Industry analysis to guide the asset strategy of the human nutrition and health premix business of Company XYZ

by

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A THESIS

Submitted in partial fulfillment of the requirements

for the degree

MASTER OF AGRIBUSINESS

Department of Agricultural Economics

College of Agriculture

KANSAS STATE UNIVERSITY

Manhattan, Kansas

2017

Approved by:

Major Professor
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ABSTRACT

Company XYZ is a global manufacturer of human nutrition & health (HNH) premixes. They operate globally through 14 manufacturing sites. HNH premix North America manages a network of three production facilities plus several warehouses on the east and west coasts of the United States. The purpose of this thesis is to provide insights for informing the asset strategy for the human nutrition and health premix business of Company XYZ focusing on the analysis of competitive forces and market drivers for the herbs and botanicals segment. Specifically the thesis aims to achieve the following three objectives: 1) identify potential supply chain bottlenecks and capacity constraints by mapping out the supply chain and examining the production flow, the installed capacity, and current asset strategy; 2) identify key market drivers and related industry trends by assessing the competitive forces and change forces affecting the industry growth rate; 3) present synthesis of strategic issues and strategy recommendation for asset allocation strategy.

The analysis involves examination of the supply chain logistical flows for raw materials used in current production of blends and premixes as well as the supply chain for herbs and botanicals. It also includes the assessment of current production capacity by providing a detailed overview of production facilities, blending equipment, production lines and geographical coverage. The aim is to assess the existing procurement capabilities and to identify potential bottlenecks that may constrain the supply chain flow as the demand for HNH premixes grow.

The industry analysis was undertaken to better understand the outlook for the premix industry and the factors driving and impeding the growth in the herbs and botanicals sector. The current premix competitive environment was evaluated for the food & beverage as well as dietary supplement sectors. In addition to calculating the industry's concentration and Herfindahl-Hirschman index (HHI), Porter's Five Forces framework was used to analyze the intensity of competitive forces in the industry and the attractiveness of the HNH premix industry as the demand for premixes in that segment continues its growth trajectory. The qualitative assessment of the industry structure and competitive forces was conducted using data from interviews with experts designed and conducted in the fall of 2016.

The results indicate that the current asset footprint, procurement base, and supply chain capabilities of Company XYZ will allow it to position itself as a leading supplier for the growing HNH nutrition segment. In addition, the results indicate that given the high-value low-volume nature of herbs and botanical blends there are no significant strategic advantages to be gained from changes in geographic asset footprint. However, these results do not account for actual production costs and overheads at each location since the analysis did not include a financial assessment.

The results from the analysis of socio-economic trends illustrate that moving forward the companies in the dietary supplement sector focused on applications that support brain and cognitive functioning will account for the largest increase in demand for herbs and botanical blends. It was recognized that Company XYZ currently finds itself in a "red ocean" where it competes over market share in a slow-growth and highly competitive

industry. Two potential strategies that will help transition a company into a “blue ocean” – a high growth and low-rivalry environment involve: i) taking over customers’ in-house blending activities by offering a better value proposition through Company XYZ’s’s economies of scale, superior quality standards, and blending capabilities; and ii) enhancing diversification into the herbs and botanicals segment of the HNH premix industry focusing on brain health applications.

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ACKNOWLEDGMENTS

In the words of actress Jane Fonda, “No Pain, No Gain!” That statement has certainly rung true for the past two-and-a-half years.

First and foremost, I would like to thank my wife, Kati Cooke, for her support and sacrifices to help us both balance family and work life during my pursuit of this degree. My hope is that it can help me instill the same value of education in my children; Thomas, Matilda and Linnea.

I would like to thank Company XYZ for the support they have shown over the past two-and-a-half years and the value they place on life-long learning. I would particularly like to give my gratitude to my former line manager Mr. Brian Wilcox for agreeing to this colossal undertaking, and to Mr. Sam Sylvetski and Mr. Roger Vrencken for their supportive recommendations. Sincere gratitude also goes out also to Mr. Leo Dijkhuizen for his support and understanding during the stressful times.

I would like to thank the Faculty and Staff at Kansas State University for all their assistance. Dr. Allen Featherstone, Deborah Kohl, Mary Bowen and Gloria Burgert and have been a critical source of support and assistance navigating the program. Dr. Alexan Shanoyan has been a strong, strategic, and patient mentor helping me identify, nurture, and clearly articulate my thesis topic. I am eternally grateful for his moments of counsel. Our discussions were always helpful and timely.

My final thanks go out to my classmates – MAB class of 2017, many of whom I have laughed and cried with. I will never forget you.

CHAPTER I: INTRODUCTION

1.1 Company Overview

Company XYZ is a global science-based company active in health, nutrition and materials. Company XYZ delivers innovative solutions that nourish, protect and improve performance in global markets such as food and dietary supplements, personal care, feed, medical devices, automotive, paints, electrical and electronics, life protection, alternative energy and bio-based materials. Company XYZ and its associated companies deliver annual net sales of about €10 billion with approximately 25,000 employees globally.

Company XYZ's daughter company is headquartered in Kaiseraugst, Switzerland is a leading manufacturer of vitamins, carotenoids and other ingredients for the feed, food, and personal care industries. The business has sales of nearly €4 billion and a long tradition of innovation that benefits people, planet and profit. As a fully integrated global player, its business are organized into three market-facing businesses: Animal Nutrition & Health (ANH), Human Nutrition & Health (HNH) and Personal Care (PC). Company XYZ's HNH ingredients are used to enhance the taste, texture, quality, nutritional value and of food, beverage and dietary supplements. Company XYZ's portfolio of ingredients are used in everyday consumer products such as dairy, baking, fruit juice, beer, wine, savory and functional food products.

Custom nutrient premixes integrate functional ingredients from a comprehensive selection of vitamins, minerals, amino acids, nucleotides and nutraceuticals. Premix blends are primarily manufactured for business-to-business markets for human, animal and personal care applications. The business represents a significant portion of Company XYZ's annual turnover. The global premix business for HNH sources more than 1200

different ingredients that can be used in blends made up of a few to several tens of ingredients, custom manufactured for small or large scale customers.

1.2 Research Problem

In 2013, Company XYZ acquired two competing premix manufacturers: Acquisition Company 1 based in New York and Acquisition Company 2, based in New Zealand.

A study regarding the assessment of the company's assets commenced in 2016 with the objective of determining the optimal asset footprint (facilities, blending capabilities etc) of the HNH premix business, that considers the integrated operations of Acquisition Company 1, Acquisition Company 2 as well as Company XYZ's legacy HNH premix business (14 sites globally).

It is assumed spare capacity exists at each production site that could be used to serve certain potential growth segments.

Herbs and botanical blends currently play a minor part in overall production volumes and the company requires a better understanding of opportunities within this segment. The vision of the human nutrition premix business is to optimally serve all relevant markets regionally in terms of volume, speed and blend complexity. The conclusion of the larger asset strategy project may result in a re-calibration of current assets that would optimally serve customers in terms of cost, speed and quality.

An assessment of the market for herbs and botanical premixes is of significant value to the company's senior management. This study investigates potential supply chain bottlenecks and capacity constraints by mapping out the supply chain and examining the production flow, the installed capacity, and current asset strategy. Secondly the study

identifies key market drivers and related industry trends by assessing the competitive forces and change forces affecting the industry growth rate. Finally, the study presents a synthesis of strategic issues and strategy recommendation for asset allocation strategy.

CHAPTER II: LITERATURE REVIEW

2.1 Introduction

Since the beginning of the commercialization of premixes for either food, pharma or feed applications, there have been few studies related to asset strategic planning, industry analysis or supply-chain optimization of this industry. Similarly, studies on the industry analysis of herbs and botanicals specifically for premix applications appear to be non-existent. Nevertheless, this study aims to build a case on whether the human nutrition and health premix business should consider herbs and botanical premixes as a viable option to expand its offering through adapting theoretical models used in related industries.

2.2 Supply Chain Strategy

The need for holistic modeling efforts that capture the extended supply chain enterprise at a strategic level has been clearly recognized first by industry and recently by academia. Strategic decision-makers need comprehensive models to guide them in efficient decision-making that increases the profitability of the entire chain. The determination of the optimal network configuration, inventory management policies, supply contracts, distribution strategies, supply chain integration, outsourcing and procurement strategies, product design, and information technology are prime examples of strategic decision-making that affect the long-term profitability of the entire supply chain (Patroklos, Dimitrios and Eleftherios 2004). While the most important part of this study is to analyze the premix industry from the perspective of herbs and botanicals, the supply chain of raw materials as well as success factors in each step of production is important to understand. Patroklos et al. state that strategic supply chain management deals with a wide spectrum of issues and includes several types of decision making problems that affect the long-term development and operations of a firm, namely the determination of number, location and

capacity of warehouses and manufacturing plants and the flow of material through the logistics network, inventory management policies, supply contracts, distribution strategies, supply chain integration, outsourcing and procurement strategies, product design, decision support systems and information technology. While all these supply chain elements are important, not all aspects are covered in this study. Nevertheless, this study takes a holistic approach in examining the supply chain, production flow and capacity not only from the perspective of equipment and machinery, but also support networks such as company capabilities in formulation, specification and quality assurance.

2.3 Market Structure Analysis

Markets are collections of buyers and sellers who set terms for how consumers access products and services. Analyses of markets include geographic markets, such as those markets housed within one country or region, specific segments of larger markets, such as the software industry housed within the larger personal computer industry, or specific brands, such as the well-recognized brand of the Disney Corporation (Chen 1996). The premix market is comprised of buyers, food companies who purchase finished premixes (blends of ingredients), and suppliers, raw material producers that supply ingredients that supply the nutrients of the finished goods. The determinants of market structure used in this study include several competitors and product offering differentiation.

This thesis examines the premix market structure according to the industrial organization. Industrial Organization is builds on the theory of the firm by examining the structure of (and, therefore, the boundaries between) firms and markets (Williamson 1981). Common market structures studied within the field of the industrial organization include, but are not limited to, perfect, monopolistic, duopolistic as well as oligopolistic

competition. Aspects of the analysis section below analyses the premix industry to determine the type of structure the competition finds itself in.

2.4 Competitive Analysis

The analysis section used the 5-forces analytical framework by competitive strategy patriarch, Michael Porter. The 5-forces framework is a powerful tool used by companies to assess the industry attractiveness and the potential for achieving superior profitability. Factors pertaining to the power of both suppliers and buyers, the threat of new entrants, the threat of substitutes as well as the intensity of existing rivalry are taken into consideration (Porter 1980). The framework is useful in helping to understand a firm's position within the current competitive environment, and also the opportunities and threats in the competitive environment the firm considers to enter. To the author's knowledge, there are no studies in the existing literature focusing on the application of Porter's Five Forces framework in the analysis of the premix industry, while many studies have focused on the application of that framework for analyzing the food industry including studies of, well-known multinationals such as McDonald's, Burger King, Wendy's Starbucks and Whole Foods. (Panmore 2017). In Whole Foods' case, the Five Forces analysis pinpointed issues and concerns that shape the company's strategic direction. These external factors have either supported or limited the growth of the firm. Whole Foods Market managers and investors have used the results of the analysis to determine appropriate responses to the conditions of the industry environment (Panmore 2017).

2.5 Strategic Modelling

The strategy canvas and value curve are introduced in the strategy recommendation section to serve as a diagnostic and action framework for building strategy (Kim and Mauborgne 2005). The strategy canvas communicates where competitors for a given

product are currently investing and what factors are competitors competing (i.e. service, delivery, product, features and marketing). The strategy canvas captures these characteristics on a two-dimensional graph, with the competitive factors presented on the horizontal axis. Well-known companies such as Southwest in the airline industry and Starbucks in the Coffee industry have carved out their strategic differentiation (Fox 2012). In the case of Southwest, through a combination of no-frills, no-hassle convenience and cost of traveling by car and with the speed and friendly service of an airline they were able to carve out their strategic differences. In the case of the human nutrition and health premix business, this study considers the value curve based on factors such as price, quality assurance, innovation, sustainability, vertical integration, technical support and speed.

CHAPTER III: PREMIX SUPPLY CHAIN, PRODUCTION FLOW & CAPACITY

A premix usually refers to a substance or object that is mixed in an early stage of the manufacturing and distribution process. Company XYZ's custom nutrient premixes integrate functional ingredients from a comprehensive selection of vitamins, minerals, amino acids, nucleotides and nutraceuticals. Its main objective is to deliver micro ingredients in the manner desired by the consumer. Premixing has progressed over the past 30 years from the simple hand mixing of several simple ingredients to the mechanical mixing of tens of different kinds of specialized ingredients (Wikipedia 2015).

The strict quality standards and requirements are critically important in the premix industry. A quality premix can only be produced through stringent quality assurance programs such as good manufacturing practices (cGMP). Quality assurance is a proactive, continuous system for monitoring reproducibility and reliability of a product. It encompasses all the activities undertaken to ensure predetermined standards of a quality premix. Good manufacturing practices cover all the areas of the production process like personnel, facilities, raw materials, quality assurance checks, inventory control, processing, mixing, packaging and delivery (Avitech Health PVT. LTD. 2006).

The main arguments for sourcing a premix as opposed to single ingredients include the following;

a) Time Savings:

- Improve purchasing efficiency by minimizing the number of raw materials and vendors
- Reduce in-house quality control processes
- Reduce lengthy scaling processes

- Increases product development support and technical guidance from initial concept development through pilot runs of finished products and scale up to production
- Streamline the development process and ensure success while saving time.

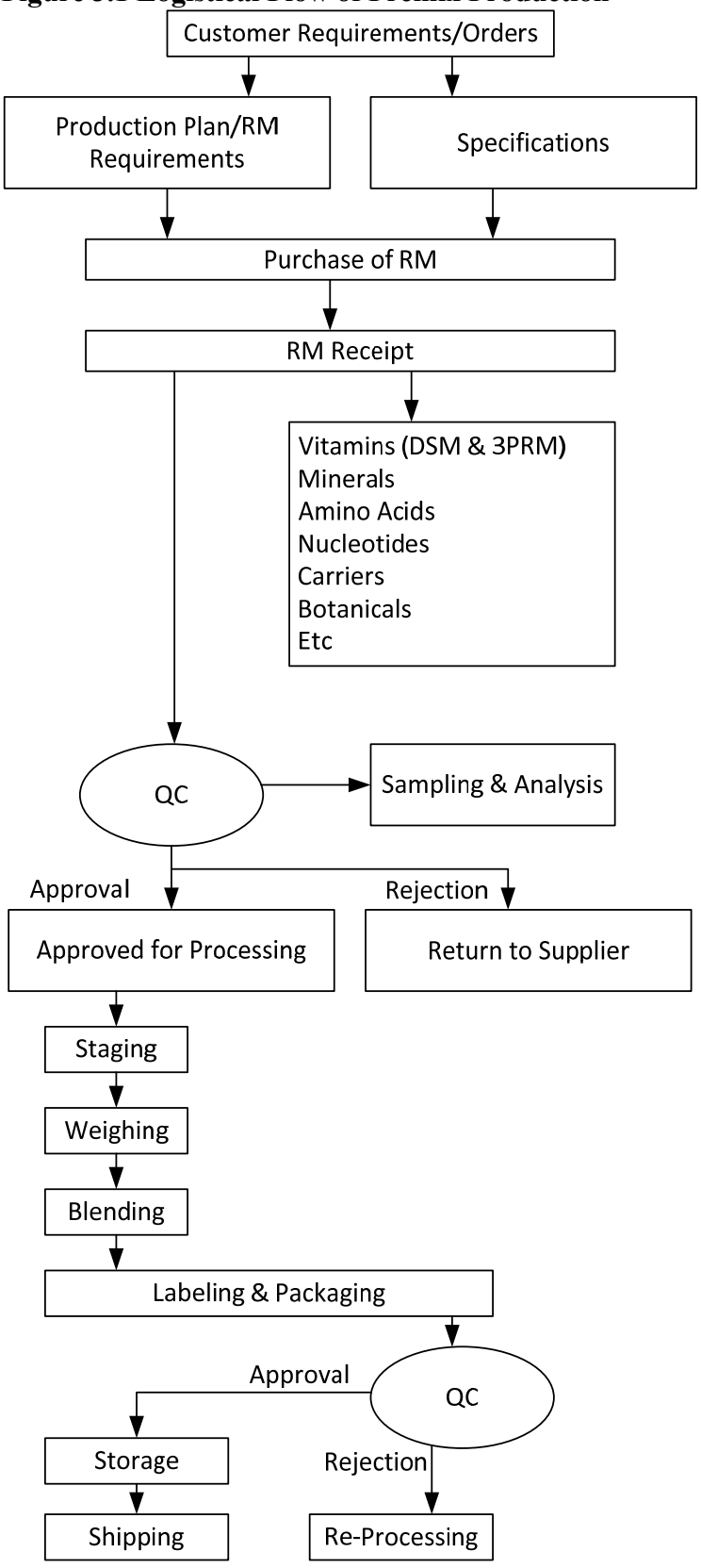
b) Cost savings:

- Reduction in freight costs of individual ingredients
- Reduction of inventory/warehousing
- Elimination of costly scaling errors
- Reduction of waste
- Reduction of labor costs
- Reduction of quality control costs
- Reduction for the need of outside assays
- Reduction on the number of purchase orders processed

3.1 Production & Flow

Premix manufacturing has several stages as (Figure 3.1). The major stages include: selection and specification, purchase and procurement.

Figure 3.1 Logistical Flow of Premix Production



3.1.1 RM Selection & Specification Considerations

The availability of ingredients in premixes such as vitamins, minerals and botanicals can vary between sources. For example, the availability of zinc from zinc oxide may differ from that of zinc sulphate or the ginsenoside content of American Ginseng may differ from that of Panax Ginseng. Therefore, it is important to have knowledgeable formulators and food scientists available to guide customers is choosing the appropriate combination of ingredients. Other considerations such as regulatory requirements such as Kosher and Halal play a role in raw material selection.

3.1.2 Purchase & Procurement

For the supply-chain to succeed, the form of ingredient selected must be readily available. Therefore, having a well-functioning organization with a network of reputable suppliers and proximity to materials is important. Raw materials need to be procured from reputable sources in order to conform to specifications set by the formulator or food scientist. For example, no material should be received without a certificate of analysis. Purchases should occur periodically taking care that sufficient inventory is maintained at all times. A purchase plan is an absolute requirement in accordance with production requirements.

3.1.3 Receipt & Storage

When receiving and handling certain types of ingredients, the recipient may need to understand the special storage requirements of the materials, i.e. allergens may require separate storage from non-allergens. A material may also need to be stored in a temperature controlled environment otherwise it may lose potency. This is especially true with some vitamin forms or botanicals. Therefore, when considering producing a blend in a specific

location it may be important to understand whether the location has access to special zoning capabilities or specialized equipment such as refrigeration.

3.1.4 Sampling and Analysis

Sampling of raw materials is performed following the company's quality assurance program. The decision of producing a blend in a specific location must take into consideration the support functions required to serve the needs of business. If a facility does not have laboratory capabilities that can test for micro or chemical analysis, or if a site is not within proximity of a service provider that can provide this service to meet lead times, then it may be difficult to support a customer with a certain type of blend. The cost of purchasing instruments such as an H.P.L.C, flame photometer and spectrophotometer used for analyzing raw materials may outweigh the benefit of offering particular blends in a specific region.

3.1.5 Processing

Processing seeks to modify the physical properties of raw materials to meet the specifications of premix and it usually includes either sieving, milling or both. Sieving is a process of removing foreign materials from raw materials as well as separating coarse ingredients. The operation can be carried out by vibratory or mechanical sifters. A mill is usually used to reduce the particle size of a raw material to meet the desired screen analysis. Therefor when considering producing certain types of blends in a specific location, it is important to have access to and experience using these types of processing equipment.

3.1.6 Weighing

Weighing is important in the manufacturing of a premix. No matter how good the formula is, it is difficult to achieve the desired nutrient levels in the premix without precise weighing. Any extra addition of vitamins may not improve performance but cost extra money, whereas lower levels could depress performance. Precision in weighing is critical for certain ingredients like trace minerals where mistakes may prove toxic.

The accuracy of the balance enables precise weighing. The accuracy decreases with increasing size of the scale. As a general rule, a scale is accurate to no more than 0.1% of its total capacity. There is large variation in doses of different micro ingredients added in a premix. Balances need to be sized according to their use. Again as with mills and sieves, suitable weighing equipment may need to be available to produce certain specialized blends.

3.1.7 Mixing

The mixing process is at the heart of any premix-manufacturing unit. In a premix, the proportion of ingredients vary considerably. Thus, to obtain a homogenous blend, the mixing operation should be divided into two steps: micro mixing and macro mixing. Micro mixing is for mixing micro ingredients that weigh less than one percent of mixer capacity. These ingredients should be initially mixed in a smaller capacity mixer such as a v- or cone blender. The micro mix should then be mixed in the large mixer with the other ingredients.

Macro mixing is the actual blending of all components of the premix along with carriers in a batch mixer. The content uniformity of the premix is based on the type of mixer, mixing time and mixing order. Specialized mixers capable of low coefficient of

variation are typically used in premix blending. Examples such as Nauta mixers are used to ensure homogenous mixing. Other examples of premix mixers include ribbon mixers, conical screw mixers, plough mixers, etc.

3.1.8 Packaging

The primary purpose of packaging for premix is to maintain the stability of micronutrients and to protect the integrity of the premix. Improperly packaged premixes experience considerable loss in the potency of various sensitive ingredients. Selection or designing of packaging material should be according to the local climatic conditions. It should bear following properties:

- Provides barrier against light, moisture, oxygen
- No chemical interactions with the premix
- Provides good printing surface
- Sturdy enough to withstand the transport pressure

The different types of packaging materials that could be use are cardboard boxes, polyethylene bags, aluminum foil, paper and plastics. Ideally, aluminum foil lined multilayered paper bags provide excellent barriers against light, moisture, oxygen, odor and flavor. Hence for very sensitive ingredients and where cost is not a constraint, aluminum foil packaging is the material of choice.

3.1.9 Storage

The quality of premix is affected by the storage conditions in the facility until it is transported through distribution channels. Aspects such as the temperature and humidity of the warehouse need to be taken into consideration, otherwise the efficacy of the nutrients within the blend can be negatively affected. As with raw materials, finished goods may

need to be stored separately depending on the make-up of the blend. Zoning in the distribution center may be a consideration when deciding upon the production location of the premix.

3.2 Herbs & Botanicals

A botanical is a plant or plant part valued for its medicinal or therapeutic properties, flavor, and/or scent. Herbs are a subset of botanicals. Products made from botanicals that are used to maintain or improve health may be called herbal products, botanical products, or phytomedicines (US Department of Health & Human Services 2011).

To be classified as a dietary supplement, a botanical must have properties defined by Congress in the Dietary Supplement Health and Education Act that became law in 1994. A dietary supplement is a product (other than tobacco) that:

- is intended to supplement the diet
- contains one or more dietary ingredients (including vitamins; minerals; herbs or other botanicals; amino acids; and other substances) or their constituents
- is intended to be taken by mouth as a pill, capsule, tablet, or liquid
- is labeled on the front panel as being a dietary supplement

Botanicals are sold in many forms: fresh or dried products; liquid or solid extracts; tablets, capsules, powders; tea bags; and other forms. Fresh ginger root is often found in the produce section of food stores. Dried ginger root is sold packaged in tea bags, capsules, or tablets. Liquid preparations made from ginger root are also sold. A particular group of chemicals or a single chemical may be isolated from a botanical and sold as a dietary supplement, usually in tablet or capsule form. An example is phytoestrogens from soy products.

Common preparations include teas, decoctions, tinctures, and extracts:

- A *tea*, also known as an *infusion*, is made by adding boiling water to fresh or dried botanicals and steeping them. The tea may be drunk either hot or cold.
- Some roots, bark, and berries require more forceful treatment to extract their desired ingredients. They are simmered in boiling water for longer periods than teas, making a *decoction* that also may be drunk hot or cold.
- A *tincture* is made by soaking a botanical in a solution of alcohol and water. Tinctures are sold as liquids and are used for concentrating and preserving a botanical. They are made in different strengths that are expressed as botanical-to-extract ratios (i.e., ratios of the weight of the dried botanical to the volume or weight of the finished product).
- An *extract* is made by soaking the botanical in a liquid that removes specific types of chemicals. The liquid can be used as is or evaporated to make a dry extract for use in capsules or tablets.

3.3 Company XYZ's HNH Global Footprint

Company XYZ's HNH Premix consists of fourteen plants and a number of warehouses globally. In addition, several sites are located adjacent to either an Animal Nutrition and Health (ANH) or Manufacturing and Technology Site (M&T). ANH sites produce similar products for the animal feed business and M&T sites produce finished forms of products such as vitamins, carotenoids and omega-3 oils. The territory that the company serves is global and production sites are located on all continents from Upstate New York to Auckland, New Zealand. Figure 2.2 displays the geographic location of each of the facility.

Figure 3.2 Company XYZ's Premix HNH Locations

3.4 Production Facilities

3.4.1 NY, USA

The New York facility, built in 1995 was the flagship location and former headquarters of Acquisition Company 1. Until mid-2015 it was also the headquarters of the integrated Global Premix HNH business of Company XYZ, which is now relocated to Kaiseraugst, Switzerland. The facility has a production capacity of 11,000MT between dry and liquid premixes and serves the dietary supplement, food and beverage and infant nutrition segments. The facility also includes a warehouse and distribution center located 3 miles from the main location. Through a wide range of blenders the facility has the capability of producing custom blends from 1kg to 5MT. Premixes produced in Schenectady serve customers located in every region of the U.S. as well as Mexico and Canada.

3.4.2 NJ, USA

The New Jersey facility was the North American production facility of Company XYZ's legacy premix HNH facility. The plant is located on a much larger M&T facility where Company XYZ produces vitamin forms and intermediates such as Arachidonic acid. The facility serves the dietary supplement, food & beverage and infant nutrition segments. The facility currently has an annual output of 2,000MT between dry and liquid premixes. Warehousing for raw materials and finished goods is serviced by 3rd party contracting. It is expected that all liquid blends for North American customers will be supplied through the NJ facility.

3.4.3 CA, USA

The California facility came through the acquisition of Acquisition Company 1 and produces dry premixes for the dietary supplement and food and beverage segments. It currently does not serve the infant nutrition segment. The facility currently has an average output of 225MT per month. California has a capacity of 3,000MT per year. Premixes are produced (but not limited to) for customers in the Western States and Mexico.

3.4.4 Mexico

The El Salto, Mexico plant is located in the state of Guadalajara and began production in 2000 and was part of Company XYZ's's legacy HNH premix business in Latam. The facility produces both liquid and dry blends and is adjacent to another larger premix facility that serves Company XYZ's's Animal Nutrition and Health premix business. The total capacity of El Salto is 7,200MT per year, while production volumes reached 4,000MT at the end of 2016. The facility is certified ISO 9001, FSSC 22000 and Kosher. In addition, Mexico is certified to serve the pharmaceutical markets.

3.4.5 Colombia

Construction of the Colombia plant was completed in March 2010 and was part of Company XYZ's legacy premix HNH business. As with the Mexico plant, it is located adjacent to an ANH premix facility. Total capacity is 3,000MT per year while production volumes reached 1,200MT by the end of 2016. The facility is certified ISO 9001, FSSC 22000, Kosher and Halal. The facility is also certified to produce premixes for pharmaceutical applications.

3.4.6 Brazil

The Brazil facility that began operating in 1999 was the sole production facility that served Acquisition Company 1's Latin American Market. Company XYZ's legacy Premix HNH business in Brazil was served by a facility located in X City, that has been mothballed since production of all legacy HNH blends were transferred to Acquisition Company 1's facility in 2014. Campinas has a total capacity of 7,200MT per year while production volumes reached 4,000MT at the end of 2016. The facility is certified ISO 9001, FSSC 22000, HACCP, Kosher and Halal. It ceased producing pharmaceutical blends in 2015 that have subsequently been transferred to other pharma certified facilities.

3.4.7 France

The France location is a legacy HNH premix facility situated within the grounds of a larger M&T site in which Company XYZ produces various straight products such as vitamin and carotenoid forms. France has a total capacity between liquid and dry blends of 4,500MT per year with an expected output of 3,500MT by the end of 2016. The facility holds certifications for FSSC 22000, ISO 9001, ISO 14001, is Halal and Kosher certified and is also registered with the U.S. FDA.

3.4.8 South Africa

The South Africa facility is a legacy Company XYZ Premix HNH production site located adjacent to a larger Animal Nutrition & Health premix site in the suburbs of City X. The plant primarily focuses on dry blends for the sub-Saharan African market with a total capacity of 4,500MT and an output of 2,000MT at the end of 2016. The facility is FSSC 22000 and ISO9001 certified.

3.4.9 Poland

The Poland facility was completed in September 2012 and was part of Acquisition Company 1's European operations prior to the acquisition. Acquisition Company 1 had been producing premixes in Denmark for more than 10 years but due to cost factors and the proximity to new market growth, the decision was made to construct a new facility in Poland. The plant focuses on dry and liquid blends for the Eastern-Europe as well as other Europe Middle East Africa (EMEA) customers with a total production capacity of 4,500MT annually. The plant produced 4,000MT at the end of 2016. The facility is FSSC 22000, Halal, Kosher, NQA certified and Registered with U.S. FDA.

3.4.10 Vadodara, India

The Vadodara, India facility located in the state of Gujarat was under construction by Company XYZ at the time of the Acquisition Company 1 acquisition at the end of 2012 and underwent re-design when Company XYZ made the decision to replicate new facilities to match those of the legacy Acquisition Company 1 plants. The facility began production in April 2014 and focuses on both dry and liquid blends for the South Asia sub-region. It has a maximum capacity of 2,500MT and total output of 600MT occurred at end of 2016. The plant is FSSC 22000, FSSAI, Halal & Kosher Certified.

3.4.11 Xhinghou, China

The Xinghou, China plant is located on the outskirts of Shanghai. It is a legacy Company XYZ HNH premix facility located on the grounds of a larger M&T facility that produces B-Vitamins. The plant was opened in 2002 and has a maximum capacity of 3,500MT per year. The facility produces premixes for all segments of the domestic China market. The plant is ISO9001:14000, FSSC22000 as well as HACCP and Kosher Certified.

3.4.12 Malaysia

The Malaysia premix facility was a legacy Acquisition Company 1 facility that supplied premixes to customers in the Asian market, primarily the food and beverage segments. Due to the close proximity of the site to Singapore a number of initiatives to optimize production between both sites have been undertaken. The site opened in 2009 and has a maximum capacity of 6,000MT per year. The facility is FSSC22000, Kosher and Halal certified.

3.4.13 Singapore

The Singapore premix facility is a standalone facility and part of Company XYZ's legacy HNH premix network. The facility was opened in 1997. In conjunction with the Malaysia facility supplies the food and beverage segments as well as dietary supplement premixes to the Asian markets. The facility is ISO:9001, FSSC22000, HACCP as well as Kosher & Halal Certified. The facility has a maximum production capacity of 4,500MT.

3.4.14 New Zealand

The New Zealand facility was acquired through Acquisition Company 2 in July 2013. The facility produces both dry and liquid blends for the Human and Animal Nutrition segments. The facility primarily serves customers in the infant nutrition segments in China

and Oceana and has a maximum capacity of 3000MT per year. The facility holds FSSC22000, ISO9001, HACCP and is Kosher as well as Halal certified.

Table 3.1 summarizes the capacities of Company XYZ's facilities. Total capacity is x MT with a utilization of x %

Table 3.1 Summary of HNH Premix Sites

Site	Capacity (MT)	Vol. 2016 (MT)	Utilization	Dry	Liquid
New York, US	11000	7000	64%	x	x
California, US	3000	1500	50%	x	
New Jersey, US	2000	1325	66%	x	x
Mexico	7200	4000	56%	x	x
Colombia	3000	1200	40%	x	
Brazil	7200	4000	56%	x	
France	5000	3500	70%	x	x
Poland	4700	4000	85%	x	x
South Africa	4500	2000	44%	x	
China	3500	1400	40%	x	x
India	2500	600	24%	x	x
Malaysia	6000	3200	53%	x	x
Singapore	4500	3200	71%	x	x
New Zealand	3000	1500	50%	x	x
Total	67100	38425	57%		

Source: (Company XYZ 2016)

3.5 Blending Capabilities

The types of blenders that Company XYZ currently uses are found in Table 3.2.

Table 3.2 Types of blenders by production facility

Site	Bin	Container	Cone	Gemco	Liquid	Nauta	Paddle	Plow	Ribbon	Ruberg	Tumble	V-Blend
New York, US	x			x	x			x	x			x
California, US	x							x	x			
New Jersey, US			x	x	x				x			
Mexico					x	x					x	x
Colombia		x			2017	x			x		x	
Brazil	x				x			x	x			
France					x	x				x		
Poland	x				x			x				
South Africa					x	x	x					
China	x				x	x					x	
India	x				x			x				
Malaysia	x				x			x				
Singapore					x	x					x	
New Zealand			x		x							

Source: (Company XYZ 2016)

3.6 Types of Blenders

3.6.1 Bin Blenders

Bin Blenders are highly efficient blending and mixing containers due to their irregular shape. An advantage of using bins is that they can be charged and discharged away from the mixer. This means that the blender does not get contaminated with product and time is saved on charging and cleaning. IBC Bin Blenders are ideal for use in multi-product environments where the machine will be required to mix a number of different products within a short period (Pharmatech 2017).

3.6.2 Container and Drum Blenders

Drum or container blenders are typically used for blending bulk solids such as granules or powders and are typically mixed by an intelligent system, which if required, can provide a data report for tracking blender settings such as weight, mixing times and number of revolutions. Therefore, it is possible to get complete documentation for a quality assurance system. Unlike Bin blenders, these types of blenders are stationary and typically cannot be moved from its position (Muller 2017).

3.6.3 Cone Blenders

The folding, spreading, and cascading action of the Conical Blender provides a rapid, homogeneous blending of dry and semi dry materials. The end over end revolving action, moving materials in and out of a restricted area results in a thorough intermeshed of the products into a uniform mix. Cone blenders can also be equipped with a solids intensifier bar for disintegrating lumps or agglomerates and for dispersing minor ingredients. With the addition of a rotary union and liquid feed tube, an agitator assembly can incorporate minute quantities of finely dispersed mist through the agitator discs into the product mix (Servolift 2017).

3.6.4 V-Blender

A V-Shaped blender, such as the one produced by Gemco, provides a constant, dividing and intermeshing particle movement provided by two connected cylinders. This precise mixing action results in blend variations of 1-2%. Each cylindrical leg has an access cover for easy material loading and cleaning. The Gemco V-blender is a fixed position type of blender that requires low maintenance and consumes little horsepower (Gemco 2017).

3.6.5 Nauta Cone-Screw Blender

A Nauta cone-screw mixer is generally used for applications that require a gentle mixing action and minimal heat generation. Heat can negatively impact some sensitive ingredients. It is also an ideal blender for mixing many small lots into one larger uniform lot. Material at the bottom of the vessel is lifted by a screw and spread over the upper sections. It is also a good machine for breaking up lumps (Prism Pharma Machinery 2017).

3.6.6 Paddle, Plow and Ribbon Blenders

Paddle, Plow and Ribbon blenders are used for a wide variety of mixing applications. They are types of horizontal blenders used for homogeneous blending of difficult blending applications. They are ideally suited for applications including feed and grain, non-directional liquid or slurry mixes, soap pellets, particulates, abrasive products, pastes, filter cakes, and fragile/friable products (Ross 2017).

3.6.7 Tumble Blenders

A tumble blender can be any type of blender that rotates its contents. V-shaped or double-blenders are typically types of tumble blenders. Diffusion is the main mechanism for mixing: batch materials cascade down, distributing particles over a freshly exposed surface as the vessel rotates on a horizontal axis (Ross 2017).

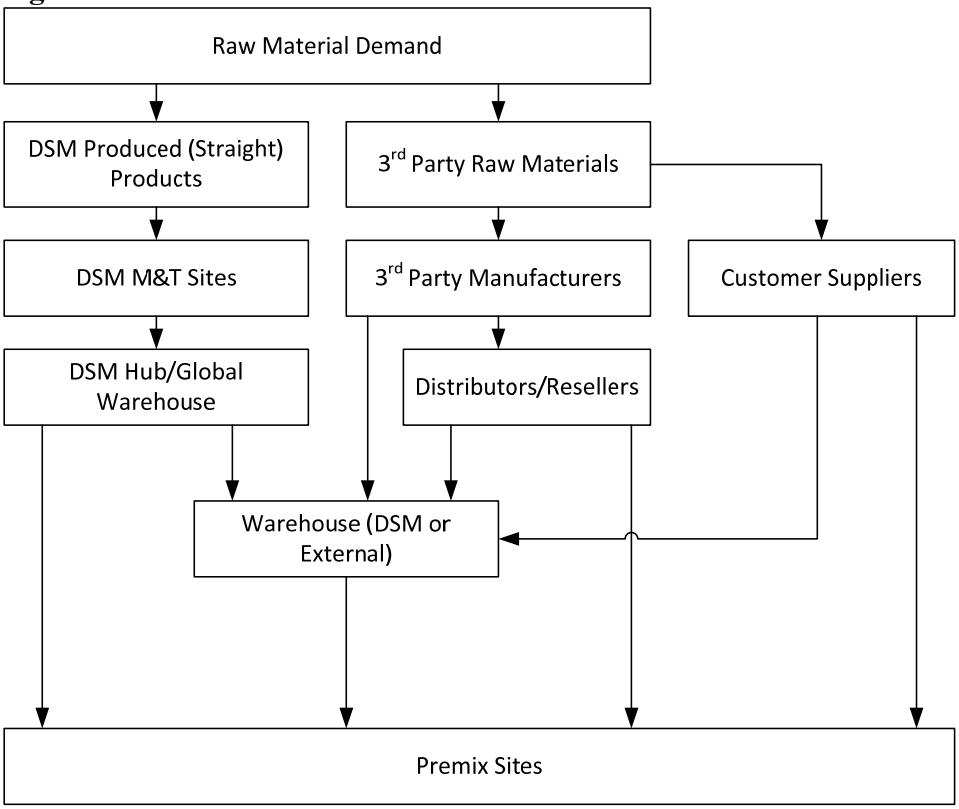
3.7 Blenders for Herbs and Botanicals

Due to the diverse properties of herbs and botanicals and the versatility of the blender required in blending these ingredients, the bin mixer would be the most appropriate type of blender to consider for this purpose. The largest proportion of herbs and botanical blends are currently produced in bin blenders in Company XYZ's California facility. If the company makes the decision to increase production of these kinds of blends, it makes sense to use the experience and knowledge it already has rather than starting to use a blender with unknown track history of blending these kinds of ingredients. Therefore, any site the company decides to use for this purpose should already have this equipment installed. This would be limited to 7 production sites globally (Table 3.2)

3.8 Raw Material Supply Chain

Raw materials used in the production of premixes are procured in several different ways. Figure 3.3 outlines the basic supply chain flow.

Figure 3.3 Flow of Raw Material Procurement



Source: (Company XYZ 2016)

Company XYZ HNH Premix has two primary categories of raw materials: those which are sourced in-house, typically vitamins, carotenoids or proprietary products such as PeptoPro or Oatwell and raw materials such as minerals, trace elements, amino acids and nucleotides that are typically procured from non-Company XYZ sources. They are also referred to as third party raw materials and procured in several different ways.

Company XYZ has several Manufacturing and Technology sites located around the world that produce products for HNH premix. These are located primarily in the Tri-Nation Region (France, Germany, Switzerland). Vitamins and forms are produced in Switzerland, France Germany. Some products or forms may be produced in China or the U.S. (New Jersey). Proprietary products may be produced in-house or by toll manufacturers. Once

manufacturing of finished forms has been completed they are transferred by truck to the global logistical hub in The Netherlands where they are stored until demand triggers the need to transfer to distribution centers in the regions.

Company XYZ has distribution centers (RDCs) located in all 5 regions (Asia, China, Europe, North America, Latin America). The global logistical hub doubles as the RDC for Europe. Finished products from Company XYZ internal sites are typically received directly from a RDC. In the United States the RDC is located in New Jersey.

There are several different ways in which HNH premix facilities receive raw materials from third party manufacturers. First, they can be sourced directly from a manufacturer - typically this is with either bulk item materials such as Maltodextrins (carriers) or higher value products such as amino acids or nucleotides. Raw materials are shipped from their site of manufacture to either a third party or a Company XYZ warehouse and stored for a specified period. They may also be shipped directly from manufacturing site directly to a HNH premixing facility.

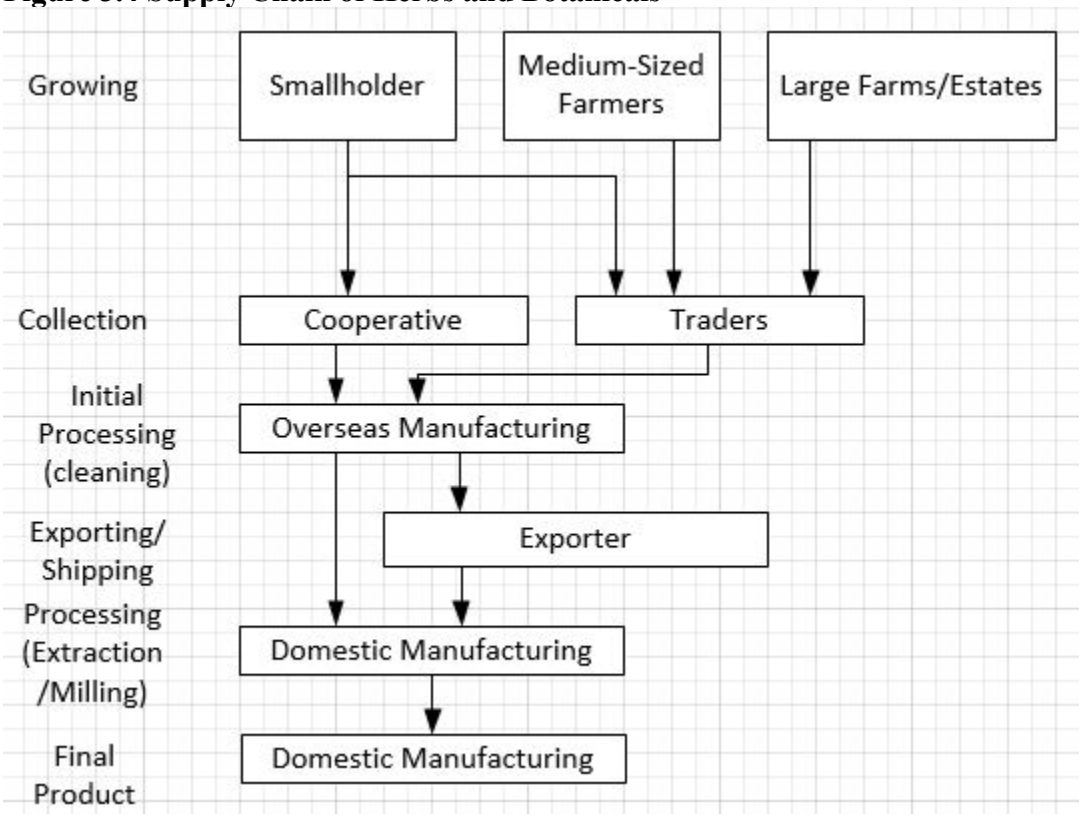
Third party raw materials (3PRMs) can also be sourced through intermediaries such as distributors or resellers, where justified. Low spend items or those not received in FTL's are examples of 3PRMs sourced through distributors or resellers. Finally, customer supplied materials are also used in the production of premixes. 3PRMs from distributors/resellers or customers can either be sourced directly to a premixing facility or stored for a specified amount of time either in a Company XYZ or 3rd party warehousing facility.

3.9 Supply Chain of Herbs & Botanicals

The supply chain starts with the growing of the plant. Examples of this is the root of Ginseng or the leaves of Gingko. A significant proportion (>60%) of the herbs and botanicals found in the food & beverage and dietary supplement industry originate in Asia in countries such as India and China. Plant growth is completed by either smallholders (in some cases individuals growing in their gardens), medium-sized farmers or large scale/mechanized growers. The type of growing depends on the type of crop grown. For example, there is more ginger root cultivated in these countries than ginseng. Therefore, there is a higher likelihood that ginger is grown on large scale mechanized farm or estates than ginseng.

In the next stage of the chain, medium and large-sized farmers typically deal directly with traders whereas smallholders sell their produce into a cooperative or collective. These organizations then sell to domestic manufacturers for initial processing (such as de-hulling) or cleaning. This may also be done by co-operatives or sub-contracted by traders themselves. The semi-processed products are then typically sold to larger trading companies that deal with a wide range of products and have the expertise in international trade and the products are sold to international companies process the products into fine powders by milling or produce by-products (such as extracts) from the crops. The final stage of the supply chain is procurement of a processed herb or botanical by a manufacturer that converts into a finished product that serves the food and beverage or the dietary supplement industry. A summary of supply chain regarding the flow of Herbs and Botanicals can be seen in Figure 3.4.

Figure 3.4 Supply Chain of Herbs and Botanicals



Source: (Brenneis 2016)

3.10 Types of Functional Ingredients Used in Company XYZ Premixes

As previously mentioned, Company XYZ premixes are made up of a wide range of ingredients. Blends can contain all vitamins or a mix of vitamins, minerals, amino acids or whatever the customer may require.

Table 3.3 indicates quantities (in kg) of functional ingredients used in Company XYZ premix sites globally in 2015. More than half of those ingredients are consumed in North American premix sites. North America uses the most diverse range of functional ingredients (Table 3.3). More than 50% of all herbs and botanicals sourced globally are consumed in the North American premix sites (Table 3.4).

Table 3.3 Types and Quantities of Functional Ingredients Sourced Globally in 2015 (kg)

Products	Apac	China	Europe	Latam	North America	Grand Total
Arachidonic Acid	60					60
Aroma				2,626		2,626
Botanical Others			400		6,450	6,850
Caffeine	219,475		23,400	65,088	54,729	362,692
Color	365	120	50	840	1,564	2,939
Extracts	13,360	250	14,328	294	303,161	331,393
Flavonoids	25		100		260	385
Flavor	5,380		965	116,784	44,472	167,601
GABA					125	125
Glucosamine	300			6	125	431
Green Tea	20	117	4,974	148	10,385	15,644
Lipoic Acid			5		1,405	1,410
Lycopene	650			220	160	1,030
Malic Acid				775	8,823	9,598
Masking			810	260	238	1,308
Milk Thistle					25	25
Nutraceutical Others			31,068	6,791	1,235	39,094
Q10	5		610		947	1,562
Sterol			15	30	20	65
Steviol	100			30	20,380	20,510
Sugar Others					1,675	1,675
Tartaric Acid				400		400
Zeaxanthin			255	530	30	815
Grand Total	239,740	497	76,980	195,767	461,296	974,280

Source: (Company XYZ 2016)

Table 3.4 Number of Functional Ingredients by Region per Category 2015

Products	Apac	China	Europe	Latam	North America	Grand Total
Arachidonic Acid	1					1
Aroma				4		4
Botanical Others			1		3	4
Caffeine	2		5	3	8	18
Color	3	1	1	4	8	17
Extracts	13	3	21	8	80	125
Flavonoids	1		1		6	8
Flavor	21		10	25	50	106
GABA					1	1
Glucosamine	1			1	2	4
Green Tea	1	2	5	1	8	17
Lipoic Acid			1		2	3
Lycopene	1			2	2	5
Malic Acid				2	1	3
Masking			2	2	4	8
Milk Thistle					1	1
Nutraceutical Others			3	5	5	13
Q10	1		2		3	6
Sterol			1	1	1	3
Steviol	1			1	4	6
Sugar Others					1	1
Tartaric Acid				1		1
Zeaxanthin			3	5	1	9
Grand Total	46	7	56	66	192	367

Source: (Company XYZ 2016)

3.11 Company XYZ Health Benefit Solutions

Company XYZ has a broad portfolio of innovative, high-quality nutrients and has technical knowledge and expertise in a wide range of health benefit solutions. Within the Human Nutrition and Health segment, these solutions are broken down into several different concepts. The concepts are based around different kinds of ingredients known to provide solutions to these requirements. A summary of each concept and the category of ingredients included are summarized in Table 3.5.

Table 3.5 Concepts and Main Ingredients

Concept	Vitamins	Carotenoids	Nutraceuticals	Nutritional Lipids	Minerals	Herbals
Defy Your Age	x	x	x	x	x	
Essentials For Men	x	x	x	x	x	
Essentials For Women's Health	x	x	x	x	x	
Essentials For Vegetarians	x	x	x	x	x	
Flex Your Joints	x			x		
Guard Your Heart	x		x	x	x	
Healthy Aging	x	x		x	x	
Nourish Your Beauty	x	x	x	x	x	
Optimize Your Immunity	x	x	x		x	
Power Your Performance	x		x		x	
Relax Your Mind	x		x	x	x	x
Shape Your Body	x		x		x	
Strengthen Your Bones	x		x	x	x	
Upgrade Your Vision	x	x	x		x	
Energize Your Mind	x		x	x	x	x
Essentials For Kids & Teens	x	x		x	x	
Essentials For Life	x	x		x	x	

Source: (Company XYZ 2016)

Herbs and botanicals are mainly found in health benefit concepts that stimulate or relax the mind.

Memory, attention, focus, development and mood are all known to be affected by various kinds of ingredients. Ingredients such as Vitamin E, Magnesium, Citicoline, B-Vitamins and Lutein and numerous Herbs and Botanicals have been linked to cognitive functioning and brain health from Bacopa to Gingko and from Aswagandha to Ginseng (Daniells 2014).

According to various leading health publications, some of the top herbs and botanicals used for their medicinal properties or effects on memory enhancement properties include Gingko Biloba, Ginseng, Rosemary, Sage, Green Tea, Rhodiola Rosea, Gotukola, Periwinkle, Blueberry & Bacopa (Underground Health 2013).

CHAPTER IV: ANALYSIS OF COMPETITIVE FORCES AND MARKET DRIVERS AFFECTING GROWTH

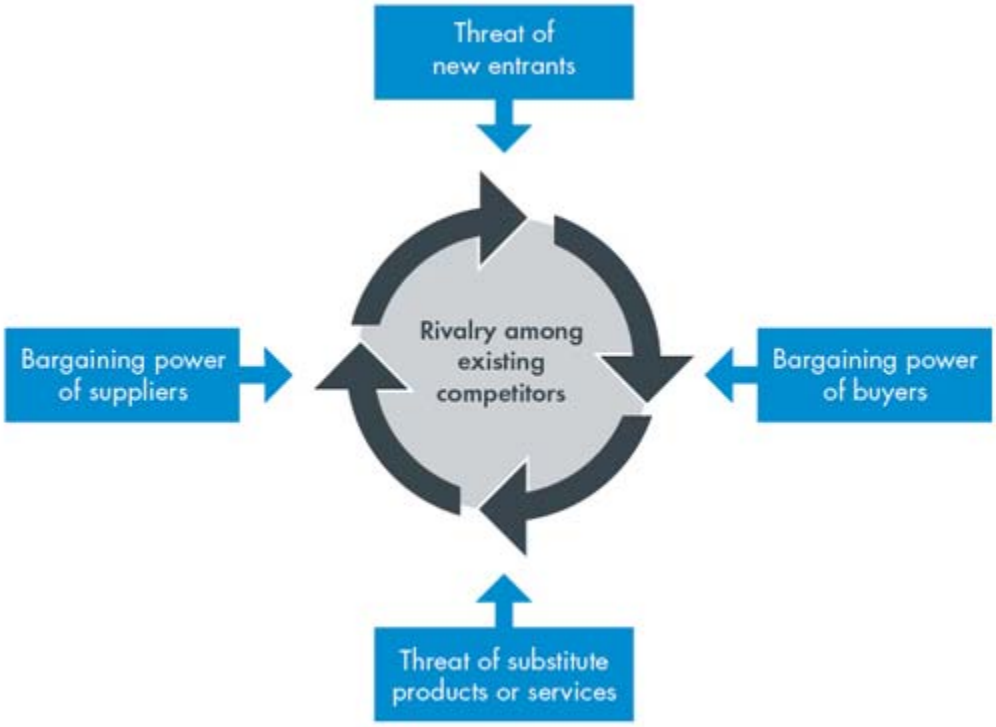
4.1 Michael Porter's Five Forces Analysis

Porter's Five Forces of Competitive Position Analysis is a simple framework for assessing and evaluating the intensity of competitive forces in an industry. Porter's theory is based on the concept that there are five forces that determine the competitive intensity and attractiveness of a market. Porter's five forces help to identify where power lies in a business situation. This is useful both in understanding the strength of an organization's current competitive position, and the strength of a position that an organization may look to move into. Strategic analysts often use Porter's five forces to understand the attractiveness of the industry in terms of profit potential. By understanding the firm's competitive position within the industry, the intensity of rivalry, the entry barriers, the presence of substitute products and services, and the relative bargaining power of buyers and sellers, the framework can help firm's strategic decisions (Porter 1980).

The Five Forces Analysis examines the forces acting on any one position within a business system at a specific time. The relative strength of the Five Forces is indicative of the general profitability for any position in the business system (value chain). Strong forces offer the worst prospect for long-run profitability. Weaker forces offer greater opportunity for superior performance. Company profitability is a function of how well individual firms recognize these forces and implement strategies to position against each force, influence the forces themselves, or move proactively to a new and more favorable positions. As a tool of structural analysis, the Five Forces model helps separate exogenous

factors, those that affect all firms in an industry, from endogenous factors, that affect individual firms (Porter 1980). Porter's Five Forces can be seen in Figure 4.1 below.

Figure 4.1 Porter's Five Forces



Source: (Porter 1980)

4.1.1 Bargaining Power of Customers

This specifically deals with the ability customers have to drive prices down (Figure 4.1). It is affected by how many buyers, or customers, a company has, how significant each customer is and how much it would cost a customer to switch from one company to another. The smaller and more powerful a client base, the more power it holds.

4.1.2 Bargaining Power of Suppliers

This force addresses how easily suppliers can drive up the price of goods and services (Figure 4.1). It is affected by the number of suppliers of key aspects of a good or service, how unique these aspects are and how much it would cost a company to switch from one supplier to another. The fewer the number of suppliers, and the more a company depends upon a supplier, the more power a supplier holds.

4.1.3 Threat of Substitute Products or Services

Competitor substitutions that can be used in place of a company's products or services pose a threat (Figure 4.1). If customers rely on a company to provide a tool or service that can be substituted with another tool or service or by performing the task manually, and this substitution is fairly easy and of low cost, a company's power can be weakened.

4.1.4 Threat of New Entrants

A company's power is also affected by the force of new entrants into its market (Figure 4.1). The less money and time it costs for a competitor to enter a company's market and be an effective competitor, the more a company's position may be significantly weakened. Several factors determine the degree of the threat of new entrants to an industry. Many of these factors fall into the category of barriers to entry, or entry barriers. Barriers to entry are factors or conditions in the competitive environment of an industry that make it difficult for new businesses to begin operating in that market. An example of the threat of new entrants Porter devises exists in the graphic design industry, where there are very low barriers to entry (Wilkinson 2013).

4.1.5 Rivalry amongst Existing Competitors

The importance of this force is the number of competitors and their ability to threaten a company (Figure 4.1). The larger the number of competitors, along with the number of equivalent products and services they offer, dictates the power of a company. Suppliers and buyers seek out a company's competition if they are unable to receive a suitable deal.

4.2 Procedures for Porter's 5-Forces Application to Analysis of Premix Industry

The analysis of the premix industry using Porter's Five Forces framework involves evaluation of the intensity of each force and the discussion of related implications for Company XYZ's strategy. The data are collected through expert interviews. A questionnaire was designed and tested for internal business stakeholder interviews. Each question was based on how they perceive the intensity of the five forces in the context of the premix industry. Managers from several departments were identified and invited to give their input. The respondents included members of the following departments to ensure a balanced viewpoint; sales, marketing, R&D, formulations, quality and purchasing. A scale was formulated to represent to what degree each power is exerted upon the organization. For example, a 2 will represent a strong power position exerted upon the organization and -2 will represent a limited power position. By assessing the various items, an indication of the power that group possesses within the business system can be determined. After assessing the current power based on all items, the status of power, whether the power is increasing, stable or decreasing should be found.

4.3 Industry Definition

The definition and classification of segments within Company XYZ is not consistent across the world. Therefore, for the purpose of this project all food, beverage and

infant/early life nutrition (baby food/infant formula etc) business will be classified as food & beverage (F&B) and all dietary supplement, pharmaceutical and nutraceutical business be classified as dietary supplement (DS). The following sections will provide an overview of Company XYZ's North American position in the F&B and DS segments as well as the competitive environment it is involved with.

4.4 Food and Beverage Segment

The food and beverage segment as defined by Company XYZ is made up of companies that produce consumer products such as bakery, cereals, bars, dairy products, beverage & sports nutrition to name a few. The customer base includes both large multinationals such as Coke, Pepsi, Kellogg, Kraft Heinz and Dannon as well as much smaller and regional customers. The top 10 Company XYZ customers in the Food and Beverage segment are in Table 4.1.

Table 4.1 Top 10 Customers F&B Segment 2015 (Sales in USD)

Customer	Sales 2015 (USD)
FB Customer 1	23,406,228
FB Customer 2	15,601,058
FB Customer 3	12,215,233
FB Customer 4	8,025,964
FB Customer 5	7,915,666
FB Customer 6	5,071,782
FB Customer 7	4,042,461
FB Customer 8	4,009,371
FB Customer 9	3,128,306
Total	83,416,068

Source: (Company XYZ 2016)

The food and beverage segment is expected to grow at 2-3% annually (Nutrition Business Journal 2016). Some of the challenges the company faces in this segment includes

a forecasted moderate growth in the mainstream brands/companies, which Company XYZ has traditionally served over the years. Larger companies are acquiring smaller ones to achieve growth (e.g. GMI-Annie's, Coke-Fairlife; and Campbell's-Plum). There seems to be a trend towards healthy, natural, de-fortified, clean label products vis-à-vis millennials gaining influence as consumers. There is a continued customer drive for cost savings & productivity and therefore pressure on suppliers such as Company XYZ to help fund growth. Regulatory constraints are growing resulting in scientific proof of claims. The opportunities for this segment includes the large food and beverage manufacturers purchasing and running smaller brands as stand along companies (i.e. General Mills and Annie's, Campbell's and Bolthouse/Garden Fresh Gourmet). Smaller/midsized companies are filling gaps while volume shifts away from large mainstream brands and Company XYZ believes it can grow with these customers. There also appears to be a strong growth in the non-dairy milk, snack bar, premium juice & yogurt segments therefore growth can be focused on premium, health type offerings. Total 12-months retail value of the Food & Beverage market are in Table 4.2 below.

Table 4.2 Size & Growth of Total F&B Retail Market (B$US)

Ready to Eat Cereal	8.6	-2.1%
Yogurt	7.9	2.4%
Snack Bar and Breakfast Biscuits	3.7	2.9%
Premium Juice	3.1	-0.8%
Sports Nutrition	3	7.5%
Baby food	1.7	0.9%
Non-Dairy Milk	1.5	7.1%
Enhanced Water	1.3	3.6%
Total	**30.8**	**2.7%**

Source: (Nutrition Business Journal 2016)

4.5 Dietary Supplement Segment

The Dietary Supplements industry is expected to surpass the GDP growth rate in North America through 2020 ranging between 3-7% depending on application i.e. multi-vitamins vs nutraceuticals (Table 4.3). Company XYZ is overly dependent on large brand owners in the mass market segment, which tend to be smaller, slow growing, lower margin channels (Table 4.3). The "Market" column represents how the market is typically distributes its products i.e. 16% of dietary supplement sales go through MLM. The "Company XYZ" Column represents the distribution of Company XYZ sales channels i.e. 8% of the company's dietary supplement sales are sold through MLM channels. The "Growth Rate" column represents the growth rate of that sales channel and GPx represents the profitability of that particular segment to Company XYZ. For example, MLM channels are the least attractive channel in terms of profitability for Company XYZ.

Table 4.3 Breakdown of Company XYZ Channel vs Market Channels, Growth Rate and GPx

Customers	Market	Company XYZ	Growth Rate	Comp XYZ GPx
Others	5%	8%	4%	50%
Practitioner	9%	2%	7%	52%
Online	6%	6%	11%	43%
MLM	16%	8%	5%	32%
Mass	27%	61%	2%	33%
Natural-Specialty	37%	15%	6%	38%

Source: (Nutrition Business Journal 2016), (Company XYZ 2016)

The mass market segment includes grocery stores such as Walmart, Target & K-Mart, drug stores such as Walgreens & CVS, and clubs including Sam's Club Cost Co and BJ's. Multi-Level Marketing (MLN) includes companies such as Avon or other network marketing channels. Company XYZ's top 10 customers in the Dietary Supplement segment are in Table 4.4.

Table 4.4 Top 10 Customers DS Segment 2015

Customer	Sales 2015
DS Customer 1	28,651,725
DS Customer 2	16,008,551
DS Customer 3	13,489,732
DS Customer 4	11,847,888
DS Customer 5	10,665,812
DS Customer 6	10,180,881
DS Customer 7	7,330,626
DS Customer 8	7,301,906
DS Customer 9	6,473,762
Total	111,950,882

Source: (Company XYZ 2016)

Currently Company XYZ is overly dependent on a few core products in the portfolio of straight products and the company's largest category (Omega 3's) highest margin product (life's DHA) is in a declining category. Company XYZ is underdeveloped in the Natural & Specialty channel. The company has ambitious growth targets of $263M to $428M by 2020.

In Table 4.5, the total retail sales value of the Dietary supplement market was valued at $28.6B. Company XYZ's total sales in 2015 was $263M, therefore the company's total market share in this segment is ~0.9%. By 2020 this is expected to grow to ~1.1%.

Table 4.5 Size & Forecasted Growth of Total DS Retail Market (B$US)

Description	2015	2020	Forecasted Annual Growth
Plant Oil (Algal, Flaxseed etc)	0.3	0.4	3.0%
Fish Oil	1.1	1.2	1.0%
Minerals	2.8	3.6	5.0%
Multi-Vitamins	5.8	6.8	3.0%
Nutraceuticals	5.5	7.8	7.0%
Single Vitamins	6.3	8.4	6.0%
Traditional (Herbs & Botanicals)	6.8	9.1	6.0%
Total	**28.6**	**37.3**	**4.4%**

Source: (Nutrition Business Journal 2016)

4.6 Premix

Currently no information exists on typical premix contents of finished products as this varies widely depending on the segment the premix is sold. It is not uncommon to find inclusion rates of <1% for F&B applications and >95% for Dietary Supplement applications. On average in the F&B sector Premium Juices, Sports Nutrition and Enhanced Waters typically contain a higher premix level compared to a cereal or snack bar. Similarly, in DS applications a multi-vitamin or herb and botanical product has a higher premix content than a fish oil or plant oil. However as mentioned, there is no hard and fast rule to this.

4.7 Current Premix Business & Outlook

Company XYZ's total NA sales of premix into the F&B segment in 2015 was estimated to be ~$209M from a total market of $290M and growing at a rate of 2-3% per year. Therefore, in the F&B segment, premix represents ~0.94% ($209/$30.8B) of the total F&B retail market. At current estimated growth rates the total value of premix for this

segment is estimated to be valued at ~$320-$336M ($290*1.02^5-1.03^5$) by 2020 (Company XYZ 2016).

Company XYZ's total NA sales of premix into the DS segment in 2015 was $31.2M, which represents just 0.1% ($31.2M/$28.6B) of the total retail value for this segment. The company expects the total value of the premix business to grow by $21M over the next 5 years. Therefore, if the total value of premix in DS is expected to be valued at $52.2 by 2020 ceteris paribus, premix would therefore be 12.2% (52.2/428) of Company XYZ's total DS segment.

4.8 Premix Competitive Environment

Prior to the acquisition of Acquisition Company 1 in 2012, Company XYZ and Acquisition Company 1 were the two largest premix companies with truly global footprints. Both Acquisition Company 1 and Company XYZ were serving customers in all major markets on each continent of the world. There have been long debates within both organizations regarding the market share each company had in their specific segments. The problem with accurately determining market share is that no empirical or official data has ever existed with regards to the premix as a whole and has been largely considered using actual sales vs predicted market size. When data is not based on hard evidence it can create some doubt with respective stakeholders.

4.8.1 Competitor 1

Competitor 1 is an Ireland headquartered global performance nutrition and ingredients group with operations in 32 countries. It has market positions in sports nutrition, cheese, dairy ingredients, specialty non-dairy ingredients and vitamin and mineral

premixes. Competitor 1 represents the premix arm of Competitor 1 Plc and has 4 premix sites globally; two in North America, China and a new manufacturing site in Germany.

4.8.2 Competitor 2

Competitor 2 LLC is a holding company operating through its subsidiaries, which imports and distributes ingredients and flavors to food and beverage, flavor, nutrition, fragrance, botanical and veterinary, and pharmaceutical/nutraceutical industries internationally. Competitor 2 LLC was formerly known as Competitor 2 Legacy 1, LLC and changed its name to Competitor 2 LLC in July 2011. The company was incorporated in 2002 and is based in Illinois. As a premix manufacturer and supplier, it operates mainly in the North American and European Markets with two manufacturing facilities in the USA; a liquid blending facility (formerly Competitor 2 Legacy 2.) and a dry blending facility in Illinois.

4.8.3 Competitor 3

Competitor 3 specializes in the development, formulation and manufacturing of premixes intended to enrich a variety of product applications; including breakfast cereals, functional foods, dairy and non-dairy-based meal replacement beverages, nutrition bars, sports nutrition products, infant formulas and daily multivitamin supplements. Competitor 3 is predominantly present with dry blends in North America with some presence in Brazil and other Latin countries. They have one manufacturing facility in Louisiana.

4.8.4 Competitor 4

Competitor 4 is involved in custom nutrient blends for the food and dietary supplement industries and claim to have expertise in microencapsulation, agglomeration, micronizing, and spray drying. There main customer base appears to be companies looking

for assistance with chelated ingredients drum to hopper blends, granulations & agglomerations, microencapsulation technology, spray dried nutrients, trituration and bakery ingredients. The company appears to be involved only in dry blends and have manufacturing facilities in Connecticut and Illinois.

4.8.5 Others/Customer in-house

There are a number of other producers of premix within the North American market including; Competitor 5 a company involved in a small segment of the F&B industry (Flour Fortification), Competitor 6 a company involved with encapsulation technology for minerals mainly targeted at dietary supplement customers as well as customer in-house premix production. The latter is found significantly in the dietary supplement sector.

4.9 Market Share

After interviews and discussions with Company XYZ key business experts stakeholders of each market segment the main players and existing market share are summarized in Table 4.6 below.

Table 4.6 North American Market Share by Segment (2015)

Company	Food & Beverage	Dietary Supplement
Company XYZ	72%	22%
Other/Customer In-House	1%	65%
Competitor 1	16%	5%
Competitor 2	6%	6%
Competitor 3	3%	1%
Competitor 4	2%	1%

Source: (Company XYZ 2016)

Based on the market share indicated the 2015 total value of each business segment for each market player is summarized in Table 4.7 below.

Table 4.7 North American Premix Value by Segment and Player ($M USD)

Company	Food & Beverage	Dietary Supplement
Company XYZ	$ 208.80	$ 31.20
Other/Customer In-House	$ 2.90	$ 92.18
Competitor 1	$ 46.40	$ 8.51
Competitor 2	$ 17.40	$ 9.93
Competitor 3	$ 8.70	$ 1.42
Competitor 4	$ 5.80	$ 1.42
Total	**$ 290.00**	**$ 144.65**

Source: (Company XYZ 2016)

4.10 Concentration Ratio & Herfindahl-Hirschman Index

Markets are often characterized according to the degree of seller concentration. This permits quick and reasonably accurate assessment of the likely nature of competition in a market. These characterizations are aided by having measures of market structure. Market structure refers to the number and distribution of firms in a market. A common measure of market structure is the *N*-firm concentration ratio. This gives the combined market share of the *N* largest firms in a market. For example, the four-firm concentration ratio in the soft drink industry is 0.9, which indicates that the combined market share of the four largest soft drink manufacturers is about 90 percent (Besanko, et al. 2010).

One problem with the *N*-firm ratio is that it is invariant to changes in the sizes of the largest firms. For example, a 4-firm ratio does not change value if the largest firm gains 10% share at the expense of the second-largest firm, even though this could make the market less competitive. The Herfindahl-Hirschman index avoids this problem. The Herfindahl index equals the sum of the squared market shares of all the firms in the market; that is, letting S_i represent the market share of firm I, Herfindahl = $\sum_i (S_i)^2$ (Besanko, et al. 2010). For example, if 6 firms have market shares of 35%, 20%, 15%, 15%, 10%, and 5%. The index is $35^2 + 20^2 + 15^2 + 15^2 + 10^2 + 5^2 = 2200$. Larger index numbers correspond to

more highly concentrated industries. The higher the market's concentration, the closer a market is to being a monopoly (and the lower its competition). If, for example, there were only one firm in an industry, that firm would have 100% market share, and the HHI would equal 10,000, indicating a monopoly. If, there were thousands of firms competing, each would have nearly 0% market share, and the HHI would be close to zero, indicating almost perfect competition (McConnell, Brue and Flynn 2015).

4.11 Premix Market Concentration Ratio & HHI

Table 4.7 gives a breakdown of the market share of each of the players in the North American market for both food & beverage and dietary supplement. Note: In-house blending is not considered in the calculation.

The concentration ratios (CR) considering 4-firm and HHI for both can be calculated as follows:

Food & Beverage:

CR: 72% + 16% + 6% + 3% = 97% = Highly Oligopolistic Market i.e. total domination by a small number of firms.

HHI: $72^2 + 16^2 + 6^2 + 3^2 = 5485$, therefore oligopolistic.

Dietary Supplement:

CR: 22% + 6% + 5% + 1% = 34%, therefore a low concentration. The lower the figure means industries at the lower end of this range enjoy perfect competition.

HHI: $22^2 + 6^2 + 5^2 + 1^2 = 546$. The low figure indicates a low concentration of competition.

It was mentioned in the previous chapter that herbals and botanicals are concentrated on health benefit concepts that concern either the stimulation or relaxation of the mind. To evaluate potential products these types of ingredients would be included in it

was decided to look at some of the major retailers of supplements and to evaluate their offerings concerning mental health concepts.

Top 10 Ranked Supplements & Vitamins Retailers in the United States are listed in Table 4.8 below (Knoji n.d.). A comprehensive list of the top-50 stores can be found in Appendix 1.

Table 4.8 Top 10 Ranked Supplement & Vitamin Retailers

Rank	Title	HQ	Overall Score
1	Vitamin Shoppe	North Bergen, NJ	4.7
2	Healing Natural Oils	San Diego, CA	4.6
3	Professional Supplement Center	Sarasota, FL	4.6
4	GNC	Pittsburgh, PA	4.6
5	Healthy Directions	Bethesda, MD	4.4
6	Hi-Health	Trumbull, CT	4.3
7	Moringa Source	Danbury, CT	4.3
8	LifeExtension	Fort Lauderdale, FL	4.3
9	A1Supplements	Louisville, TN	4.3
10	ProHealth	Carpinteria, CA	4.3

Source: (Knoji n.d.)

The results from the interview of Company XYZ experts and stakeholders indicate that competition is fierce, particularly in the food & beverage segment where Company XYZ already has a high market share. In the food and beverage segment, a significant amount of energy is spent on trying to defend market share and there is mounting price pressure felt from the competition. On the other hand, in the dietary supplement sector there is pressure on trying to grow market share. There is a drive to convince customers on outsourcing their in-house blending activities.

4.12 Premix 5-Forces

To conduct the Five Forces analysis of the premix industry, a list of factors was developed and used in designing the expert interview questionnaire. The factors are summarized in table 4.9. Each factor was rated on a scale of -2 to 2, with -2 representing a low intensity and 2 representing a high intensity. Everything in between (-1, 0, 1) would represent a moderate intensity.

Table 4.9 Premix 5-Forces

Force	Factor to be determined
Bargaining Power of Suppliers	Supplier concentration (dominated by a few companies and is more concentrated than the
	Threat of forward integration to the industry's business
	The industry is an important customer of the supplier group
	Availability of substitute products / technologies to replace the supplied product
	Switching costs to change to other sources of supply or substitute products / technologies
	Importance of supplier product to performance
	Volume as percent of supplier's total sales
	Customer concentration (dominated by a few companies and purchases in large volumes)
Bargaining Power of Customers	Threat of backward integration to the industry's business
	The product it purchases from the industry are standard or undifferentiated
	Customer's average profitability (low profits create incentive to lower purchasing costs)
	The industry's product is unimportant to the quality of the buyer's products or services
	Availability of substitute products / technologies to replace the supplied product
	Switching costs to change to other sources of supply or substitute products / technologies
	Volume as percent of our total assets
Rivalry Among Exististing Competitors	Number of competitors
	Concentration of competitors
	Competitors are similar in strategies, origins and personalities
	Industry growth is slow, precipitating fights for market share
	Product differentiation
	Fixed costs are high, or the product is perishable, creating strong temptation to cut prices
	Capacity is normally expanded in large increments
	Exit barriers
Threat of New Entrants	Patent position of existing players in the value chain
	Proprietary product difference / brand strength
	Cost for customers to switch to new entrant
	Access to distribution channels
	Government policy encouraging new entrants (tax credits, regulatory waivers)
	Cost advantage from experience
	Incumbents have resources to fight back
	Incumbents are likely to cut prices
	Industry growth
Threat of Substitutes	Relative performance at same price of substitutes
	Knowledge and availability of alternate materials / technology
	Customers switching costs to enable product substitution / alternate technology
	Customers' demonstrated propensity to substitute

4.12.1 Data Collection and Expert Interviews

The data was collected through personal face-to-face interviews, followed by some additional follow up interviews by phone. The sample of respondents included Company XYZ employees in either middle or senior management positions. They were selected

based on the expertise and the position held by that person to the function most closely related to the force being analyzed. For example, purchasing and quality management was surveyed regarding threat of suppliers since that function is closest and most knowledgeable about the number of suppliers qualified. Sales and marketing were surveyed on threat of substitutes, bargaining power of customers etc since they were deemed closest to the relevant aspect. All in all, 10 stakeholders from sales, marketing, purchasing, research and development, quality as well as formulations were surveyed to get a well-rounded opinion. A list of actual areas of expertise of participants interviewed in the survey regarding each force can be found in table 4.10. A survey instrument was designed and used to gather the data. The questions asked to each stakeholder can be found in Appendix A.

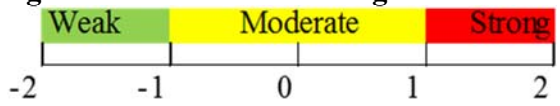
Table 4.10 Forces and Stakeholders Interviewed

Force	Stakeholder Interviewed
Bargaining Power of Suppliers	Purchasing, Quality
Bargaining Power of Customers	Sales, Marketing
Rivalry Among Existing Competitors	Sales, Marketing, R&D
Threat of New Entrants	Sales, Marketing, R&D
Threat of Subsitutes	R&D, Quality, Formulations

The responses of the interviews were transcribed and summarized for each force. For example, when purchasing and quality management were asked about their opinion of the threat of suppliers to the business and the bargaining power they have, each raw material used and the number of suppliers approved per raw material can be studied. It was mentioned that if there were more than 10 suppliers per raw material then the value given would be -2, representing a low threat. If there were less than 4 suppliers per raw material, it would be a high threat. Everything in between would be considered moderate (4-5=1, 7-8

=0, 9-10=1). Since the number of raw materials per supplier averaged at around 5-6 suppliers, it was found to be a moderate threat (0). Figure 4.2 illustrates the strength of the force for each metric

Figure 4.2 Metric and Strength of Force



Similarly, when threat of substitutes was discussed with stakeholders from research and development, quality and formulations, in terms of knowledge of available alternate materials/technology, it was concluded that there were moderate (-1). Each force and question related to the calculation of each force are in Table 4.11.

Table 4.11 Survey questions and results

Customer Power	Result	Force
Customer concentration (dominated by a few companies and purchases in large volumes)	-2	Low
Threat of backward integration to the industry's business	-2	Low
The product it purchases from the industry are standard or undifferentiated	-2	Low
Customer's average profitability (low profits create incentive to lower purchasing costs)	-1	Moderate
The industry's product is unimportant to the quality of the buyer's products or services	-2	Low
Availability of substitute products / technologies to replace the supplied product	-1	Moderate
Switching costs to change to other sources of supply or substitute products / technologies	-1	Moderate
Volume as percent of our total assets	-2	Low
Overall	**-1.63**	**Low**

Supplier Power	Result	Force
Supplier concentration (dominated by a few companies and is more concentrated than the industry it sells to)	0	Moderate
Threat of forward integration to the industry's business	-1	Moderate
The industry is an important customer of the supplier group	-2	Low
Availability of substitute products / technologies to replace the supplied product	-2	Low
Switching costs to change to other sources of supply or substitute products / technologies	-2	Low
Importance of supplier product to performance	2	Low
Volume as percent of supplier's total sales	-1	Moderate
Overall	**-0.86**	**Low**

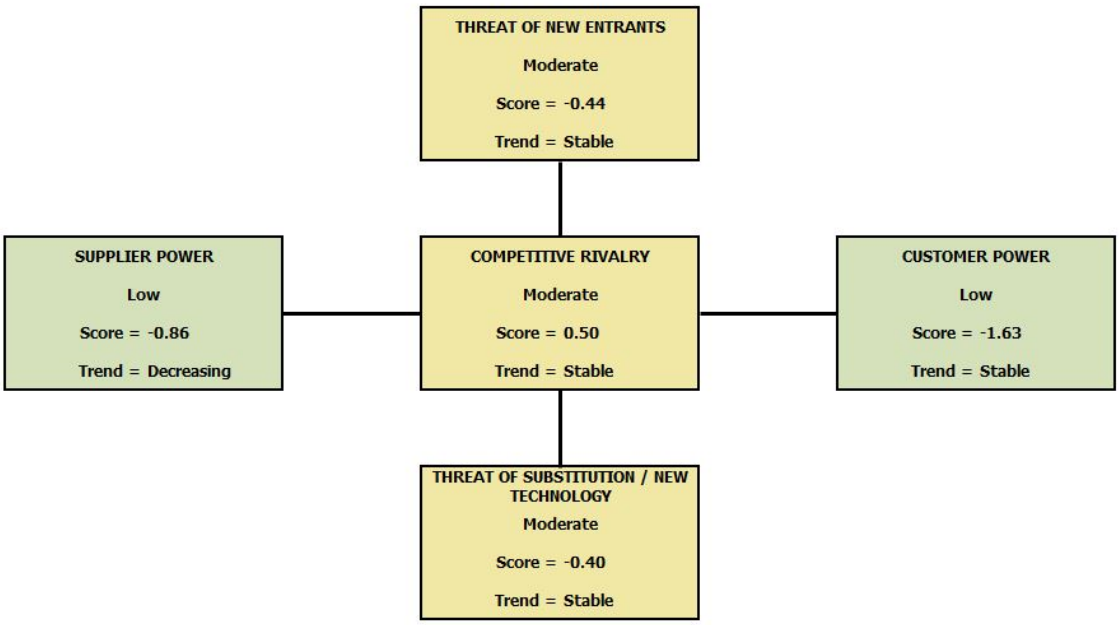
Competitive Rivalry	Result	Force
Number of competitors	1	Moderate
Concentration of competitors	-1	Moderate
Competitors are similar in strategies, origins and personalities	1	Moderate
Industry growth is slow, precipitating fights for market share	2	High
Product differentiation	0	Moderate
Fixed costs are high, or the product is perishable, creating strong temptation to cut prices	0	Moderate
Capacity is normally expanded in large increments	-1	Moderate
Exit barriers	2	High
Overall	**0.5**	**Moderate**

Threat of New Entrants	Result	Force
Patent position of existing players in the value chain	2	High
Proprietary product difference / brand strength	0	Moderate
Cost for customers to switch to new entrant	1	Moderate
Access to distribution channels	1	Moderate
Government policy encouraging new entrants (tax credits, regulatory waivers)	-2	Low
Cost advantage from experience	-2	Low
Incumbents have resources to fight back	0	Moderate
Incumbents are likely to cut prices	-2	Low
Industry growth	-2	Low
Overall	**-0.4**	**Moderate**

Threat of Substitutes	Result	Force
Relative performance at same price of substitutes	0	Moderate
Knowledge and availability of alternate materials / technology	-1	Moderate
Customers switching costs to enable product substitution / alternate technology	1	Moderate
Customers' demonstrated propensity to substitute	0	Moderate
Government policy (tax credits, incentives)	-2	Low
Overall	**-0.4**	**Moderate**

A summary of the results can be found in Figure 4.3 below.

Figure 4.3 Results of The Premix 5-Forces



4.13 Discussion of the Results

As mentioned in 2.1 there have been relatively few studies regarding asset strategy planning, industry analysis or supply-chain optimization of the premix business. After extensive searches, it appears the use of a five forces framework analysis by a premix producer is the first of its kind.

Nevertheless, when analyzing the results, comparisons can be made with industries of a similar nature. The following sections will discuss the results of the analysis compared to five other companies active in the food industry, Whole Foods (Supermarkets), Pepsi (Beverages), Starbucks (Coffee) & Unilever (Consumer Goods). The comparison of each company's five forces analysis can be seen in table 4.12.

Table 4.12 Comparison of Five Forces

Competitive Rivalry	Moderate	High	High	High	High
Customer Power	Low	High	High	High	High
Supplier Power	Low	Moderate	Low	Low	Moderate
Threat of Substitutes	Moderate	High	High	High	Low
Threat of New Entrants	Moderate	High	Moderate	Moderate	Low

4.13.1 Competitive Rivalry (Moderate)

Rivalry is higher in the F&B market compared to the DS market. The competition for the F&B segment is aggressive and customers are more price sensitive due to blends being less complex and easier to switch between suppliers. Nevertheless, Company XYZ has the most technical know-how and experience with premixing and has the most sites and capacity globally, which provides a competitive advantage to serve multinational customers. The rivalry in the F&B market makes sense since it was calculated in Table 4.11 to be somewhat oligopolistic (5489) whereas DS was not (547). It can be seen in Table 4.10 how Company XYZ compares to companies in a comparative industry. These companies are listed as high for competitive rivalry. For example, PepsiCo, there are strong forces in competitive rivalry because due to the sheer number and high aggressiveness of competing firms and low switching costs. Most firms in the food and beverage industry are aggressive, such as in product innovation and marketing, thereby exerting a strong force on PepsiCo (Smithson 2017).

4.13.2 Customer Power (Low)

There currently many (thousands) of customers in the market and macro trends such as combating pill fatigue will bring additional ones into the market. Some customers produce premixes in-house or via tollers but companies do not have the equipment for producing premix blends, therefore, cannot easily switch to this option. While it may be relatively simple to physically replace one company's premix with another, there is a

significant risk in doing so. For example, premixes are tailored to the customers processing facilities/conditions and final product application can be affected by changing from one product to another. Premixes can however be reverse engineered by a competitor but this may take significant time and cost to do so. A customer can take up to one year to qualify a new premix supplier. Customer power in the similar companies are listed as high. For example, Unilever is subjected to high customer power because of very low switching costs and high quality of information, which are both strong forces. The low switching costs make it easy for consumers to transfer from Unilever's products to other companies' products. This external factor contributes to the strong intensity of the bargaining power of buyers (Kissinger 2017).

4.13.3 Supplier Power (Low)

There are multiple suppliers per ingredient/nutrient. Company XYZ is the largest premix producer globally and has the greatest leverage in spend. Therefore, suppliers do not have significant bargaining power. There are a few suppliers (i.e. Competitor 2) that are also involved in the premix business. However, due to multiple supply options they do not have significant bargaining power. Since there are multiple suppliers per nutrient/ingredient, apart from proprietary or client-specified products, there are little to no costs involved in switching suppliers. Supplier power appears to be moderate to low across companies of a similar nature. For example, Starbucks' suppliers have relatively weak power since there are a high variety of suppliers, a large overall supply and size of individual suppliers are relatively small. Therefore, Starbucks' suppliers do not have much impact on them (Greenspan 2017). On the other hand, Whole Food's suppliers have a moderate impact because they have a moderate level of supply and much larger sized suppliers compared to Starbucks. Whole Foods Market's suppliers are mostly large

wholesalers, such as United Natural Foods Inc. (UNFI). Because of their size, these suppliers exert moderate pressure on Whole Foods Market (Lombardo 2017).

4.13.4 Threat of Substitutes (Moderate)

There are relatively few substitutes to replace the nutrients contained in premix blends. Consumers become more concerned and educated regarding the health benefits of receiving the correct nutrients for life functioning. Nevertheless, the greatest threat comes from nutrients via other forms of food. For example, natural trends such as the organic movement or move towards fresh fruit and vegetables may impact the decision of the consumer to purchase a non-fortified product compared to a fortified one. This is not likely to happen overnight however companies may move towards producing products with more natural ingredients. This may, however, provide an opportunity for Company XYZ vis-à-vis her and botanical premixes. It can be seen in Table 4.10 that there is a range of powers exerted on comparative companies with regards to the threat of substitutes. The low switching costs enable consumers to easily use substitutes to Unilever's products. This external factor imposes a strong force on the company and the consumer goods industry environment. However, the overall impact of substitution is weakened because of the low availability of substitutes. For example, it is easier to access Unilever's Close-Up toothpaste from grocery stores than to obtain substitutes like homemade organic dentifrice (Kissinger 2017). On the other hand, it is high in PepsiCo because consumers easily enjoy real fruit juices and brewed coffee products instead of drinking Pepsi or Tropicana products. In addition, PepsiCo consumers can easily shift to these substitutes, which are generally affordable. Also, most of these substitutes are widely available in grocery stores and other providers (Smithson 2017).

4.13.5 Threat of New Entrants (Moderate)

None of the existing premix producers hold patents for intellectual property and since no chemical reactions take place in blending, blends are relatively simple to replicate. However, brand and reputation are symbols of service and have a significant impact on a customer's decision to purchase from a specific company. In addition, the cost to change supplier would be low but qualification would play a big role in a customer's decision. Incumbents have relatively easy access to raw material suppliers but would initially lack the buying power and broad knowledge of the market (when to buy, from what suppliers at what cost) and may limit their chances of success. More competition is however, likely to drive prices down. It can be seen in Table 4.10 that there are a range of powers exerted on companies with regards to the threat of new entrants. Unilever is low, whereas Whole Foods is high. It is costly to build strong brands like Unilever's. This external factor weakens the intensity of the threat of new entrants against the company. Also, Unilever takes advantage of high economies of scale, which support competitive pricing and high organizational efficiencies that new firms typically lack. As a result, the company remains strong despite new entrants (Kissinger 2017). On the other hand, Whole Foods Market is in an industry where establishing a new business requires moderate spending. Even small retailers can compete with the company. It is also relatively easy to operate in the grocery and health food store industry. Moreover, new entrants have high chances of success because they can easily attract customers away from firms like Whole Foods Market (Lombardo 2017).

4.14 Shift in Demographics and Opportunity

The number of older persons, those aged 60 years or over has increased substantially in recent years in most countries and regions as the baby boomer generation has aged, and that growth is projected to accelerate in the coming decades (United Nations 2015).

Between 2015 and 2030, the number of people in the world aged 60 years or over is projected to grow by 56%, from 901 million to 1.4 billion, and by 2050, the global population of older persons is projected to more than double its size in 2015, reaching nearly 2.1 billion.

Globally, the number of older persons is growing faster than the numbers of people in any other age group. As a result, the share of older persons in the total population is increasing virtually everywhere. While population aging is a global phenomenon, the aging process is more advanced in some regions than in others, having begun more than a century ago in countries that developed earlier, and getting underway only recently in many countries where the development process has occurred later, including the decline of fertility.

Table 4.13 compares the populations of several advanced countries aged 60-and-older. The 60-and-older demographic made up 20.7% of the total U.S. population in 2015. Japan, Germany and Finland reached a 60-and-older population makeup of 23.3%, 23.1% and 19.1% respectively, in 2000. Reviewing marketing experiences in countries that have already experienced disproportionate growth in the older population could point the way for opportunities in the U.S.

Table 4.13 Percentage of Population Aged 60 or Over

Year	2000	2015	2030
Japan	23.3%	33.1%	37.3%
Germany	23.1%	27.6%	36.1%
Finland	19.9%	27.2%	31.5%
United States	16.2%	20.7%	26.1%

Source: (United Nations 2015) Note: The United Nations classifies the aging population as 60 years or over. The United States Census classifies the aging population as 65 years or over).

People aged 60 years and older make up the fastest-growing segment of the U.S. population. The food industry has an important role to play during this critical era of people's lives. Healthy aging and the prevention of chronic disease is heavily dependent on proper nutrition. Increased incidence of sarcopenia and impaired cognitive health are relevant health concerns in the U.S. There are significant opportunities for R&D pipelines to help improve the quality-of-life and length of independence of older adults by addressing the sensory, social and physical changes associated with aging (DeSimone and Hickman 2016).

Knowledge workers are workers whose main capital is information. Examples include software engineers, physicians, pharmacists, architects, engineers, scientists, public accountants, lawyers, and academics, whose job is to "think for a living".

Drucker in his book "Managing in Turbulent" times stated that work has sharply shifted from manual-type work to knowledge-based work (1980). In 1920, the ratio of manual workers to knowledge workers was 2:1. By 1980, things were the other way around. The mid-point in this shift was 1956, the year white-collar workers first outnumbered blue-collar workers (Naisbitt 1982).

The knowledge-based economy is an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high

skill levels, and the increasing need for ready access to all of these by the business and public sectors (OECD/Eurostat 2005).

According to world labor statistics compiled by The World Bank (2016), there is a clear trend in developed countries from industrial based to knowledge employment. Table 4.14 give a snapshot of employment statistics from several different regions over a 16-year period.

Table 4.14 Employment in industry % total employment (non-knowledge based jobs)

Region	1994	2010	Change
Japan	34%	25%	-9%
United States	24%	17%	-7%
European Union	31%	25%	-6%
China	21%	44%	23%
Turkey	23%	27%	4%

Source: (The World Bank 2016)

Nutrition intervention is a major component of the fight against any disease. Providing the population with nutrition solutions focused specifically on supporting brain health and avoiding chronic disease may help prevent cognitive decline and age-associated diseases (Maglione 2010).

As seen in the population and employment statistics, the fact that there is clear trend towards an aging population in knowledge based economies and the population of these economies and looking for solutions to preserve mental health, suggests the demand for products that support these concerns will only increase in the coming years.

CHAPTER V: STRATEGIC ISSUES SYNTHESIS & STRATEGY RECOMMENDATIONS FOR ASSET ALLOCATION

5.1 Focus of the Project

As mentioned in the introduction the purpose the larger project is to understand whether or not the company could utilize a specific site for specializing in producing herbs and botanicals. To come to this conclusion, it is necessary to firstly understand the size of the market for herb and botanical products, and specifically where it would make sense to locate facilities to produce herb and botanical premixes. It was mentioned in 3.7 that Company XYZ currently has seven sites (NY, CA, Brazil, Poland, China, India and Malaysia) that has the appropriate technology (bin blenders) required for blending herbs and botanicals. It was mentioned in 3.10 that around 50% of current herb and botanical premix production is currently carried out in the United States and, as highlighted in table 3.3, more than half of all ingredients are utilized in U.S. manufacturing sites. Therefore, the U.S. has significantly more experience in producing these kinds of blends than other regions. It would therefore seem appropriate to investigate potential opportunities for herbs and botanicals from the U.S. market perspective. The following sections will concentrate on the U.S. region with regards to the research problem.

5.2 Proximity of sites to potential customer base

It was mentioned in section 1.2 that this study would look at analyzing optimal production location given considerations regarding capacity as well as logistical proximity to customer and supplier base. It was ascertained in section 5.1 that the North America region would be the focus for this project. Therefore, the next step is to look at physical proximity of customers and suppliers to each North American premix site. It was mentioned that bin blenders are the most suited to blending herb and botanical ingredients.

Both Ontario and Schenectady currently use these kinds of blenders whereas Belvidere does not. Nevertheless, when looking at raw material suppliers and customers, Belvidere will be included in the event that site may be more optimally located to receive raw materials and supply customers.

Table 4.8 lists the top 10 vitamin and supplement suppliers in the United States. A comprehensive list of the top 50 retailers and manufacturers can also be found in Appendix C. Distances in miles from production site to customer location have been calculated and the most optimally located site is highlighted in green for each customer. A summary of the results can be found be found in Table 5.1.

Table 5.1 Incidences sites are optimally located to customer or customer's manufacturer (All NA Sites)

	NY	NJ	CA	Total
Incidences optimally located to customer	1	26	20	47
Incidences optimally located to customer's manufacturer	1	15	13	29
Total	2	41	33	76
Percentage	3%	54%	43%	100%

Source: (Company XYZ 2016)

It can be seen that when comparing production locations between all sites New Jersey is the most optimally located albeit not having the correct blending equipment available.

Table 5.2 Incidences sites are optimally located to customer or customer's manufacturer (NY vs CA)

	NY	CA	Total
Incidences optimally located to customer	27	20	47
Incidences optimally located to customer's manufacturer	16	13	29
Total	43	33	76
Percentage	57%	43%	100%

When comparing only NY and CA then NY appears to be marginally more optimally located.

5.3 Proximity of sites to raw material supply base

Figures 4.1 gives an overview of the procurement process of raw materials (both internally sources) and Figure 4.2 explains how premix producers typically procure herbs and botanicals. Herbs and botanicals are sourced in the downstream stages of the manufacturing process meaning they are typically sourced from local distributors or manufacturers that are in the country or region they are consumed. This can be seen from the list of 75 suppliers of herbs and botanicals in Appendix C. All are either located on the mainland U.S. or Canada.

As compared in 5.2 it is relevant to look at distances between suppliers and production site to determine whether one site is more optimally located in terms of raw material supply. This comparison was carried out for all sites as well as Schenectady and Ontario only. The results are seen in Table 5.3.

Table 5.3 Comparison of proximity of suppliers to suppliers

All Sites	NY	NJ	CA
Incidences site optimally located	1	46	27
Percentage	1%	62%	36%

Schenectady vs Ontario	NY	CA
Incidences sites optimally located	46	27
Percentage	62%	36%

From table 5.3 when comparing all US sites, the most optimally located site is Belvidere. When comparing NY and CA alone, NY is the most optimally located.

5.4 Conclusion

The results in 5.3 and 5.4 conclude that from a physical distance perspective there is no major advantage of one site to another. NY has a slight advantage over CA on raw

material, however there is no justification for concluding it would make sense to produce these kinds of blends in one site compared to another.

The next step in the comparison would be to compare production costs in each site to produce blends and to look at the procurement of different volumes of raw materials supplied to each site to decide upon whether it would make sense to utilize one site for producing these kinds of blends. This comparison is beyond the scope of this project therefore a recommendation will be made to investigate this.

5.5 Strategy

Considering Company XYZ's current position in the market and the way it behaves in order to defend market share clearly follows a red ocean strategy. According to Kim and Mauborgne in their book Blue Ocean Strategy, a red ocean has a defined market, defined competitors and there is a typical way to run a business in that industry (Mauborgne and Kim 2005).

To understand Company XYZ's competences vs the competition it will be useful to create a strategy canvas. Chan and Mauborgne explain that a strategy canvas is both a diagnostic and an action framework for building a compelling blue ocean strategy and serves two purposes; firstly, it enables a company to capture the current state of play in the market space and secondly facilitates the understanding of where the competition is currently investing.

Therefore, a strategy canvas will be compiled based on the following elements; Price, Quality Assurance, Innovation, Sustainability, Vertical Integration, Technical Support & Speed. The explanation of each factor is stated below

5.5.1 Price

Typically, the price of the finished blend.

5.5.2 Quality Assurance

The level of quality assurance the blend has undergone. For example, whether or not it has had microbial analysis carried out to ensure salmonella free or ID analysis to ensure the materials used in the product are true, for example that a ginseng is actually a ginseng and not something else.

5.5.3 Innovation

The level of R&D or product development the customer has received from the company in creating the blend. For example, some competitors do not have the capability to develop a formula but may only follow instruction from the customer on how to produce the blend.

5.5.4 Sustainability

How sustainable the company is in terms of the raw materials used from which sources. In addition to this the customers may be concerned about energy use in production or what kind of recycling programs the producer participates in from its respective products.

5.5.5 Vertical Integration

How vertically integrated the premixer is in terms of the whole portfolio of ingredients the blend is made up of. Some companies may produce a whole line of ingredients itself while others may rely entirely on 3rd part sourcing.

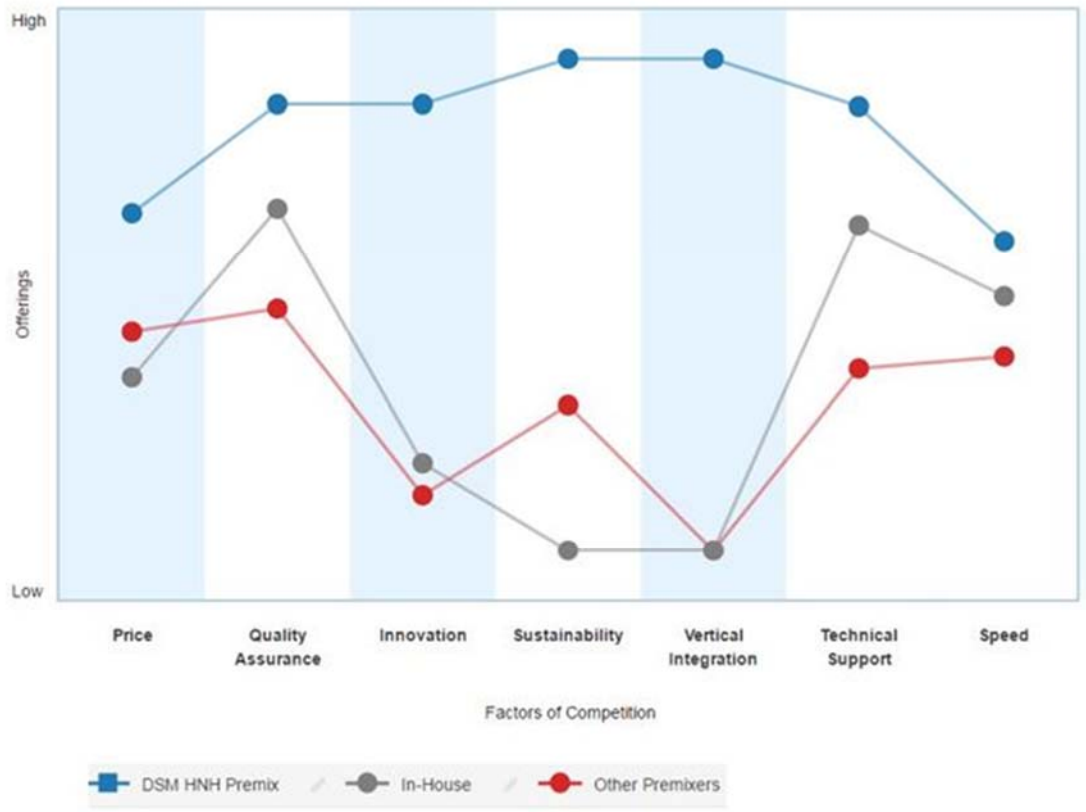
5.5.6 Technical Support

The level of technical support the customer receives in terms of how a blend may interact with other macro ingredients in its final products i.e. oxidation of other ingredients is generally a cause for concern.

Speed - How quickly a blend can be delivered as to facilitate JIT systems and reduce total cost of ownership.

On a scale of 1 to 10 (1 = Low and 10 = high) the value of each players factor in the red ocean can has been plotted on a strategy canvas, which can be seen in Figure 5.1.

Figure 5.1: Strategy Canvas & Value Curve of the HNH Premix Business



The value curve (the line that connects the points of each factor) is the graphic depiction of each of the competitor's relative performance across the industry. Although Company XYZ has a high price they also have a high level of offering across all the competing factors. From a market point of view each competitor is different in the same way. Company XYZ follows a differentiation strategy (high price, high offering) while the other premix

competitors also have the same strategic profile (low price, low offering = low cost players). Therefore, it does not make sense to outcompete them on price.

Kim and Mauborgne state that to fundamentally shift the strategy canvas of an industry, you must begin by reorienting your strategic focus from competitors to alternatives and from customers to non-customers of the industry. In this case, the industry is competing on traditional type premixes i.e. those that are made up of vitamins, minerals, amino acids etc. Alternatives would be herbal and botanical blends. Customers in this case are those which are currently sourcing premixes. Non-customers could be those that produce in-house blends or a completely different type of non-traditional blends (i.e. herbs & botanicals). Therefore, should the company decide to pursue this they would be moving from the red ocean into the blue ocean.

It can be seen in Table 3.9 that a large market can be gained through convincing "would-be" customers to outsource their "in-house" premixing.

Based on the market analysis and breakdown of market share I would hypothesize that it would be possible to penetrate more of the dietary supplement business by focusing on trying to convince "in-house" producers to outsource their premixing. I also hypothesize this can be done by focusing on herbs and botanical blends. By increasing the production of herbs and botanical blends in California, more capacity will be utilized and subsequently Company XYZ's cost position will improve.

The rationale for this decision is that food & beverage sector is already very saturated, Company XYZ has a high market share and competition is fierce. As mentioned Company XYZ has a high price with a high offering therefore simply reducing price is not a sustainable option. In addition, while some applications of the F&B segment are growing,

the growth is half of the growth in the dietary supplement sector. Of the applications in the F&B sector that are growing, herbal or botanical ingredients are not used, which means Company XYZ would not have the ability to utilize spare capacity in their California production site and therefore cost position would not improve.

On the other hand, every application in the dietary supplement sector is growing and significantly in “traditionals” (6.6%) where herbs and botanicals make up a large portion of the blends. Company XYZ has the opportunity to utilize its spare capacity in its California site by producing these types of blends.

A potential source of failure for this idea is that the non-customers or the “would be’s” simply do not see the value of outsourcing their premixing. They also may not want to due to human factors such as empathy to those people that may lose jobs. Nevertheless, the main arguments to these “non-customers” include; time saving, for example improved purchasing efficiency by minimizing the number of raw materials and vendors they deal with, reduction of own in-house quality control processes, reduction of lengthy scaling process. They would receive product development support and technical guidance (from initial concept development all the way through pilot runs of finished products) and scale up to production. They would also save money through a reduction in freight costs on individual ingredients, reduction on inventory/warehousing and reduce the number of purchase orders processed. They would eliminate costly scaling errors, reduction waste, reduce labor, Q.C. and other outside analytical costs.

Some of the reasons why this strategy has not been implemented earlier is that Company XYZ has not considered non-customers. They have simply been competing for market share and thus swimming in a “red ocean”. Competencies have also been a factor.

Company XYZ (formerly Company XYZ's Previous Entity) were producers of vitamins and the premix business was seen as another way of distributing its vitamins. Over the years, they incorporated additional 3rd party (non-Company XYZ produced) materials as and when customers required. Therefore, there have always been reservations with regards to the unknown and key stakeholders within the organization have not wanted to take risks or do something different. Historically, the company has been comprised of people resistant to change. Employees develop processes to compliment the work that they undertake and regardless of the benefits that may come by doing something different (in this case blending herbals and botanicals on a larger scale or serving alternative customers), an extreme amount of resistance to change is always felt. Typically, it requires people to move out of their comfort zones and exert extra effort to take on new complexities and adapt new processes.

Kotter states in his book Accelerate (2014) that people do not want to reorganize and thus do not think clearly about the need to change or even pay attention to the benefits that can be gained from the change. In this case, they pay no attention to producing non-typical blends or serving non-typical customers. Kotter mentions that in principle people keep doing what they always do and that certainly rings true in this case! Complacency, particularly group complacency is an almost unbelievably powerful force.

It would be interesting to see if my proposed strategy of focusing on herbal and botanical blends coupled with the correct change leaders will kick-start a focus on this kind of business.

Kotter states that complacent people see no reason why they should do anything much different and do not look for ways to develop competitive advantage. Mostly they keep doing what they are doing. Time will tell.

CHAPTER VI: CONCLUSIONS

6.1 Conclusion

The research and analysis in this study fulfil the objectives of this thesis. Potential supply chain bottlenecks and capacity constraints were identified by mapping out the supply chain and examining the production flow, installed capacity as well as the current asset strategy. Key market drivers and related industry trends were identified my assessing the competitive and change forces affecting industry growth rate. Strategic issues and recommendations for asset strategy were also presented.

It was concluded that, given the current assets, seven sites globally have the appropriate facilities, equipment and supporting services to produce herb and botanical premixes. Two sites in North America, NY and CA, where it was identified the greatest potential for these blends exists, given the geographical and demographical potential, currently have the correct technology.

The Porter's five forces framework was used to analyze the level of competition within the premix industry and business strategy development. The competitive intensity and attractiveness of an industry was evaluated. Customer/buyer as well as supplier power were found to be low whereas the threat of new entrants, competitive rivalry as well as threat of substitution were all found to be moderate. This means that suppliers and buyers can exert little pressure on the company, for example by raising prices and decreasing the profit potential of the company. The company should continue with a strategy that keeps raw material price pressure low and to continue being the leader in the market in quality and innovation. The moderate pressures exerted on the company from the threat of new entrants, competitive rivalry or substitutes is a concern and the company needs to adopt a strategy that minimizes the effect on lower priced competition entering the market or

current competitors gaining market share. The analysis of competitive intensity of the premix industry was also supported by calculating the concentration ratio and Herfindahl-Hirschman index. It was seen that the concentration ratio and HHI were lower for the dietary supplement market and that the company could potentially make larger gains in this segment compared to food and beverage segment.

A strategy canvas and value curve was created to depict the current premix strategic landscape and to evaluate the future prospects for a company. The current state of play within the known market space is captured, which allows the business stakeholders to clearly see the factors that the industry competes on and where the competition currently invests. It was seen that basically each competitor within the premix industry is different in the same way and that Company XYZ needs to reorient their focus from competitors to alternatives and from customers to noncustomers of the industry. Therefore, further thought into herbs and botanicals would be an option to achieve this.

6.2 Recommendations for Further Research

The focus if this research was primarily to evaluate current company assets and industry trends that builds a case for evaluating the feasibility of producing herbs and botanical premixes, which would support Company XYZ's larger strategy project by recalibrating facilities and equipment that would maximize current asset usage. Chapter 3 of this study in part looked at proximity of raw materials and potential customer base to production facilities but compared only distances in transportation miles from supplier to site and site to potential customer. The study lacked in sight on production costs optimization as well as forecasting demand for herbs and botanical premixes. A recommendation would be to develop an optimization model that would compare

production costs among sites as well as a demand forecasting model to provide the company a better estimate of serving certain customers in specific areas.

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APPENDIX A

Item	Range	Score	Status	Comments	Implications
Supplier concentration (dominated by a few companies and is more concentrated than the industry it sells to)	-2 = >10 suppliers 2 = < 4 suppliers	0	Decreasing	Multiple suppliers per nutrient & the fact we produce the most-used nutrients, suppliers do not have strong bargaining power, with the exception of speciality nutirents	Preparing risk assessment in each region to identify most-used nutrients and ensuring we have multiple suppliers identified, audited and approved
Threat of forward integration to the industry's business	-2 = very low 2 = very high	-1		Flavor houses are more likely to provide premixes than nutrient suppliers. Handful of nutrient suppliers do provide premixes (i.e. Prinova, LycoRed, RFI, etc.)	Continue to monitor the industry for this activity, but trend unlikely to strengthen among nutrient players
The industry is an important customer of the supplier group	-2 = very important 2 = not important	-2		Dependent on the product application, but overall for DS the majority of the product or advertised functionality is heavily dependent on nutrients	Continue to ensure we are providing efficacious, high-quality third party raw materials in addition to proprietary nutrients
Availability of substitute products / technologies to replace the supplied product	-2 = lots of substitutes 2 = no substitutes	-2		There are typically multiple suppliers for one nutrients as well as multiple market forms and alternative nutrients as well, with the exception of proprietary or client-	Ensuring we have multiple suppliers identified, audited and approved
Switching costs to change to other sources of supply or substitute products / technologies	-2 = insignificant 2 = very high	-2		Little to no costs involved in switching suppliers or market forms, and in some cases results in positive cost adjustments	Ensuring we have multiple suppliers identified, audited and approved
Importance of supplier product to performance	-2 = very low 2 = very high	2		Efficacy, high-quality, and purity are critical to a product's performance and meeting label claims	Raw material testing, vendor qualification/ auditing, and quality continue to be paramount
Volume as percent of supplier's total sales	-2 = very high 2 = very low	-1		We surmise that 60% of the premix is the cost of the final product, however it is heavily dependent on the product application (pill vs. beverage for example)	Continue to negotiate with suppliers, increase volumes, seek alternative suppliers with same specifications in order to increase margins and increase sales

Item	Range	Score	Status	Comments	Implications
Customer concentration (dominated by a few companies and purchases in large volumes)	-2 = >10 suppliers 2 = < 4 suppliers	-2	Stable	There are multiple customers and trend of combating pill fatigue will bring new players into the market (i.e. gummies, chews, cap dispensing, strips, meltaways, mints, etc.)	In addition to reaching out to traditional DS players, seek new and unique companies looking to combat pill-fatigue
Threat of backward integration to the industry's business	-2 = very low 2 = very high	-2		In most cases customers are doing this in-house or via tollers, so we would be winning business from customers and not gaining market share from competitors	Develop compelling marketing and sales collateral that showcases how utilizing DSM can help improve their business and mitigate risk
The product it purchases from the industry are standard or undifferentiated	-2 = unique 2 = undifferentiated	-2		Custom nutrient premixes are unique and tailored to the customers processing conditions and final product application	Continue to offer unique blends that help to differentiate our customers products on store shelves or look to fortify existing products to provide a point of difference
Customer's average profitability (low profits create incentive to lower purchasing costs)	-2 = high avg profits 2 = low avg profits	-1		Depends on application and percentage of premix against overall product, but on average we anticipate our customers profitability to be 10-40%	Customers profits are generally high which would allow for more pricing flexibility and less pressure
The industry's product is unimportant to the quality of the buyer's products or services	-2 = very important 2 = not important	-2		The products efficacy, quality and safety are paramount to the products success	Continuing to invest and enhance our quality systems for testing, auditing and ensuring efficacy of third party materials (as well as in-house materials)
Availability of substitute products / technologies to replace the supplied product	-2 = no substitutes 2 = many substitutes	-1		Although a premix can be reverse engineered by our competitor, there is much more value that goes into a premix vs. straight	Continue to rework premixes and provide different variations to help enhance a customers product (i.e. overall wellness plus heart health)
Switching costs to change to other sources of supply or substitute products / technologies	-2 = very high 2 = insignificant	-1		In some cases it takes up to a year to qualify another supplier and ensure the premix can be recreated	Continue to service existing business providing reworks and alternative custom premixes to enhance their end product
Volume as percent of our total assets	-2 = very low 2 = very high	-2		Very low for DS - suspect its mostly from food, beverage, infant formula and NIP projects	Opportunity to increase business in this area

Item	Range	Score	Status	Comments	Implications
Number of competitors	-2 = > 4 competitors 2 = >10 competitors	1		Majority of business from in-house by customers and tollers (comp. includes LycoRed, Prinova, Wright, Watson, Caravan, Merek, Stern, Mullencheme)	Develop compelling marketing and sales collateral that showcases how utilizing DSM can help improve their business and mitigate risk
Concentration of competitors	-2 = > 10% share 2 = compete on similar strategic basis	-1		Majority of business from in-house by customers and tollers (comp. includes LycoRed, Prinova, Wright, Watson, Caravan, Merek, Stern, Mullencheme)	Develop compelling marketing and sales collateral that showcases how utilizing DSM can help improve their business and mitigate risk
Competitors are similar in strategies, origins and personalities	-2 = unique 2 = undifferentiated	1		Our technical know-how paired with 14 dedicated faculties for premixes provides a competitive advantage	Continue to invest in premix facilities, specifically those designed to meet DS needs/ requirements. Possibly even FS with CFR 111 standards to make finished
Industry growth is slow, precipitating fights for market share	-2 = growth 5% GDP 2 = growth ~ = GDP	2	Stable	Industry growth is slow, but anticipated to increase as consumer awareness increases and alternative products to pills surge	Look to FS and technical knowhow to help create a market advantage
Product differentiation	-2 = high 2 = low	0		Depends on type of product focus. Overall wellness, men's health, women's	Continue to invest in formulations and potentially even FS to create a competitive
Fixed costs are high, or the product is perishable, creating strong	-2 = low fixed costs, long inventory life 2 = high fixed costs / very perishable	0		Generally speaking raw material costs are 60% of product cost	Continue to negotiate the best cost on raw materials and look to improve manufacturing efficiencies
Capacity is normally expanded in large increments	-2 = increase < 2% of industry 2 = increase >20% industry	-1		DSM has the largest capacity in the industry, globally.	Seek out capacity numbers for competitors, tollers, and in-house
Exit barriers	-2 = low 2 = high	2		Cost of raws, machinery, labor, quality, experience, etc.	Some competitors may surface, but be limited in resources or expertise (i.e. only focus on beverages, etc.)

Item	Range	Score	Status	Comments	Implications
Patent position of existing players in the value chain	-2 = strong over planning period 2 = weak over planning tool	2	Stable	No patent position of existing players in the value chain	Continue to deepen relationships with third party manufacturers and seek out new suppliers
Proprietary product difference / brand	-2 = highly differentiated 2 = little differentiation	0		Brand is a symbol of our service and what we deliver, so brand has a impact	Continue to increase brand awareness of Fortitech Premixes and reinforce its brand as a thought leader and innovator.
Cost for customers to switch to new entrant	-2 = high 2 = low	1		The cost would be low but qualification would play a big role	Stay current with safety and quality standards to ensure positive results for audits from customers and third parties
Access to distribution channels	-2 = low 2 = high	1		Incumbents would have easy access to raw material suppliers, but lack the buying power and broad knowledge of the market (when to buy, from what supplies and at what cost)	Continue to deepen relationships with third party manufacturers and seek out new suppliers
Government policy encouraging new entrants	-2 = none 2 = many and valuable	-2		Government does not play a role in encouraging new entrants to the market	No implications for this line item
Cost advantage from experience	-2 = high 2 = low	-2		Experience plays a strong role in delivering a premix (understanding	Showcase unmatched technical ability to develop unique premixes
Incumbents have resources to fight back	-2 = substantial resources and will 2 = few resources, limited will	0		Incumbents don't have the expertise or resources to fight back with the exception of cost	Cutting prices is a short term play and we should be firm and confident in the value we deliver with a premix, as its not just price
Incumbents are likely to cut prices	-2 = very likely 2 = very unlikely	-2		Competition is highly likely to cut prices to create an advantage to win business	Cutting prices is a short term play and we should be firm and confident in the value we deliver with a premix, as its not just price
Industry growth	-2 = growth 3% < GDP 2 = growth 5% > GDP	-2		DS market is expected to grow at GDP 3% globally	Look to alternative product applications to fuel industry

Item	Range	Score	Status	Comments	Implications
Relative performance at same price of substitutes	-2 = low 2 = high	0		Because competitors may reduce costs and decrease margins to win business, this may be true, but they do not have same buying power and experience	Cutting prices is a short term play and we should be firm and confident in the value we deliver with a premix, as its not just price
Knowledge and availability of alternate materials / technology	-2 = none 2 = many	-1		There are not many alternatives in terms of technology	No implications for this line item
Customers switching costs to enable product substitution / alternate technology	-2 = high 2 = low	1	Stable	Timing plays a factor for customers to switch, which could take up to a year, for auditing facilities	Continuing to invest and enhance our quality systems for testing, auditing and ensuring efficacy of third party materials (as well as in-house materials)
Customers' demonstrated propensity to substitute	-2 = low 2 = high	0		Taking share from in-house	Convince customers to switch from in-house to a premix supplier, which would free up their resources to achieve even more
Government policy (tax credits, incentives)	-2 = none 2 = many and valuable	-2		There are no Government policies or tax credits/ incentives	No implications for this line item

APPENDIX B

Rank	Title	HQ	Overall Score
1	Vitamin Shoppe	North Bergen, NJ	4.7
2	Healing Natural Oils	San Diego, CA	4.6
3	Professional Supplement Center	Sarasota, FL	4.6
4	GNC	Pittsburgh, PA	4.6
5	Healthy Directions	Bethesda, MD	4.4
6	Hi-Health	Trumbull, CT	4.3
7	Moringa Source	Danbury, CT	4.3
8	LifeExtension	Fort Lauderdale, FL	4.3
9	A1Supplements	Louisville, TN	4.3
10	ProHealth	Carpinteria, CA	4.3
11	Karmic Balance	Sarasota, FL	4.3
12	Native Remedies	Oshkosh, WI	4.3
13	eVitamins	Shelby Township, MI	4.2
14	Puritan's Pride	Bohemia, NY	4.2
15	Global Healing Center	Houston, TX	4.2
16	True Health	Cottonwood, AZ	4.2
17	Live Superfoods	Bend, OR	4.2
18	Seeking Health, Inc	Bellingham, WA	4.2
19	LuckyVitamin.com	Conshohocken, PA	4.2
20	AllegroMedical	Tempe, AZ	4.2
21	All Vitamins Plus	Lake Worth, FL	4.2
22	VitaSouth.com	San Antonio, TX	4.2
23	Healthy Choice Naturals	Laguna Hills, CA	4.2
24	HealthDesigns.com	Elkhart, IN	4.2
25	Forces of Nature	Brooklyn, NY	4.1
26	HerbsPro.com	Hayward, CA	4.1
27	Serovera	Fort Lauderdale, FL	4.1
28	Pure Formulas	Miami, FL	4.1
29	MedMarket	Coeur D Alene, ID	4.1
30	Health Supplement Wholesalers	York, PA	4.0
31	Dr.Vita.com	Las Vegas, NV	4.0
32	House of Nutrition	Yonkers, NY	4.0
33	Dr. Sinatra	Southaven, MS	4.0
34	MVP K9 Supplements	Murphy, TX	4.0
35	Econugenics	Santa Rosa, CA	4.0
36	WebVitamins	Unknown	4.0
37	Pure Matters	Santa Clara, CA	4.0
38	ReNew Life	Palm Harbor, FL	4.0
39	Purity Products	Plainview NY	4.0
40	Swanson Health Products	Fargo, ND	4.0
41	Sport Formula	Alta Loma, CA	3.9
42	IVLProducts	Camp Verde, AZ	3.9
43	911 Health Shop	Unknown	3.9
44	TNVitamins	Farmingdale, NY	3.9
45	Lab88	Woodmere, NY	3.9
46	Primal Force	Royal Palm Beach, FL	3.9
47	VitaDigest.com	Walnut, CA	3.9
48	SIX Nutrition	American Fork, UT	3.9
49	Athletic Xtreme	Boise, ID	3.9
50	The Muscle & Fitness Store	Unknown	3.9

APPENDIX C

Retailer	HQ	Miles Schenectady, NY	Belvidere, NJ	Ontario, CA
Vitamin Shoppe	North Bergen, NJ	155	70	2758
Healing Natural Oils	San Diego, CA	2435	2700	114
Professional Supplement Center	Sarasota, FL	1331	1169	2542
GNC	Pittsburgh, PA	481	311	2392
Healthy Directions	Bethesda, MD	377	215	2612
Hi-Health	Trumbull, CT	150	130	2814
Moringa Source	Danbury, CT	141	126	2803
LifeExtension	Fort Lauderdale, FL	1422	1257	2677
A1Supplements	Louisville, TN	858	661	2150
ProHealth	Carpinteria, CA	2881	2814	121
Karmic Balance	Sarasota, FL	1331	1169	2542
Native Remedies	Oshkosh, WI	974	907	2029
eVitamins	Shelby Township, MI	516	585	2266
Puritan's Pride	Bohemia, NY	204	123	2807
Global Healing Center	Houston, TX	1756	1568	1511
True Health	Cottonwood, AZ	2431	2315	429
Live Superfoods	Bend, OR	2793	2725	854
Seeking Health, Inc	Bellingham, WA	2950	2882	1258
LuckyVitamin.com	Conshohocken, PA	253	196	2663
AllegroMedical	Tempe, AZ	2456	2340	345
All Vitamins Plus	Lake Worth, FL	1372	1210	2637
VitaSouth.com	San Antonio, TX	1905	1764	1318
Healthy Choice Naturals	Laguna Hills, CA	2804	2737	41
HealthDesigns.com	Elkhart, IN	697	630	2073
Forces of Nature	Brooklyn, NY	170	74	2759
HerbsPro.com	Hayward, CA	2925	2857	393
Serovera	Fort Lauderdale, FL	1408	1246	2674
Pure Formulas	Miami, FL	1428	1266	2696
MedMarket	Coeur d'Alene, ID	2588	2491	1340
Health Supplement Wholesalers	York, PA	315	119	2592
Dr.Vita.com	Las Vegas, NV	2532	2462	235
House of Nutrition	Yonkers, NY	158	82	2766
Dr. Sinatra	Southaven, MS	1189	1044	1771
MVP K9 Supplements	Murphy, TX	1630	1487	1424
Econugenics	Santa Rosa, CA	2922	2859	463
WebVitamins	Unknown			
Pure Matters	Santa Clara, CA	2943	2857	380
ReNew Life	Palm Harbor, FL	1300	1136	2451
Purity Products	Plainview NY	184	102	2787
Swanson Health Products	Fargo, ND	1447	1379	1742
Sport Formula	Alta Loma, CA	2800	2732	37
IVLProducts	Camp Verde, AZ	2406	2290	417
911 Health Shop	Unknown			
TNVitamins	Farmingdale, NY	189	106	2792
Lab88	Woodmere, NY	178	95	2781
Primal Force	Royal Palm Beach, FL	1375	1211	2636
VitaDigest.com	Walnut, CA	2781	2713	16
SIX Nutrition	American Fork, UT	2205	2138	622
Athletic Xtreme	Boise, ID	2483	2415	862
The Muscle & Fitness Store	Unknown			
No. of destinations being optimally located to		1	26	20

Manufacturer	Location	Miles Schenectady, NY	Belvidere, NJ	Ontario, CA
Allergy Research Group	Alameda, CA	2919	2852	402
Biospec Nutritionals	Rancho Santa Margarita, CA	2806	2739	39
BrainPharma	Hollywood, FL	1420	1256	2685
Douglas Laboratories	Pittsburgh, PA	481	313	2401
Dr. Daniel Amen	Atlanta, Georgia	1016	822	2143
Dr. David Williams	Southaven, MS	1189	1044	1771
Dr. Sinatra	Southaven, MS	1189	1044	1771
Dr. Whitaker	Southaven, MS	1189	1044	1771
Genestra	Richmond Hill, ON, Canada	380	427	2491
Gilad & Gilad	Reseda, CA	2820	2753	60
HiHealth	Trumbull, CT	163	131	2819
High-Tec	Norcross, GA	998	805	2161
Irwin Naturals	Los Angeles, CA	2803	2736	37
Jubi	Scottsdale, AZ	2529	2440	347
LifeExtension	Fort Lauderdale, FL	1422	1257	2677
Moringa Source	Danbury, CT	141	126	2803
Natura Health Products	Ashland, OR	2907	2840	713
Nature's Way	Green Bay, WI	1006	939	2082
Nature's Sunshine	Spanish Fork, UT	2211	2144	602
Now Foods	Bloomingdale, IL	826	759	1972
Prevagen	Madison, WI	947	880	1946
Prince Of Peace	Hayward, CA	2930	2863	392
Progena	Albuquerque, NM	2057	1968	752
Progressive Labs	Irving, TX	1647	1503	1397
ProHealth	Carpinteria, CA	2881	2814	121
Results RNA	Orem , UT	2201	2134	617
Solaray	Park City, UT	2166	2099	653
Solgar	Leonia, NJ	151	69	2757
Vitamin Shoppe	North Bergen, NJ	155	70	2758
No. of destinations being optimally located to		1	15	13

Supplier Name	Location	NY	NJ	CA
Abelei Flavors	North Aurora, IL	836	768	1942
Aceto Corp	Lake Success, NY	169	88	2772
ADM-Wild Flavors	Erlanger, KY	709	589	2140
Aloecorp	Seattle, WA	2862	2794	1170
Amax NutraSource, Inc	Eugene, OR	2920	2853	892
Ampak	Larchmont, NY	164	88	2772
Anmar	Bridgeport, CT	152	129	2813
App Global	Ontario, CA	2764	2697	1
ASI International	Watchung, NJ	178	46	2714
Atlantic Chemicals	Glendale, CA	2798	2731	42
Aunutra Industries	Chino, CA	2771	2703	6
Balchem	New Hampton, NY	121	59	2739
BDS Natural Products	Carson, CA	2814	2747	52
Beehive Botanicals	Hayward, WI	1219	1152	2034
Benjamin Forbes Compan	Cleveland, OH	456	405	2308
BI Nutraceuticals	Boonton, NJ	152	45	2730
Bio-Botanica	Hauppauge, NY	198	116	2801
Bio-Cat Ingredients	Troy, VA	487	325	2526
Blue California	Rancho Santa Margarita, CA	2806	2739	39
Carmi Flavor & Fragrance	Commerce, CA	2799	2732	37
CHR Olesen	Anaheim, CA	2793	2726	29
Comax Flavours	Melville, NY	186	105	2789
Cyvex	Irvine, CA	2797	2730	34
David Michael Ingredient	Philadelphia, PA	249	91	2674
DMH Ingredients	Libertyville, IL	837	770	1997
Draco Natural Products	San Jose, CA	2949	2880	375
Edgar A. Weber Flavors	Wheeling, IL	828	760	1987
Fantastique Foods	Coquitlam, BC, Canada	2989	2921	1303
FCI Flavors	Addison, IL	821	753	1969
Firmenich	St Louis, IL	1023	907	1812
Flavorman	Louisville, KY	799	679	2050
Foodarom	San Diego, CA	2435	2700	114
Frutarom	Cincinnati, OH	699	579	2140
GNT USA	Tarrytown, NY	148	87	2772
Gold Coast Ingredients	Commerce, CA	2799	2732	37
IFF-Ottens Flavors	Folcroft, PA	256	98	2683
Indena	Seattle, WA	2862	2794	1170
Ingredients By Nature	Montclair, CA	155	57	3
Jiaherb	Pine Brook, NJ	136	47	2733
Kaneka	Pasadena, TX	1760	1563	1526
Kerry Group	St Louis, MO	1009	893	1791
Klamath	Klamath Falls, OR	2838	2696	717
Lang Naturals	Middletown, RI	120	248	2932
Maypro	Purchase, NY	155	94	2780
Metabrand	Edison, NJ	182	53	2731
Mineral Resources Int	Ogden, UT	2178	1350	689
Mitsubishi	Anaheim, CA	2793	2726	29
Naturex	Hackensack, NJ	148	66	2750
Nexira	Somerville, NJ	181	40	2708
Novel Ingredient	East Hanover, NJ	160	49	2734
NutraNovus	Atlanta, GA	1018	821	2140
Omega Nutrition	Vancouver, BC, Canada	2998	2930	1312
Pacific Spice	Commerce, CA	2799	2732	37
Pines International	Lawrence, KS	1287	1171	1546
PL Thomas	Morristown, NJ	161	49	2734
Prosweetz	Edison, NJ	182	53	2731
Pure Circle	Oak Brook, IL	817	749	1964
RFI	Blauvelt, NY	142	82	2766
Robertet Flavors	Piscataway, NJ	190	49	2716
Sabinsa	Payson, UT	2215	2150	596
San Joaquin	Fresno, CA	2925	2858	264
Sensient	Milwaukee, WI	891	823	2021
Stauber	Florida, NY	126	58	2746
Sweet Green Fields	Bellingham, WA	2950	2882	1258
Synergy Flavors	Wauconda, IL	848	781	1985
Taiyo	Minneapolis, MN	1206	1139	1890
Takasago	Rockleigh NJ	147	85	2770
TEC Team	Little Ferry, NJ	149	66	2736
Tree Top	Selah, WA	2782	2715	1074
Tropicana	City of Industry, CA	2787	2720	23
Ungerer & Co	Lincoln Park, NJ	148	52	2736
Van Drunen Farms	Momence, IL	812	745	1997
VDF Future Ceuticals	Momence, IL	812	745	1997
Virginia Dare	Brooklyn, NY	170	74	2759
Total		**1**	**46**	**27**
Percentage		**1%**	**62%**	**36%**

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