Creating a blue ocean strategy for a biostimulants company

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ABSTRACT

There is an opportunity to develop a biostimulants product as a new line for a crop services company. The biostimulants market is very competitive and characterized by companies that seem to over-promise and under-deliver to their customers. Yet, the potential for biostimulants to improve producer profitability by reducing the amount of fertilizers and other plant nutrients they use is immense. Creative Dynamics is considering introducing a new line of biostimulants into the market with a focus on pursuing a Blue Ocean Strategy. The objective of this research is to develop the strategy for successfully executing this Blue Ocean Strategy and assess the economic performance resulting from the strategy compared to a traditional competitive strategy under alternative competition conditions.

Creative Dynamics follows the Blue Ocean framework to understand the current market space today in order to develop a strategy for market entry. Major points of differentiation discovered by the Blue Ocean Strategy Canvas include Creative Dynamics price offerings and yield increase potential related to their plant biostimulants product concepts.

The simulation suggests that by focusing on points of differentiation, such as price and yield increase potential, Creative Dynamics could successfully present its new biostimulants line as a Blue Ocean product despite the noise in the market. Through carefully orchestrated and managed strategic price structure, the company should be able to sustain its new competitiveness for a long time.

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CHAPTER I: INTRODUCTION

This thesis research describes the opportunity for Creative Dynamics to use raw amino acid inputs obtained through its partnership with UMI, top amino acid producer in the world, to produce biostimulants to be distributed through its crop improvement line. Creative Dynamics considers the addition of amino acids for their biostimulant effects for plant nutrition product development a value it can bring to its customers. The amino acids in formulation with macro- and micronutrients are to enhance nutrient use efficiency, crop productivity, and improve crop stress mitigation in crop growing. This chapter is organized in three sections. The first provides the background information on Creative Dynamics and UMI. Section 1.2 presents the research problem and question and the research objectives are presented in Section 1.3.

1.1 Company Background

1.1.1 Creative Dynamics International, Inc.

Creative Dynamics International, Inc. produces and sells salt, chemical products, and specialty plant nutrition inputs. With its headquarters located in Ontario, Canada, the company operates in the United States, Canada, Argentina, and Europe and employs about 1,500 people on a full-time equivalent basis. The company started operations in the early 1960s through a series of acquisitions in both Canada and the United States. By the late 1990s, the company's had salt mines and processing plants throughout North America and Europe. Creative Dynamics is organized in two business units: Salt; and Plant Nutrition. The salt business undertakes mining, processing, packaging, and selling the salt products. These include sodium chloride, magnesium chloride, rock salt, mechanically and solar evaporated salt. It also sells blended products of potassium chloride and calcium chloride as specialty products.

This study focuses on the plant nutrition business unit. The unit provides sulfate of potash in assorted grades for agricultural products, including specialty fertilizers, which may be broadcast or directly applied to soil. Its plant nutrition products also come in liquid forms and chemical mixtures, and as encased micronutrients targeting organic farmers.

1.1.2 The Proposition.

UMI Co. Inc. is an international conglomerate in the chemical and food additive industry. It has extensive experience in the production and formulation of sweeteners, cooking oils, seasonings, and beverages. It supplies amino acids to companies outside the food industry. It is looking for opportunities to diversify and expand its amino acids footprint even as it pursues a sustainability objective of "zero waste". Incidentally, this is aligned with Creative Dynamics' own sustainability goal or reaching carbon neutrality by 2035. There was a natural strategic alliance opportunity for UMI to offer its waste streams from its amino acid manufacturing to Creative Dynamics as high grade inputs in the production of its plant nutrition products. The product that may be produced by Creative Dynamics is the class of products known as plant biostimulants (Colla, et al. 2017), which the European Union defines as:

> "… fertilizing product the function of which is to stimulate plant nutrition processes independently of the product's nutrient content with the sole aim of improving one or more of the following characteristics of the plant and/or the plant rhizosphere: (1) nutrient use efficiency, (2) tolerance resistance to (a)biotic stress, (3) quality characteristics, or (4) availability of confined nutrients in the soil or rhizosphere (European Parliament and of the Council of the European Union 2019, 22)."

Colla et al. (2017) observe that adding amino acids in crop production has the potential for increasing crop yield while minimizing agriculture's impact on human health and the environment. Amino acids as biostimulants have been shown to support agricultural production under sustainable initiatives in winter wheat production (Popko 2018, 3-14). The use of amino acids and plant biostimulants in general allow Creative Dynamics to incorporate diversity in their product portfolio and meet evolving customer needs.

1.2 Research Problem and Question

Biostimulants production using the type of amino acids supplied by UMI is a novel process at Creative Dynamics. As a novel initiative, Creative Dynamics does not have fool-proof protocols and processes for manufacturing and marketing them. There is, therefore, a need to explore the technical and economic feasibility of this initiative at Creative Dynamics. Creative Dynamics needs to confirm that it has access to technical and production capability to produce the specified biostimulants advantageously against incumbents in the plant nutrition market. Answering this question would provide Creative Dynamics with some confidence in its journey into amino acid biostimulants for plant nutrition.

1.3 Objectives

The overall objective of this research is to evaluate the economic feasibility of producing biostimulants at Creative Dynamics using amino acids supplied by UMI. The specific objectives are as follows:

1. Review the value innovation of amino acids as biostimulants in crop production and compare it to other biostimulants and chemical solutions.
2. Evaluate the technical and operational feasibility of Creative Dynamics using UMI's amino acids in the production of biostimulants.
3. Evaluate the conditions under which the production of biostimulants by Creative Dynamics using UMI's amino acids would be economically feasible.
4. Establish the process used in this analysis as a comprehensive process for evaluating future investment opportunities at Creative Dynamics.

CHAPTER II: LITERATURE REVIEW

This chapter presents a review of the literature on biostimulants in plant nutrition with a focus on the amino acid biostimulants. It also presents a review of the literature on the plant nutrition market into which Creative Dynamics is entering. The review explores the state of products in the market and the potential gaps that Creative Dynamics could address.

2.1 Definition of Plant Biostimulant

Plant biostimulants are increasingly becoming utilized in agriculture as the knowledge of their effects and benefits are discovered. Identifying the physiological mechanisms affected by plant biostimulants is important for implementing practices that are sustainable, efficient, economical and safe. 'Plant biostimulant' is a broad term that encompasses various components from seaweed extract to microorganisms. In an effort to construct a definition that allows for the regulation of plant biostimulants, there has been a call for specifying what constitutes as a biostimulant in agricultural products. A definition for plant biostimulant is necessary for regulatory, marketing, and safety purposes as well as essential for clarity for the end-user. du Jardin (2015, 3) has defined plant biostimulants as "any substance or microorganism applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and/or crop quality traits, regardless of its nutrient content".

2.1.1 Major Categories of Plant Biostimulants and Regulatory Framework

Author du Jardin has outlined major categories of plant biostimulants based off information from scientists, regulators and stakeholders within the plant biostimulant industry. The major categories of plant biostimulants described by du Jardin are: (1) humic and fulvic acids; (2) protein hydrolysates and other N-containing compounds; (3) seaweed extracts and botanicals; (4) chitosan and other biopolymers; (5) inorganic compounds; (6) beneficial fungi; and (7) beneficial bacteria (du Jardin 2015, 3).

This expansive definition of plant biostimulants has left creating a regulatory and governing framework for plant biostimulants in agricultural products difficult. However, in 2019, The European Union (European Parliament and of the Council of the European Union 2019, 22) led the world by providing a clear definition for plant biostimulants:

“Plant biostimulant” means a product stimulating plant nutrition processes independently of the product’s nutrient content with the sole aim of improving one or more of the following characteristics of the plant or the plant rhizosphere:

(a) nutrient use efficiency;

(b) tolerance to abiotic stress;

(c) quality traits; and

(d) availability of confined nutrients in soil or rhizosphere.”

The EU definition provides a framework for the industry to work with regulators for ensuring sustainable and safe practices of labels, claims, and uses. This step by the EU is essential for the end-user to have access to clarity of product claims and product inputs.

2.1.2 Amino Acids as Plant Biostimulants

The definition above helps frame the field of biostimulants. The plant nutrient enhancers may be produced from a number of amino acids. Given Creative Dynamics and UMI's initiative focus on amino acids, the biostimulants of interest for consideration in this research as amino acid biostimulants. Amino acids make up the building blocks of proteins and are used by the plant in many metabolic functions. Key amino acids are arginine, proline, glutamate, and tryptophan. Creative Dynamics has specifically selected these four amino acids due to their extensive scientific literature supporting their benefits for plant growth and productivity. Amino acids are critical to plant growth as they combine to form proteins, which are then stored in plant cells to serve in developmental and physiological functions, such as pollen, seed, and germination (Herman 1999, 601). These plant activities are essential for crop productivity and ability to withstand abiotic and biotic stress. Plants' ability to grow properly is due to their ability to respond effectively to environment and other available resources.

Although there is growing use of biostimulant products (specifically, that contain amino acids) for their known characteristics of increasing plant health and vigor, there is still research needed to understand mechanisms with clarity and then transcribe this information for the grower and regulating governments. There are many ways in which amino acid biostimulants improve plant nutrition performance. Teixeira et al. (2018, 396), applied foliar and seed treatments of distinct amino acids in soybeans that resulted in increases in variables associated to the nitrogen metabolism in soybean plants. The authors state that the amino acids are molecules that can signal metabolic processes leading to an increased assimilation of nitrogen by plants (Santi et al. 2017, 433). These studies emphasize the benefit of applying amino acids as biostimulants to crops as a way to increase nitrogen uptake (nitrogen being an important crop input). The enhancement of nutrient use efficiency carries promise for improving crop productivity, leading to economic gain. For this reason, amino acids are becoming a popular agricultural input.

Amino acids are incorporated into foliar applied products and scientific studies are being held to identify the mechanism behind the beneficial results of amino acid or plant biostimulant applications. For example, a 2020 study on foliar application of amino acids (L-glutamate and L-proline) on turfgrass established the integrity of their foliar uptake. McCoy et al. (2020), isotopically labeled the amino acids and traced their uptake in the grass foliage. Their results “demonstrate that glutamate is rapidly absorbed into creeping bentgrass foliage and that it is utilized to produce GABA and proline” (McCoy 2020, 358). This study is unique in that the experiment and results were able to demonstrate that “intact amino acids are taken up by turfgrass foliage rather than being mineralized to other transportable forms of nitrogen.” (McCoy 2020, 358). Once inside the plant’s cells, the amino acids can be used in plant metabolic processes. After seeing that amino acids are then being incorporated into the plant tissue, it is important to highlight their effects on plant growth and nutrient use efficiency. Specifically, their positive effects of nitrogen uptake in plants has been coming to attention considering nitrogen is a major input for crop production. Nitrogen is a vital nutrient used by plants that makes up the main component of chlorophyll, amino acids, and the proteins used to carry out essential plant functions.

Many of these amino acids and components are known for their inflection of nitrogen uptake and assimilation in plants, making their role as biostimulants of plant growth (du Jardin 2015, 5). The industry addresses nitrogen use efficiency through improvements in soil applications and different types of presentations of nitrogen. Providing a biostimulant to the plant allows the plant to use nitrogen as efficiently as possible. Amino acids applied as biostimulants have been explored for their benefits in this area and therefore should be incorporated in the crop's nutritional program for both row and specialty crops

2.1.3 Examples of Amino Acids

In addition to their benefits of nitrogen use efficiency, amino acids are also able to aid plants during abiotic stress. There is scientific literature to support the beneficial effects of proline applied to over 20 crop varieties under salinity stress conditions collected by El Moukhtari et al (2020, 2). El Moukhtari et al's collection presents evidence of proline's benefits. For example, Wani et al. (2016) reported that a 20-millimolar concentration foliar application of proline mitigates the effects of salt stress on *Brassica juncea* by increasing lengths and fresh and dry masses of both shoots and roots, and the area of leaves. How is proline able to support plants under salt stress? According to Misra and Gupta (2005, 332), "proline anabolism allows plants to adjust their osmotic homeostasis, helping them to restore their water content particularly when they are under osmotic stress." The amino acid, glutamate, is an important input for the biosynthesis of proline in higher plants (El Moukhtari et al. 2020, 4). These two amino acids are known to be important for plant biological processes and contribute a variety of benefits, emphasizing their roles as biostimulants.

Tryptophan, another amino acid, has also been studied and shows beneficial results through foliar applications made to various crops, increasing their productivity. A literature review of tryptophan by Mustafa et al. (2018, 16) highlights the work previously conducted in many crops with applications ranging from foliar sprays, seed priming, and soil applications. The review displays a study conducted by Mustafa et al. (2016, 78) that tryptophan as a foliar spray applied to snap beans "increased not only growth, vegetative, and yield attributes, but amino acid and phenolic contents as well." This is a result of tryptophan as an active precursor of auxin production in plants and auxin is a plant hormone that is part of vegetative growing processes (Zhao 2014, 1).

Another amino acid that is gaining attention in plant nutrition is arginine. Although its mechanisms of its utility inside plants remains unclear, there is understanding that arginine is used to construct polyamines (and perhaps nitric oxide) which are critical for antioxidant activity within the plant, aiding plants during biotic and abiotic stress (Winter et al. 2015, 1). In addition, arginine metabolism within the plant partakes as a major role in nitrogen transportation and reuse by acting as nitrogen storage forms in roots (Slocum 2005, 729).

2.2 Plant Biostimulants and Nitrogen Uptake

Nitrogen dissemination, nitrogen use efficiency, and nitrogen storage within plant cells are all crucial bioprocesses plants require for function and amino acids are central to these activities. As mentioned before, nitrogen is a critical agricultural input. Therefore, any efforts to reduce or maximize nitrogen applications should be explored. Amino acids are increasingly becoming known for their aid in nitrogen use efficiency, which is a benefit for improving general crop productivity that provides gains for growers. The utilization efficiency of nitrogen within the plant is essential for achieving ideal crop nutritional conditions. Maximizing crop nutrition uptake is imperative as regulations begin to limit ingredients, sources, and rates (especially changing regulations in the E.U.).

Amino acids, and plant biostimulants in general, are applied to crops in various ways to increase yield, plant health and vigor, and aid plant resilience during abiotic and biotic stress conditions. They have also been shown to improve nutrient use efficiency. In addition to their nutrient use efficiency benefits, they can create metal-amino acid molecules. This means they can deliver micronutrients easily to the plant tissue by chelation. As nitrogen is one of the most important essential plant nutrients, nitrogen management is a major focus of crop fertilizer programs. Therefore, examples of nitrogen management and methods to improve nitrogen uptake are shown in Table 2.1. The table shows industry's efforts to maximize the efficiency of nitrogen applications and uptake by the plant in order to increase profits, reduce waste, and meet novel restrictions in the agricultural regulatory landscape. As a result, there is a need for nutrient management and productivity enhancement tools that increase efficiency and fit within sustainability practices. The addition of biostimulants to the field can address nutrient use efficiency and plant stress mitigation while meeting these needs and providing the grower value.

Table 2.1: Methods Used for Enhancing Nitrogen Uptake

Ag Practice	Cost /acre	Source
Cover crop seed (incorporating N back into soil)	$11-20	National Cover Crop Survey (August 2020)
Split N fertilizer applications (50/50 – feeding N throughout the season)	$76	Sellars et al., (2019) Illinois, farmdoc daily
Koch’s Urease inhibitor, Agrotain ™ (coating to mitigate N loss)	$6-9	University of Nebraska (2008)
Verdesian’s NutriSphere-N HV® for Liquid (additive to mitigate N loss)	$26	Verdesian / http://www.aapfco.org/terms_def/nutri-14_bond.pdf (pg. 2)
Nutrien’s ESN ® (premium price / ton on urea – coating to mitigate N loss)	$0.20 more per pound + cost of urea	Midwest Bio Ag / Nutrien (https://blog-crop-news.extension.umn.edu/2020/05/are-controlled-release-nitrogen.html)
Pivot Bio’s PROVEN ® (nitrogen-producing microbe in soil)	$20	(https://www.agriculture.com/crops/soil-health/back-to-biology#:~:text=The%20manufacturer's%20suggested%20retail%20price,programs%20and%20discounts%2C%20says%20Sanders.)
Stoller’s Bio-Forge® Advanced (Facilitates N uptake through hormone balancing)	$12	https://laca1.org/Presentations/2016/Rice/Rice%20Presentation%20-%20Stoller%20USA%20-%20Klumpp.pdf
Creative Dynamics’ Armor (amino acid based fertilizer)	$4.61	Creative Dynamics’ internal assessment

Biostimulants and amino acids can bring efficiency and increased productivity in combination with nutrition. It has been reported that the global annual consumption of nitrogen fertilizer was about 109 million metric tons in 2020 and expected to rise to almost 112 million metric tons by 2022 (FAO, 2019, 5). Despite its importance to feeding the world, nitrogen fertilizers present significant environmental challenges. The majority of the world’s nitrogen fertilizer is in the form of ammonia, and it is produced using natural gas or coal as the primary energy source, producing large carbon dioxide pollution. Farmers have also been known to over apply or misapply their nitrogen fertilizers, causing significant leaching into surface and/or groundwater. Solutions to these through making required nitrogen available to plants through biostimulants could, therefore, produce economic, social, and environmental benefits. For example, growers are shown in Table 2.1 using organic nitrogen sources, no-till and cover crops, split fertilizer applications, and conventional crop breeding (Hirel et al., 2011, 1452). Likewise, arbuscular mycorrhizal fungi (AMF) in the soil microbiome of the field (Verzeaux et al., 2017, 53) can contribute to producing and nitrogen and increasing its availability to plants. Other alternatives are using a urease inhibitor product (chemical compound coated on dry fertilizer granules for mitigating nitrogen loss) such as Agrotain™. When comparing methods for enhancing nitrogen uptake in plants in Table 2.1, there is a need to question if the method is sustainable, cost effective, and productive.

Creative Dynamics is considering the opportunity to use raw inputs of amino acids in their fertilizer products to create value for the customers, increasing nutrient use efficiency through innovated plant biostimulant products. Creative Dynamics plans to use monopotassium-glutamate, tryptophan, proline, and arginine from UMI. Amino acids can contribute to the goal of increasing yield and quality with sustainable inputs that perform with effectiveness and consistency.

CHAPTER III: BLUE OCEAN STRATEGY

The insight obtained from Chapter II will be used in Chapter III to address the problems of producing a sustainable, affordable, and effective plant biostimulant product that can enhance growers' nutrient use efficiency and stress mitigation. There is a requirement for Creative Dynamics to design a product that is economically feasible and competitive within the market. The current Creative Dynamics biostimulant in the market presented in Table 2.1 has the lowest price in the biostimulant market. This chapter explores the current strategic position of the product and how Creative Dynamics Mineral may reposition to enhance its economic feasibility and probability of success.

The chapter is organized in three sections. The first presents an overview of the Blue Ocean Strategy as a way for building strong market positions that make the competition irrelevant to success. The second section particularly presents value innovation as a central mindset in Blue Ocean Strategy and explores the three critical tools blue ocean companies use in their development and execution of Blue Ocean Strategies: strategy canvas; value curves; and the ERRC (eliminate, reduce, raise, and create) model of realigning products and services for blue ocean engagement. The final section applies these tools to Creative Dynamics Capital as the foundation for assessing the economic feasibility of developing amino acid biostimulants lines for extending its product offerings in its plant nutrition business unit.

3.1 Blue Ocean Explained

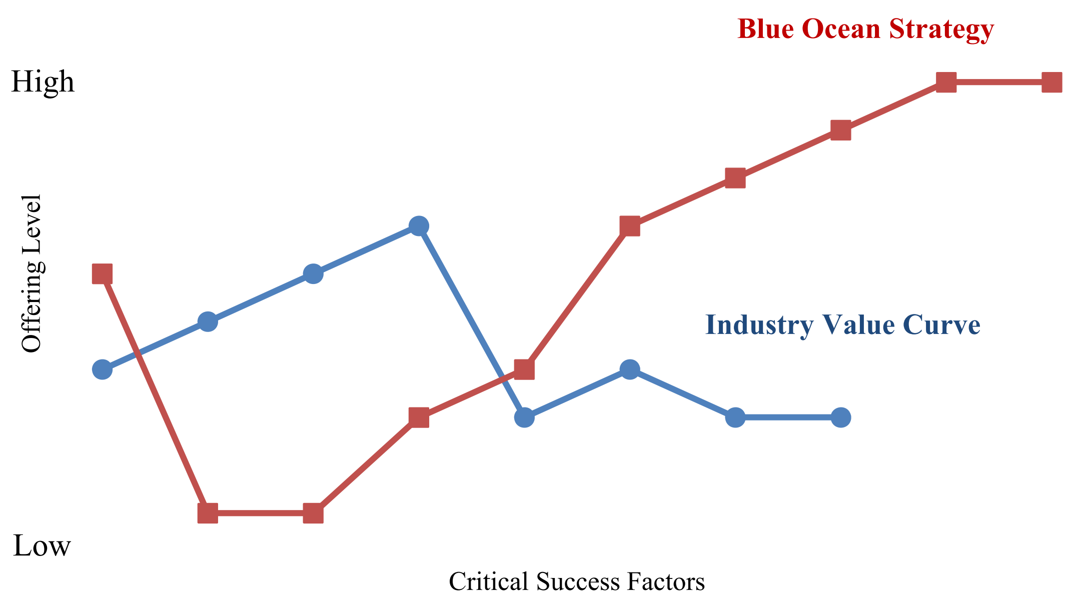
The Blue Ocean Strategy is coined by Chan Kim and Renée Mauborgne (2015). The premise of this strategy is that organizations should endeavor not to compete with their rivals, but to make them irrelevant. Their method begins with identifying an untapped market and positioning oneself in the space such that competition is unable to dislodge the organization wants that position is established. This is what they defined as Blue Ocean. Kim and Mauborgne provide a number of diagnostic tools to discover unexplored markets. The diagnostic tools aim to setup pathways for businesses to operate in a blue ocean where concurrently the company benefits from differentiation and low costs with new demand. The Blue Ocean Strategy presents a view of current market boundaries and industry structure that is then followed up with an action framework to reconstruct company focused on a blue ocean.

3.2 Blue Ocean Tools

Blue Ocean Strategy contains analytical tools and frameworks enabling the construction and execution towards new market space and competition irrelevancy. The tools reveal the current landscape of the specific industry and provide a pathway to think about the future where the competition is irrelevant. The tools used in this research are Strategy Canvas, Four Actions Framework (expressed as an ERRC (eliminate, reduce, raise, create) grid), and Value Curve.

An example of the strategy canvas is shown in Figure 3.1. On the x-axis are the main competitive factors currently at play within the industry, and the y-axis measures how the industry's players rank for each attribute on a scale defined from low to high values provided on a scale of 1 to 10, where 1 is the worst and 10 is the best execution of the industry's or company's performance of a selected competitive factor. It is a powerful tool for organizations to use to determine the different mental models of individuals about their industry and their own organization. Being subjective, collecting the measures of multiple people allows an empirical assessment of people's perceptions. All the rankings are plotted on a line graph to reveal placement in a line form. One dedicated line represents the industry value curve and the other line represents the Blue Ocean Strategy. The value curve reveals the strategic profile (strategic focus) of the industry where the main players contend.

Figure 3.1: Layout of Strategy Canvas of an Industry



Next, the Four Actions Framework (ERRC Grid – **E**liminate, **R**aise, **R**educe, **C**reate – a table responding to the four approaches) derives from the strategy canvas where four questions are asked of the industry:

1) Which factors should be *eliminated*?
2) Which factors should be *reduced well below* the industry's standard?
3) Which factors should be *raised well above* the industry's standard?
4) Which factors should be *created* that the industry has never offered?

It is essential to act upon all four components of the Four Actions Framework to develop a new strategic profile for creating a blue ocean. This strategic profile represents the company's value curve, which is encased in the strategy canvas. The value curve is used to gauge the strategy efforts for contesting within a clear market space.

3.3 Creative Dynamics' Amino Acid Biostimulants as Blue Ocean Strategy

Creative Dynamics considers operating in a blue ocean market to bring new plant biostimulant products to their customers. Therefore, there is a need to implement the Blue Ocean Strategy. The goal is to create innovation, identify a new market, and remain active with low costs. It is accepted and understood that plant biostimulants market is crowded and can even be touted as 'snake oils'. There is demand for plant biostimulants as regulations become stricter, sustainability efforts rise, and as efficiency of crop production increases with demand. It is necessary to identify the key competing factors within the current industry. This maps the territory by outlining the boundaries and expectations the plant biostimulants industry is currently operating within. Once these are identified, there are results and recommendations prepared for Creative Dynamics to revolve their strategy profile.

CHAPTER IV: BLUE OCEAN STRATEGY APPLIED TO CREATIVE DYNAMICS

In this chapter, the Blue Ocean Strategy is enacted for Creative Dynamics to have the adequate knowledge and action framework required for strategic moves for plant biostimulants products. The details of data collection and assessment are recounted in this chapter. The result offers the creation of a strategy canvas for the company and value curves profiling the plant biotsimulants industry. The Four Actions Framework – ERRC grid – grant Creative Dynamics a snapshot of their strategic focus for operating in blue oceans with products of amino acid based plant biostimulants.

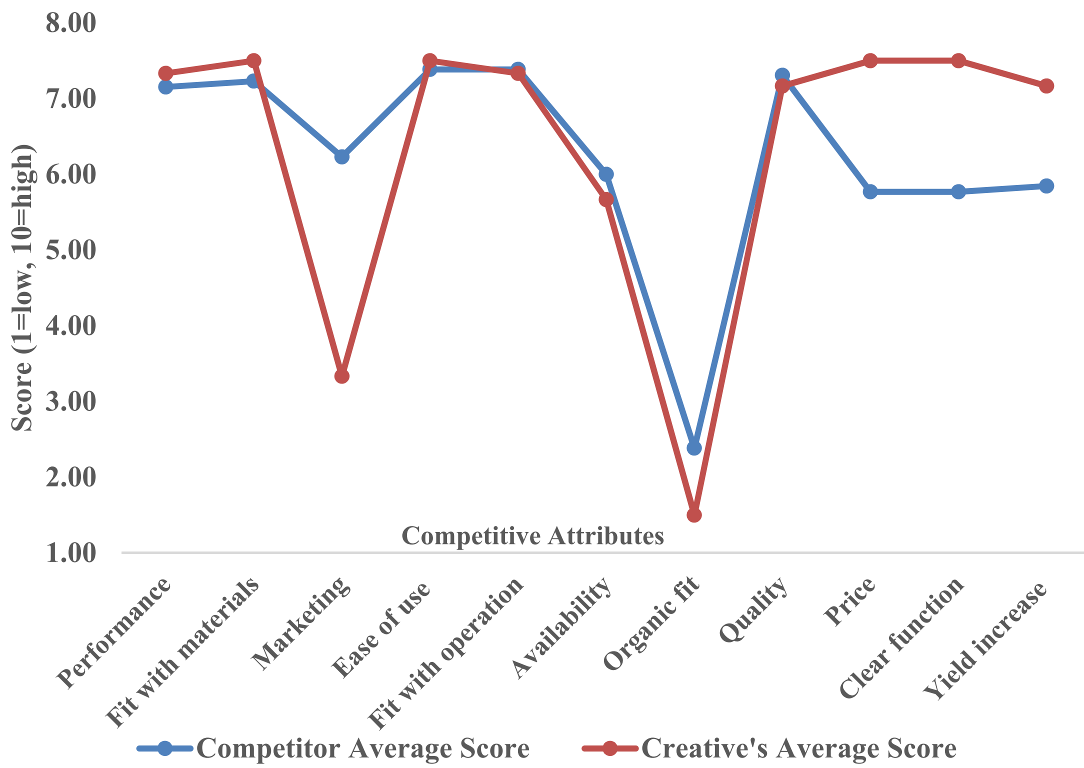
Seven members of the project team were interviewed to, first, identify the critical success factors in the biostimulants market, second, to assess the industry value curve, and finally, to determine Creative Dynamics' strategy pathway or canvas. This chapter displays the results and development of the strategy canvas extracted from the survey.

An alternative pricing model was developed from the insight gained from following the Blue Ocean Strategy for Creative Dynamics' amino acid based biostimulant product. A new scenario developed in the model is compared to a pricing scenario without enacting a Blue Ocean Strategy. The model description and results are present in this chapter.

4.1 The Strategy Canvas for Creative Dynamics' Amino Acid Biostimulants

The strategy canvas is graphically shown in Figure 4.1 and displays the main competitive attributes of the plant biostimulants industry that the team members referenced in the survey. The blue line represents the industry competitor's strategic focus along with the red line representing Creative Dynamics' strategic profile. Whereas there are similarities, the differences between the industry's approach and Creative Dynamics' approach is telling. Creative Dynamics ranks low for advertising and marketing execution but ranks high compared to the industry norm on the economic prices available to the grower. The potential to differentiate from the industry lies mostly in Creative Dynamics ability to provide clear messaging on timing of application of product and continue to lower costs in order to sell products at a lower price.

Figure 4.1: Strategy Canvas for Creative Dynamics' Amino Acid Biostimulants



The nine competitive attributes, or critical success factors, the team members determined are labeled in Figure 4.1 along the x-axis, with the last three as representing the value curve of Creative Dynamics. The y-axis displays the average score the team members assigned each attribute for the industry competitors and Creative Dynamics. In summation, a plant biostimulant product – following the industry's leaders in this strategy canvas blue line – provides the following: performance, ease of use, and quality. For elaboration, the competitive attribute of performance references the consistency of benefit gained by the user year after year. The ease of use and fit with operations refer to the compatibility of the product with current farm equipment and other crop inputs. The quality of the leading biostimulant products have a high quality meaning a stable formulation without strenuous shelf-life restrictions.

Creative Dynamics' red line on the strategy canvas above shows three points of higher scores than the leaders within the chosen market: price strategy, function offering, and crop yield increase potential. To describe these three points, Creative Dynamics is seen to offer better prices for the customer, is considered to provide products with superior functionality, and produces higher yields when applied according to label instructions. A summary of the statistics is available in Table 4.1.

Table 4.1: Strategy Canvas Summary Statistics Amino Acid Biostimulants (N=7)

Critical Success Factor	Competition				Creative Dynamics			
	Average	Std. Dev.	Min	Max	Average	Std. Dev.	Min	Max
Performance	7.2	1.8	2.0	10.0	7.3	0.9	6.0	8.0
Fit with materials	7.2	1.7	2.0	9.0	7.5	1.1	5.0	8.0
Marketing	6.2	2.0	3.0	9.0	3.3	1.7	2.0	7.0
Ease of use	7.4	1.3	2.0	10.0	7.5	1.0	5.0	9.0
Fit with operation	7.4	1.7	4.0	9.0	7.3	0.8	6.0	9.0
Availability	6.0	2.1	2.0	9.0	5.7	3.3	6.0	8.0
Organic fit	2.4	3.3	3.0	9.0	1.5	0.8	5.0	9.0
Quality	7.3	2.7	2.0	9.0	7.2	1.4	1.0	10.0

Table 4.1 shows that the range among the respondents for all critical success factors was much lower for Creative Dynamics than for the competition. This indicates that the team members overseeing the product have a more consistent view of their own company

than they have of the competition. For example, the coefficient of variation (standard deviation/average) is between 1.3 and 2.7 times lower for all Creative Dynamic's factors with the exception of marketing and availability, which are 1.6 and 1.5 times that of the competition's product. Team members for Creative Dynamics ranked their own company with low marketing scores, ranking a 3.3 average versus a 6.2 score for the competition. This creates significant opportunity for strategic conversation among team members about how they see their product and the genesis of the wide variations in their perceptions of marketing and product availability. This becomes important input for discussions within the team as production and marketing strategies are exchanged prior to product development.

4.2 The Value Curve for Creative Dynamics' Amino Acid Biostimulants

The value curve represents the strategic profile of the players within the industry. Creative Dynamics' survey results did not display a strong value curve proposition in relationship to the plant biostimulants' industry leaders. However, this value curve shows considerable points of differentiation: Creative's price strategy, function offering, and yield increase potential (displayed on last 3 x-axis of strategy canvas, Figure 4.1, red line). The value curve summary of statistics is provided in Table 4.2.

Table 4.2: Value Curve Summary Statistics for Creative Dynamics' Amino Acid Biostimulants

Value Factor	Competition				Creative Dynamics			
	Average	**Std. Dev.**	**Min**	**Max**	**Average**	**Std. Dev.**	**Min**	**Max**
Price	5.8	2.0	3.0	9.0	7.5	1.4	5.0	9.0
Product functionality	5.8	3.3	2.0	10.0	7.5	0.8	7.0	9.0
Yield increase	5.9	2.4	2.0	10.0	7.2	1.2	5.0	9.0

Team members' average scores for Creative Dynamics for price, product functionality, and yield increase were higher than their scores for the competition on these factors. As seen from the critical success factors, there was a higher degree of agreement among team members about their scores for their own product than for the competition's product. Coefficient of variation values for the competition scores were 1.5 to 6 times higher than for Creative Dynamics.

4.3 Creative Dynamics' ERRC Grid for Blue Ocean Strategy Execution

Four Actions Framework comprising of the ERRC Grid (**E**liminate, **R**aise, **R**educe, **C**reate) for Creative Dynamics gives action items for the company to become distinguished within the plants biostimulants market.

1) Which of the factors that the industry takes for granted should be *eliminated*?

- The retailer relationship with the seller is evolving. There is potential to eliminate the old 'transactional' interactions with retailers and replace it with a relationship-oriented focus. The industry allows a lot of room for products that over-promise results.

2) Which factors should be *reduced well below* the industry's standard?

- The push for heavy marketing for plant biostimulants is a common component for many of the products within this space. There seems to be a general need for it that can be met without all the flashy budget. Alternatively, instead of focusing on broad claims and multi-use functions, Creative Dynamics distinguishes from the norm with product label claims with specific functions and clear instructions for product application.

3) Which factors should be *raised well above* the industry's standard?

- The survey results show that the industry in general tolerates higher prices for biostimulant products. The industry's standard may raise with the quality and consistency expected of performance with products placed with more economical prices. The industry's standard should raise the value of the of these biostimulant products.

4) Which factors should be *created* that the industry has never offered?

- In general, the industry space around navigating regulatory requirements and describing and defining plant biostimulants has created obstacles as definition and regulation go hand in hand. The push for sustainability is rising and there is a need to simultaneously seek solutions that meet sustainability efforts along increase efficiency/production. The top performers of the plant biostimulants industry do not provide OMRI (Organic Materials Review Institute) Certified product. This is an opportunity for Creative Dynamics to seek certification and provide product that is 1) price advantaged, 2) consistent in field, and 3) with clear messaging of product application (consensus is products with multi-use, multi-function, multi-timing can get confusing and lack efficacy. There is a chance to cut out the noise).

Plant biostimulants may provide promise of the solutions growers seek. An example of this includes the sustainability initiatives behind the use of biostimulants in order to increase the efficiency of fertilizer use in the field along with increasing plant productivity under abiotic stress. Regulatory pathways for fertilizer product registrations are evolving and this creates incentive for sustainable practices.

In summary, the outcome of the Blue Ocean Strategy shows an apparent ability of Creative Dynamics distinguishing itself from the competition in the plant biostimulants market space by enhancing their price advantage and creating a relationship-oriented association with the retailer and grower, rather than the traditional transactional interactions. For example, Creative Dynamics can position the product with simple messaging: "If the product doesn't deliver yield increase over grower standard practice, you don't pay for it". The payout comes with the yield increase due to product performance. The company receives pay for a percentage of yield increase over the average yield with grower standard practices. The risk is shared between the grower and the seller along with clear messaging of confidence in product performance. The parameter of the sale agreement can be adjustable to the function of the product and payout is tethered to the performance of the product function.

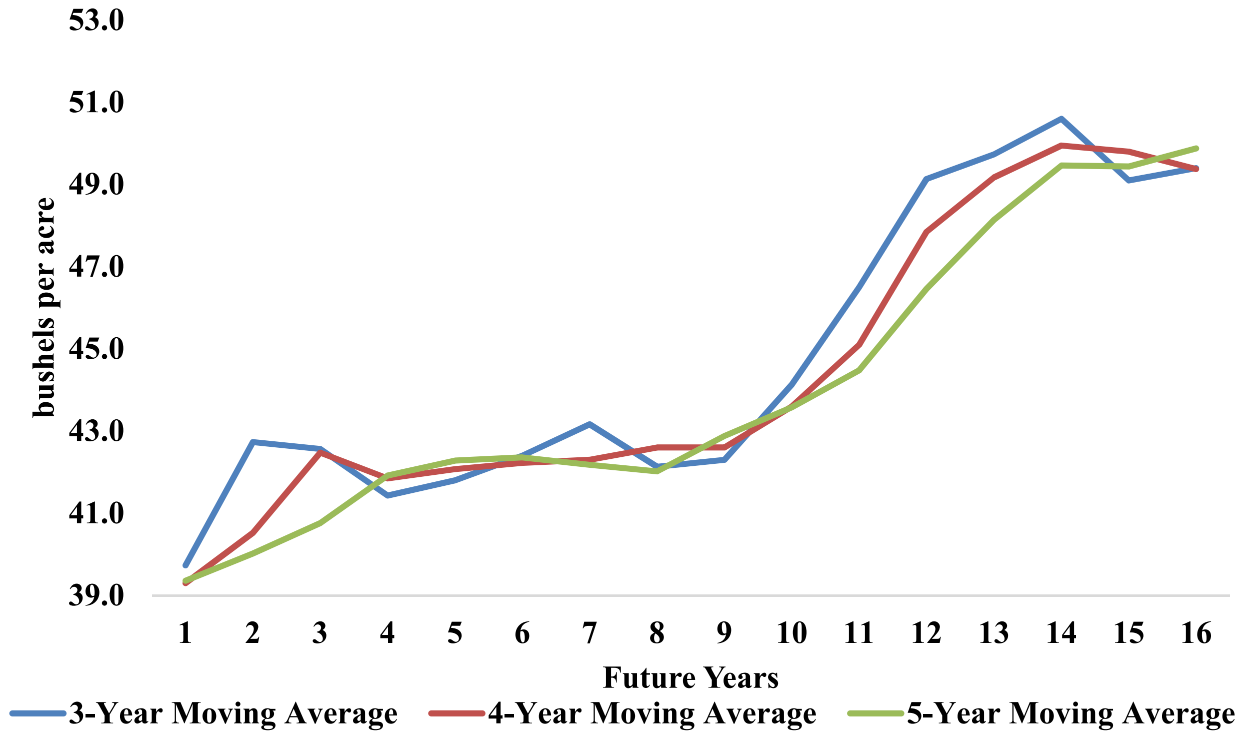
4.4 The Economic Feasibility of Creative Dynamics' Amino Acid Biostimulants in Blue Ocean Strategy

A major approach to Blue Ocean Strategy is to make the most common competitive tool, price, irrelevant in engaging customers. This means develop value innovations and value propositions to customers that make it difficult for competitors to use a single reactive response to dilute them. The value curve and strategy canvas present an opportunity to focus Creative Dynamics' customers' attention on yield improvement resulting from using its biostimulants. There are many competitors in the market offering biostimulants and their consistent performance has been found wanting. This can reduce customer confidence in this emerging nutrition and crop performance tool. Creative Dynamics proposes to connect customers' price for its biostimulants directly to their experience with the product's performance in improving their crop yield. This is the bold proposition the company may make to its customers in this blue ocean: If using its product according to the instructions do not produce a minimum yield improvement, the customer does not pay for the product. It is believed this would provide a risk management for customers and provide a different type of relationship between Creative Dynamics and its customers. Would it work?

The minimum expected yield improvement from using Armor, the product of interest, for each crop on which it might be used, is the principal factor that determines that the company is not overpromising. Further, the improvement has to be credible enough to engender customer interest. However, yield is a function of many factors, and the company must integrate these factors into its value proposition to enhance its power in creating a blue ocean environment in this market. The economic feasibility of this strategy is driven by a number of assumptions. Over a planning horizon of 15 years, current price for Armor is expected to decline due to new and better products as well as competition. Additionally, yield is stochastic as are prices. How does the company forecast these two critical variables to ensure that its strategy is superior to the red ocean price-based approach? It is argued that if the average price under the Blue Ocean Strategy exceeds the traditional pricing model, then it is feasible.

The crop of interest for this initiative is soybeans. A simple forecast of yield is adopted in this study. We use 3-year, 4-year, and 5-year moving averages of historical US soybean yields to 2020 to generate three future yields as potential yield scenarios, respectively: Yield Scenario A; Yield Scenario B; and Yield Scenario C. Other methods, such as regression of yield on time, could have been used to achieve the same end. However, this approach would not produce the necessary stochasticity in yield that makes this strategy useful in the practical marketplace. The principal limitation of this approach, while producing the stochasticity in yield, is that it assumes the future will mimic these historical trends adjusted by their moving average assumption. The three yield scenarios are shown in Figure 4.2. The figure shows that the average yield ranges from 44.61 bushels/acre for the 5-year moving average scenario (Scenario C), through 44.80 under the 3-year moving average scenario (Scenario A) to 44.91 bushels/acre for the 4-year moving average scenario (Scenario B). The standard deviations for Scenario B and Scenario C are the same: 3.38 bushels/acre, while Scenario A presents a slightly higher standard deviation of 3.62 bushels. The differences among the average projected yields under the three scenarios were not statistically significant.

Figure 4.2: US Soybean Yield Projections under Alternative Assumptions About the Future



The statistics from Armor field trials are used to compare yield performance under Armor use with yield performance without Armor. It is also assumed that yield with Armor use is also stochastic, generated using a normal distribution based on the average yield of 12.5% and standard deviation 5.0% of results from Armor field trials. These scenarios are Armor Scenario 1, Armor Scenario 2, and Armor Scenario 3. The projected improvements in each year are multiplied by the projected yield without Armor in that year to produce the expected yield with Armor. That is:

$$\begin{aligned} y_{ijt} &= (1+\rho_{jt})Q_{it} - Q_{it}, \quad i = A, B, C;\ j = 1, 2, 3 \\ &= \rho_{jt} Q_{it} \end{aligned} \tag{4.1}$$

where Q_{it} is the yield projection from the USDA US soybean yield under yield scenario *i*, and year *t*, ρ_{jt} is the randomly generated yield improvement resulting from using Armor under performance scenario *j* in year *t*. The improvement in yield resulting from using Armor is y_{ijt}, which, from equation 4.1, is the product of the yield improvement and projected yield in each period and under specific scenario. Table 4.3 presents the summary statistics for yield improvements resulting from using Armor under the three yield scenarios. It shows that the average yields under Scenario A, Scenario B, and Scenario C were 44.8, 44.9, and 44.6 bushels/acre. The stochastic yield improvements averaged 12.0% for Scenario 1 and 12.2% and 13.4% for Scenario 2 and Scenario 3. These translated into an Armor Advantage of 5.3 bushels/acre under Scenario A, 5.4 bushels/acre under Scenario B, and 5.9 bushels/acre under Scenario C. Armor Advantage under Scenario B was the most volatile, exhibited by a coefficient of variation of 0.31, which was significantly higher than those for both Scenario A and Scenario B.

Table 4.3: Summary Statistics for Yield Improvements with Armor Based on 15-Year Projection

Variable	Yield Scenario A	Yield Scenario B	Yield Scenario C
Average Yield without Armor (Q_{it})	44.8	44.9	44.6
Average Yield with Armor ($(1+\rho_{it})\ Q_{it}$)	50.1	50.3	50.5
Average Armor Advantage ($\rho_{it}\ Q_{it}$)	5.3	5.4	5.9
Average Percent Armor Advantage (ρ_{it})	12.0	12.2	13.4
Armor Advantage Standard Deviation	1.3	1.7	1.1
Armor Advantage Coefficient of Variation	0.2	0.3	0.2

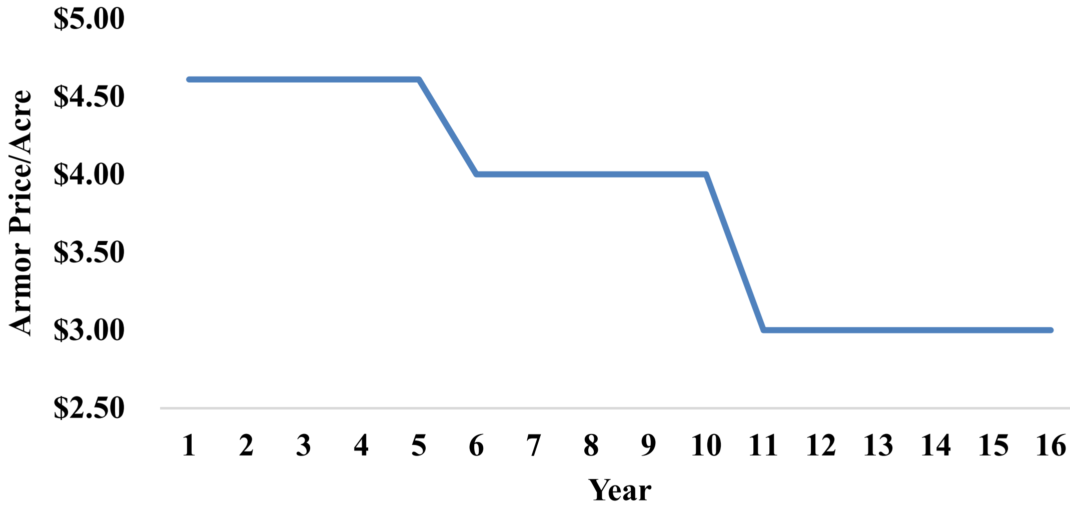
To make price irrelevant to customers and position itself in a blue ocean market, it is proposed that Creative Dynamics' makes the following proposition to its customers: If their yield improvement resulting from using Armor falls below 8% in any year, they do not pay for the product; if it above 8% but no higher than 12%, they pay the market rate for Armor, i.e., $4.61; and if it is above 12% yield improvement, then they pay an 8.5% premium for the product (Table 4.5). From the randomly generated yield improvement, it is found that Armor Advantage exceeds 12% 56.3% of the time for all Armor Advantage scenarios and falls below 8% 18.8% and 12.5% under Scenario 1 and Scenario 2. In no year did Armor Advantage fall below 8% under Scenario 3. The benefits from Armor Advantage exceeding 12% are high enough to leave the customer better off even after paying the 8.5% premium on the product. Therefore, Creative Dynamics' confidence in its product to deliver a win-win outcome to its customers enables it to make the price of Armor irrelevant in the decision to use Armor. Reiterated, the value proposition is that if the farmer using Armor does not make at least 8% improvement in yield compared to not using Armor, then they do not pay for the biostimulant.

Table 4.4: Armor Pricing Proposition Under Blue Ocean Strategy

Percent Yield Increase with Armor Compared to Not Using Armor	Price ($/acre)
≤8%	$0
>8%-12%	$4.61
>12%	$5.00

It has been assumed that the competitive pressure on price will result in the price trend presented in Figure 4.3. It shows that Creative Dynamics can hold onto its price of $4.61/acre for the first year. Competitive pressure will cause this price to decrease to $4.00/acre for the following five years, and then decline to $3.00/acre in the final years. This is a traditional price attrition pathway for most technologies' product lifecycles, some are even more aggressive than this. Armor's current price of $4.61/acre is expected to decline under competitive pressure. By connecting what customers pay for Armor to the value they get from using Armor, this competitive pressure disappears.

Figure 4.3: Assumed Armor Price Trend as a Result of Market Competition and Technological Changes



It is assumed that the acreage using Armor increases at an average annual rate of about 5%, with a base area of 36,840 acres. This growth rate implies Armor could cover about 76,588 acres 15 years after the base year. The acreage, yield and price conditions influence the competitiveness of Armor against no Armor. Total revenue accruing from Armor use is the product of the realized price (based on Armor Advantage yield outcome) and number of acres on which Armor was applied. The feasibility of Armor under the Blue Ocean Strategy described above is based on this time horizon and acreage coverage. Table 4.5 shows the summary statistics of Creative Dynamics' gross Armor revenue under the foregoing assumptions and three scenarios. The table shows that the Blue Ocean Strategy has the potential of increasing revenues by as little as 5.7% under Scenario A, 12.2% under Scenario B, and an incredible 30.7% under Scenario C. The net present value at a discount rate of 5% under the three scenarios are, respectively, $2.2 million, $2.4 million, and $2.7 million, compared to $2.1 million for the No Armor scenario.

Table 4.5: Summary Statistics of Revenue Under Alternative Armor Use Scenarios and No Armor Scenario

Variable	Yield Scenario A	Yield Scenario B	Yield Scenario C	No Armor
Average Revenue	$211,485	$224,584	$261,664	$200,136
Standard Deviation of Revenue	$116,803	$99,369	$52,328	$17,253
Coefficient of Variation	55.2%	44.2%	20.0%	8.6%
NPV @ 5%	$2,225,838	$2,387,583	$2,711,073	$2,141,983
Armor Advantage	$83,855	$245,600	$569,090	

For the strategy to be enduring, farmers must see that they benefit. Soybean prices were projected to be the average annualized daily prices by year for the past 15 years (Figure 4.4). The average price was estimated at $11.59/bushel, with a standard deviation of about $1.99/bushel. The revenue under condition where farmers do not use Amor is defined as the product of price in each year and the yield and total acreage. This revenue is contrasted with the revenues accruing to farmers under the three scenarios where Armor is used. Therefore, Table 4.6 summarizes the benefits from using Armor for soybean farmers.

Table 4.6: Summary Statistics of Farmers Revenue with and without Armor

Situation	Scenario	Average Revenue	Standard Deviation
Farmer Net Revenue with Armor	Scenario A	$31,708,332	$10,004,168
	Scenario B	$31,629,655	$9,865,455
	Scenario C	$31,374,089	$9,678,765
Farmer Net Revenue Without Armor	Scenario A	$28,545,929	$9,350,095
	Scenario B	$28,589,544	$9,217,096
	Scenario C	$28,390,180	$9,033,376
Armor Advantage	Scenario A	$3,373,887	$654,072
	Scenario B	$3,345,627	$648,358
	Scenario C	$3,321,547	$645,388

Figure 4.4: Projected Soybean Price Based on Annualized Daily Prices of Preceding 15 Years

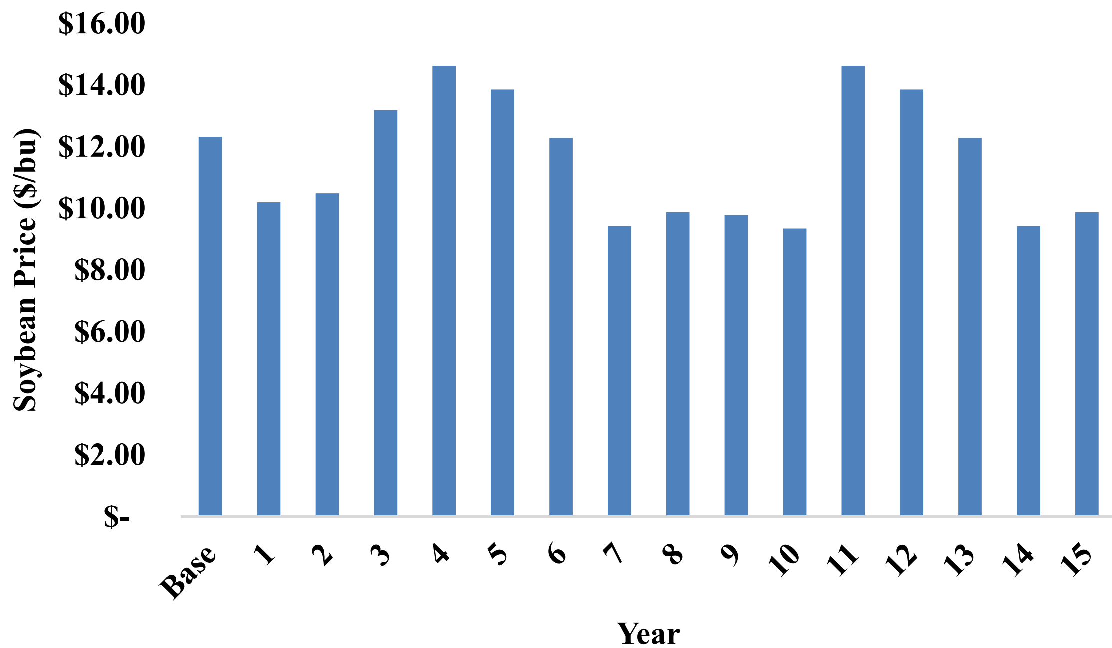


Table 4.6 shows that average net revenue for farmers increase by 11.2% under Scenario A (3-year moving average for yield), with a standard deviation of 2.6%. It increased by 11.4% under Scenario B with a standard deviation of 4.0%, and by 12.6% under Scenario C with a standard deviation of 2.9%. There is, therefore, no doubt that under the three stochastic scenarios, both Creative Dynamics and its farmer customers benefit by an average of 16.2% and 11.7%, respectively. This suggests that this Blue Ocean Strategy is a win-win for both the company and its customers. Therefore, it has the potential to be a sustainable strategy. The caveat to these results is the assumptions under which they have been generated. However, the number of scenarios and stochasticity in the analyses gives confidence that the reality of the outcome would be within the bounds of the estimated results.

CHAPTER V: SUMMARY AND CONCLUSIONS

This final chapter recollects the research conducted for Creative Dynamics with a summary and conclusion of the findings. The chapter is written in four parts and are titled as Summary, Conclusions, Suggestions for Addressing Gaps in the Study, and the main Take Away for Creative Dynamics. Ultimately, the surmise of this study for Creative Dynamics entails the benefit of strategic planning by using the Blue Ocean methodology.

5.1 Summary

The research purpose begins with the partnership between Creative Dynamics and UMI, where UMI supplies amino acid raw materials to Creative Dynamics. Creative Dynamics is in need of optimizing the use of these amino acids in the plant nutrition agricultural market. The company needs to know if a Blue Ocean Strategy applied to a potential plant biostimulant product would be economically feasible.

The amino acids are largely used in plant biostimulants, which as described in this study, is a crowded and growing industry. The industry growth for plant biostimulants is fueled by the demand to meet sustainable agricultural standards, pushed by consumers seeking organic options and by governing bodies regulating crop inputs for environmental concerns. However, plant biostimulants has only recently been defined and yet is broad in terms of what includes a plant biostimulant and in terms of what plant biostimulants do in the field. Plant biostimulants can include plant growth hormones, seaweed extracts, amino acids, and live beneficial microorganisms (and the list continues). Plant biostimulant functions can be claimed as increased nutrient use efficiency, increase in plant vigor, and abiotic and biotic stress mitigation. The supportive science is expanding every year as researchers seek to understand the mode of action and specific mechanisms in how these ingredients interact with the plant’s physiology in order to benefit from the improved production efficiency.

This study overviews the current landscape of the plant biostimulant market and identifies critical success factors that current products use to thrive. Creative Dynamics’ strategic focus is assessed using blue ocean methodology with the following tools: strategy canvas, ERRC grid, and value curve. The blue ocean tools lead to the key distinguishing factors that allow Creative Dynamics to separate from industry expectations. Specifically, Creative Dynamics is to leverage their low price point advantages and focus on relationship-oriented approach with customer interactions.

A new pricing structure is proposed to Creative Dynamics for their plant biostimulant product, Armor. The proposed price is directly tied to the products’ performance in the field and its ability to increase yield. If the product does not perform, the grower does not pay for it. The goal of this blue ocean approach is to enable a win-win scenario for both Creative Dynamics and their customers. This price structure affords the company the risk to engage with the customer in a novel and unique way. This price structure also enables the company to interact with retailers and producers in a relationship-oriented manner.

In summary, the Blue Ocean Strategy canvas disclosed where Creative Dynamics compares in performance to major players within the market. The value curve revealed where the company’s strategic focus inhabits. Creative Dynamics rises above the industry norms with their economical prices to the grower, their yield increase potential, and with their clear product function descriptions. The ERRC grid identified areas where the biostimulants industry could eliminate, raise, reduce, and create. This includes elimination of transactional relationships with grower/dealers, raise the product value to grower, reduce the unclear product advertising, and create products with clear functions and supported performance (for example, drought stress mitigation). In order for the company to break away from the rest of the industry, the company can further set their low price to growers as an incentive to apply the product to more acres. A pricing model developed in this study forecasts both Creative Dynamics and its farmer customers benefit by an average of 16.2% and 11.7%, respectively, over the current practice without Blue Ocean Strategy.

5.2 Conclusions

Creative Dynamics would benefit with a Blue Ocean Strategy in this project venture as the new price structure and blue ocean approach is economically feasible. The company's low prices allow an opening to distinguish itself from the current market's landscape. Additionally, the enlarging incentive to use plant biostimulants in agriculture provides opportunity for the company to be well positioned nationally and internationally to meet regulatory restrictions and increasing sustainability demands. Both companies share sustainability goals; here is an opportunity to contribute to the shift in agricultural practices to result in increased efficiency and reduced environmental adverse effects. The sustainability goals can be achieved through the Blue Ocean Strategy with the attempt to highlight the confidence in the product's performance capabilities in field. The proposed pricing model is based off a relationship approach to the customer, rather a transactional one. This distinction further separates Creative Dynamics from key competitors as well as give exposure for Creative Dynamics' name and products to more potential customers. Also, the company as a holder and creator of many brand-lines can use the blue ocean framework in future projects. The blue ocean approach of seeking untapped market space allows the company to grow profits and value for its customers. This study provides a framework, guide, and model to operate in future endeavors.

5.3 Suggestions for Addressing Gaps in the Study

Future work derived from this study to address gaps would include additions to the pricing model, especially for considering the payout to the retailer. The strategy canvas suggests that the plant biostimulants major players do not cater heavily to the growers that seek products with organic registrations (such as OMRI Certification). The cost and requirements to meet this need should be considered to determine if this is another distinguishing feature to seek a blue ocean market. This could strengthen brand recognition and customer trust in the relationship with the company if Creative Dynamics is willing to cater to the organic sector.

The study does not consider the effects of bad actors or cheats within the Blue Ocean framework proposed here. However, it is noted that Blue Ocean Strategy is built on trust, using a win-win approach. Therefore, it would be against the partners' self-interest to act dishonorably. Additionally, farmer's privacy rights could become a concern regarding yield data collection calculation for Armor's price estimation. Given the participation benefits, it is argued that the net benefits are in favor of participation and against privacy concerns. The trust foundation of the relationship carries this confidence of protecting each other's interests.

Finally, the pricing model developed for the Blue Ocean Strategy uses soybean as an example crop. It does not include sales of Armor to acres growing specialty crops, which have higher prices. There needs to be additional work to determine the benefits from

Armor to help the company determine its appropriate price for these other commodities that may perform differently from soybeans.

5.4 Take Away for Creative Dynamics

The main take away for Creative Dynamics stems from the application of the Blue Ocean Strategy. Respectively, the company has gained knowledge of the plant biostimulants market space and is able to visualize its standing within the industry. Creative Dynamics now has a framework to apply this strategy in future product research and development efforts. The research steps outlined in this study are beneficial for considering market analyses, price analyses, and project returns for next generation product development and for new product lines. The company can use this knowledge to assess a market in depth and operate from a novel approach that deems competitors irrelevant. The company can use the market analysis tools to identify gaps and needs within an industry. Research and development can use the results to influence innovation and bring value to untapped markets. Additionally, the model used for this research to calculate the proposed change in pricing structure can be modified for other products, different crops, and for envisioning new scenarios.

The use of plant biostimulants is increasing due to their beneficial effects in crop production. Demand for these products will continue to escalate as growers and regulators seek solutions for efficiency and sustainability problems in current agricultural practices. Creative Dynamics benefits from the market assessment through the Blue Ocean Strategy framework to understand where and how the company fits within the competitive space with their plant biostimulants product.

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