that on October 11, 1999, the company was re-established as a share company transferring Birr 38,594,000 total company capital which was managed under the public ownership to share company. It was said, following its re-establishment, it has undergone a lot of expansion and innovation works in order to meet the ever increasing demand of the market. As indicated, later on, in 2010, the ownership of the company was privatized to Petram PLC with Birr 63, 500,000 total capital. Hereafter, again, the company has undergone different plant renovation and product design and development works which aimed at enhancing the market competitiveness potential of the company through meeting the requirement and expectation of customers and regulatory and statutory requirements as explained within the strategic plan of FFMSC.

Facility Layout and Design: The facility layout and design of the case company was that considered flow of movement, materials handling, outputs needs, space utilization, receiving and shipping, safety, ease of communication and support (Site observation and FFFSC Facility Design and Layout, 2017).

Food Products of the Case Company: The food products of the case company were more than twelve types (FFMSC Strategic Plan, 2012). They include wheat flour, infant foods locally known as Faffa, Cerifams (Figure 1 and Annex 2), Dubei Duket, Famix and family foods locally known as Favena, Barley Mix, Corn Flakes, Snack Foods, Saba Soya Milk and other products such as Bread Improver (Magi Mix) which functions under the license of Lessafre Group[1]. In

Figure 1.Food Products of the case company
Source: www.faffafood.com

[1] It was established in 1853 in Northern France with a core business of production and distribution of yeast & yeast extracts world-wide; setting global standard for yeast and other fermentation products; and designing, manufacturing and marketing solutions that promote baking, nutrition and health.

addition, as per the information obtained from the strategic document of the case company, FFMSC provides services such as weigh bridge service, physical and chemical lab testing, roasting and milling services.

Transportation: The case company has its own trucks that collect raw materials from purchase centers in addition to the suppliers' trucks that deliver raw materials (FFMSC Strategic Plan, 2012). The same document has also indicated that FFMSC has vehicles which distribute finished products to sales agent centers. In addition, during site visit it has been observed that belt conveyors are used for all the processes of the plant factory.

Storage: The case company has 5 Silos in its compound (FFMSC Strategic Plan, 2012). The strategic plan has indicated that the 5 silos have a total storage capacity of up to 500 tons of raw materials. It also stated that the silos have pre-cleaning, sieving, and aeration facilities. In addition, it has indicated that FFMSC has temporary raw material storages in process lines.

Quality and safety assurance and control: The case company undertakes physical, chemical and biological tests on all raw materials supplied by a truck starting at acceptance time in order to make quality control check (FFMSC Quality Manual, 2017). In addition, it has been indicated that when necessary the company refers to national and international standards for additional quality tests.

Laboratory: The case company has well equipped laboratory that undertakes chemical, physical and microbiological tests in order to make a quality control check as observed during site observation. The laboratory has well organized test result recording and documenting system for all the tests that have been conducted in the laboratory (FFMSC Quality Manual, 2017). As observed during site visit, these include different forms and log books designed for recording laboratory results. It has been also observed during site visit that the laboratory has been well equipped with laboratory devices such as temperature control devices, flow meters, control boards, etc. As seen directly in the laboratory room, most of the laboratory equipment are digital devices while some of them are capable to produce charts.

Machinery: The case company has machineries such as magnetic separator, circular roasters, drum dryer, bed dryers, extruders, milling, mixing and packing machines (FFMSC Strategic

Plan, 2012). During site visit, it has been also observed that mixing machines of the company are fully automatic, while the packing machines are semi-automatic.

Laundry: During site observation, it has been observed that the case company has a laundry room in which a laundry machine has been installed in order to wash clean the factory workers work-time clothes such as guan and others. Such service is provided to all workers that work in close contact with the product production processes (Site observation and FFFSC Facility Design and Layout, 2017).

Customers: The customers of the case company include disaster risk management and food security sector of Ethiopia, WFP, World Vision Ethiopia, UNHCR, CARE Ethiopia, Save the Children and Non-governmental Aid Organizations, supermarkets, shops, and the public at large (FFMSC Strategic Plan, 2012). The same plan has also indicated that the product beneficiaries are the public and vulnerable people such as infants, family and famine victims, displaced people, refugees, etc.

Process steps: The case company's main product process steps include receiving raw materials, pre-cleaning and storage, transportation of raw materials through conveyers to intermediary storage, secondary cleaning, roasting, grinding, milling, (extruding, optional), mixing, packing, and storage (FFMSC Operating Procedure Manual, 2017). The different product lines have different process steps as observed from the existing process flow diagrams of different product lines of FFMSC. An example of the process step has been presented in Annex 6.

Scaling and packing: The size of scaling and packing ranges from 0.05 kilogram to 50 kilogram, depending on the types of products and the requirement of the market (FFMSC Operating Procedure Manual, 2017). Connected with this, it was observed during site visit that the bag filling operation is automatic while sealing and packing operations are semi-automatic or using hand movable sealing machine.

Management Structure: The organizational structure of the case company from top to bottom was as described herein under (FFMSC Strategic Plan, 2012):

The organization has at the top board of directors followed by Director General Position which has two Deputy Director Generals under it – one for support work and the other for operations

work. Each of the two deputy general director positions is responsible for the division structured under it (Annex 7). The summary is presented below.

Deputy Director General Position for Operations

- Commercial department – responsible for managing marketing and sales distribution divisions structured under it,
- Manufacturing department – responsible for technical, production, and production planning divisions structured under it,
- Procurement & material management departments – responsible for procurement and materials management division,
- SHEQ Service –responsible for quality control and assurance, Safety & Environmental Quality divisions. This could have been combined into one box using the approach of integration as separate boxes could duplicate efforts.

Deputy Director General Position for Operations

- HRD department – responsible for HR Service & People Development Division and Employee Relations & General Service Division,
- Finance Department – responsible for Financial Accounting, Cost & Budget and Management Accounting Divisions,
- Strategic Planning & business development service,
- IT service.

Staffing: Currently, the case company has a total of 284 (F= 86, M= 198) permanent staff, among which 19 professionals have MA, BA and BSC while the other 33 are semi-professionals having diploma and certificates (FFMSC HR Manual, 2017).

Implementation of IMS: The case company has been implementing IMS composed of ISO 9001:2015 quality management system and ISO 22001:2005 food safety management system in order to meet quality and food safety requirements of the food products it produces and supplies to the market (ISO 22001 FSMS audit report November, 2017). The company was first certified for implementing ISO 22001:2005 in April, 2008 by the accredited body called South Africa

Bureau of Standards (SABS) and audited in November, 2017 (ISO 22001 FSMS audit report April, 2008). The ISO 22001:2005 food safety management system includes within it the HACCP principles, PRP such as GMP and GHP and oPRP other than it provides the requirements for food safety. In addition, the company has been certified for implementing ISO 9001:2008 in March, 2015 by the United Kingdome (UK) based certification body called ISOQAR which itself was accredited by UKAS (The United Kingdom Accreditation Service) (ISO 9001 QMS audit report March, 2015). Accordingly, the organization has been audited of its ISO 9001:2008 in November, 2017 and certified for implementing ISO 9001:2015 which is the newly revised version of the ISO 9001:2008 (ISO 9001 QMS audit report November, 2017). During the document review process, it has been observed that auditing of the ISO 9001:2015 QMS and ISO 22001: 2005 FSMS was done on a separate bases for each of the management systems.

3.3 Target Population

The research target population was composed of 283 employees that work for FFMSC and 8 suppliers that supply raw materials to FFMSC, 25 whole sellers and retailors that whole sale and retail products received from FFMSC and all end users that finally use the food products of FFMSC.

3.4 Sample, Sampling Technique and Sample Size Determination

Sample: The sample of the single case study was that considered the existence of IMS knowledge with the target population as well as the experience and the direct involvement which the target population had in effecting the implementation of IMS. This was because of IMS is a new approach that requires to have a thorough knowledge concerning its theoretical bases and for so far existing practices and experiences. In addition, the literacy and understanding capacity of the target populations has been well considered for it was necessary to be sure that the sample should be the one that understand and give response to the survey questionnaire. The sample was also made to consider the composition of representatives and it was made to include the staffs working for FFMSC at management level, technical and non-technical level to which HACCP team members, raw material suppliers, product sales agents/retailors and end users were included.

Sampling Technique: The sampling technique used were mixed types - random sampling and purposive sampling techniques. Based on this, random sampling was used to sample the case company technical staff, raw material suppliers, product sales agents/retailors and end users while purposive sampling technique was used to sample management level staffs of FFMSC. In addition, random sampling technique was used to sample focus group discussion and key informant interview participants, respectively, from non-technical staff of the FFMSC, raw material suppliers of FFMSC, product sales agents/retailors of FFMSC and end users (community members).

Sample Size Determination: The sample size determination was made using the confidence interval method formula $n = (ZS/E)^2$ where: n = sample size, Z = standardization value indicating the confidence level, S = the sample standard deviation and E = the desired precision level in estimating the population parameter (P.N. Arora and S. Arora, 1994).

3.5 Data Sources

The data sources of the research were primary and secondary data sources. The primary data sources were the employees of the case company who were the respondents of questionnaires. In addition, the case company raw material suppliers, product sales agents/retailors and end users (mothers) were considered as primary information sources of the research involving them in FGDs and KIIs. The case company's records and documentations which included policy documents, manuals, written procedures, standards, reports, records of customer complaints, records of non-conformities, records of quality cost, management review and audit documents were also considered as a secondary data sources on top of the reviews made to different research results and government data sources. Other than the mentioned ones, the data source has also included the researchers' own onsite observation and perception.

3.6 Instruments of Data Collection

The data collection instruments were composed of questionnaire, focus group discussion, key informant interview questions and tabulated format that used to collect data on return of products as customer complaints and cost of quality.

The content structure of the questionnaire was that considered options of responses which were composed of multiple choices, scaling and scoring as Strongly agree (5), Agree (4), Neutral (3), Disagree (2) and Strongly Disagree (1) using five-point Likert scale and as very good (3), good (2) and poor (1) using a three-point Likert scale.

Pre-hand prepared 5-6 key questions were used to gather information from FGDs in which a manageable group size composed of 12 (F=4, M=8) non-technical staffs of the case company were made to discuss on points of discussion based on the knowledge, experience and involvement they have on IMS and the raised issues were captured by the researcher. Similarly, pre-hand prepared 5-6 key informant interview questions were used to gather information from the case company long stayed knowledgeable staff, raw material suppliers, sales agents/retailors of products and end users. In addition, tabulated data collection format was used to gather data on product return as customer complaints, product non-conformance and quality cost data.

3.7 Procedures of Data Collection

The data collection procedure was first presenting to the case company office - FFMSC a letter of cooperation written from St. Mary University Institute of Quality and Productivity Management Office. This was followed by communicating and briefing the director of the case company on the importance of the research and on the need of getting the company cooperation to undertake the research within the case company and also to facilitate the situation in which departments, sections and staff of the case company cooperate and make full participation in the research conducted.

3.8 Pilot Study

Pilot study was conducted within the case company through distributing the research questionnaire to randomly sampled five technical and managerial level staff of FFMSC in order to check the applicability and understandability of the questionnaire and to determine the time it took to fill in per individual.

3.9 Response Rate

The response rate of the respondents to the distributed research questionnaire was 100 percent out of the total 13 technical staff of FFMSC who are working at different responsibility levels.

3.10 Method of data analysis

The data collected through distributing questionnaire was organized, categorized and processed using SPSS version 24 application software and MS Excel 2013 for different SPC analysis and working-out statistics such as mean, standard deviation, standard error of mean, variance, Cronbach's alpha for data reliability and validity test and RII for identifying relative importance of the contributing factors and ranking, at least, ten of the most contributing ones based on the responses of the questionnaire respondents. Correlation analysis was also done in order to see the type and level of association between and within the data under consideration. In addition, analysis was done on the response data taking into consideration the requirements given in ISO 9001:2015 and ISO 22001: 2005, respectively, for quality management system and food safety management system.

Other than this, the information gathered through FGD, KII and onsite observation were organized, categorized and then triangulated with the data gathered through questionnaire for the sake of assuring data consistency and reliability in representing and defining the subject of the research.

3.11 Reliability and Validity Test

The reliability and validity test of the response data collected through distributing questionnaire was checked computing Cronbach's alpha 0.866 using SPSS version 24. In addition, the information collected using FGD, KII and onsite observation was triangulated with the response data for the purpose of assuring data consistency and reliability in representing and defining the issue under the research.

$$RII = \sum_{i=1}^{5} \boldsymbol{Fi} \quad , \frac{(W1 + W2 + W3 + ...+ Wn)}{A*N}$$

(**Source**: Cronbach L. J, 1951)

Where;

Fi = Factor (initial – 1-5)

RII = Relative Importance Index

W = the wearing (score given to each scale) given to each factor by the respondent such as Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2 and Strongly Disagree = 1.

A = Total number of respondents,

N = Total number of questionnaire.

3.12 Ethical Consideration

All citations made in the research report have been duly acknowledged. In addition, data collection was done keeping the integrity of the case company – FFMSC, respondents, participants of key informant interviews and focus group discussions.

3.13. Data Analysis and Interpretation

The data gathered from the records of the case company on the process of quality and safety assurance and control was analyzed and interpreted first understanding and identifying the key product characteristics which have been critical to customers or key process variation using the key steps of SPC implementation principles and the methods outlined by the Managers-Net and Gold-Practice (2008) (Figure 5). Based on this, the type of data collected for the SPC analysis was determined as variable and attribute data defining the variable data as the data obtained from measurements on a continuous scale, such as: temperature, weight, density, etc and the attribute data was defined as the data that have discrete distinctions such as good/bad, accept/reject, percent of moisture content, percentage defective, or number of defective per hundred, etc. This step of data analysis was followed by the characterization of the process data variation as natural (common) or assigned (special) variation of the attributes. The variable and attribute data obtained this way was computed and worked out of their SPC charts in order to see whether the food manufacturing process is controlled

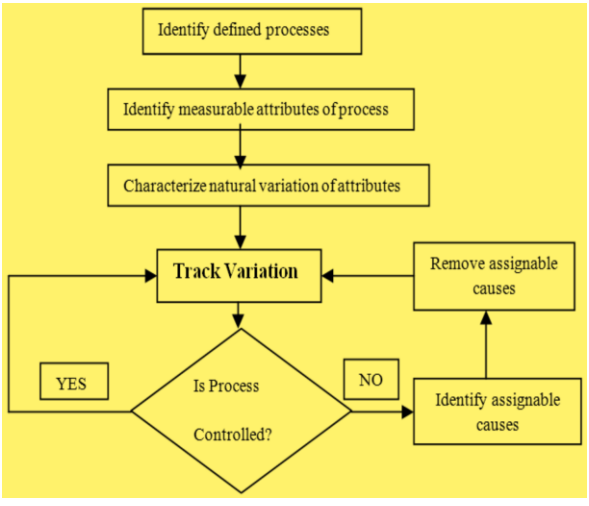

Figure 5. Steps of Data Analysis and Interpretation
Source: Managers-Net and Gold-Practice (2008)

indicating that the quality and safety of the food products was within the set requirements.

On the other hand, the data which has been collected using questionnaire related to the IMS of the case company was analyzed and interpreted first processing frequency, mean, variance, standard deviation, standard error of mean, correlation and Cronbach's alpha for reliability and validity check of the response data using SPSS version 24. Then this result was triangulated with the information gathered through FGD, KII and onsite observation techniques for the purpose of assuring data consistency. Finally, the obtained result was compared with the food quality and safety requirements of ISO 9001:2015 and ISO 22001:2005 rearranging and integrating the two management requirements for the study purpose. The result of the comparison was interpreted in terms of what the implication has referred to in meeting food quality and safety requirements, regulatory and statutory requirements, customer needs and expectations, reduction of quality cost and customer complaints, reduction of rework and return of products, enhancing market competitiveness and profit maximization. In addition, the contributing factors for the success have been worked out and identified computing RII based on the wearing given to each level of scale by the respondents using the given formula. Then the obtained result was ranked using Excel Application Software 13 in which the first ten ranked factors were selected as the most contributing factors for the effective implementation of IMS.

CHAPTER FOUR

4. RESULT AND DISCUSSION

4.1 Demography of the Respondents

The descriptive statistic of the respondent data showed that 84.6% (11) and 15.4% (2), respectively, were male and female. Similarly, the age ranges of the respondents were between 26-32, over 40 and between 33-39 years, respectively, for 61.5% (8), 30.8% (4) and 7.7% (1). This has indicated that the majority of the employees of the case company were at younger age (less than 30 years) followed by adult age (over 33 years) and being dominated by male employees.

On the other hand, the composition of the educational status of the respondents was BA/BSC Degree and above, Diploma and 1-4 grade, respectively, for 69.2% (9), 23.1% (3) and 7.7% (1) (Figure 6). This has indicated that the dominant number of technical employees has the educational status of BA/BSC Degree and above especially who have been working as a top management member level, lab head & technician, production manager, etc while the rest have a lower level of educational status. The data analysis has also shown that 53.8% (7), 23.1% (3), 15.4% (2) and 7.7% (1) of the respondents have worked, respectively, for 1-5, over 17, 6-11 and 12-16 years within the case company implying that most of the employees have long stay within the case company the minimum and maximum being, respectively, in a range of 1-5 years and over 17 years.

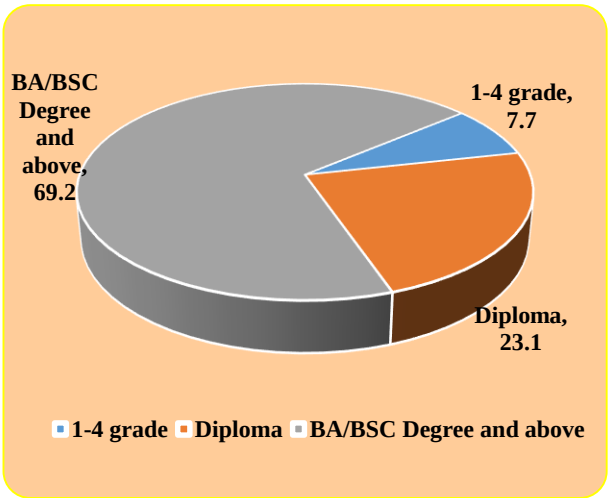

Figure 6. Educational Status of Respondents
Source: Research Data

In addition, the descriptive statistics has indicated that 30.8% (4), 23.1% (3), 15.4% (2), 15.4% (2), 7.7% (1) and 7.7% (1) of the respondents, respectively, had a responsibility of supervisor, lab technician, worker, deputy manager, quality manager and other assignment not specified in

the questionnaire. This has implied that the composition of the technical employees was that represented all level working employees of the case company. In addition, the non-technical employees of the case company were made to participate in FGD and KII and the result was triangulated with the information generated through questionnaire. This has enabled to include all level working employees of the case company.

4.2 Implementation of IMS

The results of secondary and primary data analysis has indicated that the case company (FFMSC) has implemented two ISO based QMSs - ISO 9001:2015 QMS and ISO 22001:2005 FSMS. This has been confirmed by 92.3% (12) of the respondents. Accordingly, IMS has been implemented by the case company for 4-years and above, 3-years and 2-years, respectively, as responded by 46.2% (6), 30.8% (4) and 23.1% (3) of the respondents of the questionnaire. The given response was varied indicating that the employees have no equal information about the situation went-on within their own company despite the majority of them worked for long within the company. This may be considered as the case company's gap for the reason that such an issue could happen from lack of update on organizational information as stated in ISO based QMS.

Concerning the reason for implementing IMS by the case company, 61.5% (8), 23.1% (3), 7.7 (1) and 7.7 (1) of the respondents, respectively, said the reasons were (all proposed reasons - build positive image, gain growth & competitiveness and engage in continuous improvement), engage in continuous improvement, gain growth and competitiveness and build

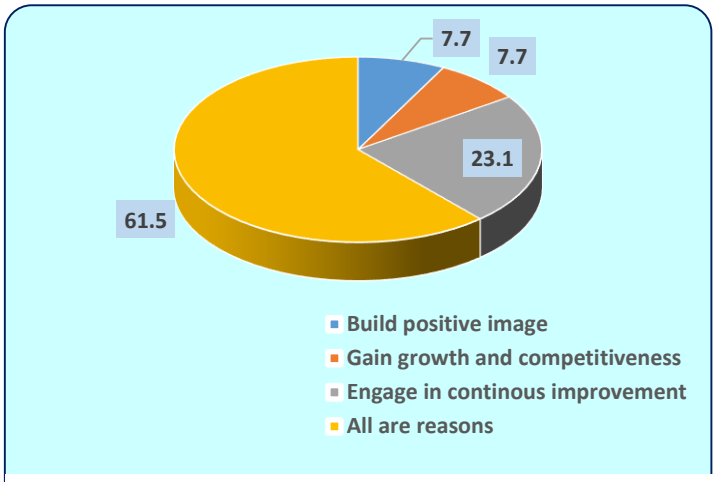

Figure 7. Respondents Response Why FFMSC Implemented IMS
Source: Research Data

positive image (Figure 7). The given response has generally indicated that the main reasons for implementing the IMS by the case company was a combination of building up positive image, gain growth & competitiveness and engage in continuous improvement.

4.2.1 Satisfaction on the Implementation of IMS

The gathered data group was checked for internal consistency computing cronbach's alpha using the formula given on page 34 and the value was found to be 0.869. This has shown that the data was true representative to explain the issue under study. The aggregate mean and SD were also computed and found to be 4.43 and 0.6, respectively. This has indicated that the distribution of data had central tendency. In addition, the correlation analysis was done and indicated that the establishment of QFSMS was positively and strongly correlated with defining management scope (r=0.804) and documentation of QFSMS (r=0.716) showing that defining scope and documentation were important for the establishment of QFSMS within the case company.

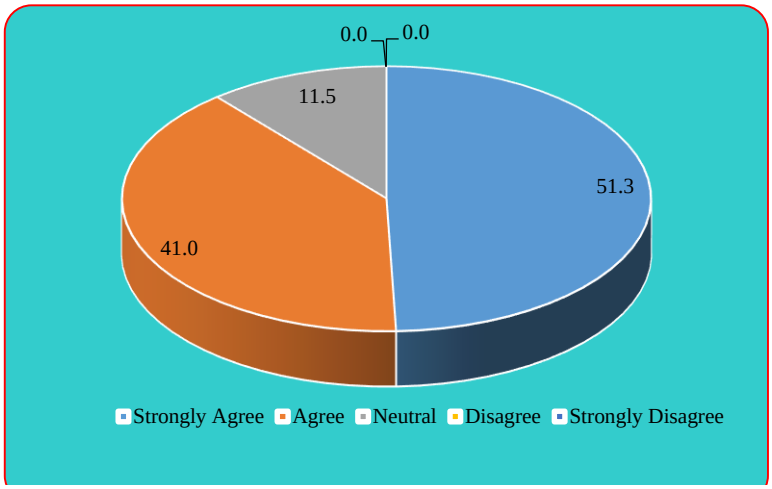

Figure 8. Satisfaction of Respondents on the Implemented IMS
Source: Research Data

On the other hand, respondents have scored their satisfaction on the implemented IMS of the case company using five level scaling and scoring system (Annex 10 and Figure 8). Based on this, the result has shown that most of the respondents reflected a feeling of '*Strongly Agree*' to the statements that specify the implementation of the specific management requirement on left side of the table. As a result, the aggregate percentage score that responded '*Strongly Agree*' was 51.3 while for '*Agree*' it has been 41.0. This has indicated that the employees have satisfaction with the implemented IMS of the case company. Similarly, the non-technical employees of the case company that participated in the conducted FGD and KII have indicated that they have satisfaction with the implemented IMS of the case company. Nevertheless, the questionnaire respondents have reflected a feeling of medium satisfaction '*agree*' scoring 41%. This has indicated that the case company has gaps in

fully meeting the requirements and expectations of its internal customers (the employees) on some of the requirements. In addition, an aggregate score of 11.5 was identified for the respondents that responded '*neutral*' indicating that they have no information or they were not confident to explain about the implementation of requirements.

This was also identified as the other gap of the case company because of the observed problem might have happened as a result of the lack of assuring that all employees were well updated on the day-to-day situation of their company.

4.2.2 Satisfaction on Management Responsibility

The calculated cronbach's alpha for this data group was 0.866 indicating that the data had internal consistency to be a true representative of the issue it represented. In addition, the aggregate mean of the data was also found to be 4.22 and the highest SD 1.08 showing that the data distribution was normal except for the indicated SD value. On the other hand, the correlation analysis done on the group data has shown that the commitment of FFMSC to QFSMS had positive and strong correlation with communicating QFSMS policy, ensuring planning & integrating QFSMS, appointing QFST leader with specified responsibility & authority and reviewing QFSMS with a correlation value, respectively, r =0.618, r =0.629, r =0.674 and r =0.777. This has indicated that the commitment of the case company related to the correlated activity areas was very satisfactory.

Nevertheless, the analysis done on the satisfaction of employees on the management responsibilities has indicated that the aggregate individual percentage of responses expressed in terms of '*Strongly Agree'*, '*Agree*', '*Neutral*' and '*Disagree*', respectively, was 40.4, 44.2, 12.5 and 7.7 (Annex 11 and Figure 9). This has shown that the overall satisfaction of the respondents was medium as the highest score value (44.2) was given to '*Agree*'. As identified from the responses the employees of the

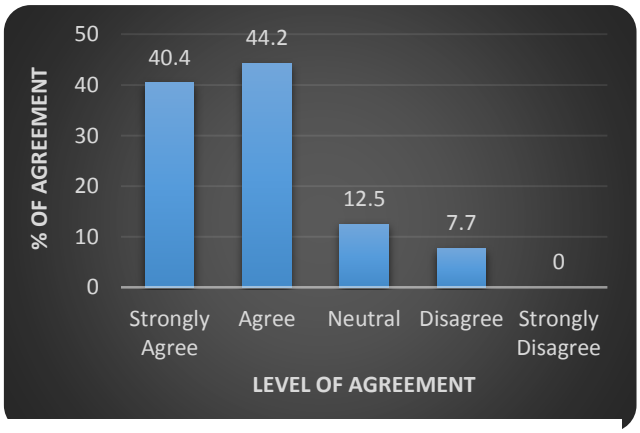

Figure 9 Respondents Satisfactions on Management Responsibility.

Source: Research Data

company, the main reasons for medium level satisfaction was not being fully satisfied in the area of ensuring planning, defining responsibility, effective communication and establishing procedure for potential emergency situations within the case company.

On the other hand, there were respondents that expressed their feeling as '*neutral*' with an aggregate percentage score value of 12.5. This has indicated that the employees have no information or they were not felt confident to suggest ideas on the case company's meeting the specific requirements related to management responsibility. Hence, it was considered as a gap of the case company for it might have been happened as a result of the lack of involving or not updating employees on the implementation of key requirements. In addition, there were also respondents that have expressed a feeling of '*Disagree*' with an aggregate score value of 7.7. The reason analyzed from these specific respondents has indicated that the feeling of 'Disagree' was responded because of the employees were not well satisfied by the action taken in the area of appointing QFST leader, establishing procedure for potential emergency situations, review of IMS progress and updating information on continuous bases.

4.2.3 Satisfaction on Resource Management (HR, Finance & Material)

The consistency of the data was calculated using cronbach's alpha for which the value was found to be 0.730. It has indicated that the data was a true representative of the issue under discussion. The aggregate mean of the data was 4.13 and the highest SD of the data distribution was 0.899 indicating that the data has normal distribution. In addition, the correlation analysis done on the data has shown that providing adequate resources for the QFSMS positively and mildly correlated ($r = 0.589$) with the competence of QFST and other personnel while the latter one had strong correlation ($r = 0.714$) with providing resources for infrastructure and the work environment of the QFSMS. This has shown that resource allocation had been very important to have competent team and personnel who would have a paramount importance for establishing, managing and maintaining of the infrastructure and the work environment needed for implementing the requirements of QFSMS in the case company.

On the other hand, the analysis done on the data of respondents indicated that the case company has fulfilled the required resources for the implementation of the IMS. Based on this, most of the respondents expressed their feeling on the fulfilment of the required resources to the level of '*agree*' with an aggregate percent score of 46.2. This was because of the requirements were not implemented to their full satisfaction (Figure 10 and Annex 12). On the other hand, respondents have reflected a feeling of '*strongly agree*' with aggregate percent score of 34.6 indicating that the requirements were well implemented to their full satisfaction. To this end, the overall satisfaction level on the implemented requirements of resource management was to the level of '*agree*' with an aggregate percent score of 46.2. As identified, the reasons for not being well satisfied with the implemented resource management were being less satisfied in the area of providing adequate resources for updating of IMS, competency of QFST members and other personnel, providing training on identified personnel competency area and allocation of resource for management and maintenance of infrastructure.

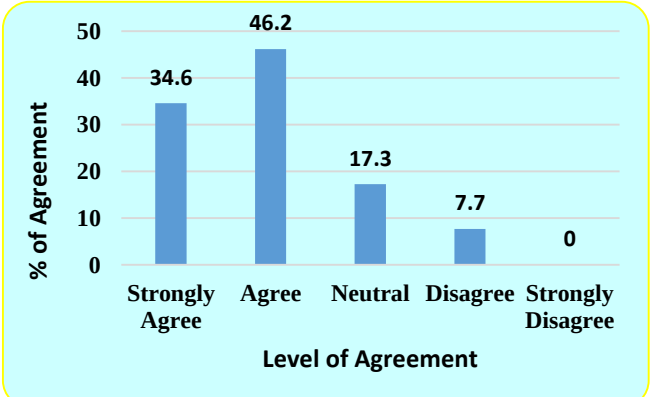

Figure 10. Satisfaction of Respondents on Resource Management

Source: Research Data

There were also respondents that reflected a feeling of '*neutral*' and '*disagree*' with aggregate percent score of 17.3 and 7.7, respectively. The reasons for feeling '*neutral*' might be the respondents had shortage of information or they might have not felt confident to speak out satisfactory implementation on the requirements. Similarly, the feeling of '*disagree*' was reflected by the respondents due to not satisfied on the implementation of specific requirement in the area of management and maintenance of infrastructure and the work environment needed to implement the requirements of ISO.

4.2.4 Satisfaction on Planning and Realizing Quality and Safe Products

The data group studied under this topic had 0.904 cronbach's alpha showing that the data had been internally consistent and it was a true representative of the topic under study. The aggregate

mean of the data was 4.26 with the highest SD 0.987 and this has indicated that the data distribution was normal. In addition, correlation analysis has shown that the followings:

- Collecting and documenting needed information was positively and strongly correlated (r = 0.754) with implementing and ensuring effectiveness of planned activities within the case company indicating that documenting information related to the way activities were planned and implemented help to assure effectiveness because of it enhances cross checking and learning.

- Appointing multidisciplinary QFST was positively and strongly correlated (r = 0.681) with collecting, documenting and updating needed information showing the importance of capturing and updating the necessary information for the work of QFST in the case company.

- Describing product characteristics was positively and strongly correlated (r = 0.819 and r = 0.786), respectively, with implementing & ensuring the effectiveness of planned activities and with appointing multidisciplinary QFST indicating that QFST was expected to describe product characteristics and implement & ensure the effectiveness of planned activities.

- Describing process steps & control measures was positively and mildly correlated (r = 0.503) with collecting, documenting and updating needed information showing that QFST has described process steps & control measures for collecting needed information in the case company.

- Conducting hazard analysis & determining the type of hazard, degree of control and the needed combination of control measures by the QFST was positively and strongly correlated (r = 0.761, r= 0.778, r= 0.619), respectively, with implementing & ensuring the effectiveness of planned activities, with collecting, documenting and updating needed information and with describing process steps & control measures activities indicating that making ready the necessary information and implementing planned activities were very important for hazard analysis and determining control measures.

- Documenting oPRP specifying all the necessary information was positively and mildly to strongly correlated (r= 0.549, r= 0.783, r= 0.539, r= 0.729), respectively, with implementing and ensuring effectiveness of planned activities, with collecting, documenting and updating needed information, with appointing multidisciplinary QFST and with describing product characteristics indicating that oPRP was done by QFST collecting needed information, describing product characteristics and implementing planned activities within the case company.

- HACCP plan documented the hazard to be controlled, CCPs, control measure(s), critical limit(s), monitoring procedure(s), corrections and corrective action(s) to be taken, responsibilities and authorities, record(s) of monitoring at the CCP was positively and mildly correlated (r= 0.591) with QFST conducted hazard analysis & determined the type of hazard, degree of control and the needed combination of control measures indicating that QFST has undertook hazard analysis to work out the HACCP plan within the case company.

- FFMSC updated product characteristics, intended use, flow diagrams, process steps and control measures following the establishment of operational PRP(s) and/or the HACCP plan was positively and strongly correlated (r= 0.658) with HACCP plan documented the hazard to be controlled, CCPs, control measure(s), critical limit(s), monitoring procedure(s), corrections and corrective action(s) to be taken, responsibilities and authorities, record(s) of monitoring at the CCP indicating that FFMSC has updated HACCP planned information.

- Verification planning defined purpose, methods, frequencies and responsibilities for the verification activities was positively and mildly to strongly correlated (r= 0.582, r= 0.658, r= 0.927, r= 0.697), respectively, with collecting, documenting and updating needed information, with describing product characteristics, with documenting oPRP specifying all the necessary information and with FFMSC updated product characteristics, intended use, flow diagrams, process steps and control measures following the establishment of operational PRP(s) and/or the HACCP plan indicating

that checking was done whether needed information was available & updated as required.

- FFMSC established and applied a traceability system was positively and strongly correlated (r= 0.801, r= 0.717), respectively, with FFMSC described process steps, control measures & prepared flow diagrams for the products or process categories covered by the QFSMS and with HACCP plan documented the hazard(s) to be controlled, CCP(s), control measure(s), critical limit(s), monitoring procedure(s), corrections and corrective action(s) to be taken, responsibilities and authorities, record(s) of monitoring at the CCP indicating that the establishment and application of traceability system was done describing and documenting the necessary steps & the control measures to be taken.

- FFMSC ensured affected products identified and controlled with regard to their use and release was positively and mildly to strongly correlated (r= 0.760, r= 0.597, r= 0.629 and 0.556), respectively, with FFMSC appointed multidisciplinary QFST, described process steps, control measures & prepared flow diagrams for the products or process categories covered by the QFSMS, with HACCP plan documented the hazard(s) to be controlled, CCP(s), control measure(s), critical limit(s), monitoring procedure(s), corrections and corrective action(s) to be taken, responsibilities and authorities, record(s) of monitoring at the CCP and FFMSC established & applied traceability system indicating that FFMSC has ensured the identification and control of affected products through appointing QFST and describing the process steps & control measures it should do.

On the other hand, the respondent data analysis has shown that 42.3, 43.6, 14.6 and 7.7 of the respondents were, respectively, reflected a feeling of '*strongly agree*', '*agree*', '*neutral*' and '*disagree*' (Figure 11 and Annex 13). This has indicated that the satisfaction of respondents on the implemented planning and realizing quality and safe products of the case company was medium. The reasons identified for medium level satisfaction were not being well satisfied on the effectiveness of planned PRP, oPRP and HACCP activities, describing and updating product

characteristics, conducting hazard analysis and ensuring affected products were identified and controlled.

In addition, the aggregate percent value of 7.7 was identified as the respondents' feeling of '*neutral*'. This has implied that these employees have had no equal information or their participation and understanding on planning and realizing quality and safe products within the case company was low that couldn't enable them feel confident to speak it out. Despite the result has shown this, the non-technical employees participated on FGD and KII have witnessed that all employees had involvement and updated information on planning and realizing quality and safe products. Nevertheless, it was considered as a gap of the case company as there was a need on the company side to make sure that all employees have involvement and access to information.

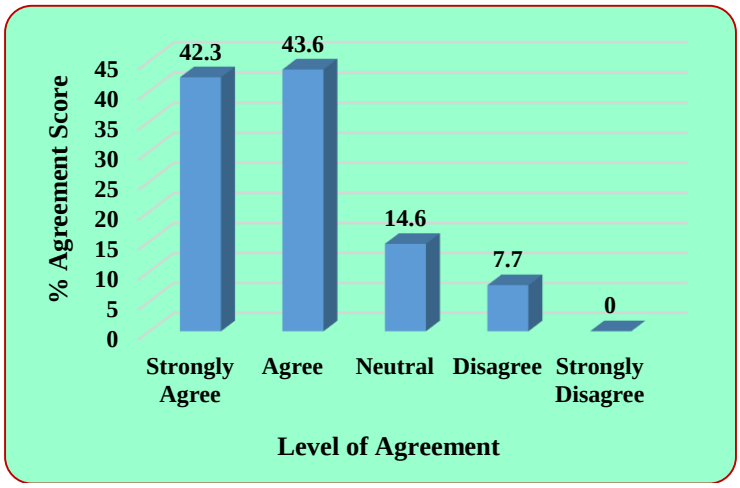

Figure 11. Satisfaction of Respondents on Planning and Realizing Quality and Safe Products

Source: Research Data

4.2.5 Satisfaction on Validation, Verification and Improvement of IMS

This group data was calculated of its cronbach's alpha as 0.795 and this has shown that the internal consistency of the data was acceptable indicating its true representativeness for the topic under study. The data had been also calculated of its aggregate mean and highest SD and found to be 2.76 and 0.899, respectively, indicating that the data had normal distribution.

In addition, the correlation analysis done on the data has shown that systematic evaluation QFST on the individual results of planned verification and results of verification activities, including the results of the internal audits and external audits was positively and strongly correlated (r= 0.612, r= 0.787), respectively, with QFST planned & implemented the processes needed to validate control measures and/or control measure combinations & to verify & improve the QFSMS and with FFMSC conducted management review and internal audits at planned intervals to determine whether the QFSMS conforms to the planned arrangements, to the food safety

management system requirements established by FFMSC, and to the requirements of the international standard (IS) and was effectively implemented and updated indicating that the systematic evaluation of QFST was implemented. The same correlation analysis has shown that ensuring continued effective improvement by the top management of FFMSC through communication, management review, internal audit, evaluation of individual verification results, analysis of results of verification activities, validation of control measure combinations, corrective actions and updating QFSMS was positively and mildly correlated (r= 0.558) with conducting management review and internal audits at planned intervals to determine whether the QFSMS conforms to the planned arrangements, to the food safety management system requirements established by FFMSC, and to the requirements of the international standard (IS) and that it effectively implemented and updated indicating that ensuring continued effective improvement by the FFMSC top management had required conducting management review and internal audits at planned intervals to determine whether the QFSMS conforms to the planned arrangements, to FSMS requirements, international standard requirements and that it should be effectively implemented and updated.

The result of the analysis done on the respondents' data has shown that the respondents had generally medium satisfaction on the implementation of requirements related to validation, verification and improvement of IMS having an aggregate percent value of 51.9 for a feeling of '*agree*' (Figure 12 and Annex 14). The reason was not being fully satisfied on QFST planned control measures, conducting management review and internal audits and systematic evaluation activities of QFST.

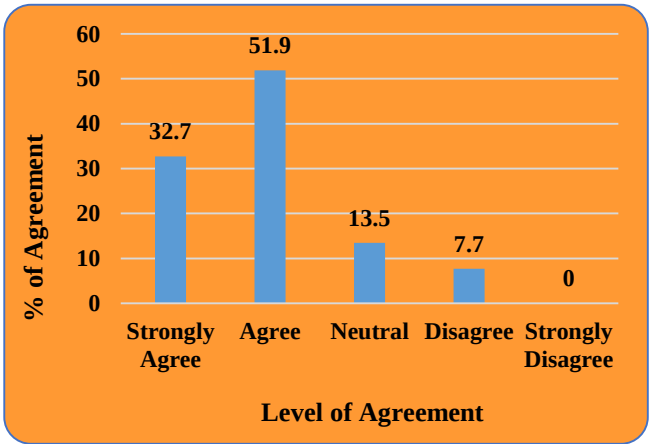

Figure 12. Satisfaction of Respondents on Validation, Verification and Improvement of IMS
Source: Research Data

Further, the data analysis has also shown that there were respondents that reflected a feeling of '*neutral*' and '*disagree*', respectively, with an aggregate percent score value of 13.5 and 7.7, respectively. The reason for reflecting a feeling of '*neutral*' by these respondents was explained

as having no enough information on the subject area or their participation and involvement in such activities within the case company was very low that couldn't develop their feeling to tell others about the performance of the implemented requirements in the subject area. Similarly, the reasons for the respondents that reflected a feeling of '*disagree*' with an aggregate percent score value of 7.7 were explained to be due to the respondents not felt satisfied on the conducted management review, internal audits and in ensuring continual improvement of the effectiveness of IMS.

4.3 Effectiveness and Performance of the Implemented IMS

4.3.1 Internal and External Customers Satisfaction

Internal Customers Satisfaction: It has been identified that 53.8% (7) of the respondents felt that they and their colleagues satisfied on the implemented IMS of the case company while 46.2% (6) of the respondents felt that they were satisfied moderately (Figure 13). They have reasoned out that their satisfaction was in the area of encouraging and giving recognition to teamwork, provision of training to employees, existence of continuous improvement on the implemented IMS, company management culture and availing the needed resources for the work. Similarly, the non-technical employees participated in FGD have explained the following satisfaction on the case company management:

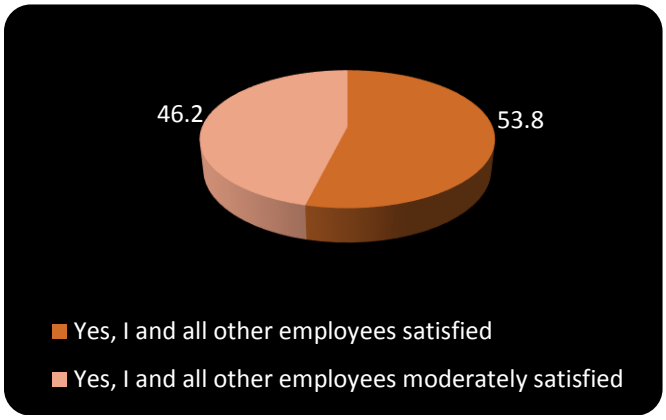

Figure 13. Satisfaction of Respondents and their Colleagues on the Implemented IMS

Source: Research Data

- The management of the case company cares for the employees; which has enabled some of them to stay in the company for over 35 years,
- Some key employees were given job opportunity even after they retired from their work because of the employees effort was recognized by the management eg- the case of lab technician was indicated as one of the examples; who after retirement recruited with a higher salary by the company.

- Training and briefing was provided to them on the way they do their work, handle customers, how they should care for quality and safe product processing and handling, etc,
- The management respects the rights of the employees and keeps its commitment in providing employees' benefits as per the agreement entered with the association of the company employees,
- Management has empowered the employees and has trust on the employees' work – as mentioned this has made the employees feel as the owner of the company.

External Customers Satisfaction: The external customers (suppliers, sells agents and end users) who participated on KII have explained their satisfaction on the services and products of the case company (Source: Research data). They have mentioned that the company had good work relationship with customers indicating the followings were its good practices:

- The handling of employees was very friendly and equal to all as all KII participant said,
- Payment was paid for the purchased raw materials without delay as suppliers said,
- Return products that have defects of packaging, missed stamp of expiry date and products spoiled before their expiry date were exchanged with new ones for free without any bureaucracy as sells agents said,
- The management level employees such as director general, deputy directors general and section heads are easily accessible and have open door policy to communicate and take comments from the customers as all participants said.

The participants have also mentioned that there were complaints which they received from retailors and end users related to the costly price of the products and sometimes related to fixing long expiry date while the products spoiled ahead of the date of expiry date (Source: Research data). As said by the sells agents, the longer expiry date products has been shortened from one and a half year to one year for those products identified to have such problem giving attention to the complaints. Nevertheless, the price related complaint was not got solution yet because of the national and international level cost of raw materials has got escalated as time went on instead of getting better.

4.3.2 Quality and Food Safety Control and Assurance

4.3.2.1 Quality and Food Safety Process Control

Policy: The case company (FFMSC) has established its policy stated as Integrated Food safety and Quality Policy which has been approved by the Director General of the company and made known to its internal and external stakeholders being fixed on the wall of all departments and sections in visible areas (FFMSC Revised Quality Policy, 2017). The policy has stated that it is strongly committed to produce and provide safe, nutritious and high quality pre-cooked and blended food products that fulfill applicable international, national and mutually agreed food safety and quality standards, regulatory and statutory requirements to the highest satisfaction of customers. It has also specified that the key measure for its success is exceeding the needs and expectations of the customers.

The policy has further stated that the company implement, maintain and continually improve the integrated food safety and quality management system; train and aware every employee; ensure allocation and effective utilization of resources; establish effective communication arrangement; prepare and respond to emergency situations and accidents; and ensure the continuing suitability, adequacy and effectiveness of the system with strong commitment and participation of the management and employees at all levels. It is indicated that the policy has been communicated, understood, implemented, reviewed, updated and maintained at all levels of the organization.

Mission, Vision, Core Values, Strategies, Objectives and Activities: Based on the review of FFMSC's strategic document, the following issues were explained as follows:

Vision: The vision of the company is playing lead role in building mentally and physically capable generation by producing high nutritional value products while becoming internationally competitive business entity (FFMSC Strategic Plan, 2012).

Mission: The mission of the company is to produce and sale various types of pre-cooked baby foods, semi-cooked supplementary foods, protein enriched fortified flours, emergency foods and related products of high nutritional value in response to the growing demand of consumers (FFMSC Strategic Plan, 2012).

Core values: The core values of the company has been stated as commitment to providing emergency food, maintaining the existing brand name, effective communication between employees and the management, healthy relationship with financial institutions and likeminded organization and maintaining the existing long time experienced employees (FFMSC Strategic Plan, 2012).

Strategies, Objectives and Activities: The case company has been working based on a five-years based strategic plan designed for a period of 2012/2013 to 2016/17 (FFMSC Strategic Plan, 2012). The document has set out the strategic issues, strategic objectives and the activities to achieve them. The management members participated in KII has explained that the strategic document has been shared to all departments and through them the awareness of the employees on the strategic plan was created. In addition, it has been explained that the company profile has been prepared and distributed to all interested in order to sell the company image and through that to expand market competitiveness and income growth. The assumption was that the strategic plan would be evaluated and re-designed after every five-year period with the involvement and participation of the employees, stakeholders and collaborators of the company. However, it has been identified that the strategic plan was not revised or redesigned after the phasing out of the preceding strategic plan. As explained by the deputy director general of the company, at present, the company is using annual plans done on yearly bases instead of working out the next cycle of the strategic plan.

Management Commitment: The information obtained from questionnaire, FGD, KII, and the document review have shown that the management of the case company has commitment towards effecting quality and safety within the company (Source: Research data, 2018). As said, its commitment has been explained by the amount of resources it has allocated for the work, the level of the employees consulted, involved and empowered, the level of speed it had for taking action and giving decision, the level of attention it gave to policy drafting, dissemination, implementation, certification for ISO 9001:2015 and ISO 22001:2005 and the follow up it has done for the effective implementation of the mentioned ones (Source: Research data, 2018).

Fulfilment of Lay-out & Infrastructure and Facilities: Based on the realization obtained from the case company site observation, the company has been well equipped with all the necessary

lay-out & infrastructure and facilities which included the followings (Source: Research data, 2018):

- Buildings with the required partition and fulfilled supplies and materials for the work,
- Factory plants and measuring equipment,
- Experienced professional and non-professional staff with well-defined management structure and responsibility for which manuals were full filled,
- Operational (production) and support facilities and systems (HR, finance, planning, R & D, ICT, facilities such as sanitary facility (latrine, laundry, shower),
- Transportation and storage facilities,
- Emergency (fire hazard) and security control system,
- Staff recreation room (lounge).

It has been also observed that the production sites of the factory are well spaced that enabled free movements of staff and are well ventilated in order to make workers feel fresh and energized to achieve their work as per the set target. The spacing has also enabled ease of observation in case when there was misplaced items, products and the working situation of each staff.

Awareness Creation and Providing Training to Employees: The assessment done on reports of the case company (FFMSC Annual Report, 2017) and the discussion and interview made with the FGD and KII participants indicated that the employees have awareness on the quality and food safety policy, strategy, objectives and activities of the case company because of they have been oriented by the management and also participated in the process. Similarly, almost all of the employees participated on FGD and KII have explained that they were provided with training related to the way they handle customers, the way they should care for and assure quality and food safety in the process of production such as waste reduction in doing the followings:

- ✓ Reducing plant idle time due to faulty operation,
- ✓ Reducing production of non-conforming products,
- ✓ keeping the sanitation and neatness of production sites and machines through washing clean after any batch production especially the Roaster, Fluid-Bed-Drier and Drum Drier as there are remnants of the previous batch that may deteriorate the next batch quality and food safety,

- ✓ Keeping personal hygiene and neatness through keeping clean work time clothing such as overcoat (guan), head cover, the need to use gaunt when doing the work that has a contact with product processing and after processing when products are filled and packed, etc.

As realized from site observation as well as the commitment and understanding of the employees, the employees of the case company were well-oriented and capacitated on the work they should do and also on the level of contribution this may have on the overall production of quality and safe food products and the return it has on market competitiveness and profit maximization.

Assigning Quality and Food Safety Team Leader and Team Members: The assessment done into the minutes and written letters of the case company has shown that the company has assigned a team leader to follow up and control the quality and food safety processes of the factory. Similarly, team members composed of different profession and work area responsibilities were also assigned under the team leader. The HACCP team members of the case company were 13 and their composition has included the followings:

1. Operation manager,
2. Deputy director general,
3. Manufacturing director,
4. HR director,
5. Commercial director,
6. Procurement director,
7. Marketing & business development research director,
8. Technical division manager,
9. Central planning & IT service head,
10. Food technologist, clinic service head,
11. SHEQ service head,
12. Quality coordinator IMST secretary.

As observed from file, all of them were formally represented by the company management committee minute and a letter to work as a team leader and team members, respectively. It was said, the assignment of the quality and food safety team leader and its team has enabled timely

follow up and control of any emerging problem of hazard in the process of supply and distribution chain systems. It was also explained during site visit that the teamwork has enabled the organization to assure quality and safe food production management starting from checking the raw material purity such as percent of impurity, percent moisture content and density to control of filling, packaging, transportation, distribution and delivery of the final product to sales agents/retailors and end users with a view of preventing hazards. Further said, this has enabled the sustainable improvement and delivery of quality and safe food products where the image and the brand of the company remained for long dominantly well-known in the local and national market and the community at large.

Fulfilment of PRP, HACCP Plan, and oPRP: It was observed that the case company has fulfilled the followings and put them into functional (FFMSC HACCP Team 2017 Report, 2017).

Fulfillment of PRPs: Fulfilling these PRPs were the first and foremost preconditions for conducting HACCP in any food manufacturing establishments. The necessary preconditions which have been fulfilled by the case company include some of those already described under the fulfillment of lay-out and infrastructure above. In addition, the company has fulfilled PRPs which include building and plant layout, acquisition of appropriate factory plant, waste management system, GHP, GMP, GTP, GHKP, GLP, GSP, good pest control practice, fulfilment of utilities (electricity, water, telephone lines, internet service) and well laid-down system that enabled all departments, sections, units and the top management to work in aligned manner towards achieving hierarchical level set goal and objectives; the final top one being satisfying customer needs and expectations where government regulatory and statutory requirements and the ISO and the case company set standards were well met (FFMSC HACCP Team Assessment, 2017). The existence of these different good practices have been also witnessed by the technical and non-technical employees participated on FGDs and KIIs highlighting that practicing and sustaining these good practices within the company has become the culture of the company; and mentioned that it was for these good practices that the company could sustain for almost half a century with well-built good image throughout the country.

Fulfillment of HACCP Assessment and Plan: As per the information obtained from the quality and food safety team leader, team members and the HACCP documents of the company (HACCP Assessment, 2017), HACCP assessment was conducted and plan was prepared to tackle the identified problems and to prevent the future likely occurrence of the hazard in raw material supply chain, food processing, filling & packaging, storage and distribution stages of the processed products. As explained, these were assessed and analyzed by the quality and food safety team members being coordinated and guided by the assigned quality and food safety team leader. This information was also confirmed by the FGD and KII participants. It was mentioned that CCP has been identified and defined of its type, place of occurrence in the process or supply chain system, time of occurrence, frequency, intensity of the hazard it would cause to the end product user, the type and level of control measures it would require (FFMSC HACCP assessment, 2018). The flow of steps followed by the quality and food safety team for preparing the HACCP plan, conducting the HACCP, identifying and defining CCPs, proposing and defining appropriate control measures has been presented in Annex 8. Based on this, three CCPs were identified named as *Drum Drier, Fluid Bed Drier and Roaster*.

Fulfilment of oPRPs: Based on the quality and food safety team leader explanation, the operational pre-requisite plans were carried out after the HACCP plan got ready and operationalized. The plans have determined and defined the appropriate control measures to be taken at each identified CCP level (FFMSC HACCP Plan, 2018). As explained and reviewed from the HACCP plan, oPRPs have defined the type of variable and control measure, level of application, tolerance level or rate and timing of the control measure in order to control or minimize the occurrence of the hazard to the maximum level in a way that it would not cause food hazard to the end user (the community members).

Based on this, for all of the identified CCPs, one of the variables to be controlled was the maximum and minimum temperature which specified to what minimum-maximum level of temperature the baked pre-cooked food product dried and corn/soya bean grains roasted to proceed into the next process step. Similarly, the second variable to be controlled was the maximum and minimum time duration which specified to what minimum-maximum time duration the baked pre-cooked food product dried and corn/soya bean grains roasted in order to acquire the required quality and food safety characteristics. It has been clarified from the

observation and document review that both of the control measures have been put into practice (FFMSC Process Control Records, 2017). However, their operational determination was found to be dependent on the knowledge and experience of the operator working on the machines, supervisor and head of the operation because of the machines are analogue rather than they are digital. This couldn't enable to record regularly the time and temperature variability in order to control whether it was within the specified control limit. The responsible operator, quality team leader and the operation manager with whom discussion was made mentioned that there was no problem observed so far in reading and recording process time and temperature because of the operators were well experienced and also for they have been supported by a frequent follow-up and technical backups.

On the other hand, the contacted employees and the management members have explained that the presence of PRPs, HACCP plan and oPRPs has helped them and the organization to proactively take timely correction and corrective action on the likely to occur quality and food safety hazard doing consistent control and follow-up on the drying and roasting processes.

Identification and Traceability: It has been discussed with the employees of the case company and also assessed from the records of the company that identification and traceability procedure has been defined and put into practice for the products that the company receives as a raw material and also distributes as final process products (FFMSC Operating Procedure manual, 2017). As seen from the developed identification and traceability procedure of the company, the required steps have been defined and shown in a flow diagram (Annex 8). The process flow diagram prepared for each of the product line has shown that what input received, what process it would go through, what output would generate and who would be responsible in terms of action taking, involvement and being informed. The identification and traceability procedures include the following steps:

- ✓ Register identification and traceability information at material receiving stage including information pertinent to the supplier,
- ✓ Establish traceability up to initial distribution,
- ✓ Monitoring and review periodically,
- ✓ Trace initiation,

- ✓ Assign personnel,
- ✓ Collect product,
- ✓ Apply tracing method,
- ✓ Report the result,
- ✓ Analyze the result and give decision.

However, the analysis done indicated that the flow diagram didn't specify well the external suppliers and customers as a part of the identification and traceability system of the company while the approach followed was very similar to SIPOC (supplier, Input, Process, Output and Customer) approach. This has indicated that the developed identification and traceability procedure of the case company was prepared only for internal purpose that didn't involve the external suppliers and customers of the company despite information was registered at material receipt stage for the later on use for identification and traceability purposes when doing such process would be necessary.

Record and Documentation: The researcher realized from the visit made, document review, FGD and KII that the company has a good culture of data recording and documenting system with all the departments that the researcher contacted for data gathering (Research data, 2018). The records and documentations were related to work process procedures, standards, plans and achievements, monitoring plans and results, minutes, formal letter based communications, financial, data related to purchase, sales and R & D areas. The filing system was found to be easily accessible and complete as recording and documenting was done by the respective responsible and accountable personnel and recording and documentation has included all the necessary basic information. Nevertheless, in some of the cases it has been observed that records and documentation was not done in a manner that considered integration but done for each activities on a separate bases while in some cases being integrated.

Communication: Sales agents who were participated on KII has explained that the company had been communicating them on any change of policy and the follow up changes went on within the company concerning product development, price change, packaging size change and others as deemed necessary (Research data, 2018). Similarly, the raw material suppliers have also mentioned that they had been communicated by the company concerning the requirement and

specification the raw materials they supply should fulfill. As they said, this has helped them to supply the required raw material despite it had been very difficult to get the required level of material as needed. They have also mentioned that they had tried to communicate the same to their grass root level suppliers so that the requirement of the raw materials would be fulfilled from the source – the producers. Herewith, some called for the existence of a coordinated effort especially where the ministry of agriculture take action to train and aware the farmers on the importance of quality and safety production system. As they said, it was only then that quality and food safety management system would be assured in all the supply chain system (Research data, 2018).

On the other hand, the sales agents said that they had communicated freely with the company concerning what was needed to be communicated especially they had mentioned that they had communicated on the existing market niche and demand, type of products needed, packaging size, the time the products needed, etc (Research data, 2018). They further said that they had communicated to the company the complaints raised by the end users such as packaging size increase or decrease, reducing period of expiry date for some sensitive products, price consideration, change of packaging material and the like.

In addition, the non-technical employees participated on the FGD has mentioned that they had a freedom to communicate anything important to the company management concerning the quality of the raw material, process level emerging problems and any other concern they may have related to employee motivation and others similar to this (Research data, 2018). Generally, it has been apprehended that the communication process was good and was effected in a way that a feedback system has been considered.

Inspecting and Testing: It has been realized that inspecting and testing were carried out by the case company in all process areas of the factory with the special emphasis given to received raw materials, HCCP identified CCPs, packaging material supplies, recall and non-conforming products (FFMSC Operating Procedure Manual, 2017). The reason was explained as it was to prevent and control biological, chemical and physical substances that have the potential to cause quality and food safety hazards to products in the process any time at any process step. It was also further explained that this was done in order to meet the company set quality and food safety

specifications, the wants and expectations of customers, government regulatory and statutory requirements and international standards (Research data, 2018). As a result, the carried out process controls of the case company were studied for their effectiveness applying SPC methodologies and the findings were as presented under the following sub-topics.

Raw Materials Impurity Control and Test: As per the information obtained from the company laboratory head, impurity control tests were carried-out before formally suppliers or the company purchasers deliver any raw material to the case company warehouse. The control tests done on raw materials include the followings:

- total impurity in percent,
- moisture content in percent,
- Raw material density in weight unit/volume unit,
- Particle size determination for flour using different size mesh,
- Odor (organoleptic) test using sensory evaluation (flour).

The observation and the document review made have shown that the inspection and testing operations were well done with a principle of fostering the aspects of prevention towards any likely potential quality deteriorating and food safety hazard causing substances ahead of entering into the food manufacturing processes. The inspecting and testing of these food quality deteriorating and food safety hazard causing substances was categorizing them into biological, chemical or physical substances. During inspection and testing, all the necessary information was recorded that enable to trace back if incase it would be necessary to do so for any positive or negative happenings. As explained by the laboratory head, majority of the tests were done by the factory laboratory except when there was work overburden and there was a request from customers that the products and raw materials be tested by external laboratories such as in the case of emergency nutritious product production for drought affected and food insecure community members. It has been indicated that the effect of this good hygiene and manufacturing practices was reflected on the production of quality and safe food which has been highly demanded in the market.

Process Control at CCPs: As the detail was presented on page 53 second paragraph, three CCPs - Drum Drier, Fluid Bed Drier and Roaster processing machines, were identified through

conducting HACCP assessment, analyzing the assessment result and preparing plan towards the process follow up and control at each identified CCP level (FFMSC HACCP Team Plan, 2017). As mentioned, the identified process critical points are the processing machines that do the processes which need the control of the process variability when they are in operation so that they could process and produce products that are needed and expected with customers and could meet preset specifications of the company, the standards of the Ethiopian government and the ISO's. Accordingly, an analysis was done into the data of these processes using SPC methodologies and the result has been presented under the following topics:

1. Soya Bean Roasting Process Temperature Control on Probate Roaster Machine

The case company set limit for soya bean roasting process temperature on the probate roaster machine was in the range of 220-250^{0}c (FFMSC Operation Manual, 2018). Based on this, the soya bean roasting process temperature data of five days was sampled each with eight sub group. The sampled data was arranged and calculated of its group data average, range and range average. Hereafter, the upper and lower control limits (UCL & LCL) of the process temperature variability, process capability ratio (PCR or Cp– for two sided), process capability index (Cpk - for one sided) and sample distribution standard deviation (σ) were calculated using the following SPC formula:

$$UCL_X = \bar{\bar{X}} + A_2\bar{R}$$

$$LCL_X = \bar{\bar{X}} - A_2\bar{R}$$

$$\sigma = \bar{R}/d_2 \text{ (Sample standard deviation)}$$

$$C_P = \frac{UCLx - LCLx}{6\sigma} \text{ (two sided)}$$

$$C_{Pk} = \frac{USL - \bar{\bar{X}}}{3\sigma} \text{ (one side - smaller-is the better)}$$

$$C_{pk} = \frac{\bar{\bar{X}} - LSL}{3\sigma} \text{ (one side - larger-is the better)}$$

Source: Douglas C. M., 2009

The result has shown that the process temperature was in control for it is found to be within the case company set upper and lower process temperature specification limits as depicted in X & R Charts in Figure 14 & 15. However, the distribution of the process temperature data showed systematic distribution instead of random distribution because of most points plotted consecutively below the center line (CLx) in the case of X-Chart while in the case of R-Chart, the distribution was aligned with the CL_R. On the other hand, the process capability ratio (PCR or Cp) of the process was computed to check if the process was met the product specification limit or not. Accordingly, Cp was calculated using the process standard deviation $\sigma = 8.6$. The result was found to be 0.5. This has shown that the process couldn't meet the set specification limit because of Cp<1. This was because of the distribution of the sample data standard deviation covers only 50% of the area covered by the normal distribution of the standard deviation of the process 6σ (6 x 8.6 = 51.6). In addition, the computed minimum Cp_k was found to be 0.46 which is less than Cp=0.5 indicating that the data distribution standard deviation points were not centered. This has shown that despite the process temperature variation was found within the set upper and lower control limits, the soya been roasting process would not produce roasted soya bean to the specification limit because of the process temperature variation was not equally distributed about the center line (CLx). This means that the process was not capable to meet the specification limit set by the company. Hence, it is recommended that FFMSC should check the temperature regulation

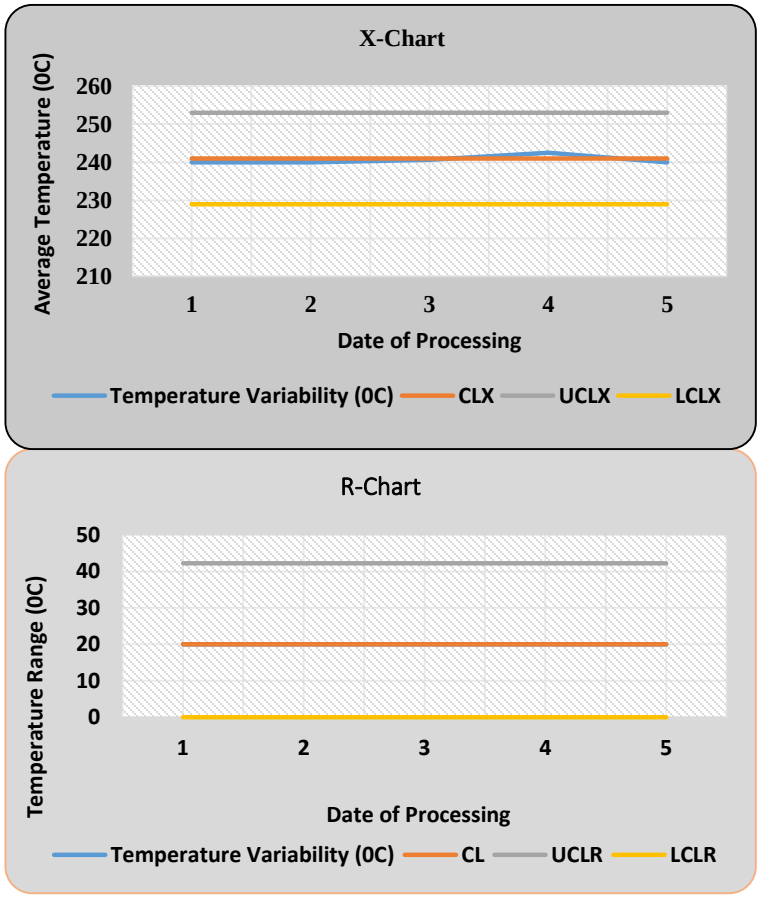

Figure 14 & 15. FFMSC's Probate Roaster Process Temperature Control for Soya Bean Roasting.

system and the routine recoding mechanisms of the soya bean roasting process temperature on the Probate Roaster Machine in order to avoid the observed problem.

2. Wheat & Fruit Flour Mixture Baked Dough Drying Process Time Control on Drum Drier

The time set by the case company for drying wheat & fruit mixture baked dough on the Drum Drier Machine was in the range of 60-180 seconds (FFMSC Operation Manual, 2018). Considering this, five days process time control data each with seven sub group was sampled from the process of drying baked dough of wheat & fruit mixture on the Drum Drier Process Machine. Hereafter, the process time data was arranged and calculated of its group data average, range and range average, upper and lower control limits (UCL & LCL) of the process temperature variability, process capability ratio (PCR or Cp - two sided), process capability index - upper and lower (C_{PkU} & C_{Pkl} – one sided) and sample standard deviation (σ) using the SPC formula and procedure used above for soya bean roasting process on the Probate Roaster Process Machine. Based on this, the time data analysis result has shown that the process time control was out of control for wheat & fruit mixture baked dough drying process on the Drum Drier Machine as shown in both X & R charts (Figure 16 & 17). As analyzed from the charts, the out of control situation was because of the time variation was out of the case company set process time upper and lower specification limit in the case of X-chart while in the case of R-Chart for the process time variation was out of the upper time specification limit while aligned on the lower limit. The same similar finding was identified for process temperature control that was used to dry the same baked dough however it was not presented in this document considering the same

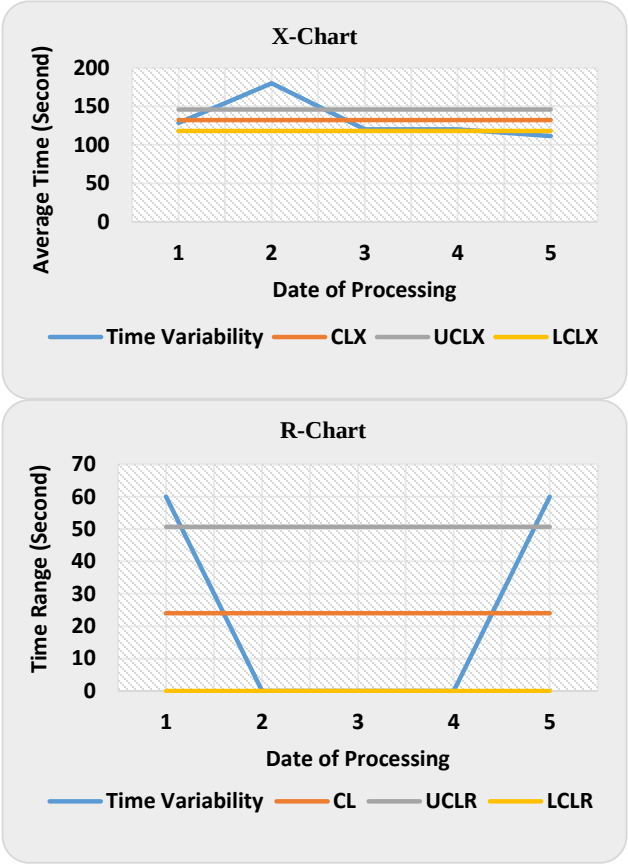

Figure 16 & 17. FFMSC's Drum Drier Process Time Control for Wheat and Fruit Dough Baking

information was reflected in both cases and it would be redundant to present together with the process time data analysis result.

On the other hand, the PCR or Cp was calculated using same SPC formula specified above for soya bean roasting process on the Probate Roaster Process Machine and the result was found to be 0.45 indicating that the process couldn't meet the case company specification limit because of Cp < 1. This means that the actual data distribution standard deviation covers only 45% of the area covered under the normal process distribution standard deviation ($6\sigma = 6 \times 0.17 = 1.02$). In addition, the calculated minimum one-sided-process capability index (C_{pk}) was found to be 0.45 - equal to Cp. This has shown that the data distribution standard deviation had centered distribution.

Further to the above mentioned, the observation made during site visit and the discussion made with the machine operator and head of the production department have indicated that the followings were the possible reasons for the observed cause of variation:

- The set specification limit (60-180 seconds) was wide because so far documented practical records showed a minimum of 120 seconds as the lowest time record. In addition, the calculated lower and upper limits of the sample data were also found to be 118-146 indicating that the set specification limit was too wide,
- Lack of appropriate tailored training with the operators doing the job as mentioned by the operator,
- Lack of standardized interval in which the process time and temperature were sampled for process control as mentioned by the operator,
- Subjectivity in taking the samples by the assigned operators from one shift to the other as explained by the operator,
- The nature of the machine operating the process is analogue instead it is digital – it doesn't display process time and temperature on screen and also doesn't work-out SPC graph for the carried out process in a continuous manner as observed from the machine,
- Lack of proper and on time adjustment of the machine system doing the work as explained by the operator.

Therefore, FFMSC should assess the cause of the process time variation related to setting the time specification limit and recording of the time variation for each batch of the processed product in order to correct the identified out of control situation.

3. Corn Grain Hot Steam Treatment Process Temperature Control on Fluid Bed Drier

Fluid Bed Drier process machine is a machine that treats the corn grain with a pressurized hot steam on a moving belt under which there is a perforated metallic channel through which the hot steam circulates to pre-cook the corn garin within temperature limit of 7-10 C^0. The temeperature variability of this process was analyzed taking sample from documented process temperature control data of the case company. Based on this, five days corn grain hot steam treatment process temperature control data each with eight sub group was arranged and calculated of its group data average, range and range average, upper and lower control limits (UCL & LCL) of the process temperature variability, process capability ratio (PCR or Cp - two sided), upper and lower (C_{PkU} & C_{Pkl} – one sided) and sample standard deviation (σ) using same SPC formula and procedure used above for soya bean roasting process time on Probate Roaster Machine. Following the mentioned calculations, SPC X & R-charts were worked out for the corn grain hot steam treatment process temperature control (Figure 18 & 19) uisng the calculated information as input. The result has shown that the process was in control both in the case of X & R-charts. This was because of the corn grain hot steam treatment temerature variation was found to be within

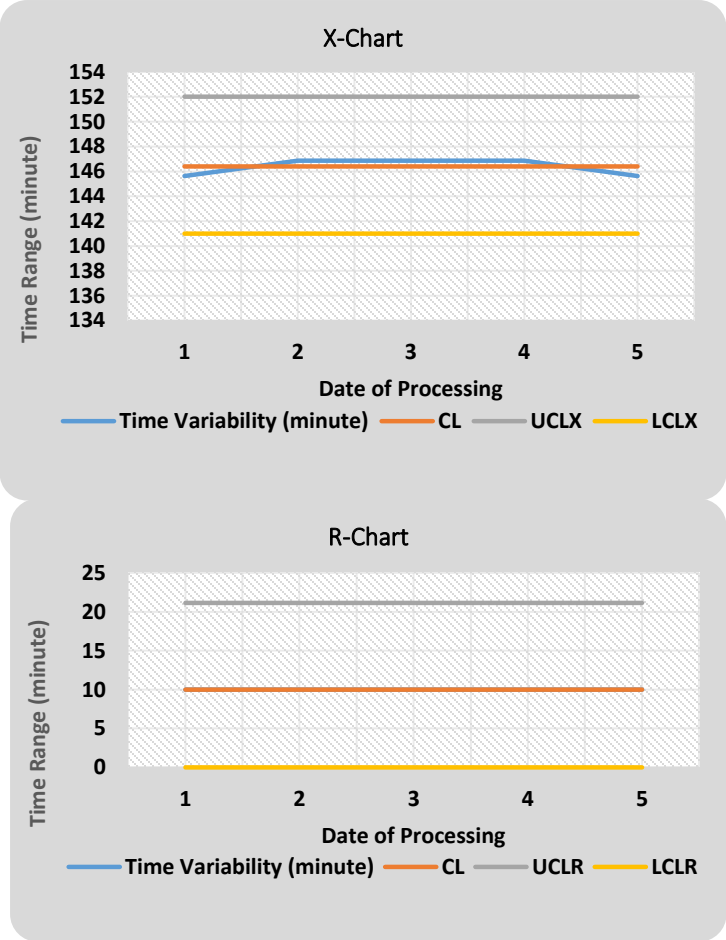

Figure 18 & 19. FFMSC's Fluid Bed Drier Process Time Control for Corn Drying.

the case company set upper and lower temeperature specification limits indicating that the process was in control. The further analysis done on the graphs has shown that the process temperature data points were systematically distributed about the CL_X in the case of X-chart while in the case of R-chart, the points were distributed being alighned with the CL_R indicating that the process temeperature was not randomly distributed above and below the cental line. It means that the distribution of the process temperature variation had no normal distribution. On the other hand, PCR or Cp was calculated and the result was found to be $C_P = 0.5$. This means that the process temperature had a capacity of covering only 50% of the area covered under the normal process temperature distribution standard deviation ($6\sigma = 6 \times 0.86 = 5.16$). This has indicated that the process couldn't produce products as per the set specification limit. In addition, the C_{Pk} was also calculated to check whether the process temperature data distribution was centered or not. Accordingly, it has been identified that C_{Pk} was 0.5 - equal to C_P indicating that the process temperature distribution had centered distribution that covers 50% of the graph area covered under the normal one-sided (left or right side of the center line) process temperature distribution standard deviation ($3\sigma = 3 \times 0.86 = 2.58$) graph area. This means that the process temperature standard deviation had centered distribution despite the graph points were not equally plotted above and below the center line as seen from the X & R charts. Therefore, this requires FFMSC to look into the common problems related to setting specification limit and the follow up system for recording the process temperature variable data in order to take corrective action on the observed problem of the process.

4.3.2.2 Product Defects, Reworks and Returns

The analysis done on questionnaire responses has indicated that 84.6% (11) of the respondents said that there had been defects, reworks and returns of products during the process of production. However, 63.6% (7), 27.3% (3) and 9.1% (1) of the respondents had mentioned that the trend was, respectively, deceasing, increasing and fluctuating compared to the

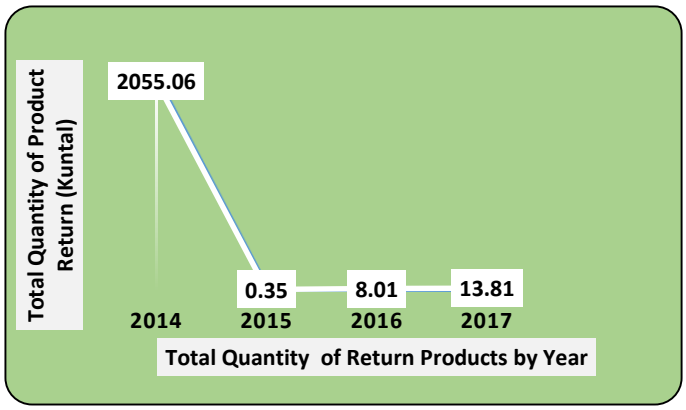

Figure 20. FFMSC's Four Years (2014-2017) Product Return Trend.

situation before and after the implementation of IMS in the company. This situation was also confirmed through the analysis of the recorded data of the company. As can be seen from the graph, the trend of defects, reworks and product returns had drastically decreased from relatively high level (2055.06 Kuntal) in 2014 to very low level (0.35 Kuntal) in 2015 and then followed by a smoothly increasing trend starting 2016 (Figure 20) indicating the need to examine the cause and take rectification measures on the case company side.

Similarly, the non-technical employees participated on FGD and KII and sales agents and end users participated on KII, have indicated that there had been defects, reworks and returns of products. However, as they said, these defects, reworks and returns of products have been reduced. As a result the effect has been reflected in terms of increasing trend on the performance of the product sales value (Figure 21) except for the year 2015 in which the sales value decreased. Based on the suggestion of the FDG participant employees of the case company, the increase of the sales product value was due to continuous close follow up and the timely measures taken on the identified problems throughout the process of production. Especially, the employees have indicated that such a trend was enhanced compared to the previous years due to the organization has implemented ISO 9001:2015 and ISO 22001:2005 which enabled all staff to care for quality and food safety practices. On top of this, they also indicated that the organization had trained them on the Kaizen 5s (sort, set in order, shine, standardize and sustain) principles which they are practicing it. As mentioned by the employees, this has brought attitudinal change with the employees for they have seen its contribution on the reduction of defects, reworks and returns of products compared to prior years in which the Kaizen principles were not in practice.

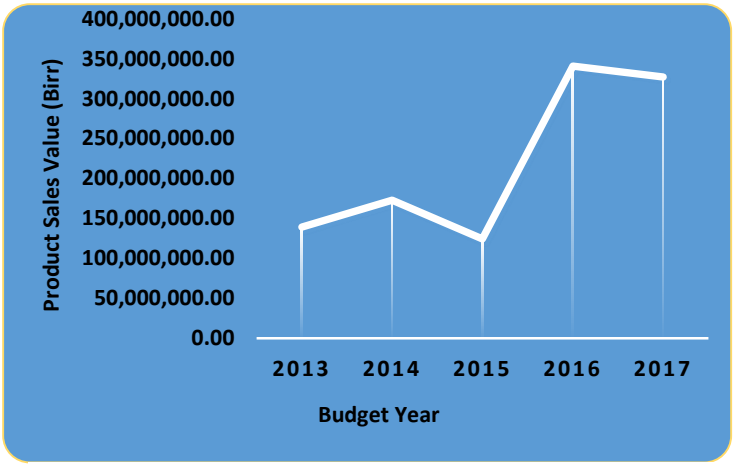

Figure 21 FFMSC's Five Year (2013-2017) Product Sales Value By Year (Birr).
Source: FFMSC Finance Report (2013-17).

4.3.2.3 Addressing Customer Complaints

It has been indicated by the FGD participant employees that the customer complaint addressing mechanism of the case company was as soon as the customers come with their complaints, who could be sales agents, end users or retailors. On the other hand, the marketing department employees participated on KII explained that customers come with complaints such as requesting change of defective products, price decrease, demand for additional supply, etc. It was further explained that responses to complaints were given after analyzing the recorded complaints by the appropriate department and the decision was given by top management level. To this end, it was mentioned that, in whatever way the product defect had been caused, the company exchanges the product with newly produced ones as far as requests were there from the customers. This idea was also strongly reflected by the KII participant sales agents and end users. As said, this has helped the company establish strong healthy relationship and trust with the customers and the customers also with the company.

4.3.2.4 Improving Market Competitiveness and Profit Maximization

As analyzed from the respondent data, 100% (13) of the respondents have felt that the implementation of IMS has helped the case company to improve market competitiveness and maximization of profit. Similarly, the analysis done on the five year (2013-2017) product sales value data has indicated that the trend of the product sales value had been in increasing trend despite it had shown decrease in 2016 (Figure 21).

On the other hand, the analysis done on the five year (2013-2017) product distribution for sales data has shown that the trend was fairly increasing since 2013 except it had shown a decrease in 2016 (Figure 22). In this regard, the FGD and KII participants said the growth was attributed to the implementation of improved management practices throughout the process of production and the market chain system in a way that informed and involved all the concerned actors.

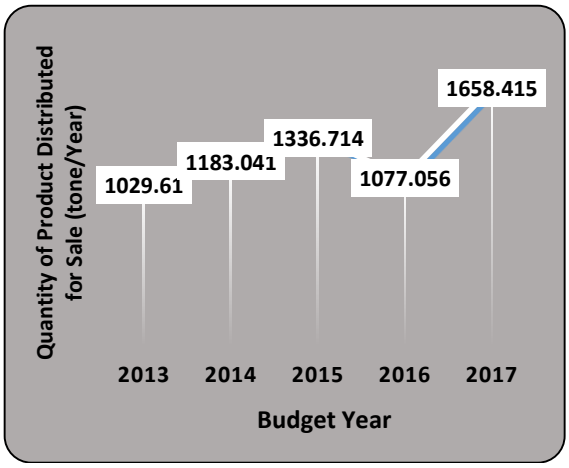

Figure 22 FFMSC's Product Distribution for Sales Trend of Five Years (2013-2017)
Source: FFMSC Marketing Report (2013-17)

4.3.2.5 Reduction of Quality Cost

Based on the analysis done on the responses given to questionnaire, 86.6% (11) of the respondents said that the case company has reduced quality cost while 15.4% (2) of the respondents said the opposite indicating that the reason was lack of proper implementation of the IMS within the case company. The technical and non-technical employees participated on FGD and KII have also explained that the cost of quality decreased because of the wastages used to exist in the production process had been greatly reduced as a result of the employees increased understanding on the implication of decreased quality cost. It was also indicated by the same group that the cost of quality was decreased as a result of the management and employees worked closely and jointly towards achieving the company objectives. In this regard, one of the evidence to be cited here was that the quantity of return data which had been 0.02% or 2055.06 Kuntal of the total sale in 2014 had been reduced to near 0% or 0.35 Kuntal in 2015 however a there had been a slowly rising trend then after (Figure 20). This has an implication that the cost of quality had been decreased for the main reason the process wastages were well controlled and managed. Nevertheless, the company should look into the causes that attributed for the observed slowly rising volume of wastes. It should also look into the mechanisms in which minimum level of waste reduction could be maintained in the production process - help to reduce the increasing trend of cost of quality through further enhancing existing good management practices of the company.

4.3.2.6 Satisfying Government Requirements and International Standards

The information obtained from FGD and KII indicated that the company has been well in conformity in meeting government statutory and regulatory requirements and international standards. The participants said this was because of the company had kept doing calibration of its measuring instruments every year working closely with the Ethiopian Standardization Agency and when necessary with other similar international organizations accredited to do calibration of measuring instruments. The document review of the organization has also shown that the company had been audited of its ISO 9001:2015 quality management system and ISO ISO 22001:2005 food safety management system as per the ISO requirement having close working relationship with the regional and international level working certified management audit firms

(ISO 9001:2015 and ISO 22001:2005 quality management audit report, 2017). The findings have indicated that the company has been working in line with the government statutory and regulatory requirements and international standards.

4.3.3 Integrating Management Systems

As realized from the analysis done on FGD, KII, questionnaire response, secondary data sources and own site observation, integrating management systems within the case company was not yet fully practiced at all levels as realized from the followings:

1. The company management structure didn't integrate MSs at structure level in such a way that integrated structure of job positions seen at structure level with well-defined integrated job responsibility. This was evidenced from the quality and food safety positions which the company separately defined on its structure instead of putting them together and defining an integrated job responsibility as a single position. Related to this, the contacted case company deputy director general said reducing the position to one and doing the work in an integrated manner would compromise the technical proficiency that the work requires. In addition, he explained that such a structure was well known with all likeminded big companies that apply SHEQ (safety, health, environment and quality) implementation principle. Nevertheless, whatever the principle could be preferred and implemented, what should be considered was integrating the implementation of the mentioned responsibilities would have added value for the reason that integration would enable to have reduced cost, enhanced efficiency and effectiveness, ease of complexity, enhanced competitiveness, enhanced versatility with employees assigned to the specific job. Therefore, from this point of view, MS integration would serve as one of the staff motivation mechanism.

2. The discussion made with the FGD and KII has identified that the work of the HACCP team and the work of two positions – quality control and food safety control positions were not well defined in a way duplication of effort was avoided. As indicated closely related job responsibilities were done by three responsible bodies - quality control officer, food safety officer and the HACCP team being staffed under different structure. Related job responsibilities should have been integrated starting from the structure level and the

detail of the job description should have been done in an integrated manner. Therefore, the consideration of job responsibility integration should have been at all levels such as starting from planning stage through implementation to monitoring, evaluation, documentation, auditing and reporting. This was because of integrating MS at all levels would have a paramount importance towards implementing effective IMS.

3. The other area where integration was not yet done within the case company was in conducting MS audits by external MS accredited audit firm despite the internal audit has been done in an integrated manner. The audit for ISO 9001:2015 and IS0 22001: 2005 was done separately by a certified management audit firm. This was reasoned that the audit firms required to audit separately because of there was no integrated audit requirement to undertake an integrated audit. However, in most of the reviewed research results, the integrated audit requirements were prepared from all MS requirements that the organization has been implementing considering the commonalities as they are and adding on the specific requirements in order to address the requirements of all the implemented management systems.

4. It was observed that some of the activities were integrated while the other not integrated eg the case of follow ups related to quality and food safety were done separately while in other cases such as recording, documentation, monitoring/follow up and reports which were done for raw material purity control, process control, traceability, monitoring & measurement, improvement practices, resource management, communication and management reviews were found to be partly integrated. However, no document was identified that specified the mechanism in which integration of responsibilities and activities were done or to be done at all levels. From this perspective, the observed job responsibility and activity integration within the case company could be because of understanding the importance of IMS practices or it could be because of the nature of the work requires integrated management system for its effective implementation. Related to this, the deputy director general of the case company has explained that there were efforts done to integrate responsibilities and activities at all levels. However, the consistency of performing integration of MSs at all levels couldn't be fulfilled because of the employees didn't fully adopt and practice it in their everyday activities.

4.3.4 Factors Contributed for Effective IMS Implementation

The factors contributed for the effective implementation of IMS within the case company was identified computing the relative importance index (RII) of the score respondents gave to listed requirements of IMS using the formula given on page 33. The result of the computation was used to rank the IMS requirements using MS Excel application based on the scale and the associated value respondents gave to each requirement on the provided likert scale. The scales were specified as strongly agree, agree, neutral, disagree and strongly disagree while the associated values, respectively, were 5,4,3,2 and1. Accordingly, out of all the IMS requirements scaled and scored, the most top ten contributing factors for the effective implementation of IMS within the case company, on relative terms, were identified and prioritized using MS Excel application. The list of the ten top contributing factors and their associated prioritized rank was as presented in the following table.

Table 3. List and rank of top ten contributing factors for effective IMS implementation.

List of Requirements	Rank
-Management has established, documented, implemented and maintained an effective QFSMS and updated it. (**Management system-4**) -Top management continually improved the effectiveness of the QFSMS. (**Validation, Verification and Improvement -8**)	1
Management has shown commitment to the development and implementation of the QFSMS and to continuously improve its effectiveness. (**Management Responsibility – 5**)	2
-Management has defined the scope of its QFSMS. (**Management system – 4**) -Management has documented quality and food safety policy and objectives, procedures and records, documents needed by the organization. (**Management system – 4**) -Management has implemented, operated and ensured the effectiveness of planned activities of PRP(s), operational PRP(s) and the HACCP plan and any changes to these activities. (**Planning & Realization-7**)	3
Quality and food safety team and the other personnel are competent and have appropriate education, training, skills and experience. (**Resource Management -6**)	4
Management has described product characteristics (end product & end use) in documents to the extent needed to conduct the hazard analysis for all raw materials, ingredients and product-contact materials. (**Planning & Realization-7)**	5
Quality and food safety team has conducted a hazard analysis and determined the type of hazards to be controlled; degree of control and the combination of control measures needed. **(Validation, 8)**	6

-Management has ensured planning and integrity of QFSMS. (**Management Responsibility – 5)** **-V**erification planning has defined the purpose, methods, frequencies and responsibilities for the verification activities. (**Planning & Realization-7)**	7
Management has updated product characteristics, intended use, flow diagrams, process steps and control measures following the establishment of operational PRP(s) and/or the HACCP plan. (**Planning & Realization-7)**	8
Management has provided resources for the establishment, management and maintenance of the infrastructure and the work environment needed to implement the requirements of ISO. (**Resource Management -6)**	9
Management has defined, documented and communicated its quality and food safety policy. (**Management Responsibility – 5)**	10

4.4. Challenges and Benefits Gained in Implementing IMS

The FGD participants explained that the main challenge in implementing IMS was the problem associated with staff turnover especially when the staff turnover was on managerial area. They said the new staff didn't assimilate itself to the existing IMS implementation system and this has caused to lack consistency in implementing IMS. The management members have also indicated the same problem despite they have mentioned that they provided training to the employees.

On the other hand, the raw material suppliers participated on KII on their part examined that the challenge was getting the required raw material from the source that meet the requirement of the case company was problem. They have said this requires the cooperation and commitment of all involved in the production and sale chain of the raw material in terms of quality raw material production and selling processes. Similarly, whole sellers and retailors participated on KII have indicated that the main challenge thy have was shortage of products while the demand was very high. They suggested that this requires the case company increase its volume products.

Concerning the benefit gained as a result of implementing IMS, the employees participated on FGD explained that it has enhanced quality production through decreasing waste and it has also motivated the employees for its approach was participative. Nevertheless, the raw material suppliers and whole sellers/retailors participated on KII indicated that they didn't know much in this aspect because of they had no involvement.

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The research entitled 'Effectiveness of Integrated Management System in Food Manufacturing Industries: the Case of Fafa Food Manufacturing Share Company' was conducted as a single case study research in Addis Ababa, Ethiopia, at the Fafa Food Manufacturing Share Company which was the case company of the research. The overall objective of the research was identifying the effectiveness of IMS in food manufacturing industries in Ethiopia and the contributing factors for its effectiveness in meeting customer and regulatory requirements, international standards, effectiveness and efficiency in resource utilization, market competitiveness, income and profit maximization. Based on this the summarized findings were the followings:

- The results of secondary and primary data analysis has confirmed that that the case company (FFMSC) has implemented two ISO based QMSs - ISO 9001:2015 quality management system and ISO 22001:2005 food safety management system.
- MS integration was not done at all levels eg at structure and human resource level while it has been partly done in recording and documentation, control and follow ups activity areas.
- The satisfaction on the implemented IMS was found to range between medium to high among the respondents of questionnaire, FGD and KII participants. Similarly, satisfaction of medium to high was identified on management responsibility, resource management, planning and realizing quality and safe products, validation, verification and improvement of IMS. In addition, moderate to medium level satisfaction was identified on the effectiveness and performance of IMS.
- It has been identified that necessary preconditions were fulfilled for the production process by that case company which include policy setting, strategy (vision, mission, core values, objective and activities), organizational structure, management commitment, providing training to employees, assigning quality-food safety team leader with team

members, fulfilment of PRP, HACCP plan and oPRP, traceability root, recording, documentation and communication systems.

- It was identified that control of hazards was done starting during the raw material reception time with a focus on checking and controlling percent impurity of the raw materials in terms of inspecting total percent impurity, moisture content, density and doing particle size and organoleptic test for flour raw material.
- The conducted research has identified that the case company HACCP has identified three CCPs– Drum Drier, Fluid Bed Drier and Probate Roaster processes. PRPs were identified ahead and then identified and defined oPRPs and set their specifications together with a required care to be taken on the production processes.
- The SPC X & R-charts worked out for soya bean roasting process temperature control on the Probate Roaster Machine have shown that the soya bean drying temperature was in control. Nevertheless, C_p was found to be 0.5 indicating that the process has no capacity to meet the set specification due to common cause variation. Similarly, min C_{PK} value was found to be 0.46 indicating that the process was not centered. Therefore, this has shown that the process was classified under poor process which couldn't meet the case company set upper and lower specification limits.
- The worked out SPC X & R-charts for wheat & fruit mixed baked dough drying time control on Drum Drier Machine have indicated that the process was out of control implying the existence of assignable causes of variation which should be alleviated by the company. On the other hand, C_P and C_{PK} was found to be 0.45 showing that the process time distribution was not centered and meet the set specification limits with few nonconformance units because of $Cp<1$ (the distribution points deviate by 1 standard deviation from the average in which 99.73% of the population fall within the set specification limits while 27% of the points are out of the set specification limits).
- The worked out SPC X and R-charts for hot steam treated corn grain drying temperature control on Fluid Bed Drier have shown that process temperature control was under control indicating that the process was within the set specification limits. On the other

hand, C_P and C_{PK} were found to be 0.5 indicating that the process capacity couldn't meet the set specification despite it has centered distribution.

- It has been identified that the return product quantity was small compared to the volume produced and this has also shown a trend of drastic decrease from relatively high level in 2014 to very low in 2015 and then showed an increasing trend starting 2016.
- The research identified that the customer complaints were well addressed. Most of the complaints were associated with the product return which the company has replaced them for free at the time of complaint.
- It has been identified that the cost of quality for the case company has been reduced as seen in terms of the reduction of product defects, return and rework wastes.
- It was identified that the trend of product sales value data and product distribution for sales data have shown, relatively, an increasing trend indicating that there had been improvement in market competitiveness and maximization of profit.
- The conducted research has identified that the company has been well in conformity in meeting government statutory and regulatory requirements and international standards. This has been evidenced by the management audit done and calibration of its measuring instruments with the Ethiopian Standardization Agency.
- The contributing top ten factors for the effective implementation of IMS within the case company were those identified and ranked ones which their list was provided within the body of the research write up.

5.2 Conclusion

The followings were concluded based on the research results:

- It has been confirmed that the case company has implemented IMS composed of ISO 9001:2015 QMS and ISO 22001: 2005 FSMS.
- Management systems integration was not done at all levels eg at structure, activity and human resource assignment level because of it has been partly integrated in record keeping, documentation, control and follow up activity implementation areas.

- The satisfaction of employees on the implementation of IMS, management responsibility, resource management, planning and realizing quality and safe products and validation, verification and improvement of IMS was medium to high. This has indicated that the satisfaction of the employees was not to their expectation level.
- It has been identified that the necessary preconditions for the process were fulfilled and put into operation such as PRP, HACPP, CCPs and oPRP.
- The process temperature and time control for HACCP identified Fluid Bed Drier CCP was out of control indicating that the variation was out of the set upper and lower limit. While in the cases of Drum Drier and Probate Roaster CCPs, the temperature and time control was in control indicating that the variation was within the set upper and lower limit for both temperature and time. Nevertheless, in all the mentioned cases, the capability of the processes were not found to perfectly meet the set specification limit as the computed C_P was less than or equal to one indicating that the data distribution standard deviation was less than or equal to one alpha. Similarly, the computed C_{PK} was found to be less than one alpha indicating that the data distribution was not centered.
- The cost of quality was reduced as seen in terms of reduced defects, return and rework of products return of the case company while on the other hand product distribution for sales value has shown increased trend indicating improvement for market competitiveness and profit maximization.
- The implementation of IMS was found to be inconformity with government statutory and regulatory requirements and the international standards.
- The top ten contributing factors for the IMS implementation were the requirements ranked using Excel application based on the responses of the questionnaire respondents.
- Therefore, it has been concluded that the implementation of IMS was not effective as expected because of the processes were not found to produce products as per the set specification.

5.3 Recommendation

The followings were the research recommendations:

1. The case company should take measure to integrate MS at all levels starting from the structure of the company to effecting individual activities such as resource allocation, reporting, rerecord keeping, documentation, audit and management reviews.
2. The identified out of control situation for CCPs process temperature and time control should be corrected and corrective actions also should be taken by the case company further studying the specific causes under each CCP.
3. The observed good practices such as fulfilment of PRPs, oPRPs, HACCP, assignment of quality and food safety team leader with its members should be well maintained and assured of their well-functioning.
4. Product return volume during the production process was rising again and this requires taking correction and corrective actions dealing with the observed problem.
5. Other food manufacturing industries of Ethiopia which have already integrated MS or would like to integrate in the future should learn from the indicative results of this research in order to look further into their respective process operations and take correction and corrective actions or develop mechanisms that prevent the occurrence of any potential hazards or defect causing situations.

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ANNEXES (82 – 100)

Annex 1. Research Questions- For Technical Staff

Introduction

This questionnaire is to collect information and data for evaluating the '**Effectiveness of Implementing Integrated Management System (IMS) in Food Manufacturing Industries taking the case of Fafa Food Manufacturing Share Company (FFMSC) as a benchmark***'*. The focus of the questions is on five criteria requirements of IMS (ISO 9001:2008 and ISO 22001: 2005) – *quality and food safety management system; management responsibility; resource management; planning and realizing quality and food safety products; validation, verification and improvement of quality and food safety management system*.

Based on this, the research is conducted to meet academic interest with the objective of fulfilling the partial requirement for an MSC degree in Quality and Productivity Management. Therefore, you are kindly requested to cooperate in giving response to all questions presented in the questionnaire. The researcher promises you that any of your response will not be disclosed or pass on, in any case, to a third party other than the concerned higher academic institution which is the owner of the research being conducted. Herewith, the researcher would like to thank in advance for your cooperation in giving response to all questions on time diligently.

Part I. General Questions

1. How long have you been working for FFMSC? (**Circle one**)
   1. 1-5 years 2. 6-11 years 3. 12-16 years 4. Over 17 years
2. What is your age range? (**Circle one**)
   1. 18 -25 years 2. 26-32 years 3. 33-39 years 4. Over 40 years
3. What is your sex? (**Circle one**)
   1. Male 2. Female
4. What is your educational status? (**Circle one**)
   1. 1-4 grade 2. 5-8 grade 3. 9-12 grade 4. Diploma 5. BA/BSC Degree and above
   6. Other (Specify) ----------

5. What is your responsibility within FFMSC? (**Circle one**)

1. General Manager 2. Deputy Manager 3. Quality Manager
4. Supervisor 5. Worker 6. Lab technician
7. Other (Specify) ----------

6. Do you know that IMS is practiced by FFMSC? (**Tick one**)

1. Yes 2. No

7. If your answer is 'yes' to the above question, for how long it is practiced? (**Circle one**)

1. 1- Year 2. 2-Years 3. 3-Years 4. 4-Years and above

8. Why do you think FFMSC would like to implement IMS? It was to ---- (**Circle one or more**)

1. Build positive image 2. Gain growth and competitiveness
3. Gain certificate of standard 4. Engage in continuous improvement
5. Make employees get happy 6. Enhance profitability. 7. All are reasons

Part II. Requirement Related Questions

Note: For the requirements of IMS specified in the table from number 9 to 39, please, **put tick mark (√)** corresponding to each stated idea on the left side of the table to show your agreement, disagreement or neutrality.

No	Requirements	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
IV	**FFMSC's Quality and Food Safety Management System (QFSMS)**					
9	Has established, documented, implemented and maintained an effective QFSMS and updated it as per the International Standard (IS) when necessary.					
10	Has defined the scope of its QFSMS.					
11	Has documented quality and food safety policy and objectives, procedures and records, documents needed by the organization.					
V	**FFMSC's Management Responsibility**					

No	Requirements	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
12	**H**as shown commitment to the development and implementation of the QFSMS and to continuously improve its effectiveness.					
13	**H**as defined, documented and communicated its quality and food safety policy.					
14	**H**as ensured planning and integrity of QFSMS.					
15	**H**as defined responsibility, authority and communicated within the organization.					
16	Has appointed quality and food safety team (QFST) leader with well specified responsibility and authority.					
17	**H**as established, implemented and maintained effective arrangements for communication with personnel, suppliers, contractors, customers, statutory and regulatory authorities and other organizations.					
18	**H**as established implemented and maintained procedures to manage potential emergency situations and accidents that can impact quality and food safety and which are relevant to the role of FFMSC in the food chain.					
19	**H**as reviewed FFMSC's QFSMS at planned intervals to ensure its continuing suitability, adequacy and effectiveness.					
VI	**FFMSC's Resource Management**					
20	**H**as provided adequate resources for the establishment, implementation, and maintenance and updating of the QFSMS.					
21	**I**ts quality and food safety team and the other personnel are competent and have appropriate education, training, skills and experience.					
22	**H**as identified the necessary competencies for					

No	Requirements	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
	personnel, provided training, evaluated the implementation and the effectiveness of the above, ensured awareness of the personnel on their contribution.					
23	**H**as provided resources for the establishment, management and maintenance of the infrastructure and the work environment needed to implement the requirements of ISO.					
VII	**FFMSC's Planning and Realization of Quality and Safe Products**					
24	**H**as implemented, operated and ensured the effectiveness of planned activities of PRP(s), operational PRP(s) and the HACCP plan and any changes to these activities.					
25	**H**as collected, maintained, updated and documented all relevant information needed to conduct the hazard analysis.					
26	**H**as appointed quality and food safety team which have a combination of multi-disciplinary knowledge and experience.					
27	**H**as described product characteristics (end product & end use) in documents to the extent needed to conduct the hazard analysis for all raw materials, ingredients and product-contact materials.					
28	**H**as described process steps and control measures and prepared flow diagrams for the products or process categories covered by the QFSMS.					
29	**Q**FST has conducted a hazard analysis and determined the type of hazards to be controlled; degree of control and the combination of control measures needed.					
30	**O**perational PRPs have been documented specifying hazard(s) to be controlled, control					

No	Requirements	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
	measures, monitoring procedures, to be taken corrections and corrective actions, responsibilities and authorities, record(s) of monitoring.					
31	**H**ACCP plan has documented the hazard(s) to be controlled, CCP(s), control measure(s), critical limit(s), monitoring procedure(s), corrections and corrective action(s) to be taken, responsibilities and authorities, record(s) of monitoring at the CCP.					
32	**FFMSC** has updated product characteristics, intended use, flow diagrams, process steps and control measures following the establishment of operational PRP(s) and/or the HACCP plan.					
33	**FFMSC**'s verification planning has defined the purpose, methods, frequencies and responsibilities for the verification activities.					
34	**FFMSC** has established and applied a traceability system that enabled the identification of product lots and their relation to batches of raw materials, processing and delivery records.					
35	**FFMSC** has ensured that the products affected were identified and controlled with regard to their use and release.					
8	**FFMSC's Validation, Verification and Improvement of QFSMS**					
36	**FFMSC**'s QFST has planned and implemented the processes needed to validate control measures and/or control measure combinations, and to verify and improve the QFSMS.					
37	**FFMSC** has conducted management review and internal audits at planned intervals to determine whether the QFSMS conforms to the planned arrangements, to the food safety management system requirements established by FFMSC, and					

No	Requirements	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
	to the requirements of the international standard (IS) and was effectively implemented and updated.					
38	**FFMSC**'s QFST has systematically evaluated the individual results of planned verification and results of verification activities, including the results of the internal audits and external audits.					
39	**FFMSC**'s top management has ensured that FFMSC continually improved the effectiveness of the QFSMS through communication, management review, internal audit, evaluation of individual verification results, analysis of results of verification activities, validation of control measure combinations, corrective actions and QFSMS updating.					

Part III. FFMSC's IMS Effectiveness and Organizational Performance

40. Do you know that FFMSC has implemented IMS? (**Circle one**)

1. Yes 2. No 3. I have no idea.

41. If your answer is 'Yes' to the above question, please indicate if you and other FFMSC employees have been satisfied by the FFMSC's IMS? (**Circle one**)

1. Yes, I and all other employees satisfied. 2. No, I and all other employees not satisfied.

3. Yes, I and all other employees moderately satisfied.

42. Has the effort of team work and individuals encouraged and recognized by the FFMSC management? (**Circle one** for questions from **42 to 49**)

1. Yes 2. No

43. Have FFMSC's employees provided with a required training that impacted work positively?

1. Yes 2. No

44. Do you think that FFMSC has readily made available all resources needed for your work?

1. Yes 2. No

45. Do you think that there was continuous improvement at FFMSC due to the implementation of IMS?

1. No 2. Yes

46. Do you think that FFMSC's management has a culture of recognizing employees' suggestion and contribution?

1. Yes 2. No

47. Do you think that FFMSC has a culture of involving employees in decision making?

1. No 2. Yes

49. Have you realized that there have been defects, returns and reworks of products at FFMSC?

1. No, I have not. 2. Yes, I have

50. If your response to the above question is 'Yes', What was the trend of defects, returns and reworks compared to the situation after implementing IMS? (**Circle one**)

1. Increasing 2. Decreasing 3. Fluctuates (sometimes increases and sometimes decreases)

51. Have you perceived that the clients of FFMSC satisfied with the product and service provided? (**Circle one**)

1. Yes 2. No 3. I have no idea about it.

52. If your answer is 'No' to the above question, what do you think was/were the main reason(s)? (**Circle one or more**)

1. Customer complaints were not considered.
2. Rectification actions were not taken to the identified problems.
3. Root causes of problems were not dealt with and appropriately acted upon to eliminate once and for all.
4. Other (Please indicate) _____

53. Do you think that the implementation of IMS has helped FFMSC to improve market competitiveness and maximize profit? (**Circle one**)

1. Yes 2. No 3. I have no idea about it.

54. Do you think that FFMSC has reduced quality cost? (**Circle one**)

1. Yes 2. No 3. I have no idea about it.

55. If the response you gave to the above question is 'No' what was/were the possible main failure factor(s) out of the listed ones herein under. (**Circle one or more**)

1. Lack of proper implementation of IMS.
2. Lack of management commitment.

3. Low awareness and commitment of employees.
4. Poor follow up and review system.
5. Others (specify) ----------

56. How do you rate FFMSC against the points specified in the table from 57 to 62? (Put '**Tick Mark'** corresponding to each idea specified on the left hand of the table)

No	Rating Criteria	Very Good	Good	Poor
57	FFMSC's product quality			
58	Timely delivery of products			
59	Accepting and processing customers' complaints and giving timely appropriate feedback.			
60	Informing clients on any change of product design and development.			
61	Assisting clients to understand requirements			
62	Employees' customer handling manner			

Annex 2. Interview Questions – For Supervisors and Managers

Part IV. Open-ended Interview Questions, Focus Group Discussion Points and Key Informant Questions

63. Are all the employees of FFMSC well aware of IMS? Explain

_____
_____
_____

64. Have you faced any challenge while implementing IMS and how you solved? Explain

_____
_____
_____

65. What are the benefits you gained by implementing IMS?

_____
_____
_____

66. Do you think practicing IMS has increased effectiveness and overall performance of the FFMSC? How?

_____
_____
_____

67. What model/steps you followed to implement IMS?

_____
_____
_____

Annex 3. Focus Group Discussion Point (for non-technical staff)

1. Do you think FFMSC has effectively implemented IMS? Why?
2. Do you think you have contributed for the improvement of FFMSC?
3. How customer complaints were handled within FFMSC?
4. Do you think customer complaints were reduced compared to previous periods?
5. Do you think FFMSC has eliminated/reduced quality and food safety hazards?
6. What do you think concerning the quality cost of FFMSC, reduced or increased? Why?

Annex 4. Key Informant Questions (for suppliers, retailors & end users)

1. Are you satisfied with the IMS of FFMSC? **All three**
2. Did you get from FFMSC timely response and rectification for your complaints? **All three**
3. Are you happy with the way FFMSC's staff treat you? **All three**
4. Have you heard any information that FFMSC has been subscribed to and awarded any quality award? **All three**
5. Did you get always, in advance, necessary information concerning what requirements you should fulfill to supply inputs? **KI - suppliers**
6. Was FFMSC's delivery of products timely and efficient? **KI-Retailors & end users**
7. What is your view concerning the quality and safety of FFMSC's products? **KI-Retailors**
8. Were there any complaints that you received/heard from the end users? **KI-Retailors**

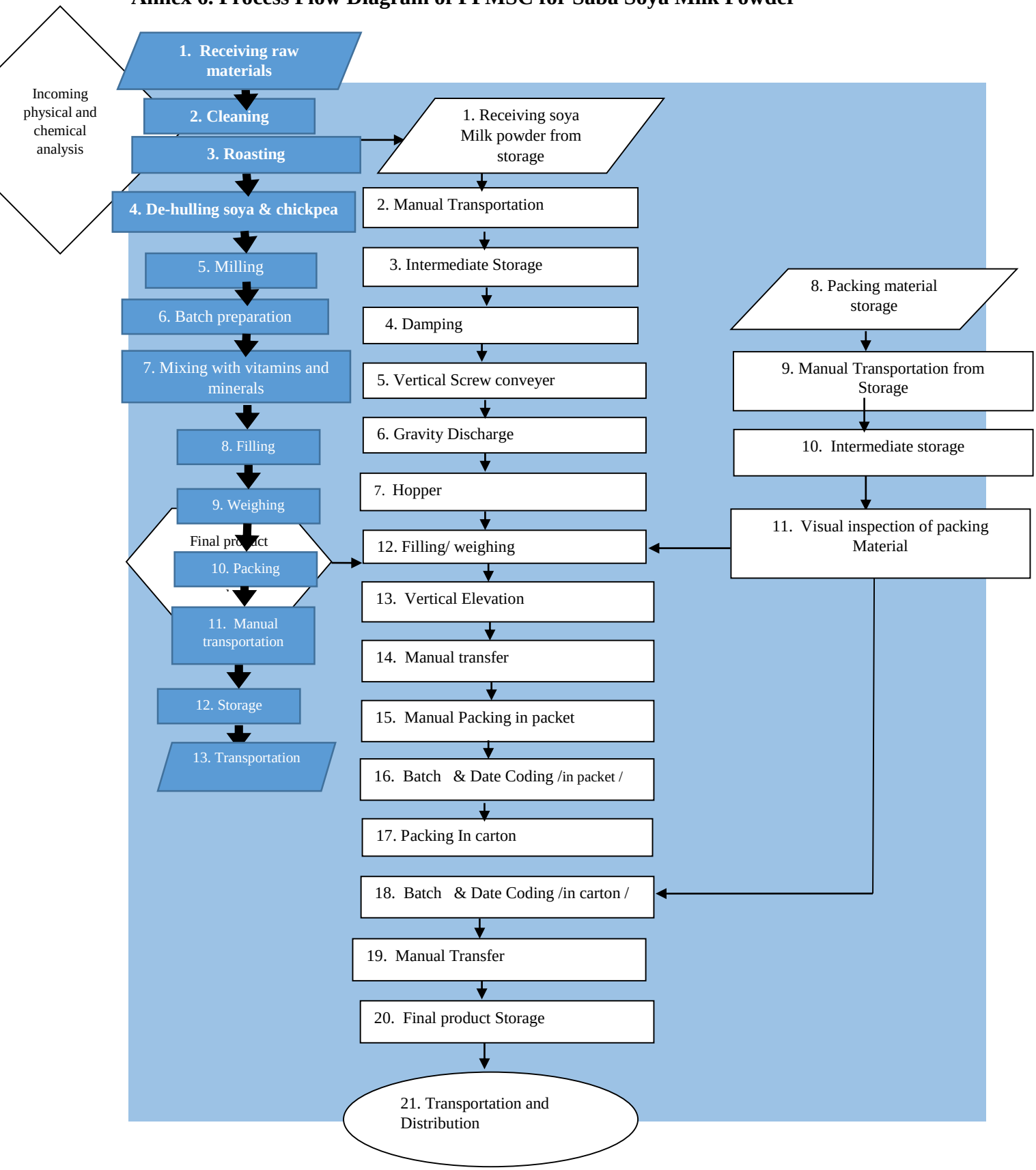
Annex 5. FFMSC's Food Products and their Composition.

Food Products of FFMSC

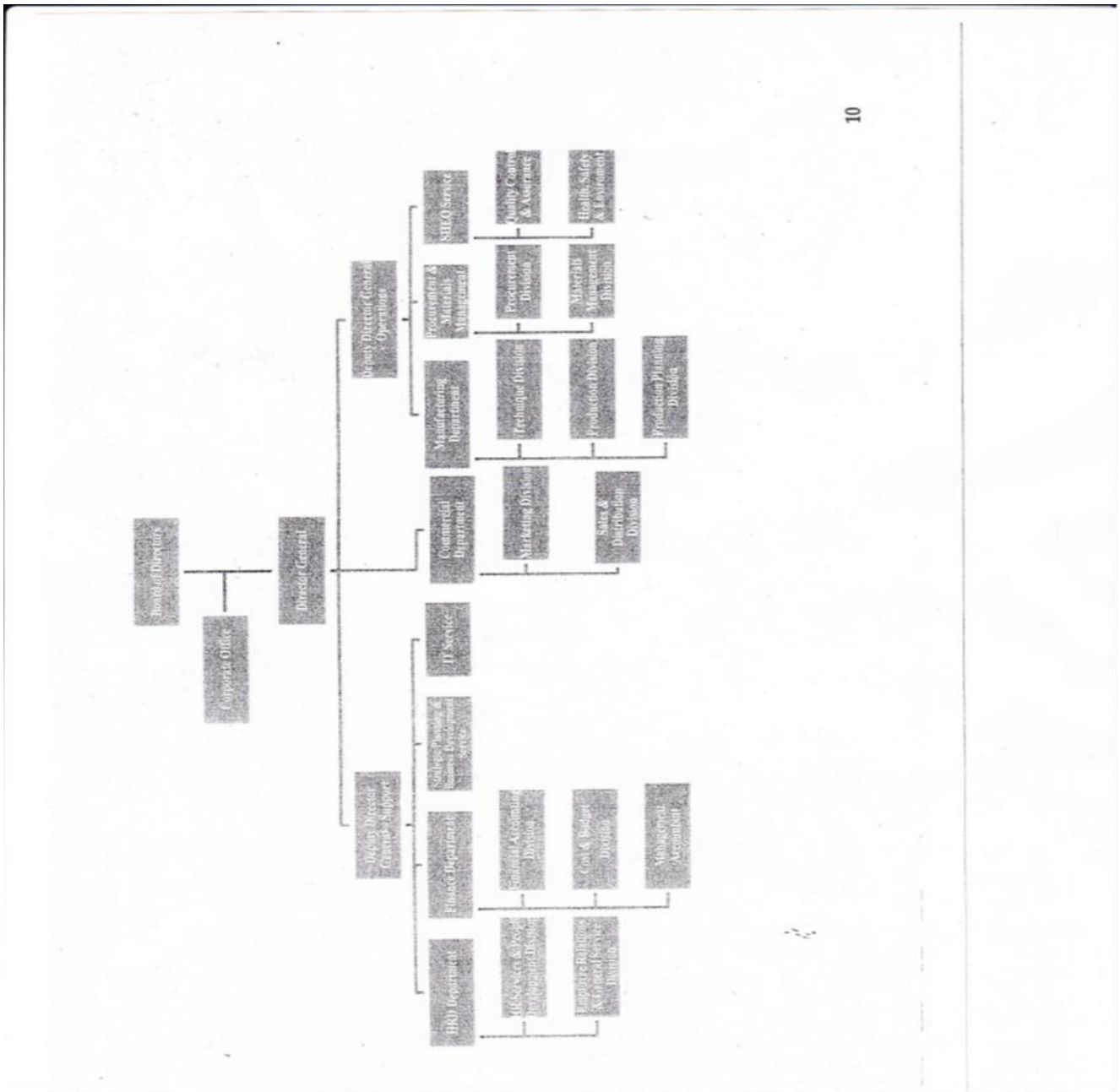
No	Product Category	Product Line	Composition	Use
1	Wheat Flour	Wheat Flour	Wheat Flour	Bread^{+} purpose
2	Infant Foods	Faffa	Wheat flour, skimmed & full fat milk powder, defatted soya flour, chick peas, sugar, vitamins (A,B_1,B_2,B_6,B_{12},C,D,E,K, Nicotinic Acid & Folic Acid), Minerals (Iron, Iodine, zinc and Calcium phosphate).	Supplementary weaning food primarily for infants above 6 months of age.
		Cerifams	**Soya + Wheat**: wheat flour, skimmed milk powder, chick peas, sugar, vitamins (A, B1, B2, B6, B12, C, D, Nicotinic Acid, and Folic Acid), Minerals (Iron, Iodine and Calcium phosphate) and enzyme alpha-amylase and vanilla flavor.	Nutritionally enriched and pre-cooked baby food usually for infants above 6 months of age.
			Rice + Fruit: rice flour, soya flour, milk powder, different fruits such as banana, orange, mango & apple, sugar, vitamins & Mineral premix, Iodized salt, palm oil, enzyme, strawberry and banana flavor.	
			Wheat + Vegetable: wheat flour, soya flour, milk powder, vegetable such as carrot, spinach & pumpkin, sugar, vitamins & Mineral premix, Iodized salt, palm oil, enzyme, strawberry and orange flavor.	
			Rice + Vegetable: rice flour, soya flour, milk powder, vegetable such as carrot, spinach & pumpkin, sugar, vitamins & Mineral premix, Iodized salt, palm oil, enzyme, banana and orange flavor	
			Wheat + Honey: wheat flour, soya flour, rice flour, milk powder, sugar, honey, vitamins & Mineral premix, Iodized salt, palm oil, enzyme and orange flavor.	
			Rice + Honey: rice flour, soya flour, milk powder, sugar, honey, vitamins & Mineral premix, Iodized salt, palm oil, enzyme, banana and orange flavor	
			Rice + Corn: rice flour, corn flour, soya flour, milk powder, sugar, vitamins & Mineral premix, Iodized salt, palm oil, enzyme, strawberry and orange flavor	
			Wheat + Milk: wheat flour, milk powder, soya flour, sugar, vitamins & Mineral premix, Iodized salt, palm oil, enzyme and flavor	
			Wheat + Fruit: wheat flour, soya flour, milk powder, fruits , sugar, vitamins & Mineral premix, Iodized salt, palm oil, enzyme, and flavor.	
			Rice + Milk: rice flour, milk powder, soya flour, sugar, vitamins & Mineral premix, Iodized salt, palm oil, enzyme and flavor.	
3	Family Foods	Dubei Duket	Wheat flour, defatted soya flour, vitamins (A, B1, B2, B6, B12, C, D, Nicotinic Acid, Folic Acid), Minerals (Iron and Iodine).	Vitamins and protein enriched family food.
		Famix	Maize flour, roasted Soya flour, vitamins (A, B_1, B_2, B_6, B_{12}, C, D, Nicotinic Acid, Folic Acid), Minerals (Iron, Iodine and calcium).	
			Famix MS: maize flour, roasted Soya flour, sugar, vitamins (A, B_1, B_2, B_6, B_{12}, C, D, Nicotinic Acid and Folic Acid) and Minerals (Iron, Iodine and calcium).	
		Favena	Oat flour, Soya bean flour, Iodized salt, vitamins and minerals.	
		Barley Mix	Barley flour, Iodized salt, Soya bean flour, vitamins and minerals.	Nutritionally enriched family food mainly.
		Corn Flakes	Yellow Corn, Sugar, Barley malt extract, vitamins, minerals and flavors.	Nutritionally enriched cereal breakfast food.
		Snack Foods	Corn, Sugar, Barley malt extract, Iodized salt, vitamins and minerals.	Nutritionally enriched family food.
		Saba Soya Milk	soya protein isolate, palm oil ,corn syrup solid ,sugar ,minerals (calcium ,phosphorus ,potash ,magnesium, zinc) vitamins (A,B1,B5,B12 folic acid),salt emulsifiers.	Enriched in vitamins and minerals which are essential to support normal growth and development.

No	Product Category	Product Line	Composition	Use
4	Bread Improver	Magi Mix	Maize flour, wheat flour, flour treatment agent: ascorbic acid; processing aids such as enzymes.	All-purpose bread improver specially designed for local recipe and process in general.
5	Draught Affected	CSB $^{+}$	Maize flour, roasted Soya flour, vitamins (A, D_3, E, k_1, B_1, B_2, B_6, B_{12}, C, D, Panto thenic Acid, Niacin, Biotin and Folic Acid) and Minerals (Iron, Iodine and calcium, Potassium, Zinc).	
		Fafa Relief	Wheat flour, skimmed & full fat milk powder, defatted soya flour, chick peas, sugar, vitamins (A,B_1,B_2,B_6,B_{12},C,D,E,K, Nicotinic Acid & Folic Acid), Minerals (Iron, Iodine, zinc and Calcium phosphate).	

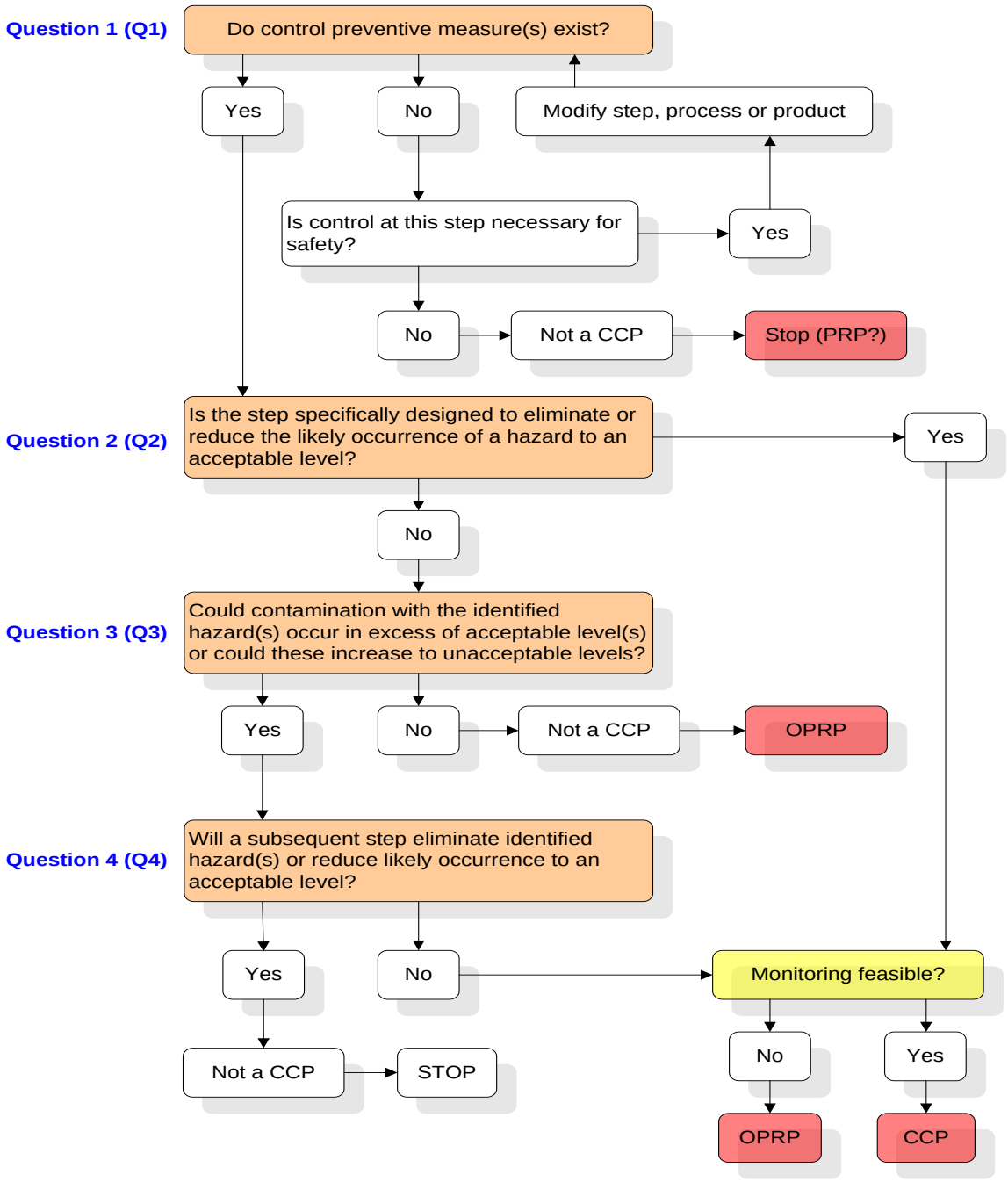
Annex 6. Process Flow Diagram of FFMSC for Saba Soya Milk Powder



Annex 7. Organogram of FFMSC - the Case Company



Annex 8. Critical Control Points Decision Tree of FFMSC



Input	Process steps	Output	Who should		
			Act	Involved	Informed
Purchased or transferred raw material or product Received item	1. Receiving item	Received item	RDST		DMSH
	2. Register identification and traceability information	Registered information	RDST		DMSH
New or revised item, process, and system	3. Establish traceability up to initial distribution	Established traceability system	RDST	IMSF IMST	DG IMSL
Audit, plans	4. Periodically monitor & review	Monitoring & review result	RDST	Ditto	DMSH
Complaints, reports, defects, incidents	5. Tracing initiation	Traceability need	Initiator DG	IMSF IMST RDST	DG IMSL
Personnel's	6. Assigning personnel	Assigned personnel	DMSH ADST	IMSL	ADST
Materials, products Tracing methodology	7. Collect the product	Identified product	ADST		DG IMSL
	8. Apply tracing method	Traceability result	ADST	IMSF	Ditto
Results and format	9. Report the result	Report	DG		Ditto
Report	10. Analyze the result and decision	Analysis and decision	TM	DMSH IMSL	ADST
Withdrawal procedure Material, finance,	11. Compensation / 12. Withdrawal /Recall	Withdrawal Compensation payment	ADST	RDST RCB	DG IMSL
Decision result	13. Close the case	Closed case	ADST	RDST	Ditto
Feedbacks, reports, results	14. Document all the Result	Documents and records	ADST RDST	IMSF	Ditto
Problems, improvement methodologies	15. Continually improve	Improvement	ADST RDST	IMSF IMSL TM	DG

Annex 9. Identifi… …cedure of FFMSC

Annex 10. Average Respondents Response on the Implementation of QFSMS.

Statements about Meeting Requirements of IMS	Respondents' %age Level of Agreement					Mean	S.D
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree		
The case company has established, documented, implemented and maintained an effective QFSMS and updated it as per the International Standard (IS) when necessary.	38.5	46.2	15.4	0	0	4.23	.725
The case company has defined the scope of its QFSMS.	53.8	38.5	7.7	0	0	4.46	.660
The case company has documented quality and food safety policy and objectives, procedures and records, documents needed by the organization.	61.5	38.5	0	0	0	4.62	.506
Mean	**51.3**	**41.0**	**11.5**	**0**	**0**	4.43	

Annex 11. Average respondents response on meeting management responsibility.

Statements about Meeting Requirements of Management Responsibility	Respondents' %age Level of Agreement					Mean	S.D
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree		
Case company has shown commitment to the development and implementation of the QFSMS and to continuously improve the effectiveness.	53.8	38.5	7.7	0.0	0.0	4.46	.660
Case company has defined, documented and communicated its quality and food safety policy.	53.8	38.5	7.7	0.0	0.0	4.46	.660
Case company has ensured planning and integrity of QFSMS.	38.5	46.2	15.4	0.0	0.0	4.23	.725
Case company has defined responsibility, authority and communicated within the organization.	38.5	53.8	7.7	0.0	0.0	4.31	.630
Case company has appointed quality and food safety team (QFST) leader with well specified responsibility and authority.	46.2	23.1	23.1	7.7	0.0	4.08	1.038
Case company has established, implemented and maintained effective arrangements for communication with personnel, suppliers, contractors, customers, statutory and regulatory	15.4	69.2	15.4	0.0	0.0	4.00	.577

Statements about Meeting Requirements of Management Responsibility	Respondents' %age Level of Agreement					Mean	S.D
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree		
authorities and other organizations.							
Case company has established, implemented and maintained procedures to manage potential emergency situations and accidents that can impact quality and food safety and which are relevant to the role of the case company in the Food Chain.	30.8	53.8	7.7	7.7	0.0	4.08	.862
Case company has reviewed its QFSMS at planned intervals to ensure its continuing suitability, adequacy and effectiveness.	46.2	30.8	15.4	7.7	0.0	4.15	.987
Aggregate	**40.4**	**44.2**	**12.5**	**7.7**	**0.0**	**4.22**	

Annex 12. Average respondents response on the fulfilment of resource management.

Statements about Meeting Requirements of Resource Management	Respondents' %age Level of Agreement					Mean	S.D
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree		
The case company has provided adequate resources for the establishment, implementation and maintenance and updating of QFSMS.	23.1	46.2	30.8	0.0	0.0	3.92	.760
The case company's QFST and the other personnel are competent and have appropriate education, training, skills and experience.	30.8	46.2	23.1	0.0	0.0	4.08	.760
The case company has identified the necessary competencies for personnel, provided training, evaluated the implementation and the effectiveness of personnel and resource allocation area result ensured awareness of the personnel on their contribution.	46.2	46.2	7.7	0.0	0.0	4.38	.650
The case company has provided resources for the establishment, management and maintenance of the infrastructure and the work environment needed to implement the requirements of ISO.	38.5	46.2	7.7	7.70	0.0	4.15	.899
Aggregate	**34.6**	**46.2**	**17.3**	**7.7**	**0.0**	**4.13**	

Annex 13. Average respondents response on meeting requirements of Planning and Realizing Quality and Safe Products.

Statements about Meeting Planning and Realizing Quality and Safe Products	Respondents' %age Level of Agreement				Mean		S.D
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree		
The case company has implemented, operated and ensured the effectiveness of planned activities of PRP(s), operational PRP(s) and the HACCP plan and any changes to these activities.	30.8	69.2	0.0	0.0	0.0	4.31	.480

Statements about Meeting Planning and Realizing Quality and Safe Products	Respondents' %age Level of Agreement				Mean		S.D
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree		
The case company has collected, maintained, updated and documented all relevant information needed to conduct the hazard analysis.	46.2	46.2	7.7	0.0	0.0	4.38	.650
The case company has appointed quality and food safety team which have a combination of multi-disciplinary knowledge and experience.	38.5	38.5	15.4	7.7	0.0	4.08	.954
The case company has described product characteristics (end product & end use) in documents to the extent needed to conduct the hazard analysis for all raw materials, ingredients and product-contact materials.	30.8	46.2	23.1	0.0	0.0	4.08	.760
The case company has described process steps and control measures and prepared flow diagrams for the products or process categories covered by the QFSMS.	53.8	23.1	23.1	0.0	0.0	4.31	.855
The case company's QFST [2] has conducted a hazard analysis and determined the type of hazards to be controlled; degree of control and the combination of control measures needed.	38.5	46.2	15.4	0.0	0.0	4.23	.725
The case company's Operational PRPs have been documented specifying hazard(s) to be controlled, control measures, monitoring procedures, to be taken corrections and corrective actions, responsibilities and authorities, record(s) of monitoring.	46.2	38.5	15.4	0.0	0.0	4.31	.751
The case company's HACCP plan has documented the hazard(s) to be controlled, CCP(s), control measure(s), critical limit(s), monitoring procedure(s), corrections and corrective action(s) to be taken, responsibilities and authorities, record(s) of monitoring at the CCP.	46.2	30.8	15.4	7.7	0.0	4.15	.987
The case company has updated product characteristics, intended use, flow diagrams, process steps and control measures following the establishment of operational PRP(s) and/or the HACCP plan.	30.8	53.8	15.4	0.0	0.0	4.15	.689
The case company's verification planning has defined the purpose, methods, frequencies and responsibilities for the verification activities.	53.8	30.8	7.7	7.7	0.0	4.31	.947
The case company has established and applied a traceability system that enabled the identification of product lots and their relation to batches of raw materials, processing and delivery records.	46.2	46.2	7.7	0.0	0.0	4.31	.855
The case company has ensured that the products affected were identified and controlled with regard to their use and release.	46.2	53.8	0.0	0.0	0.0	4.46	.519
Aggregate	**42.3**	**43.6**	**14.6**	**7.7**	**0.0**	**4.26**	

[2] QFST=Quality and Food Safety Team

Annex 14. Average responses of respondents on Validation, Verification and Improvement of IMS

Statements about Meeting Requirements on Validation, Verification and Improvement of IMS	Respondents' %age Level of Agreement					Mean	S.D
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree		
The case company's QFST planned and implemented the processes needed to validate control measures and/or control measure combinations, and to verify and improve the QFSMS.	15.4	69.2	15.4	0.0	0.0	4.00	.577
The case company has conducted management review and internal audits at planned intervals to determine whether the QFSMS conforms to the planned arrangements, to the food safety management system requirements established by FFMSC, and to the requirements of the international standard (IS) and was effectively implemented and updated.	38.5	46.2	7.7	7.7	0.0	4.15	.899
The case company's QFST systematically evaluated the individual results of planned verification and results of verification activities, including the results of the internal audits and external audits.	23.1	53.8	23.1	0.0	0.0	4.00	.707
The case company's top management ensured that FFMSC continually improved the effectiveness of the QFSMS through communication, management review, internal audit, evaluation of individual verification results, analysis of results of verification activities, validation of control measure combinations, corrective actions and QFSMS updating.	53.8	38.5	0.0	7.7	0.0	4.38	.870
Mean	**32.7**	**51.9**	**13.5**	**7.7**	**0.0**	**2.76**	