

Optimization Technique Approach to Resolve Food Sustainability Problems

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Abstract—the authors suggest possible arrangements between different supermarket chains in this study, using a strategic methodology and game theory to develop a modern, with generations to come, effectively diets. The authors will specifically acknowledge service providers and sellers of vegetarian (vegetarian) but semi (or non-vegetarian) foods. The strategic approach being used by authors offers a model of mathematical game theory that could help vegan food manufacturers get easier entrants and free substantial ads. Besides that, the template could allow non-vegetarian food producers to turn to vegan and vegetarian production seamlessly. In particular, the authors suggest an arrangement between McDonald's and Muscle of Wheat since they assume that without the aid of a major food supplier already on the market, Wheat's strength will not reach a global market. The game theory model describes an irregular R&D partnership between McDonald's and strength of Wheat. Demand for food items that are organic, nutritious, and environmentally friendly has been growing. In response, producers' market natural or other quality-differentiated foods, often claiming to have implemented good habits focused on environmental welfare. These goods have unfalsifiable consistency characteristics, as well. Because the seller may deceive the buyer with a baseless assertion, the manufacturer who maximizes profit can earn a better price with lower production costs. The research addressed in this paper indicates that the availability of high-quality certificates requires regular agreements and third-party oversight. Policy implications of this research are recorded for national organic food criteria.

Keywords— *Environment, Health, Nutrition, Normal form games, Cooperative interaction, Competitive Games, Microeconomics, Green Economic, Sustainable food production, policy facing Climate Change, and Sustainability.*

I. INTRODUCTION

A game theory model for the sustainability of agricultural production is studied in this chapter by the authors. In particular, we are developing a cooperative model that suggests potential overall partnerships between vegan and non-vegan food producers. It seems to be well founded that meat production has begun to be unsustainable from many perspectives. Furthermore, meat consumption reveals that it is linked to heart strokes, cancers, diabetes, and many other diseases. Indeed, in

cheap and high countries, affluent people follow identical high-meat diets and experience elevated rates of these neurological disorders. The industrial, agricultural system (now the predominant form of agriculture in the United States and increasingly globally) - necessary for the production of meat and milk - has implications for public health because of:

- the widespread use of pesticides and fertilizers;
- Extremely inefficient water use (such as water and productive land);
- Elevated environmental emissions.

The strong healthcare problems raised by Nutrition products, including tissues from plants, arsenic, and antibiotic, are illustrated in the mass development of animals. We also highlight the strong concerns about the exacerbated health risks for workers - arising from such unsustainable jobs - and the resultant health risks associated with populations living near meat processing factories.

The overwhelming majority of wellness, educated, and much more administration faces have contributed in recent years there is a substantial rise in demand for prepared foods that are organic, nutritious and agriculturally sustainable. By benefaction, a wider range of performance goods by Fraz~o and Allshouse [6], including fresh vegetables, goods with the other nutritional safeguards, and applications certified to have been formulated with sound wildlife protection requirements dietary foods, the food industry has responded to this increased supply. Nutrition and Appliances.

Marketers are fast to use right statements in marketing these products. Food safety, nutrition, value, labelling and manufacturing are the main features that define foodservice quality by Hooker and Caswell [7]. With different degrees of asymmetrical experience, these classes of food product quality are offered. Inherently unstable knowledge issues arise, although food companies know if they have used the necessary strategy to reach the ideal quality characteristics. Still, customers also know for sure what the companies' reliability statements are and what the listing says. Some literature also studied by Caswell and Padberg[2]. The federal government regulates food labelling, but most quality guarantees go unwatched.

Multiple value food products also generate inadequate knowledge issues that could lead to bad results.

Business performance. There are three commodity classifications based on the capacity of the customer to assess quality. These (1) goods for quest, (2) goods for experience, and (3) goods for credence Nelson [10]; Darby and Karni [3]. In their study of information labelling for food product quality attributes, Caswell and Padberg [2] extended these categories to food products. In the case of search items, before purchase, perfect quality information is available.

Spinach is a predictor of the effectiveness hunt, as it is regarded as a salad depending on its current look. For seasoned products, the quality will only be assessed because after nutrition was already eaten. Packaged food is an integral part of even a fun outcome. Clients in a certification good cannot identify quality after production (or it is detected too quickly and too late to care or it is prohibitively expensive to observe. Research papers of Curio cabinet products involve organic foods, sea turtle tuna, free-range beef, and kosher foods. Fruits and vegetables have also been in the media recently cos of the controversy over the development of national organic food legislation. The 1990 Agricultural Food Development Act (OFPA) required the U.S. Department of Health (USDA) to establish national conditions for the processing and sale of sustainable farm commodities and a mechanism of compulsory registration and regulatory regulations to ensure that green labels or goods remain legitimate.

II. A GAME THEORY APPROACH

To start a strong, stronger diet for subsequent generations, we will consider potential agreements between specific food producers using a cooperative approach and game theory. Carfi.et.al [1] has also applied game theory approach. Our collaborative relationship offers a mathematical game theory model that could help vegetarian food producers a light entry into the market and free substantial ads. In the meantime, our model would allow non-vegetarian food producers to transact smoothly into vegetarian and vegan production. The industry has increasingly found the apparent situation under which the worlds of food types pose a rather better employment target over the past few decades. Indeed, today, in a nutrition place that is increasingly less niche and continuously expanding, the huge food sector brands are looking to create more space for oneself. The 'regular' consumer in Europe shows an overall interest in various foods about processed foods: the steep increase in the revenue of soy, nuts, lemons, legumes, grains, beans and other noble crops brands is clear, as is the outcome of a vigorous marketing campaign that has recently celebrated the health benefits of nuts and seeds by Secli [10].

III. LITERATURE REVIEWS ON FOOD PRODUCTION

Here, by referencing some related sentences, we address some of the writings we used to build our concepts about food security's resilience. Difficulties with beef manufacture. In a paper by Walker. et al. [12], we interpret: "We live in a world of discrepancies and half a billion people become overweight and obese. Another 1 billion lack adequate nutrition resources, due to the fact

how 6.3 billion people on Earth (now 7.5 billion people) could be fed by current world food production if distributed equitably and based on equitable food resources." The meat itself also linked with certain cancers. Being at higher risk provided adequate protein and animal fats by creating more dietary fat globally. Non-vegan expenses for the cooking process. As stated by Fiala[5], the collected graph on the cost of intensive farming suggests: 'Existing operational procedures for food products were said to result, contributing for between 15 and 24 percent of total gas emissions. The meat industry is expanding at a greater incidence and is projected to continue in the future (see Fiala [5]). Also, we note in Nguyen. et al. [9]: "The externalities of slaughter are presented as categorized opportunities in different midpoint categories, including ocean acidification, the profession of nature, ocean warming, biodiversity loss, suutari, etc."

The natural activity was found to be the key driver to expenses (55 percent) in decreasing order of importance [13], preceded by rising temperatures (21 percent) and microbial breathing products (18 percent). With a cost impact of 80 percent, a review of negative externalities into three categories of harm shows the impacts on ecosystems are extremely significant. In contrast, impacts on human quality of life and effects on oil exploration are comparatively low with an impact of 6 per cent and 5 years share [14]. Most of the 75.4 percent of the external impacts of pig meat manufacture is related to feed production [15]. The balance was distributed through the other sub-processes by 16.3 percent, 3.2 percent, 3.7 percent and 1.2 percent, respectively, "emissions is from shelter and storage of waste products," "mulch utilization for crop fertilization," "feed transport", including "direct current use [16]." You should read Nguyen et al. [9]. for information and take it with you (n.d.) [17].

Recent data shows that animal protein intake is decreasing in the U.S., with 316 million, but in many other European countries: 6% during 2006 and 2010 [18]. The number of vegan diets, for instance, is growing, helped by a global recession, but also by healthier, sustainability behaviours. European democracies slightly modify their eating habits or keep them less balanced.

A panel of 22 independent scientists from 10 countries reviewed over 800 different potential cancer samples and analysed them in a report by the International Journal of Cancer (IARC). Red meat has classified as "Group 2A - presumably human known carcinogens" and meat products as "Group 1 - human carcinogenic" In just the same population, disease components, including second-hand emission and unhealthy are classified as corn oil. Instead of only measuring the degree of risk, the IARC concepts define the intensity of the scientific evidence that an agent is a cause of disease. A review of data from 10 tests revealed that every 50 gramme section of meat products and every 100 gramme section of fatty food consumed every day raises around 18 percent and 17 percent of cancer risk, respectively, if the meat is said to have a positive correlation with hepatocellular carcinoma (see WHO, 2015).

IV. FOOD SUSTAINABILITY

The game theory had already found to be completely useful for strategic alliance analysis because while game-theoretical features are not systematically applied in competition studies.

Many factors are dealing with food protection, already universally regarded in research, for example (Figure 1):

- The environmental effects of development and access to forest resource use, greenhouse gas emission, and genotypes.
- Effects on the local world in terms of health risks and also the fulfilment of essential needs.



Fig.1 Sustainable Development - Source: Drolc[4]

V. CASE STUDY: THE "MUSCLE OF WHEAT."

People may seek an incident involving Enzo Marascio's Wheat's excess fat, a diet created by Austrian Enzo, on any of his farm's elevated food goods. This is a breakthrough in the food industry as it shows a nutrient value almost near to beef though it is veggie. Wheat nor peas demonstrate the important strategies for making the structure of wheat fuller than tempeh, soy and yoghurt. It provides a suitable alternative for those who wish to reduce or remove their non-veg intake by adopting a diet deprived of absolutely no bad nutrient. Due to additional linkages and digestion, a mix of wheat bread and seeds like sesame assumes to give same texture and nutrient value as that of beef. Because of its remarkable quality, with this cheap synthetic material called 'Muscle of wheat' on its own, Marascio can replicate many typical meat plates.

There is still a wide gap among work of Marascio and the acceptable and utilized meat alternatives of vegans, such as congee, tempeh, soya brisket. As the next produced from the reconstruct of the materials used, without industrial modification of the basic molecules being involved, the wheat muscle develops strictly based on a dough. Moreover, the mixture of legumes but cereals achieves this new product's precision, not by extensive modification of a single feedstock. Thus, the nutrient outline of the bread muscle is stronger, as shown in figure 2.



Fig.2. The Muscle of Wheat wins Oscar Green 2015- Source: Oscar Green (2015); Napolitano, U. [8]

Dozens of wheat protein studies conducted: in general, and Prof. Fernando Tateo of the University of Milan investigated it in 1992 and, strangely, it turned out to be such unique food. It contains 20 amino acids, including the requisite 7 out of 8 amino acids, consisting of a protein that is not present in soy counterparts or animal products. Except for the good cholesterol in coconut oil or carbohydrates, it comprises no fat or caffeine, making it the ideal food for kidney disease and coeliac; deny the reality that it comes with the grain.

According to the assessment of most testers, the flavor of wheat muscle is strikingly near meat. Evenly, Marascio observed deeper views from people outside the vegan cuisine world since these individuals respond through surprise very frequently, realizing the goodness of food made up entirely of vegetables. Marascio innovation is truly innovative. It is not the conventional Kimchi Situation, cauliflower, soy hotdogs, tofu, which almost always involve unnecessary flavouring food; conventional dishes can be reformulated without major adjustments. Besides, this food is not derived from soybeans, that colossal usage of which is frequently discussed at present, especially by other vegetarians, though from veggie product at a time adopted in Italy; their grain used for the development of 'Wheat Muscles' in general refers to the 'Senatore Cappelli cultivar' known for the nutrient content (see Secli, [11]).

On the other hand, because of quality of its luxury brands, and is capable of common vision point such as climate swap. Even the current nuclear holocaust, living organisms and connected to intense soil destruction due to all the necessary factors caused by the beef industry for the consuming of livestock, we are sure that Muscle of Grains must join the globalized industry. With optimum healthy features and a negligible effect on the climate, mass and strength, Wheat is an extremely great meat and seafood choice. Furthermore, McDonald's can see the excellent motivation to switch to vegan and vegetarian output because world food politics are changing in these ways.

We proposed a model of the game hypothesis that addresses a potential unbalanced R&D joint effort with subjects: McDonald's and Wheat Muscle, helpful administration sanity. Different parts of the game will profit from this lopsided partnership. Wheat muscle would arrive at a globalized market and fare its items universally; a piece of the food market, McDonald's will rule through wellbeing (and moral) change, society will profit. In particular, we utilize D in this paper. Carfi's present idea of the agreeable game, which perceives collaboration and rivalry together and simultaneously. The arrangement and guideline of deviated R&D collusions, those among minuscule (or potentially youthful) firms and huge ones, can be progressed by co-competition (for example Global Enterprises). The numerical investigation discoveries have shown that we can discover further alternatives helpful for all organizations partaking in this examination..

- the global climate,
- Healthy people,
- Sustainability of human societies,
- Change in the atmosphere.
- The mathematical solution that we suggest is:
- Solely collaborative solutions;
- Only without 3rd player, amazingly strategies;
- Only with 3rd player, amazingly strategies;
- Maximum-collective strategies.
- The contribution is twofold:
 - there is an overview of the impact of a balanced diet on public health, policy issues, food security, ecological survival, and just how sustainable food suppliers could boost the worldwide population's climate, healthcare, and social situations.
- Game theory can be used to study market competition in both normal and extensive form.
- Increasing health issues of individuals,
- Dealing with global warming
- Fixing poverty in the world
- To enhance welfare in a specific market.

Initially, we urge McDonald or several other huge food corporations to look more closely at the model and realize that the best way to "go rich" and build wealth isn't to work with biological and sustainable local entrepreneurs.

From an economic standpoint, we are confident that cooperation is indeed the only way to succeed [19]. Food producers cannot choose to 'struggle' with other small food companies for a decent market share. Still, they must work together to gain maximum collective benefits for them and the social communities. Indeed, it is important for a world looking to the future to understand the best combination of capital for companies and prosperity for the people and our planet.

Although 2020 did not offer us many chances of going out and eating like the old days, we spent so long choosing where and how to eat anytime we did! It was a gigantic

million-dollar problem. These two acquaintances of mine are very picky (although somewhat less than me, I intend to make them appear bad: D) but in the past 8 years I have not dined with them so much, but in mine opinion, we just had to spend an hour or two of our debates, also known as food wars. We chose to end this by understanding the basic examples and figuring out how to arrive at a speedy trade-off. Theory: Given my companions' food tastes on a given day, can we effectively discover what cooking to pick rapidly that expands the fulfillment? A tad of foundation about Game Theory. We will not examine the thought now and will attempt to be pretty much as short and compact as practicable.

VI. GAME THEORY APPROACH TO RESOLVE THE FOOD PROBLEM

The game hypothesis is examining numerical models that depict the connection between reasonable leaders (food determination) (my two companions). Pretty all good! The Game Outcome One approach to anticipate the game's result is by indicating the predominant methodology for every player. A predominant system is the one that is better for a specific occasion paying little heed to the next player's inclination (whatever culinary fulfills my companions' present yearnings), so regardless of what companion #2 does, a prevailing companion #1 procedure is the ideal companion #1 methodology. The Nash Equilibrium is named the arrangement of methodologies (cooking styles) chose by the players (companions). It is viewed as harmony in light of the fact that by changing his/her choice, none of the players has anything extra to acquire. The Nash harmony is, in plain terms, a standard that nobody needs to abuse besides without the police. There is no advantage for individuals who break the standard, and they will not get anything extra. One such event is people who follow traffic lights and stop/go as per the light tone.

All right, ample theory, let's get to the application. You could follow the GitHub code here. I'm not going to use Nash but basic Python features to see if it's possible to achieve a result. Let's construct our Matrix Payoff. In this case, the two friends' ratings would be for the different cuisines they want to eat, as shown in table 1.

TABLE I. PAYOFF MATRIX OF THE RATINGS

	Mexican	South Indian	Italian	Chinese	Japanese
Varun	3	1	3	1	1
Kirti	1	2	2	4	1

Pay off matrix for different kitchens, as calculated last Friday. Given this payoff matrix but ending the food wars, the challenge is to find the dominant strategy. On a scatter map, let's plot the payoff matrix, as shown in figures 3 and 4:

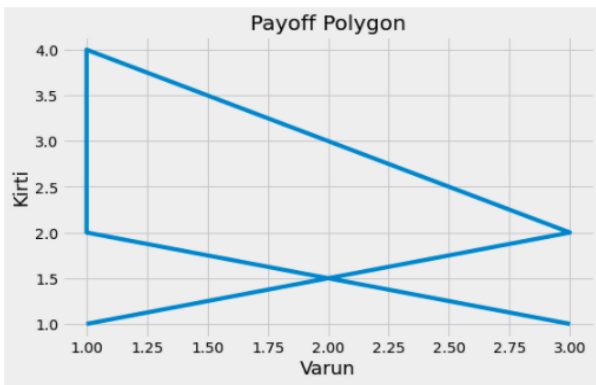


Fig. 3 Payoff Polygon 1

Above that, the curve defines the enjoyment one gets when eating different cuisines. For both mates, the coordinates belonging to the highest-ranked part of the curve related to the highest payoffs. If 'x' denotes Varun payoffs and 'y' Kirti payoffs, we have to optimize 'xy'.

To do that, we ought to find the line equation that passes through points (1, 4) and (3, 2). The line's slope is given by:

$$\text{Slope} = \frac{Y_2 - Y_1}{X_2 - X_1} \quad (1)$$

The slope comes out to be -1.

The equation of the line can be:

$$Y = \text{slope} \cdot X + \text{constant} \quad (2)$$

Eq. will become

$$y = -x + 5 \quad (3)$$

$$xy = x(-x + 5) = -x^2 + 5x \quad (4)$$

Taking the first derivative of xy concerning x:

$$\frac{d}{dx}(-x^2 + 5x) = -2x + 5 \quad (5)$$

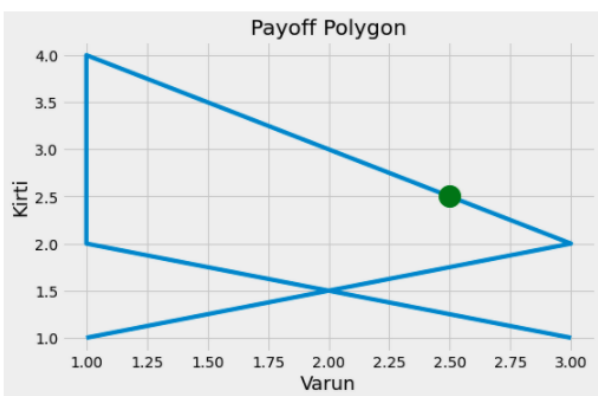


Fig. 4 Payoff Polygon 2

The green dot seems to be the point of compromise on the line described. It falls on the line of Chinese and Italian payoff coordinates and closer to Italian food.

But what does that even mean? Will we eat Chinese and Italian hybrids? Noodles sound pretty strange on a

pizza, but I had very weird pizzas (what about eggplant, goat cheese, but potato? Sure, I had it for me because it was the only vegetarian option).

Interpretation

$$\text{Dominant point} = p \cdot \text{payoff}(\text{Italian}) + (1 - p) \cdot \text{payoff}(\text{Chinese})$$

The dominant point for both is 2.5

For Varun, $2.5 = p(2) + (1-p)(4)$

Solving this, we get $p = .75$

If we solve for Kirti, we will get same answer..

VII. CONCLUSION

Uneven awareness issues can impact markets for reliability products, particularly organic foods of this type. Nutritional qualities are often certificate goods, meaning that consumers cannot fully describe their quality even after consumption. These awareness issues will gain traction as organic, and other foods with unfalsifiable performance metrics are rapidly sold. The research paper demonstrates that both a repetitive partnership and someone oversight is needed for high-quality credibility to be accessible. If a manufacturer gets away with breaking wrong quality statements, anybody can enjoy higher quality. The value of lower costs. The price of fresh foods, the consistency discrepancy here between traditional and analytical media used and the share price are calculated by the limited sense of versatility required. Attention in this manuscript is on game theory approach, and the analysis can be added to any quality-based content with overturned information. A revenue supplier has a good tendency to believe that its products are organic mistakenly. The chance because they will not be exposed strong enough if buyers are ready to pay a community outreach bonus. The importance of this report's certification and improved monitoring of ecological claims is obvious.

Consequently, the central control of organic labels and certification by the USDA would improve market success. This work presented a potential cooperative arrangement between a major globalized producer/seller of food and Concrete of Wheat, a small, local, although the highly creative producer of nutritious eating in southern Italy. We assume that, without the help of a large and popular small farmer, the local business Muscle of Wheat won't significantly enter an abroad market effectively on the planet market: McDonald's or much another time of globalization natural pecking orders. Since it is characterized, our exploration is completely material. Different scholastics and business people inspired by the food area and additionally the everyday environments of every single individual and additionally staples' inventory network will absolutely follow itself. Obviously, the model can be built up by widening perspectives, for instance, by examining both a particular worldwide food provider just and one business person and other creative veggie lover food assets, which may be distinguished over the long haul while considering the entire venture groups. We ought to be more shrewd to say the very least 'standard' if we overall reliably need to live in strong rules and save our lives and our future, accordingly he believes that endeavors should

think this to improve overall prosperity and success conditions.. Nowadays, we likewise need that McDonald and a few other food makers utilize more maintainable veggie lover food parts to utilize less essential assets, so now we are attempting to empower more comprehension of these world issues.

P = 3/4 methods for each multiple times we have such inclinations for Chinese and Italian food, we will go to Italian spot multiple times and to Chinese once. There are various methodologies for maintainability in the product business [20]. We expect, in the end, that we have an answer for this debate between them. All we ought to do is hold my PC with me or assemble a little application that truly can run this product. It's almost 12 PM since we wrapped up working this audit, and no food conveyance administrations are running. Along these lines, no Chinese or Italian around evening time for me. Noodles of ramen once more! BTW is Japanese and is viewed as the best Japanese development of the most recent century for the individuals who don't know ramen.

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