SCAN

Supply Chain Analysis for Nutrition

June 2019

gain
Global Alliance for Improved Nutrition

TABLE OF CONTENTS

REFERENCES TO SUPPLEMENTARY TOOLS

Throughout this guidance, you will see the symbol shown on the right, which signifies that there is an accompanying supplementary tool that complements the information provided. These tools can be used to help guide you in conducting a Supply Chain Analysis for Nutrition (SCAN).

The tools are mentioned on the following pages:

INTRODUCTION TO THIS GUIDANCE

This guidance document describes a methodology for analysing specific supply chains for their current and potential impact on nutrition - i.e. Supply Chain Analysis for Nutrition (SCAN). Supply chains structure how goods and services move from producers to consumers and are key components of the food system. Analysing a supply chain for a food can reveal weaknesses or bottlenecks, suggesting potential points of intervention for economic to improve nutrition.
This guidance document exists to help individuals and organisations working on supply chains for nutrition, providing best practices to ensure uniformity, consistency, and quality of the analysis. It aims to clarify key terminology and drive users to employ a common methodology when undertaking supply chain analyses for potential nutrition impact.

Tools, not rules!

This guidance presents a general procedure for supply chain analysis - not an exact recipe. Depending on the context, the procedure presented here and some of the described tools may not be relevant. In some cases, it may be advisable to omit or add steps or perform additional analyses depending on your objectives.

What are supply chains?

Supply chains are the sequence of stages and processes through which a product moves from production to distribution to consumption, as depicted in Figure 1. We generally refer to a supply chain for a specific commodity or food type within a certain region or country. For example, we may speak of the "poultry supply chain in Mozambique" or the "tomato supply chain in northern Nigeria". A supply chain comprises the flow of all information, products, materials, and funds between the different stages of creating and selling a product to the end consumer.

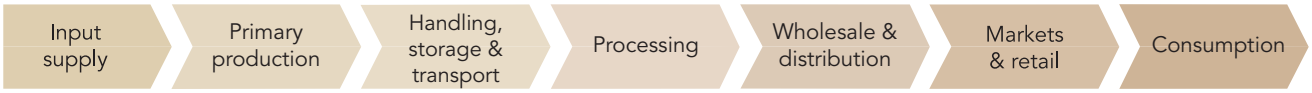

Figure 1: Diagram of a supply chain

Throughout these supply chain stages; a product can be transformed in ways that add value. The stages and processes at which value is added are commonly referred to as the value chain. Value chain processes include those that add value for the consumer, such as assembly, manufacturing, packaging, and nutritional preservation or enrichment. Value chain processes also include those that add value for the business, particularly in ways that minimise costs, such as inventory control, logistics, and reduction of waste.

Often the terms supply chain and value chain are used interchangeably and collectively. For the purposes of this guidance, we will refer to these terms collectively under the umbrella term supply chain.

As food moves through a supply chain, there are many opportunities to transform it in ways that add nutritional value. Similarly, there are many risks of losing nutritional value through nutrient loss or product decomposition. Inefficient food supply chains can result in food degradation and contamination, increasing food safety risks and costs for consumers. The longer the supply chain, the greater the opportunity or risk that nutrition can be affected along the supply chain. Figure 2 depicts some examples of how nutrition and food quality can be increased or decreased along the supply chain.

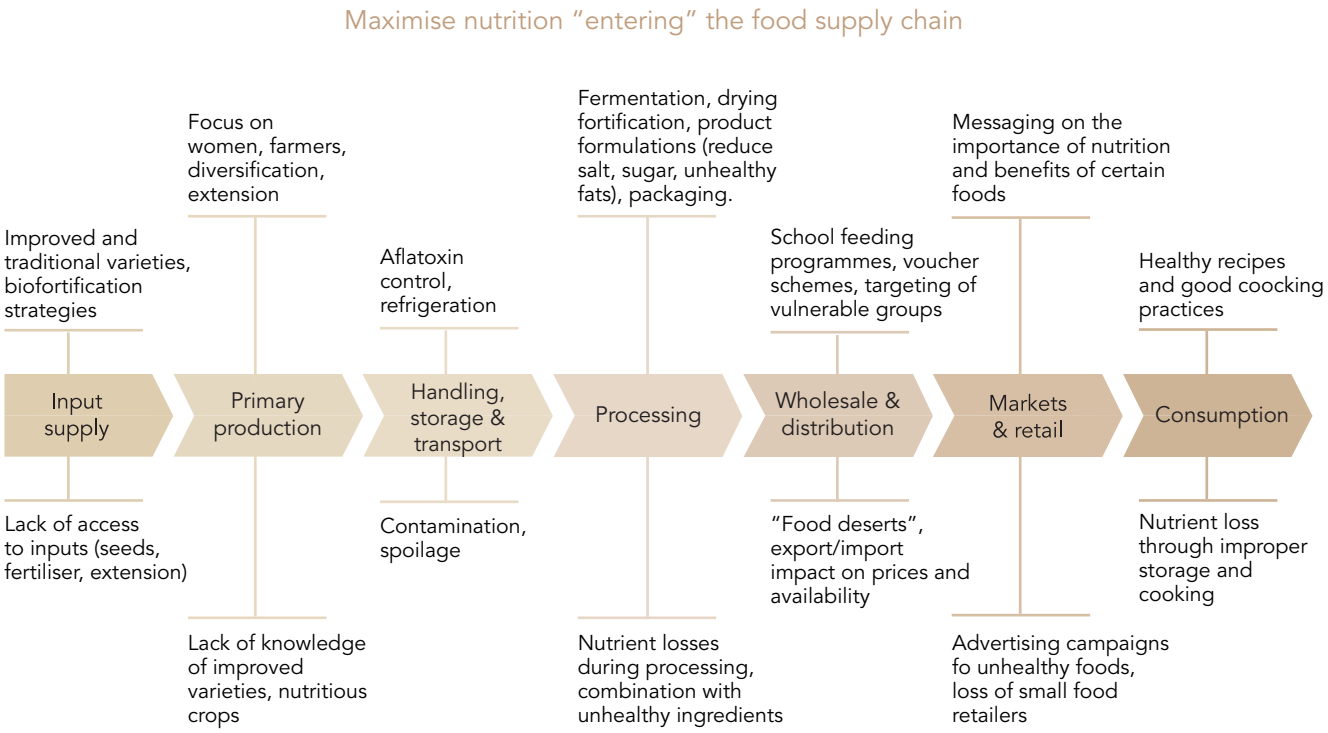

Figure 2: Examples of nutritional value opportunities and risks along the supply chain (after Franzo et al. 2017b)

Why are supply chains relevant for nutrition?

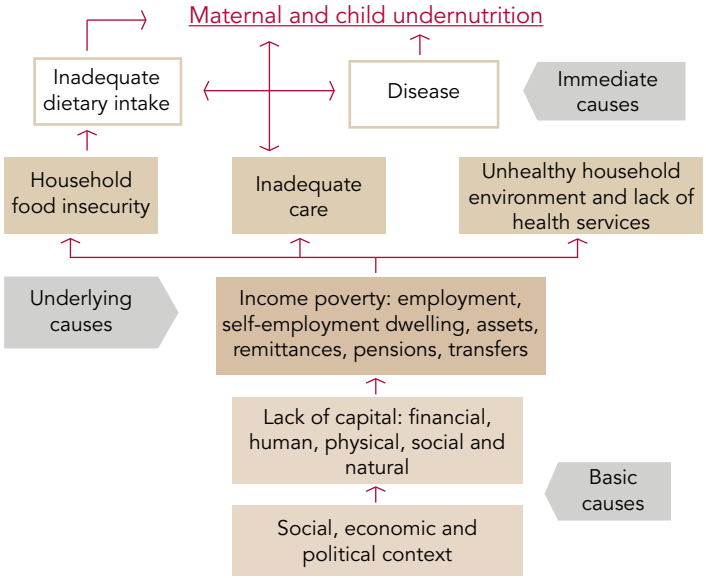

Figure 3: UNICEF conceptual frameworkon the causes of malnutrition

Malnutrition is a complex problem and generally the result of several interlinked and confounding causes spanning the health, agriculture, environmental, economic, social, and political sectors, as seen in the UNICEF Conceptual Framework for Nutrition (Figure 3). One of the key immediate causes of malnutrition is inadequate dietary intake of the micronutrients and macronutrients needed for metabolism, growth, cognition, and reproduction. Consumption of unsafe food can also hurt nutrition by causing diarrheal diseases and other illnesses. Thus, adequate nutrition requires consumption of safe and nutritious food.

Supply chains are open systems. In other words, the actors and activities within a supply chain interact with their environment as well as with each other, even those actors and influences that are not directly part of the system.

Therefore, the effectiveness and productivity of the supply chain is a result not only of the activities that take place within the chain but also of external factors and influences that affect the supply chain, including external factors (such as rules or policies) that affect food accessibility, desirability, and quality. This broader food system encompasses all food supply chains as well as the links between them and the broader social, economic, and policy context. A consumer makes his or her food choices at the interface of this food system with his or her own life. This space is known as the external food environment: the context within which consumers make their decisions about acquiring, preparing, and consuming food.

OVERVIEW OF SUPPLY CHAIN ANALYSIS FOR NUTRITION (SCAN)

The purpose of SCAN is to understand how the various stages of the supply chain contribute to the accessibility, desirability, and quality of the food in question.

SCAN does this by investigating the supply chain across three dimensions, as explained in Table 1 and depicted as a matrix in Figure 4. Across all stages of the supply chain, the four aspects (products, policies, people, and policies) contribute to the surrounding business and social environment, which impacts the food environment. This in turn, affects the accessibility, quality, and desirability of foods.

DIMENSION	KEY INVESTIGATION POINTS
Characteristics of the food environment	Accessibility, desirability, and quality
Aspects of the supply chain	Products, processes, people and policies
Stages of the supply chain	Inputs, production, handling and storage, transport and collection, processing, distribution and wholesale, markets and retail, consumption

Table 1: The three dimensions of SCAN

Altogether, SCAN could contain 60+ intersections of these three dimensions to investigate and consider. It is unlikely to be practical, feasible or necessary to outline each of these elements in detail, although each does shape our understanding of the overall food environment and its contributions to adequate nutrition. Based on the scope of the analysis and the objectives of the SCAN, greater or lesser focus can be placed on certain intersections.

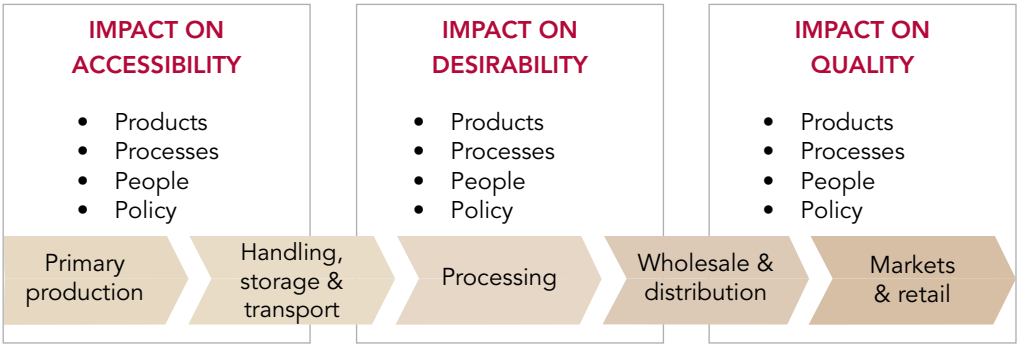

Figure 4: The dimensions of SCAN - impacting a food's accessibility, desirability and quality in relation to the stages and aspects of the supply chain

Let's now take a closer look at each of the dimensions of SCAN in greater detail.

Characteristics of the food environment

The key characteristics of the food environment, the accessibility, desirability, and quality of foods, are outcomes of the supply chain, in interaction with the broader food system. These shape consumers' decisions around food acquisition with implications for their nutrition.

ACCESSIBILITY

The accessibility of a food tells us whether consumers are logistically and financially able to purchase the food. It is determined by a food's availability and affordability, as manifesting within their local environment, as well as the consumer's resources.

Availability is an indication of whether a food can be procured consistently and easily by consumers. An available food is one that consumers can rely on to be present within their reach in the market environments where their food is purchased. Availability can be affected by numerous factors - e.g. seasonal shifts in supply and price, changes in policy and trade, or excesses or shortages of raw materials needed for a food's production or processing.

Affordability is an indication of a consumer's ability to purchase a food. Affordability is largely influenced by the product's price; generally, the more expensive something is, the less affordable it becomes. Affordability can also be influenced by packaging sizes; smaller packages require smaller expenditures and may be more affordable to lower-income consumers at a given moment, even if the price per unit of food is higher.

Affordability can also be influenced by factors not related to the food itself. If a consumer's income increases, her/his purchasing power may also increase, increasing the affordability of food. On the other hand, if the cost of other goods or services in a consumer's list of needs increases, the affordability of a given product may decrease if it is of perceived lower priority, even if its price has not changed.

DESIRABILITY

The desirability of a food indicates whether a food is appealing and will be chosen by consumers. There are several factors that may contribute to a food's desirability, including taste, convenience, aspiration, experience and/or habits.

Taste affects the desirability of a food simply because consumers typically desire tasty foods. A food's taste results from the qualities of the food, its method of preparation, other stimuli that are received during the tasting experience, the consumer's preferences, and food culture. Sometimes, the tastiest foods are those that are less nutritious. For example, people often prefer food that is sweet, salty, and rich in fat, regardless of the health risks posed by excess consumption of these.

Convenience relates to the human tendency to expend the minimum amount of energy necessary to achieve a desired result. All else being equal, consumers will often choose products that add the least amount of hassle to their lives. For example, consumers may choose products that are closer to the front of a shop or closer to eye-level on a shelf. They may choose products that are easier to prepare and consume, such as pre-cut vegetables and foods available in single-serving packages. They may also choose retail outlets that are nearby or open at their preferred hours.

Aspiration and experience can shape consumption habits. People like different things for different reasons, often having to do with their worldview, beliefs, priorities, preferences, and aspirations. Consumers may choose products and brands not only for the qualities inherent in the product itself but also for the way the product makes them feel. Consumers may choose foods they perceive as healthier, more environmentally-friendly or more sustainable. They may limit their consumption of some foods for environmental, religious, ethical, or cultural reasons. Some consumers may opt for products that will generate immediate satisfaction, while others may choose products that they believe will benefit themselves or their families in the future.

Consumers may choose a name-brand product for the feeling of social status they derive from owning and consuming the product, such as a feeling of being unique and trendy. Consumers who want to express aspirations to conform to a particular culture may seek out foods that relate to that culture or avoid foods seen as taboo or looked down upon within the community.

Habits structure our lives and shape the desirability of foods. Consumers are most likely to do what they have always done. Changing behaviour, such as adding a new product to a family recipe, changing portion sizes, or reducing intake of certain foods, requires conscious and subconscious effort. It can be surprisingly difficult to adopt even the smallest modification.

QUALITY

The quality of a food indicates whether the food is safe, nutritious, and free from significant health risks. The two main contributors to food quality are its safety and its nutritive quality.

Safe foods are those that are free from biological, chemical or physical contamination and have been produced through a procedure that is appropriately controlled to minimise these risks. Safe foods do not increase the probability of poor health outcomes when part of a broader recommended diet in the context where it is consumed. Safety is normally determined based on quantified, internationally agreed thresholds for contaminants, as defined in the Codex Alimentarius. Figure 5 depicts some examples of the types of contaminants and hazards that may be introduced to foods along the supply chain.

BIOLOGICAL	CHEMICAL	PHYSICAL
• Bacteria • Viruses • Protozoa • Parasites • Molds	• Mycotoxins • Pesticides • Fertilisers • Cleaners and soaps • Heavy metals	• Glass, metal, plastic or wood particles • Hair and dust • Insect or animal parts, • Remains or feaces

Figure 5: Examples of food safety hazards

Food safety is a serious concern. Food spoilage, decomposition, or contamination resulting from any of the hazards listed in Figure 6 can result in consumer allergy, injury, illness, or death; food waste and loss of nutritional value; and business economic losses from poor publicity and product recalls.

Nutritious foods are more difficult to define. Good nutrition depends on consumption of a moderate quantity of a combination of diverse foods, rather than consumption (or lack of consumption) of one or more specific foods. Humans require a balanced combination of dozens of micro- and macronutrients to sustain a healthy diet. Individually, foods fall along a multi-dimensional spectrum of nutritional quality, and it is misleading to simply classify foods as “nutritious” or “non-nutritious”.

Where an individual food item sits on the nutritious spectrum depends on the nutrients that the food contains, and whether it adds required nutrition to the diet of its consumer in relation to other foods in the diet. Excess or sole consumption of any food, even one considered nutritious in isolation, does not necessarily make up a healthy diet. For example, iodised salt provides an essential nutrient, iodine, not found in many other foods naturally, but excessive consumption of sodium through salt can increase the risk of high blood pressure, stroke, or heart attack.

When working with food supply chains, we seek to define foods that can be considered nutritious, so we must simplify this complex relationship. We cannot know who will consume the food in question, but we can

estimate using national or regional averages when determining whether a food will add nutrition to diets or not. Once we know which nutrients are of interest for the health of a population, we can focus the SCAN only on the qualities of the food itself. For the purposes of this guidance, we consider nutritious foods those that:

- Provide beneficial micronutrients (i.e. vitamins and minerals).
- Provide beneficial macronutrients (i.e. proteins providing amino acids, lipids providing unsaturated fatty acids, each providing energy in the form of calories).
- Provide beneficial fibre.
- Do not contain excessive quantities of salt, fat, sugar or additives/preservatives.
- Present minimal food safety risks.

Nutritious foods need to be considered within the context of a target group, since certain vulnerable groups have specific nutritional needs that can make a given food nutritious for them while being potentially undesirable for others. For example, a young child, especially one at risk of or suffering from acute malnutrition, may require a diet higher in foods that are energy-dense to support physical growth, while these might be undesirable for adolescents or adults at risk of obesity. Pregnant and lactating women have specific micronutrient needs to support the physical and intellectual growth of babies and infants in their first 1,000 days of life (from conception to age 2).

It is also important to consider a food's influence on planetary health and environmental sustainability. The 2019 report, Food in The Anthropocene: the EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems highlights this dual importance of foods and argues that immediate steps should be taken to create dietary shifts that will be both healthier for people and more sustainable for the planet and future generations.

OPPORTUNITIES FOR INVESTIGATION AND IMPACT

As described above, there are many opportunities along the supply chain to improve the chain's potential to provide better nutrition through maximisation of potential benefits and minimisation of potential adverse effects. Examples of these are given in Figure 6.

For more information, particularly on potential cross-cutting issues that relate to supply chains, refer to:
Supplementary Tool – 01 Cluster Analysis - Six Capitals.

	ACCESSIBILITY	DESIRABILITY	QUALITY
Maximise benefits	- Increase availability - Increase affordability	- Improve advertising - Raise consumer awareness and create more demand - Produce more appealing products	- Improve nutrient content and availability - Improve product characteristics - Implement processes and controls
Minimise risks	- Reduce post-harvest lossess - Reduce food waste - Plan for known or seasonal shortages	- Improve advertising - Reduce adverse product associations	- Reduce food safety risks - Reduce product characteristics that push food towards the unhealthy end of the nutrition spectrum
Cross-cutting impacts:	- Stable employment opportunities - Environmental sustainability - Gender sensitivity		

Figure 6: Examples of opportunities to maximise benefits and minimise risks to nutritious food supply chains

Aspects of the supply chain

The supply chain is composed of key actors and activities that can affect the potential for consumption of the food in question to improve nutrition. It is important to consider how they affect the transactions happening within the supply chain and the surrounding business and social environment, which affect the food environment. These actors and activities can be considered as four aspects: products, processes, people and policies.

PRODUCTS

The product is the food itself. Between agricultural production and retail sale, foods are handled, processed, and transformed on several occasions by different actors. In each of these steps, there is an opportunity for nutrition impact by altering, adding to, or preserving the nutritious nature of the food product in question.

PROCESSES

The processes that bring foods from production to market to consumption have a direct effect on the accessibility, desirability and quality of foods. Improving the flow of goods, information and money throughout the supply chain can improve the potential nutrition impacts of a given supply chain. For example, reducing logistical hurdles can shorten the time it takes a food to move from farm to market, which can reduce post-harvest loss and waste from spoilage while improving the nutrient retention of products that are reaching consumers.

PEOPLE

All along the supply chain, people are engaging with food products to add value and move them through the chain. These actors can include crop and livestock farmers, farm workers, truck drivers, processors, retail employees, shop owners, and the eventual consumer. These actors also include specific individuals as well as collectives of individuals - e.g. smallholder farmers, cooperatives, manufacturers, companies, and business associations. These people can increase the potential impact on end consumers' diets by improving the accessibility, desirability, and quality of the raw materials and intermediate products with which they come into contact.

Food supply chains also impact those who work within and interact with them. Supply chains can potentially improve these actors' nutrition, as well as that of consumers, such as by providing a fair wage or workplace policies that support nutrition and health.

POLICIES

Policies, laws, and regulations affect nearly every aspect of business and life. Government policies that pertain to taxation, employment, and trade can have direct effects on food supply chains. Government regulations outline the minimum acceptable standards for the goods and services that may be sold within a country or region. The quality and integrity of a government's efforts to enforce these standards can lead (or not lead) to a level playing field for the actors within a supply chain. This builds trust both between supply chain actors and government regulators and between supply chain actors and consumers. This trust, in turn, affects the degree to which supply chain actors comply with existing regulations.

Government laws and policies pertaining to land ownership, contract enforcement, and financial lending can affect the ability of supply chain actors to use collateral and seek loans and investment. Laws and tariffs can affect the availability and price of imported and exported raw materials and processed goods, which can

influence the accessibility of products for consumers. The availability and pricing of government or third-party services related to food safety and quality (e.g. product audits and inspections, product testing and certification) can also affect the ability of supply chain actors to bring safe and nutritious foods to markets.

Stages of the supply chain

The scope of SCAN should typically encompass the entire supply chain, from production to consumption. Depending on the objectives and purpose of the SCAN and the context of the food product of focus, stages can be added or removed as necessary. What follows are five of the most common stages to consider. Different actors can be involved in the various supply chain steps, but they can also be vertically integrated businesses which covers all or several steps of the supply chain.

1. PRIMARY PRODUCTION

The first stage of the supply chain is the primary production which include farming, fishing, animal husbandry, harvesting wild products, or other raw materials production. The production stage ends after harvest.

2. HANDLING, STORAGE AND TRANSPORT

Postharvest handling, transport and logistics are the second stage of a supply chain, which includes the planning, implementation, and control of the flow and storage of goods, services and related information from the point of origin to the point of consumption. Transport and logistics can happen both between the production and processing stages, as well as between the processing and retail stages.

3. PROCESSING

Processing is the third stage of a supply chain, within which raw materials are combined and transformed to make a final product for sale. This can include any action which preserves, prepares, or adds to foods, such as sorting and grading; chopping, slicing, and butchering of animal and plant products; cooking, drying, canning, fermenting, and curing processes; addition of additives, including nutrients for fortification; and packaging in a ready-to-eat or ready-to-cook format.

4. WHOLESALE AND DISTRIBUTION

Food distribution is the fourth stage of a supply chain, where final food products are delivered to food service operators (including retailers and caterers). This can involve storage, warehousing, and transportation through specific channels. Distribution can also include wholesalers, who purchase in bulk from the production and processing stages and sell to a retailer or direct to the consumer. In some cases, food supply chains involve non-market distribution, such as through a government food assistance programme.

5. MARKETS AND RETAIL

Retail is the fifth stage of a supply chain, which includes the sale of food goods in quantities purchasable by individual consumers from a specific point, such as a store, shop, or open-air market. Retail also includes those who provide food ready-to-eat, such as restaurateurs, street food sellers, and caterers. Retail shops tend to have a targeted consumer base and personal connections to the consumer. Retail is often the only stage of a supply chain in which consumers are directly involved. The introduction of e-commerce and other technology is, in many cases, providing a more direct involvement between consumers and other supply chain actors, even though this involvement may not be physically in person.

PERFORMING A SUPPLY CHAIN ANALYSIS FOR NUTRITION

SCAN has been designed around five main steps. These steps are indicative, rather than prescriptive; it is not always necessary to complete all steps depending on the objectives of the specific SCAN being conducted. For example, it may be the case that Step 3, primary data collection, is not necessary if the literature review in Step 2 uncovered sufficient information to meet the SCAN objectives.

The five main steps in conducting a SCAN are listed below and will be discussed in detail in this section of the guidance:

1. Intake, scoping, and definition of goals
2. Literature review, mapping, and preparation for interviews
3. Primary data collection
4. Analysis and synthesis
5. Reporting and dissemination

Figure 7 provides an overview of the SCAN process. The time required is indicative only and must be adjusted based on the SCAN objectives and the findings of Steps 1 and 2. The goal of each step is described along with each of the sub-steps and their supplementary tools (in red). Much like the main steps, working through each of the sub-steps is not necessarily required. This guidance intends to offer a menu of processes and tools that could be used to conduct a SCAN; the set of sub-steps and tools used should be chosen based on the context and SCAN objectives.

Figure 7: SCAN process overview

Step 1: Intake, scoping, and defining the goals

There are various reasons to perform a supply chain analysis for nutrition. Understanding and clearly articulating the question that the SCAN seeks to answer is a critical first step. For example, SCAN may be performed to determine:

- Whether a particular crop or commodity would be worth supporting in a particular country from a nutrition perspective;
- The stages and aspects of a certain supply chain that may have the largest effects or present the largest risks to the accessibility, desirability and quality of the end product; or
- What policy constraints might be preventing access to, or consumption of, safe and nutritious foods.

At a minimum, the research question guiding a SCAN should identify a specific supply chain or chains, in a specific geography, and goals for intervening within that chain (e.g. reducing costs, improving safety).

1.1 INTAKE SURVEY AND CONSULTATIONS

First step is to understand the objectives and scope of the assignment in order to understand the boundaries and to ensure an effective use of the SCAN tool. A SCAN will involve several stakeholders, both internal to an organisation and external. Each of the stakeholders may have different requirements or expectations for the SCAN. Understanding these is the objective of an initial intake survey and consultation. This process reviews applicable terms of reference or donor agreements specific for the assignment, work previously conducted by various organisations on the food or context in question, and any needs and requirements of stakeholders. This may be accomplished mostly through a review of documents but will usually also include some direct consultations with stakeholders. At the end of the process, the analyst should be able to define and reach key stakeholder agreement on:

- The desired scope of the SCAN, in terms of geography, food commodity and supply chain stages.
- The desired scope of the literature review within the SCAN.
- Any tools which will be used to conduct the SCAN.
- A basic understanding of what is already known about the food commodity and its supply chain.
- The roles and responsibilities of key internal and external stakeholders.
- The desired impact on nutrition that would be sought from an eventual intervention.

The SCAN process is iterative and some of these topics may need to be revisited throughout the process. However, the intake survey and consultations

For more information on this topic and for a template intake survey that can be adapted, refer to: Supplementary Tool – 02 Intake Survey.

Step 2: Literature review, mapping, and preparing for interviews

Before new data is collected, the analyst's understanding should be informed by existing literature. The literature review serves to map out current knowledge, determine its applicability to the current issue or emerging challenge, and identify gaps where this knowledge is either outdated or does not yet exist. The literature review helps ensure that the SCAN does not repeat work done previously. It should also indicate whether primary data collection is required and, if so, provide the insight needed to adapt interview guides to gather the required information.

The literature review should result in:

- A supply chain map, supply chain stakeholder overview and price mark-up model.
- A preliminary statement or hypothesis related to the supply chain's impact on nutrition outcomes.
- A first-draft Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis of the supply chain.
- If necessary, interview guides to be used in the primary data collection stage.

2.1 SUPPLY CHAIN MAP

Mapping the supply chain shows where barriers and opportunities exist to improve the accessibility, desirability and quality of nutritious foods. A supply chain map will provide the assessment team with:

- A general overview of the supply chain within the country for the food in question.
- An overview of the flow of goods and their volumes across the supply chain of a specific business or broadly across an entire market or country.
- A few preliminary ideas about where there might be challenges and opportunities in the supply chain that could affect the accessibility, desirability and quality of foods.
- A preliminary list of key stakeholders and participants who could be interviewed.

A supply chain map is created in the form of a flow chart, as in Figure 8, which fits the research and programming needs agreed to during the intake survey and consultations. The supply chain map will be referred to throughout the analysis process and finalised for the final report.

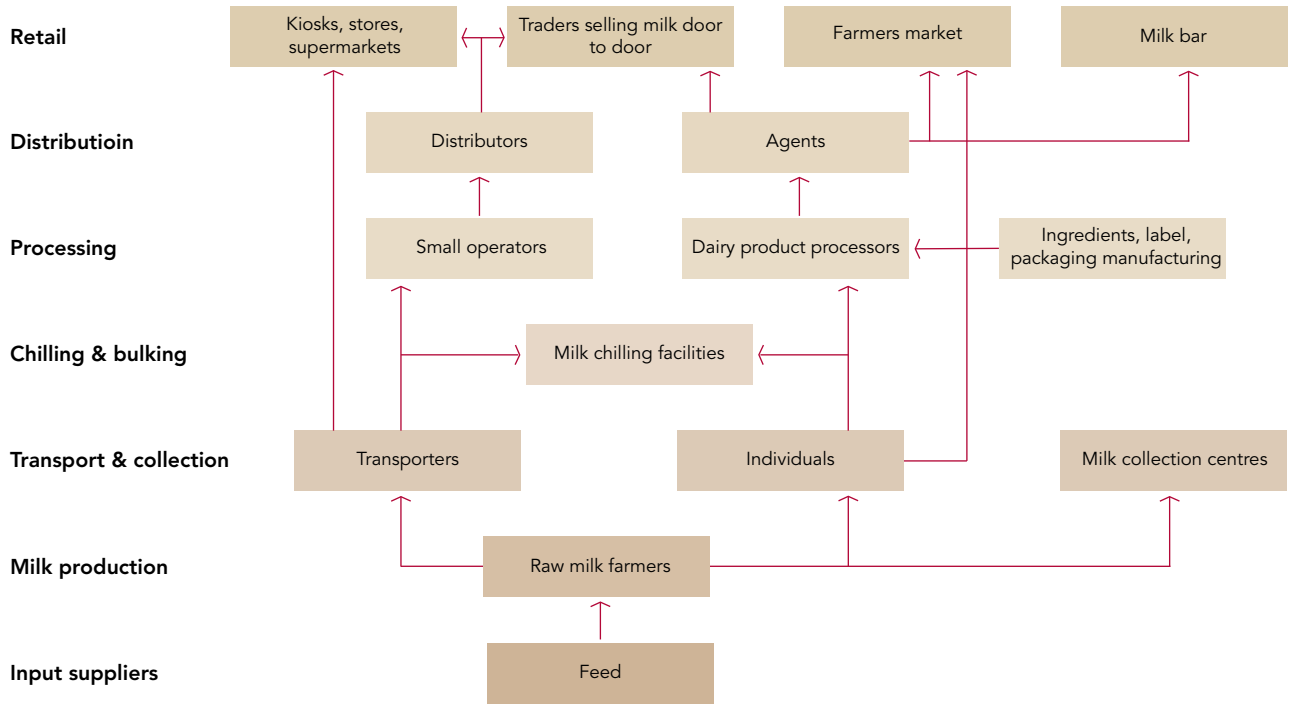

Figure 8: An example of a supply chain map for dairy

For more information and a template to create a supply chain map, refer to:
Supplementary Tool – 03 Supply chain mapping, Part I.

2.2 STAKEHOLDER MAP

It is important to map the stakeholders who are active in, influence, or are influenced by the supply chain in question. Begin to list specific participants the SCAN team will want to interview to find out more information about aspects of the supply chain. The more specific the list, the more efficient the interview process, and the more strategic the insights will be. Common participants to consider are listed in Table 2. A successful stakeholder mapping exercise will result in a specific list of individuals and organisations that should be interviewed and the key insights that are expected to be gathered during the interviews.

Table 2: Potentially relevant stakeholders to consider in a SCAN

TYPE	STAKEHOLDER EXAMPLES	POTENTIAL IMPACT ON SUPPLY CHAIN
Public	Governments at the national, provincial and local levels.	Development of laws, taxes, planning, infrastructure.
	Departments and Ministries (e.g. Agriculture, Health, Economics, etc.) and supporting agencies (e.g. Food control agencies, Bureaus of standards,etc.).	Development of policies, public-private partnerships, budgets.
Semi-public	Consumer associations, unions, business associations, and institutions (partly) owned by the government.	Mobilisation of stakeholders and relevant networks, intervention scaling.
Private	Businesses of all sizes operating along the supply chain.	Provision of goods and services; prototyping of innovations and provisionof a testing ground for interventions.
Financial	Banks and investors of all sizes.	Provision of financing arrangements, knowledge of industry risks and opportunities.
Knowledge	Research institutes, universities, think tanks, consulting firms.	Development of research on innovations, barriers and trends.
NGOs	National and international civil society organisations, including UN Agencies, for-profit and non-profit implementing agencies, donor agencies, etc.	Mobilisation of stakeholders and relevant networks, benchmarking, knowledge sharing, implementation support.

2.3 PRICE MARK-UP MAP

A price mark-up map is a way to assess the affordability (cost and price per serving) of a food within a supply chain. The chart displays the cost of goods at different stages in the supply chain, which can be validated during the field interviews. As the example in Figure 4 depicts, such a map shows how the cost of a good increases as it moves through the different stages of a supply chain.

Comparing the price mark-up map to the supply chain map can identify stages in the supply chain where operational inefficiencies are leading to increased prices. In turn, this helps to identify and assess opportunities for keeping costs low and thus ensuring foods are accessible to low-income consumers.

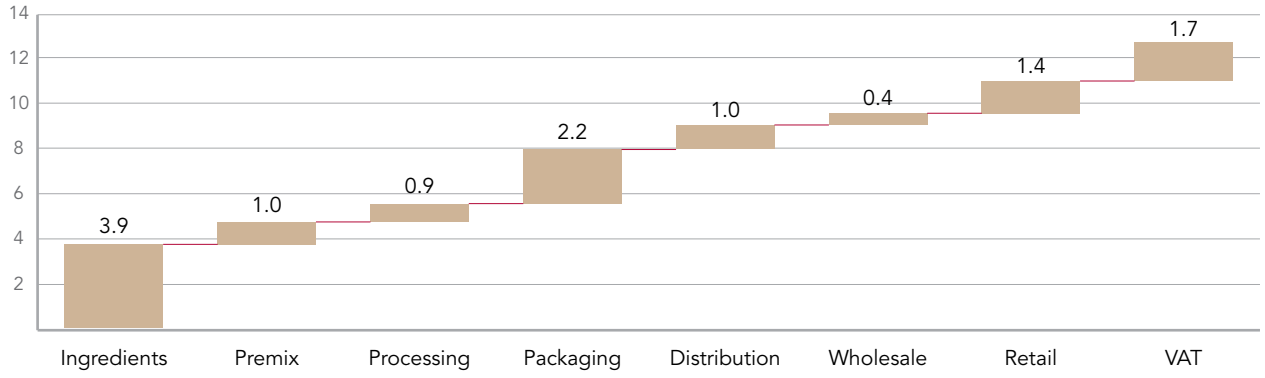

Figure 9: Example of a price mark-up plan

For more information and detailed instructions on how to create a price mark-up map, refer to:
Supplementary Tool – 04 Price mark-up map.

2.4 SWOT ANALYSIS OF SUPPLY CHAIN ACTORS

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is a commonly used model that presents positive and negative, internal and external factors that affect supply chain actors. In the context of SCAN, a SWOT analysis presents:

- Strengths or advantages an actor has over other actors.
- Weaknesses or disadvantages relative to other actors.
- Opportunities in the market that an actor can use to its advantage.
- Threats in the market that could create challenges for the actors.

A SWOT analysis is typically presented in a 2x2 matrix, as depicted in Figure 10, and can be conducted at either an individual supply chain actor level or at a market level. It enables the assessor to understand how current interactions are creating supply chain barriers and opportunities that affect the accessibility, desirability, and quality of a food. For example, a SWOT analysis can be used to identify and confirm which supply chain actors have the greatest ability to influence supply and prices and affect the accessibility, desirability, and quality of foods.
The SWOT analysis can be used to organise and analyse the results from the literature review and further identify gaps that can be filled through primary data collection.

	Positive attributes	**Negative attributes**
Internal factors	Strengths	Weaknesses
External factors	Opportunities	Threats

Figure 10: SWOT analysis matrix

For more information and detailed instructions on conducting a SWOT analysis, refer to:
Supplementary Tool – 05 SWOT analysis.

In addition to the SWOT analysis, consideration of Porter's Five Forces can also help capture the relationship between actors along the supply chain, how they impact each other, and how they compete and cooperate. Porter's Five Forces describe the competitiveness of an industry, including barriers to entry, rivalry determinants and competition, the power of the supplier, the threat of substitutes and the power of the buyer or consumer.

For more information on Porter's Five Forces, including definitions and how they interact, refer to:
Supplementary Tool – 06 Porter's Five Forces.

2.5 ADAPTING THE INTERVIEW GUIDE

Based on the results of the intake survey and literature review, the analyst should be able to determine whether it is necessary to undertake additional primary data collection. If so, an interview guide or other data collection tools (e.g., market surveys or observations) should be developed or adapted to address identified gaps and provide the data necessary to meet the SCAN objectives. The interview guide should be pre-tested with participants to ensure all questions are being understood and interpreted as intended.

One way to develop an interview guide is to work backwards from some of the intended analysis diagrams and models (see Step 4) and identify key information that is needed to populate the various diagrams. It is also possible to work backwards from a decision-tree in cases where potential interventions are already known and key information must be gathered to determine their relevance and potential for impact.

For more information and for a sample suggested interview guide which can be adapted, refer to:
Supplementary Tool – 07 Interview Guide.

Step 3: Primary data collection

When the literature review reveals gaps in available secondary information, it may be necessary to collect primary data from stakeholders. Primary data collection will help the SCAN team develop a complete picture of the supply chain's potential impact on nutrition, accurately consider the local cultural context, and capture diverse perspectives. The stakeholder engagement involved in primary data collection can also provide opportunities to foster support and interest in the research findings and recommendations.

3.1 STAKEHOLDER INTERVIEWS

Based on the stakeholder mapping conducted in Step 2.2, the SCAN team can determine who should be interviewed and what specific questions or topics would be best to ask each type of stakeholder, depending on their field of expertise and known local knowledge. Through stakeholder interviews, constraints along the supply chain can be described and contextualised in terms of how their effects are felt by a variety of supply chain actors.

Stakeholder interviews can be done in either individual or group formats. When conducting interviews, the analyst should be sure to gather information from multiple stakeholders in multiple sectors (e.g. both business and nutrition interests). Interview questions should be based on the work completed in Step 2.5, adapting the interview guide. Several other questionnaire templates are provided with this guidance, which may be useful for developing interview questions for specific stakeholders.

When conducting stakeholder interviews, the usual research ethics principles apply. The SCAN team should seek ethical approval for research involving human participants from a relevant university or national research committee. Key ethical principles include:

- Respecting autonomy including providing informed consent, ensuring participants are not coerced to participate and may withdraw at any time, and protecting the confidentiality of any personal data.
- Maximising benefits including conducting research in a manner that ensures quality and integrity and is effectively and appropriately disseminated.
- Minimising harm including considering, mitigating and disclosing to participants any possible risks of harm.

Careful notes should be taken, supported by audio recording if feasible and documented findings from the interviews should be collected and saved for future referencing.

For more information, and for a sample introduction letter used to gain informed consent from participants, refer to: Supplementary Tool – 08 Stakeholder Introduction Letter.

Step 4: Analysis and synthesis

Once all relevant data have been collected either from primary or secondary sources, the findings and insights must be organised, analysed, and synthesised. This helps the SCAN team identify key challenges, develop recommendations for interventions to overcome these challenges, and prioritise interventions for action and implementation. Primary data collection can add new insights based on the secondary data from the literature review by filling gaps in information, detecting changes and new trends, and/or by verifying and validating that previous findings are still relevant (perhaps in a slightly different context).

4.1 SUPPLY CHAIN HEAT MAP

The first step in data analysis is to organise information and capture challenges along the food supply chain. This is done using the supply chain map developed in Step 2.1 and identifying key areas where there is the most opportunity and/or risk for impacting the accessibility, desirability, and quality of the target food. Figure 11 shows an example supply chain heat map using the dairy supply chain from Figure 8 as a starting point. The heat map should consider all potential intersections of interest from the three dimensions of SCAN, described in Figure 4.

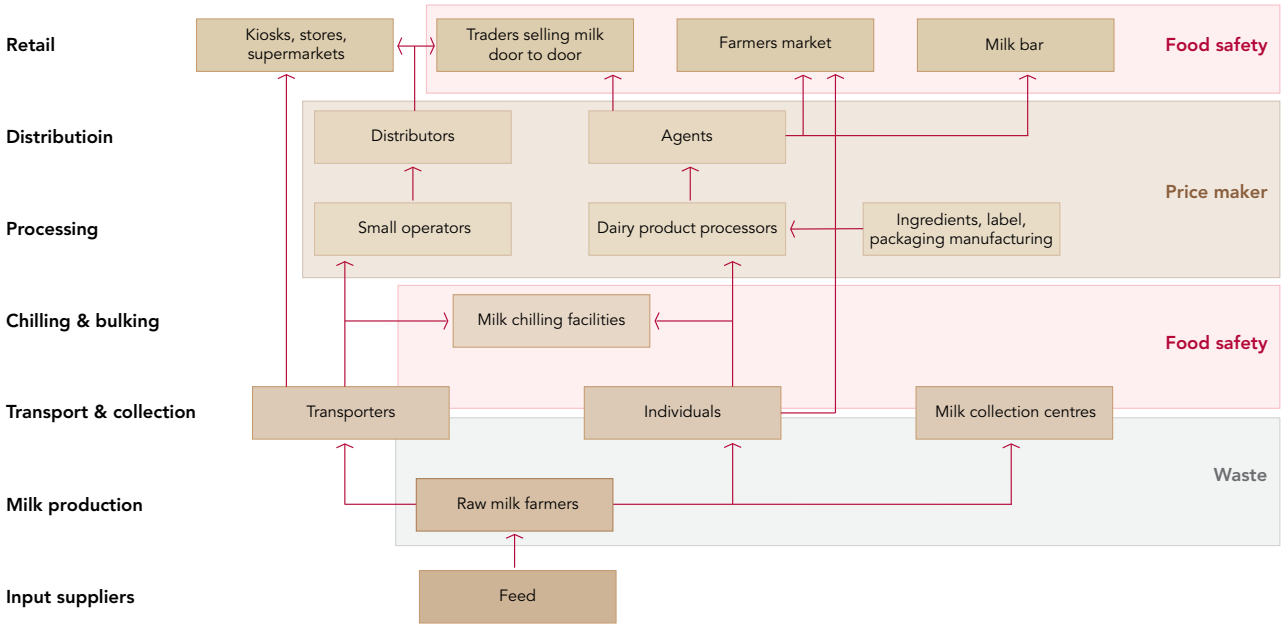

Figure 11: Example of a supply chain heat map for dairy

A supply chain heat map can be used to show:

- Supply constraints, delayed transportation, poor infrastructure, or poor flows between actors.
- Food safety and quality risks.
- Significant contributions to a final product's price.
- General information pertaining to areas of supply chains that the assessor would like to highlight.

For more information and a template to create a supply chain heat map, refer to:
Supplementary Tool – 03 Supply chain mapping, Part II.

4.2 CHALLENGE MATRIX

A challenge matrix compares key challenges identified in the supply chain heat map (see Step 4.1) and organises them into categories, based on how urgent they are or what expected impact they could have if solved, and how difficult they are or the level of effort required to solve.

These results are organised in a 2x2 matrix as shown in Figure 12. This matrix is useful for prioritising which challenges to tackle first, shown in the top-left corner with high impact and low difficulty. Those with low impact and high difficulty (bottom-right corner) should be prioritised last, if at all, as they will take the most effort to solve and provide the lowest potential impact.

	Low effort / Low difficulty	**High effort / High difficulty**
High impact / High urgency	Address now	Look into potential interventions
Low impact / Low urgency	Look into potential interventions	Address later or not al all

Figure 12: Challenge matrix

The other two quadrants (low impact, low difficulty and high impact, high difficulty) should be considered based on a careful assessment of intervention strategies that could be used and where these strategies fall on the traffic light model (see Step 4.4) or the opportunity matrix (see Step 4.5).

For more information on the challenge matrix and for templates and instructions to populate the matrix, refer to: Supplementary Tool – 09 Challenge matrix

4.3 DEVELOPING RECOMMENDATIONS

Based on the analysis and prioritisation of challenges completed in steps 4.1 and 4.2, recommendations for interventions can be discussed. Such recommendations should highlight the key constraints identified during the literature review and data collection stages of the SCAN.

There are numerous solutions that could be developed to address the challenges occurring in the intersections of the SCAN's three dimensions (Figure 4). Some questions that can be reflected upon to assist the brainstorming process are suggested in Figure 13, organised according to the various supply chain stages (production, transport and logistics, value addition and transformation, distribution, and retail) and aspects (products, processes, people, and policies). The SCAN should help decide where in the supply chain an intervention can be most effective at addressing **accessibility**, **desirability**, and **quality (ADQ)**, and with which aspects.

Recommended interventions should be:
Based on nutrition gaps or needs of target populations.
Feasible within a reasonable timeline and budget.
Implementable in the given business, political, and cultural context.
Evidence-based, with a robust impact pathway, measurable indicators, and a monitoring plan.
Based on a market-systems approach that can create sustainable change long after the intervention funding has stopped.

GAIN has developed a portfolio of interventions that may be used to increase a supply chain's ability to bring safe, nutritious foods to market and to make these foods more accessible and desirable to consumers. Figure 14 depicts GAIN's offerings and how they interact with the supply chain stages and aspects.

	Production	Transport & logistics	Value addition & processing	Distribution	Retail
Products	• Can the product be biofortified? • Are there production techniques that will increase the nutrition quality of the end product?	• Would improved business practices improve performance and thus the ADQ of the final product? • Can know-how or capital be improved? • Are there ways to minimise post-harvest losses?	• Can the formulation of the product be altered in a way that improves ADQ? • Can the way the product is processed improve ADQ (e.g. through fermentation or drying)?	• Can the product's distribution model, packaging, or labelling be improved? • Are cold-chain interventions or other means of ensuring quality appropriate? • Is there a way to reduce cost or improve desirability of the final product by changing the way it is brought to market?	• Can the product's branding or marketing be improved to drive consumer awareness and demand, maintain quality, and maximise accessibility?
Processes	• Are there farm level practices, certifications, or processes that will improve accessibility, desirability, and quality (ADQ)?	• Can the supply chain be made more efficient through better logistics or cold chain interventions? • Can logistics processes be improved to drive improved ADQ? • Can there be improved methods of tracking and tracing products and product data?	• Are there opportunities for capacity building or knowledge sharing to improve processing? • Would access to know-how or other capital have potential to improve the ADQ? • Are there any technologies available that might improve ADQ, particularly among low-income consumers (e.g. solar power, modular processing)?	• Can the distribution networks be improved to lower costs, maintain safety, or improve the ADQ? • Are there any data sharing technologies available to track and report on products and supply chain demand?	• Are there point-of-sale marketing or other opportunities for demand creation or awareness campaigns that improve the desirability of nutritious foods?
People	• Is it possible to intervene with farming households to provide access to more nutritious foods, better information on nutrition, or encouragement to consume better diets?	• Is it possible to engage with supply chain actors to provide access to more nutritious foods, better information on nutrition, or encouragement to consume better diets?	• Is it possible to engage with supply chain actors to provide access to more nutritious foods, better information on nutrition, or encouragement to consume better diets?	• Is it possible to engage with supply chain actors to provide access to more nutritious foods, better information on nutrition, or encouragement to consume better diets?	• Could point-of-sale marketing or other opportunities for demand creation encourage consumers to consume more nutritious foods or adopt other behaviours that are good for their health and nutrition?
Policies	• Can regulations that constrain the supply chain's ability to provide accessible, desirable, safe, and nutritious foods to market be altered? • How can a conducive and enabling environment be created for a nutritious supply chain? • How can the regulatory environment contribute to the supply chain's maximum positive impact on nutrition? • Are there policy initiatives or incentives that would encourage the production, demand, or consumption of nutritious foods through the supply chain?				

Figure 13: Illustrative questions to assist brainstorming to develop recommended interventions

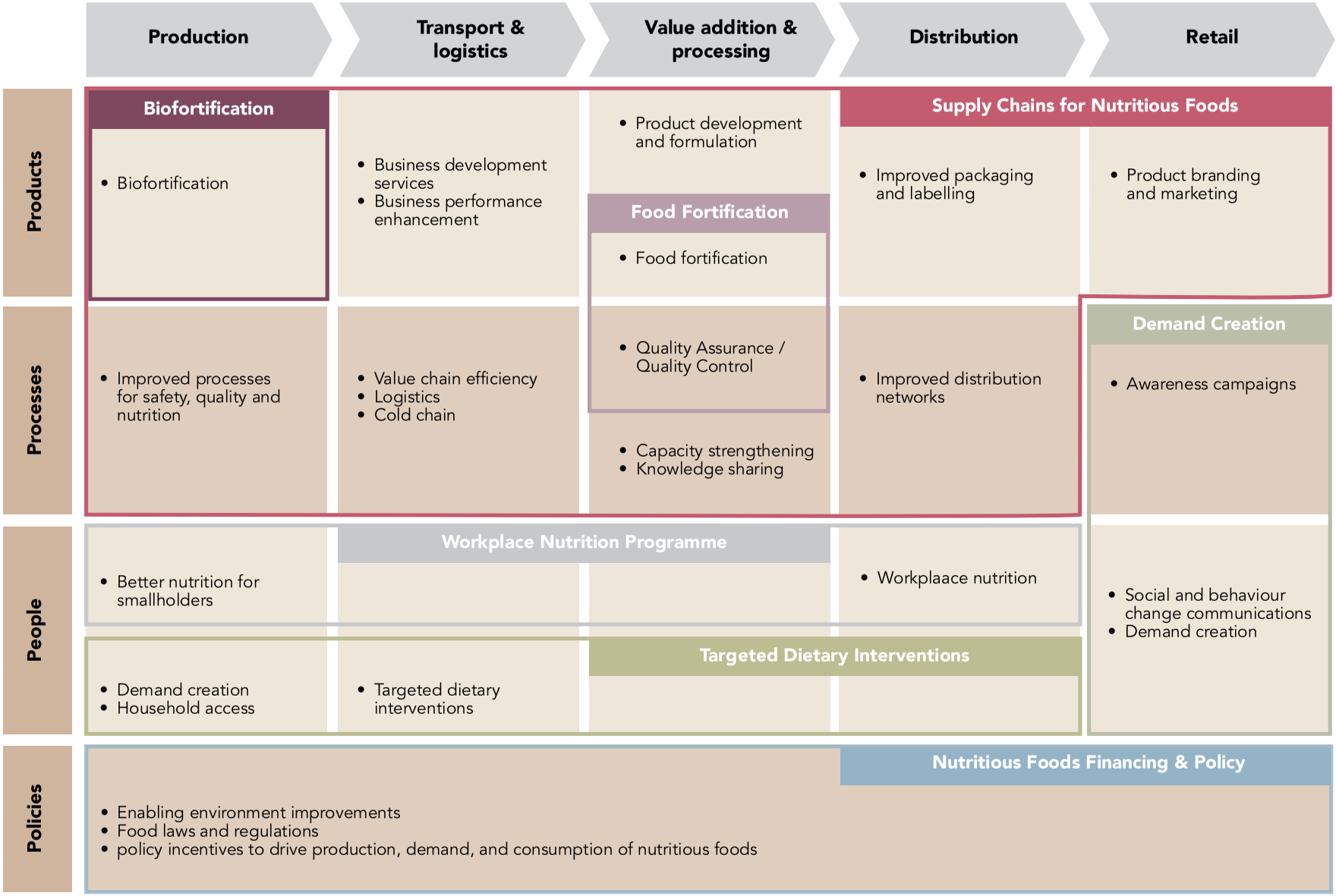

Figure 14: GAIN's complementary offerings to support supply chains

4.4 TRAFFIC LIGHT MODEL

Once solutions and interventions are identified, they must be prioritised. One way of doing this is via the traffic light model, where each potential intervention is rated against specific criteria using a green, amber, or red colour code. An example traffic light model is shown in Figure 15. In this example, the criteria of impact, sustainability/scalability, feasibility, and strategic fit are used; other criteria can be used depending on the goals and objectives of the SCAN.

It is important to clearly define and note how to score each criterion objectively. For the example, for "criteria", the following suggestions can be used to define and create scoring thresholds for each:

Impact: What are the expected results of the intervention? How many people will the intervention reach? Will those individuals be in priority populations? How significant will the impact be for individuals?

Sustainability / scalability: How long will the effects of the intervention last? How will they provide lessons or learnings that are scalable in other environments? How will local actors be empowered to continue the work after the intervention period is complete?

Feasibility: How feasible is the intervention, given the local political and economic environment and infrastructure? What are the timeline, expected budget, likely stakeholder buy-in, degree of change, and resources required? How do each of these affect the potential for success?

Strategic fit: How well does the intervention fit with existing organisational strategies or the strategic plans of the country/region in which the intervention will be implemented?

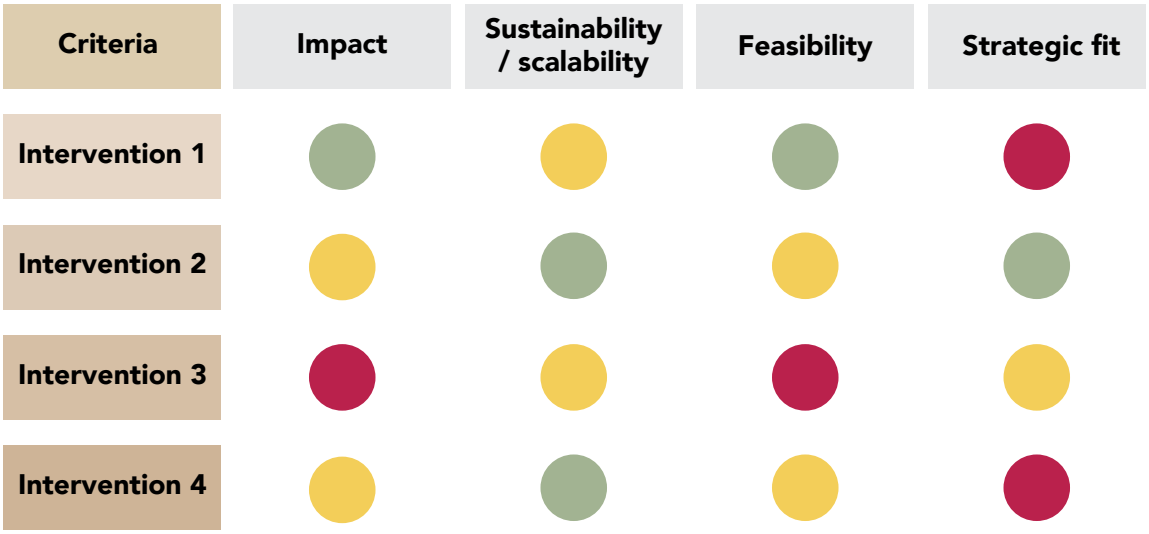

Figure 15: Example of a traffic light model to prioritise interventions

For more information on the traffic light model and for a template to create such a model, refer to:
Supplementary Tool – 10 Traffic light model.

4.5 OPPORTUNITY MATRIX

Another method of prioritising interventions is by using an opportunity matrix. Similar to the challenge matrix, an opportunity matrix helps to compare and prioritise interventions based on their potential for impact or urgency to address and the difficulty or effort required to implement them. These results are organised in a 2x2 matrix as shown in Figure 16.

Those opportunities and interventions with high impact and low difficulty should be prioritised as quick wins. Those with high impact and high difficulty should be undertaken with caution: these are major undertakings that are likely to use many resources and need to be carefully planned to ensure impact. Interventions with low impact and low difficulty can serve as fill-in activities to help maintain stakeholder interest and momentum during periods of low activity. The interventions in the low impact and high difficulty quadrant should be avoided unless they are necessary precursors to achieving other interventions in the remaining quadrants.

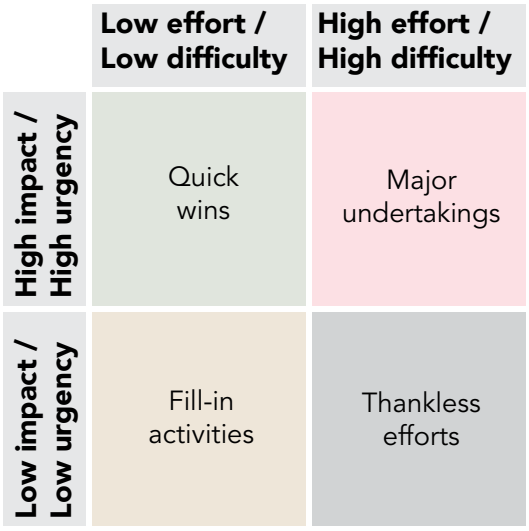

Figure 16: Opportunity matrix

For more information on the opportunity matrix and for templates and instructions to populate the matrix, refer to: Supplementary Tool – 11 Opportunity matrix.

Step 5: Reporting and dissemination

An important part of the feedback loop is to report and disseminate findings, validate them with key stakeholders, and plan for action.

5.1 STAKEHOLDER WORKSHOP

All of the above-mentioned analysis and synthesis tools can and should be validated via a stakeholder workshop. This can provide an opportunity to discuss the challenges, opportunities, recommendations, and prioritised interventions while generating further insights and agreement on the necessity, feasibility, and potential for impact of the various interventions.

Stakeholder workshops should involve a variety of supply chain actors from all sectors, including consumers and beneficiaries of potential interventions. All actors should have the opportunity to review the SCAN findings and openly agree or disagree with the recommendations and conclusions.

In some instances, it may be preferred to use a stakeholder workshop to develop some of the tools described in Step 4. For example, it can be a good way to build stakeholder involvement and ownership of the solutions when tools such as the challenge and opportunity matrices and traffic light model are completed jointly during such a workshop.

5.2 FINAL REPORT

A report should be developed to summarise the findings of the SCAN. The final report should be based on the feedback and suggestions from key stakeholders, such as those received during the stakeholder workshop. It should clearly state:

- The goals and objectives of the SCAN.
- The principal barriers to accessibility, desirability, and quality of nutritious foods, particularly for low-income consumers and vulnerable populations.
- The interventions which could be expected to address these constraints.
- A prioritised set of agreed recommendations for action, along with responsibilities and tasks to carry out such actions.

An action plan should consider current and future fundraising requirements, policies needing adaptation, and engagement with supply chain and food system actors.
The final report should be disseminated externally to key stakeholders and internally to relevant staff working to build organisational knowledge capacity and learning for other projects and programmes. The report should also be disseminated via relevant platforms for knowledge capture and sharing, such as GAIN's 'Nutrition Connect' platform.

In addition to this report, the analyst may consider using other channels to disseminate the results, such as a briefing paper, blog post, media interview, social media post, or presentation at a conference.

CONCLUSION

Ultimately, a supply chain is comprised of a series of relationships. Examining it requires understanding the market and the power of each actor to improve the accessibility, desirability, and quality of the foods moving through the chain. Supply chains are complex, and more than one solution or intervention may be required to address key challenges.

This guidance has offered insights into supply chain concepts as well as tools that can be used to assess supply chains and prioritise interventions to improve them by engaging different actors, processes and relationships. When doing so, it is critical to remember that the ultimate purpose is to improve the accessibility, desirability, and/or quality of nutritious foods; when produced and consumed appropriately, these foods can drive health and economic improvements for individuals and communities. We hope that SCAN can be one tactic in your toolbox for improving food supply chains to ensure that food systems have a positive impact on people's lives.

As we continue to improve these tools, we encourage you to provide us with your feedback and reflections on using this guidance. After using this guidance, please complete the survey found as Supplementary Tool ST-12, which will provide us with feedback to improve the guidance in the future. Please send the survey back to us and share any further comments or questions at info@gainhealth.org.

For the SCAN User Survey you can fill and send back to us, refer to: Supplementary Tool – 12 SCAN User Survey.