

The Humble Bean

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A Dissertation in Science and Research

Contents

<u>ABSTRACT</u>	295
CHAPTER ONE	296
1. INTRODUCTION	296
CHAPTER TWO	299
2. REVIEW OF LITERATURE	299
2.1. WHERE HAS THE BEAN BEEN	299
<i>Fig.2.1: Showing the transition of the cultivation of a bean.</i>	299
2.2. CORE > PERIPHERAL	300
<i>Fig.2.2.a.: Core and Peripheral</i>	300
<i>Fig.2.2.b.: Bean production in Africa.</i>	301
2.3. BEANS AND MEAT	302
2.4. VEGANISM A TRENDING WAY OF LIFE	303
<i>Fig.2.4.: Beans in the Vegan diet working on the principle of scarcity.</i>	304
2.5. INTERNATIONAL SCIENTIFIC DISCOURSE OF BEANS	304
2.6. ECOLOGY AND ITS RELATION WITH BEANS	305
2.7. BEANS, AFTER THE GREEN REVOLUTION	306
2.8. TALE OF BEAN DIVERSITY IN INDIA	306
2.9. TALE OF BEAN DIVERSITY IN INDIA	307
2.10. WHAT IS GOOD? AND WHAT IS POISON?	307
<i>Fig.2.10.: Three point Triangle representing “Raw”, “Cooked’ and “Rotten” food.</i>	308
<u>CHAPTER THREE</u>	310
<u>3. ANALYSIS</u>	310
<u>CHAPTER FOUR</u>	326
<u>4.CONCLUSION</u>	326
<u>5.REFERENCES</u>	328

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Through this course: you helped motivate me and your empathy helped me coast through stages of joy and anxiety.

ABSTRACT

The notion of the transition of the bean can be traced from the primitive to the modern times. “Beans”, being one of the most common legumes consumed on a daily bases, around the world, have a lot of insight to offer. Due to our constant regular interactions with the bean, one fails to understand the vital importance of a bean not only as an impactful energy rich nutrient packed food but also as an important token in negotiating trade through play money. The uniqueness of the beans came to life only after the establishment of veganism, wherein beans due to its versatility had a sky rocketing high consumption. Veganism thus labelled “the bean” as the food of the rich. However in life, like how all “fairytale” don’t have to have a happily-ever-after ending, similarly, “the humble bean” doesn’t have to always camouflage itself under its innocent coloured skin, it too is allowed to have a dark side. Therefore this paper will delve into the national as well as international scientific discourse of the bean shedding light not only on the pricing and iron content in the bean but also in the consumption of the bean, its positives and negatives especially when considering the perception of the cooked versus the raw bean.

Since this is my first dissertation in Science and Research that I am writing at my undergraduate level, I want to draw in an interdisciplinary approach which would encapsulate the essence of both the sciences. Therefore through the course of my dissertation, I will be taking a nutritionalists gaze to understand and see if it is possible to come up with solutions to help producers as well as consumers.

Keywords: *Beans, Food History, Core, Peripheral, Occidental, International And National Discourse, Iron Content, Pricing, Fair Trade, Scientific Literature, Veganism, Raw, Cooked*

CHAPTER 1

INTRODUCTION

There is a long standing love affair between human beings and the food which nourishes them. We come into this world hardwired to love our food not just because food helps us to survive, but also because food brings us immense pleasure.

I find that food is an experience – it provides an insight into understanding the essence of an extraordinary new culture, in the authenticity of a geographical cuisine – despite the forceful impact of globalization. Acknowledging the social restrictions on food, I will still put forth the argument that food is the only thing that can be shared across caste, language, and ethnic boundaries, which is accompanied by an increase in formal (and informal) entertaining and dining experiences across these boundaries.

Therefore from the diets of our earliest ancestors, to cooking's role in the evolution of the human brain, to the preoccupations of contemporary foodies, I feel that what one eats is consistently revelatory. This is because our memory finds it impossible to forget the taste of the orange popsicle in the hot summers and a warm delicious bowl of steaming hot chicken soup on a cold winter's night prepared by someone who loves us dearly. Through food we learn about where we come from, who we are and also understand in many ways who we want to be.

While growing up, I was not fond of beans. The only way I would eat them is if my mother told me a fairy tale of “the magic beans”; the myth of Jack and the Beanstalk.

The word "bean" has existed in common use in West Germanic languages since before the 12th century, referring to broad beans and other pod-borne seeds (Thompson, 2012). There is evidence that beans were some of the first cultivated crops in human history (Best, 2013). This makes them an essential part of the evolution of early civilizations. Hunter-gatherer groups started to develop agricultural systems, which they were able to establish into more stable communities that were the beginning of complex societies (Thompson, 2012).

The use of beans has been traced back as far as 6650 BC in parts of the Middle East. Legumes, chickpeas and fava beans have been traditionally found in 4000 year-old Egyptian tombs as they were buried with the dead for prosperity in their next life (Bauer, 1995)(Best, 2017). Beans were the first “powerful super foods” to have thrown light on the concept of life after death. This relationship exists in diets all around the world. Beans have a symbiotic relationship in which the amino acids (Bauer, 1995) of each complement one another in such a way as to form a complete protein packed with nutrients. Regional and cultural combinations such as lentils and rice, lima beans and, chickpeas and corn and couscous are a reflection of this correlation (Hall, 2015).

Often, beans are used instead of trading chips as a type of "play money". Beans have come to represent objects of little value in the European tradition (i.e. someone who doesn't know something - "bean") - this was the reason how the show Mr. Bean got its name “Mr. Bean”. They are also symbolic of immortality and mystic magic power (although connected with witches since a beanstalk can form a witches' broom), as in Jack and the Beanstalk (Hauk, 2010). Once planted, beans can represent resurrection and reincarnation since they grow spiritually upwards. Drawing from Functionalism as a school of thought, according to British Anthropologist Bronislaw Malinowski (Bell, 1992), magic was used as a cultural response to explain the deeper biological need of understanding functions of societies, thus satisfying the human mind.

Beans are also phallic, especially when they are green and can symbolize male sex organs, and can connote immortality. They can also be thought of as an elementary food or as a way of learning counting in mathematics (Hauk, 2010). The flowers that can grow from beans emit a peculiar smell that produces lunacy, bad dreams, and terrifying visions.

A. METHODOLOGY

In order to research, understand and analyse the multi-dimensional discourse of the beans further, the best methodological tool to delve into this research paper would be the implementation of the *methodological discourse of secondary sources*. A secondary source of information has been drawn upon, as I have not experienced any first-hand (primary source) or participated in the events or conditions being researched. Therefore for the purposes of this dissertation, secondary sources are scientific research papers on beans.

Considering the fact that while growing up, I suffered from Iron-deficiency, Anemia, I was advised an iron rich diet by my doctor. Along with the various iron supplements, one of the major components of the foods prescribed to me was beans. Being really young, I disliked beans as I never really understood their

value. Thus, in this paper my quest is to understand how the humble bean is acquiring its status as a super food while simultaneously understanding the relationship between the iron content in beans (both raw and cooked canned beans) and the way it is priced in India. Building up further on this perspective, I intend on proposing an idea on how beans can be used as a tool to bring about a positive change in the food scene.

B. OBJECTIVES

I initially chose this research topic to explore the multi-dimensional aspects of the ‘humble bean’ in the following way:

- ‘The spilling of the beans’ across disciplines in order to explore the intersection of history, culture, industry, new dietary fads, commerce, science, politics, market forces, consumer choice etc.

CHAPTER 2

REVIEW OF LITERATURE

2.1. WHERE HAS THE BEAN BEEN?

Prior to the advent of agriculture, people resorted to gathering their food by foraging for nuts, berries, beans and insects, hunting wild game, large and small, and fishing. Settled life soon followed with implements and techniques being developed for the sustenance of the prerequisite at that time which was agriculture (Gale, 2008). A reminiscence of a few hunter-gatherer people survive to this day, but the world of the hunter-gatherers, in which most ancient people followed this mode of life, is long gone. It disappeared in the millennia following 10,000 BCE, as farming and pastoralism gradually nuanced and spread across the world (Davidson, 2013).

Engels drew on the notion of offering the first detailed theorization of primitive communism in 1884, with publication of *The Origin of the Family, Private Property, and the State* (Engels, 1884). Marx and Engels used the term more broadly than the Marxists did later, and applied it not only to hunter-gatherers but also to some subsistence agriculture communities.

Gerhard Lenski (Bauer, 1995) saw human society as something similar, that is, as something of a process of change involving a society's level of innovation and transmission. He described this process of change as socio-cultural evolution. Lenski took a very different lens of viewing society and social structure and focused on the social and cultural elements of society, maintaining an evolutionary perspective on the notion of macro sociology.

He thus broke down the level of societies into five types:

1. Hunters and gatherers
2. Horticultural
3. Pastoral
4. Agricultural
5. Industrial

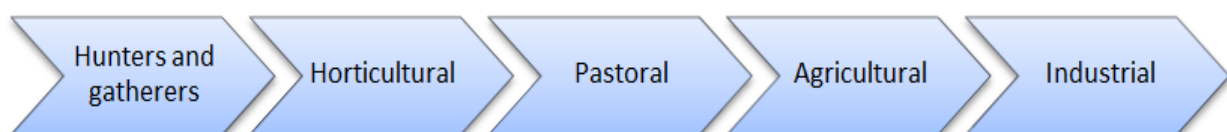


Fig.2.1: Showing the transition of the cultivation of a bean.

The historicity of the cultivation of beans can be traced back to decades ago. They are available in hundreds of shapes, sizes and colours, are versatile and amazingly convenient because they can be dried and stored for years such as coffee, vanilla beans, castor beans, and cocoa (Hall, 2015). A legume plant produces seeds in a pod; dry beans are the mature seeds within these pods. Other members of the legume family include lentils, peas, chickpeas, peanuts and soybeans. Therefore, through elaborate research undertaken (Davidson, 2013), there is evidence that they were some of the first cultivated crops in the history of mankind. This thereby draws into perspective that they are the most essential part of the evolution of early civilizations (Bertsch, 2018). Therefore when hunter-gatherer groups started to develop agricultural systems they were able to establish into more stable communities that were the essence of the beginning of complex societies.

2.2. *The creation of the Core – Periphery*

Wallerstein, (Hall, 2015) developed a theoretical framework to understand the historical changes involved in the essence of the rise of the modern world. The modern world system, has become fundamentally capitalist in nature. According to Wallerstein, his theory makes possible a comprehensive understanding of the external and internal manifestations of the modernization process during this period and makes possible analytically sound comparisons between different parts of the world.

For instance, when a shopper in the modern western occidental country beholds a colorful array of fruits and vegetables in a corporate supermarket, they are unlikely to envision a forager or a farmer bent over in the fields harvesting green beans patiently for their consumers in the global north. In retrospectivity, this is because during the time of the British colonial rule, the Global North extracted and exploited the resources from the Global South, thus labelling themselves as the core and exoticising or othering the global south as the peripheral (Fig.2.2.a). At this time the notion of privilege of a modern elite occidental shopper can be understood because with ease they are able to consume perhaps an out-of-season green bean variety. This could be classified as a cultural marker or what Bourdieu termed as “distinction”.

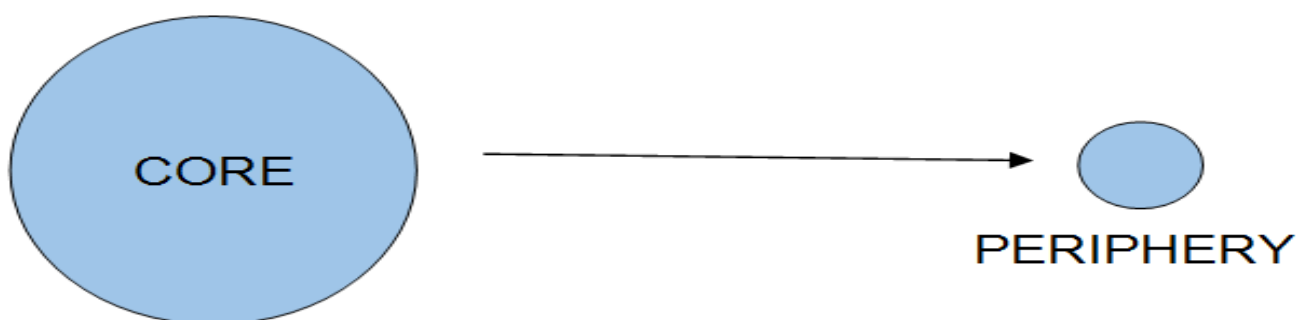


Fig.2.2.a.: Core and Peripheral

The notion that the core exploiting the peripheral can be encapsulated in the essence of the peripheral being the producer of beans (legumes) and the core being the consumers of their labour product.

Archaeological evidence (Hall, 2015) suggests that beans, especially the coffee bean is an important food crop in many parts of Eastern and Southern Africa with over four million hectares produced in more than 20 countries (Fig.2.2.b). As in Latin America, resource-poor farmers with very few inputs grow beans primarily on small scale, marginal plots like farms (Hart, 1999). In Africa, due to the predominantly prevalent gender disparity, women farmers, who have little access to fertilisers compared to men farmers, more often, grow beans. Intercropping of beans with cereals (maize, millet or sorghum), bananas and plantains or root and tuber crops is common practice.

This core and peripheral relationship elucidated that tracing the cultivation of beans can be better understood through the discourse of power structure in the form of the triangular trade (Hart, 1999). This is because the triangular trade is a historical term for trade between three regions, using a commodity from one region as payment for commodities from another region. Its best-known example is the transatlantic slave trade that operated among Europe, West Africa, and the Americas in the 17th through 19th centuries (Hart, 1999). Coffee beans were first grown in Ethiopia. This shows that the African slaves were fundamental in growing colonial delicacies like coffee which were exported to Europe. Therefore the term "triangle" describes the trade system, not the specific route taken by the cargo ships.

Region	Area (%)	Area (ha × 10 ⁻³)
Eastern Africa – highland and mid-altitude (Burundi, DR Congo, Ethiopia, Kenya, Rwanda, Tanzania, Uganda)	62	2490
Southern Africa (Lesotho, Madagascar, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe)	31	1290
Western Africa (Angola, Cameroon, Cape Verde, Togo)	3	135
Lowlands-winter season (Algeria, DR Congo, Egypt, Mali, Malawi, Mauritius, Morocco, Nigeria, Sudan, Tunisia)	4	200
TOTAL	100	4025

^aModified from 'Atlas of Common Bean Production in Africa' (Wortmann et al., 1998).

Fig.2.2.b.: Bean production in Africa.

2.3. *BEANS AND MEAT*

Dietary proteins can take the form of scarce animal products (eggs, milk, meat, etc.), but are usually derived from legumes (plants of the bean and pea family). Beans are extremely diverse crops in terms of cultivation methods, uses, the range of environments to which they have been adapted, and morphological variability. Beans are thus a crop that is adapted to many niches, both in agronomic and consumer preference terms. This can be further elucidated in the words of Percy Bysshe Shelly the 18-19th century English Romantic poet and advocate “It is only by softening and disguising dead flesh by culinary preparation that it is rendered susceptible of mastication or digestion, and that the sight of its bloody juices and raw horror does not excite intolerable loathing and disgust.” This illustrates the preparatory manner in which humans must alter animal meat for consumption – hinting at the destructive process of “meat” preparation (Langton, 2102). That is, it is only after the animal is stripped of its identity along with agency and its life, the meat seemingly unrecognizable from its prior living form, that humans are able to consume it. On the other hand, despite there being other various preparations of meat that retain the original form of the meat, many non-meat eaters find it discomforting or distressing as they vividly picture the meat as a once living, breathing, sentient being.

Today, beans are considered to be a powerful super food. This is because they are not only versatile, easy to prepare and commonly eaten but also because they have an excellent availability as they are found all over the world. Apart from this, beans are also recognised to have a very high quotient of nutritional properties while rendering to be economical in nature. All these factors have shaped the bean into becoming a ‘life-saver’, especially in the case of improving health and preventing health hazards of the people who consume them regularly. The versatile colour of the bean coat appears to affect the antioxidant capacity because this correlates with total phenolic content of the bean. Research (Bauer, 1995) had shown that coloured beans (red, brown or black) possess greater antioxidant activity than white beans.

A number of people are hoping onto the bandwagon and consuming the new fad diets, such as vegetarianism, veganism and gluten-free diets. While each special diet has requirements of its own, a common phenomenon faced amongst them is that vital nutrients are lost out on as certain foods that would generally provide them are disregarded from that diet fad. Beans, due to its versatility can play a crucial role in providing a variety of nutrients for individuals following these diets. For instance, people with celiac disease should consume a diet that is free of gluten, a protein found in a variety of grain products. They must eliminate these products from their diet, which increases the risk for deficiencies in several B-vitamins and other nutrients that typically are found in grains, especially rice. Beans are a pure and naturally gluten-free food, and they provide many of the same vitamins and minerals often found in enriched grain products,

including folate, thiamin, riboflavin, iron and fibre. Bean shifted flour may be particularly beneficial to those following gluten-free diets because bean flours can be combined with other gluten-free flours (such as tapioca flour) (Bell, 2013). Those following vegetarian or vegan diets depend on plant foods for their intake of important nutrients which are often found in animal products, such as protein, iron and zinc. While vegetarians may consume dairy or eggs, those following a vegan diet consume no animal-based products. They consume foods less in saturated fat, cholesterol and more dietary fibre; thus, lacking in vitamin B-12, vitamin D, calcium or omega-3 fats unless they consume appropriate supplements. Beans can be a valuable part of any plant-based diet because they are rich in several nutrients and serve as a meat-alternative and contain the full complement of amino acids when paired with grains (Hall, 2015).

2.4. VEGANISM A TRENDING WAY OF LIFE

In an attempt to adopt a name for this new movement, Watson coined the term “vegan,” combining the beginning and ending of the word, “vegetarian” – symbolizing the “label” depicting the transition to veganism, which starts with vegetarianism and is carried only to its rational foremost conclusion, the elimination of animal products from one’s diet as explained by Watson. “The pronunciation is ‘VEEGAN’ not ‘VAI-GAN,’ ‘VEGGAN,’ or ‘VEEJAN.’ The stress is on the first syllable (Small, 1985).” Greatly influenced by the vegan movement in Britain and Donald Watson’s philosophy to prevent any harm to living creatures, Hom Jay Dinshah founded the American Vegan Society in 1960 (Small, 1985).

The vegan diet is defined by the scientific literature as one that includes only plant foods, namely, “beans, vegetables, fruits, legumes, nuts, seeds, and vegetable fats.” On the contrary, this diet was built around the notion of beans eg. Soy Milk, bean curds, bean paste as well as bean flour which was kneaded into mock meats. As a result, it is described as a restrictive diet due to its exclusion of meat and fish.

Therefore the vegan diet has been consumed by the masses as an elite diet. This is not just because this diet presents itself as a gluten free or lactose free diet but because of the aura of scarcity created around all the products consumed in the diet.

Adorno and Horkheimer (Adorno, 1944) would argue that the enlightenment of mass deception would in this case be based on the consumption of beans in a vegan diet is exoticised as being a practice of the high culture, thus excluding the lower classes from consuming their own diet. For instance a poor Mexican farmer will find it difficult to consume his own bean produce because of the aura created around the bean. In other words this would mean that the farmer will not have the economic or cultural capital to afford his own crop production. Therefore the vegan diet has transformed itself into the phenomenon deemed important by

the culture industry through the process of standardisation. In the light of this perspective, I would argue that if a standardised vegan diet produces standardised vegan people, while at the same time simultaneously encapsulating a popular vegan culture then it is to some extent encouraging Foucault's theory of 'Normalization'.

The vegan diet works on Frank Albert Fetter's (Hall, 2015) 'scarcity principle' in which a limited supply of a good, in this case beans, coupled with a high demand for that good (e.g.: vegan staples like- soy milk or bean paste or bean flour), results in a mismatch between the desired supply and demand equilibrium. Due to this, in the pricing theory, the scarcity principle suggests that the price for a scarce good should rise until equilibrium is reached between supply and demand. However, this would result in the restricted exclusion of the good only to those who can afford it (the elite classes). Thus in other words, (fig.2.4.) shows the development discourse increases demand leading to a scarcity of resources and this leads to the creation of aspiration status.

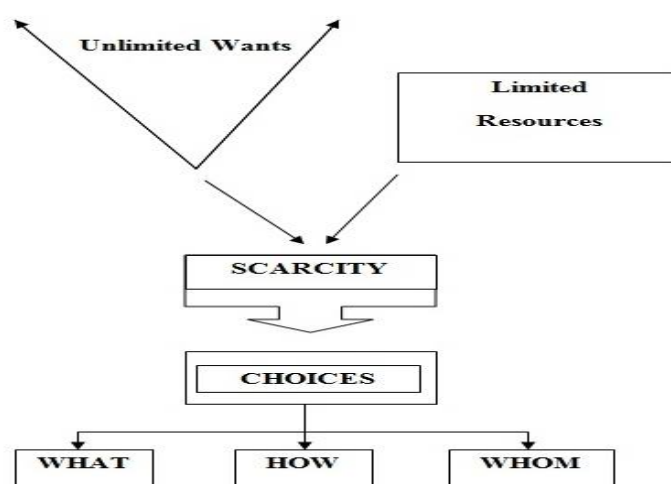


Fig.2.4: Beans in the Vegan diet working on the principle of scarcity.

Dietary protein sources in the vegan diet are plant-based proteins. Interestingly, “on a global basis, plants provide [about] 65% of the world's supply of edible protein.” Such products include, soymilk (made from soy beans), beans, bean curd, bean paste, bean sprouts, tofu, tempeh, seitan, legumes, grains, nuts, and seeds. Unlike protein from meat sources however dietary protein from plant foods is only about 85% digestible.

2.5. INTERNATIONAL SCIENTIFIC DISCOURSE OF BEANS

The iron content in beans is high in the developing countries because in recent times, the population has adopted a more oriental-style diet. In the world, among the quotidian consumed food, common beans

(Phaseolus vulgaris L.) occupy the most important position in the nutritional intake of human beings. Some of the highest bean consuming regions are India, Latin America, Sub-Sahara Africa, and they utilize both dry beans as well as other legumes (example. cowpea and bambara beans). (Papanikolaou, 2005) Throughout Southeast Asia, the consumption of legumes is not only moderate but they also have a great variety of species of beans which are produced and used as mature seeds and immature vegetative pods. Studies have shown that the per capita consumption of bean-based foods in the United States and Europe (encompassing the EU) industrialized economies have generally and consistently been substantially lower than that observed in other regions of the world (Hall, 2015).

Common beans generate an economical source of iron, especially among the subaltern low income group who cannot afford the more expensive meat proteins. The physiological effects of common bean may perhaps be due to the presence of abundant phytochemicals including polyphenols, which possess both, anticarcinogenic and antioxidant properties which help reduce obesity and cancer. The highest degree of diversity in terms of colour, size, and growth habits and seed shape is present in *P. Vulgaris*, (Bell, 2013) however, the names like pinto beans, red kidney beans, white beans and black beans are habitually encountered in many regions specialising in the plantation of legumes.

2.6. ECOLOGY AND ITS RELATION WITH BEANS

Africa was hit by a 19-month drought in 2016 caused by El Niño and higher temperatures linked to climate change. The situation has become extremely catastrophic, causing several crop species to fail and cattle to die (Goss, 1935). In addition, the lack of clean drinking water increases the threat of cholera and other fatal diseases. Across Ethiopia, Somalia, Kenya, and the autonomous region of Somaliland, 11.7 million people are facing severe hunger.

Historically, (Hatch, 2012) Africa was one of the highest producers of a large variety of beans. They used beans as “play money as well as for trade”. This “poor man’s meat”, was widely consumed by the people in Africa. This shows that the famines in Africa not only affected the people living there but also affected the availability of the bean crop in that location. This rose havoc in the case of trade, money exchange, subsistence as well as livelihood. This shed light on the fact that beans are extremely valuable in nature and anything with a value becomes a scarcity when there is an emergency (Naoko, 2009). Thus this was an example of how people negotiate around the multiple identities of beans.

Even today, in Africa the value encompassing the bean is very crucial and therefore agriculture experts have turned to what are being called "super beans," which have the ability to grow in the driest locations to

help supplement hampered resources through genetic manipulation. They have been described as "a fast-maturing, high-yield variety," and offer new hope for hunger-prone areas of the bean-loving continent.

2.7. BEANS, AFTER THE GREEN REVOLUTION

The term 'green' in Green Revolution fails to refer to its current meaning namely organic, pesticide-free, forested etc. Quite the contrary, the term was coined by a white privileged official at the U.S. State Department, William Gaud in 1969. It refers to a period in the 60s and 70s, wherein farmers in India abandoned traditional organic methods to grow crops in a modern manner by using new technologies (Anderson, 1994). The subaltern farmers without much choice stopped growing old-fashioned grains, beans and vegetables and switched to the colonisers new, high-yield varieties of wheat, rice and cotton (Best, 2017). They began using chemical fertilizers of the 'elite core' instead of cow dung of the 'peripheral'.

Niklas Luhmann (Bauer, 1995) argued that economic globalisation is 'a process of strategic decisions in which new technologies and geographies imply a spectrum of possibilities' so that, ideas around 'elite' vs. 'democratic' globalisation could replace the concepts of pro and anti-globalisation. In the case of 'fair trade', although it is a form of globalisation, it is nevertheless created out of the same conventions found in local food i.e. related to trust, equality and a connection between consumers (America) and producers (India) (Sauceman, 2007). In the practice of fair trade these conventions are combined with a sense of global responsibility using both traditional *and* industrial commercial conventions across production and consumption arenas'. However a critical review of three common claims made for fair trade found that conversely there was a reinforcement of producer–consumer differences and low levels of farmer participation beyond commodity production. Moreover (Papanikolaou, 2005) (Sauceman, 2007), since the import and export of cash crops between the core America and the peripheral India, may act against local market production in European countries, any commodity-focused trade can be seen as a threat to sustainable (i.e. localised Indian) development.

2.8. TALE OF BEAN DIVERSITY IN INDIA

Like many mountainous countries, the Indian Himalayan region is characterized by a complex mosaic of distinct agro-ecosystems, differentiated by their climatic and geological characters, vegetation and cropping patterns, crop rotations and other features. Owing to diverse topography and climatic conditions, the Himalaya represents different agro-ecological zones and each of these zones in turn comprised of myriad microhabitats. It is within this varied diversity of habitats that an amazing variety of legumes and beans have been developed over the millennia by the hill farmers and thus this region is considered as an abode of rich agricultural crop diversity specifically the legume crops. Garhwal part of Uttarakhand, (Best, 2017) is a land

encompassed by a diverse variety of various indigenous legumes which form a part of their stable diet. In spite of their popularity there is a very low documentation carried out about most of these crops. Historically, the Garhwal region has been known for its production in some of the finest varieties of *Rajma* (Best, 2017). Hence, the seeds are local and a part of the crop is retained as seeds for the subsequent seasons. Many varieties of kidney beans from different agro-zones, of Uttarakhand have become commercial crops for the farmers yet they go by and are undocumented (Best, 2017).

Edmund Kitch (Hatch, 2012) argued that commercialisation of agriculture is a phenomenon wherein selective crops are governed by commercial consideration i.e. certain specialised crops began to be grown not for consumption in villages but for sale in national and even in international markets. Commercialization of agriculture in India lead to the standardisation of only one species of a crop that helped yield the maximum income in the trade markets. The uniform crop patterning of particular bean species, due to standardisation has led to a loss of several local species of that bean.

This decline is perceived as a huge threat to the traditional species of legume crops and consequently the subsistence farming system of that region appears to be in jeopardy. The poor farmers in these regions, who produce the “local home grown variety” of the crop tend to be affected the most and also may lose their livelihoods due to no source of income generated as the markets are captured by the “standardized crop”.

2.9. PASS THE BEANS

Beans may get a bad reputation for making people gassy, but that is no reason to cut them out of your diet. This mainly arises when public health nutritionists fail to address their clients about the potential for gastrointestinal discomfort when increasing fibre and iron intake from their bean consumption. Simultaneously, experts have recommended the consumption of up to 2 to 4 cups of the legumes a week. This is because beans are extremely good and beneficial for an individual’s health. It has been studied that the more one eats or consumes beans, the less likely the individual is to have tummy trouble. “People who eat beans on a consistent basis experience less gas and bloating than people who consume them less often,” says Cynthia Sass, MPH, RD, Health’s contributing nutrition editor and author of *Slim Down Now: Shed Pounds and Inches with Real Food, Real Fast* (Swalin, 2015).

2.10. WHAT IS GOOD? WHAT IS POISON?

Plants produce lectins naturally as a defence mechanism. Lectins are known to cause significant gastrointestinal distress in human beings when they’re consumed in raw foods, but they are mostly denatured by proper cooking. Therefore, eating raw kidney beans can cause severe illness. This is not the

same in the case of canned kidney beans, as the cooking process has denatured the lectins in the canned beans, rendering them harmless. Lectins are problematic only when consumed raw. Besides beans, other common lectin-containing foods are nightshade vegetables, pulses, and grains, and seeds, like quinoa and chia.

The Raw and the Cooked is one of the seminal works of structuralist anthropology, (Bell, 2013) and probably the best known of all of French Anthropologist Lévi-Strauss. His work can be best illustrated through (Fig.: 2.10) wherein he placed the three phases of food i.e. “Raw”, “Cooked” and “Rotten” at the points of a triangular pyramid like structure to emphasize both the opposition between different stages as well as the degrees of difference between them (Thompson, 2012). Looking at the diagram from the perspective of raw food draws on the notion that the other two points on the triangle i.e. cooked and rotten are two different transformations of food. Cooked food is the product of cultural processes, which makes use of the application of heat or cooking tools like utensils or cooking pots (Dawson, 1964). Whereas on the other hand, rotten food is the product caused by natural processes, exposed over a certain duration of time as well as the process of decomposition. This shows that for Lévi-Strauss, raw food is unmarked by human intervention or decay.

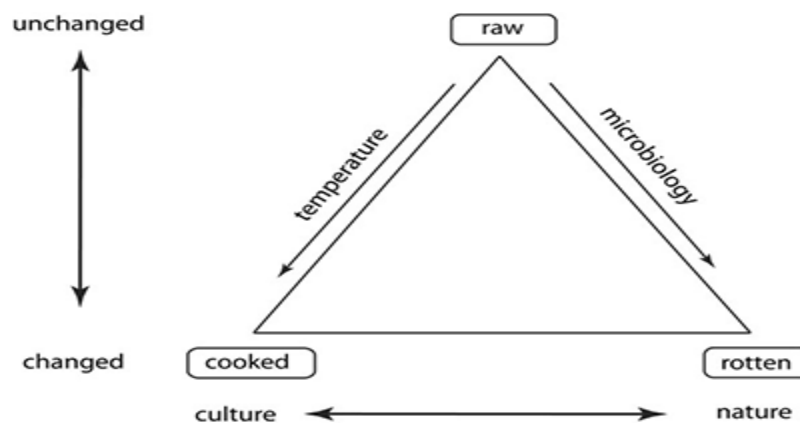


Fig.2.10: Three point Triangle representing “Raw”, “Cooked” and “Rotten” food.

Alternatively, looking at the triangle from the “cooked” perspective highlights that the other two points i.e. raw and rotten, indicates food that falls outside the category of edibility. This visually represented tool in the form of (Fig.2.10) permits a more nuanced framework for cultural comparison. We can perceive the French and Italian methods of preparing uncooked vegetables as points along a scale of cultural mediation, as well as consider them to have a difference in degree rather than kind (Dawson, 1964)(Naoko, 2009).

Lévi-Strauss (Bauer, 1995) used the technique of food mapping to shed light on the concept of “raw,” “rotten,” and “cooked” which were culturally constructed. The oppositions between the three points i.e. raw, rotten and cooked on the culinary triangle frequently point to other clusters of oppositional binaries in a particular society’s beliefs and practices. A slight tilt or shift in position in the triangle can draw on a different perspective. In this case an example could be valuing raw-er foods with less human intervention. However, this seems like a reasonable reaction to a culture in which so much food is cooked and packed in factories. This is because words, associations, and oppositional binaries construct these categories of food; thus, making it easy for food marketers to consciously promote misleadingly aligns of an image of their product with expectations of rawness, naturalness, or healthiness (Naoh, 1980). For example, soy milk is almost universally accepted to be a more natural, wholesome alternative to flavoured milk, even though some soy milks are just as loaded with processed, denaturalized sugars. At the same time, the Vegan diet depends on an opposition between the raw and the cooked. Even though dieters are not meant to eat raw proteins, the appeal of the system lies in the imagined foods cape of a simpler, more “natural” time.

CHAPTER 3

ANALYSIS

In order to do justice to my dissertation paper, I felt that the best way in which I could trace the existence of the ‘humble bean’ was by drawing my analysis scientifically through some research papers. Since the goal of my analysis is to throw light on the comparison of iron content to cost of cooked and canned beans, the best way to progress through this research paper will be by first understanding the glory of the iron (Fe) content in the humble bean. From there, once I have given justice to understanding the relationship between the bean and its iron quotient, only then will I proceed to understanding how the Iron quotient plays an important role in the pricing factor of the bean.

❖ *Bean: Immerging as a super food*

➤ *Goodbye Iron Deficiency!.....Hail oh Bean!*

The content of iron (Fe) is much higher in Beans than in any other cereal staples grown. This iron content remains intact right from the seeding process to the harvesting process. Today, the “Centro Internacional de Agricultura Tropical” (CIAT) demonstrates that there are more than 35,000 varieties of beans as a by-product of hybridization. The study carried out at CIAT portrays that that the concentration of iron found in 201 naturally growing varieties of beans tested was scarcely higher than the iron concentration found in purposely cultivated beans. The beans mirrored an average Fe concentration of 70 µg/g. However while analysing other research papers, there were some researchers who stated that the Fe concentration in naturally growing wild beans was rapidly higher. For instance the Fe concentration was ranging between 80 µg/g to 290 µg/g. At this point, it is difficult to state to what extent the Fe concentration escalations are due to. From all the reading I have done, my analysis would be that in some cases the iron concentration could be higher than ‘normal’ due to the iron enriched soil used for its cultivation or due to other natural causes or sources.

From my study, I have understood that there is no direct relationship between the Fe concentration and the geographic topography of a specific region that would affect the bean cultivation. However, one of the research papers I was going through highlighted the fact that the variability of Fe concentration in beans was not only ascribed to bean variety, but was rather influenced by the planting site, season as well as the temperature fluctuation (Petry, 2015).

➤ **Bean's super power: IRON**

Apart from iron being considered important especially in terms of the health discourse, it is also crucial to note the focus on iron fortification in public health interventions, like in the cases of anganwadis and maternal care initiatives undertaken by governmental agencies. Besides this, the major iron storage protein in Beans is sequestered in ferritin. This is seen in figure.3.1. The special power of ferritin is that it is made up of 23 protein subunits in the form of an iron oxyhydroxide-phosphate mineral. It is found in abundance in soybean, rajma, pinto, etc. Despite the fact that the indications derived from previous studies show the poor absorption of iron from animal ferritin, newer research papers contest these studies and report that ferritin-iron in plants is well absorbed by humans in the form of ferrous sulfate. This led to the assumption that the ferritin found in beans will therefore be able to survive the cooking as well as the digestion process intact without incurring any damage in the gastrointestinal tract. Thus in this manner the high iron concentration will be maintained till the very end of the process through the protection provided by the ferritin specific transporter. This then drew in a proposal by one of the research papers that argued that the increasing ferritin (high iron content) in plant food such as beans, by plant breeding programs could pose to be a solution.

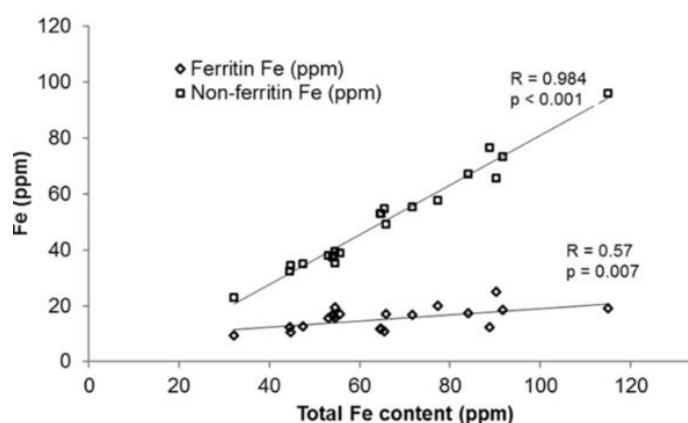


Fig. 3.1: Ferritin content either present/absent in beans.

This suggestion is however one way forward as it proves to be the measurement of the iron absorption in human beings from the different forms/types of beans they have consumed which had intrinsic labels depicted different proportions of the total iron as ferritin iron. However, at present the weight of the evidence suggests that iron speciation in beans is relatively unimportant as iron appears to be readily and completely released from ferritin by cooking and digestion and, in the same way as non-ferritin iron. Ferritin iron after its release would be expected to bind to PA in the gastric juice forming insoluble, non-bioavailable complexes (Petry, 2015).

➤ ***Iron Biofortification in Beans***

The HarvestPlus bean fortification initiative was established with a goal of selective plant breeding strategies to produce different varieties of beans with an approximate value of about 80% more than the usual amount of iron found in conventional beans. Thus, from this epistemology I am able to understand that an increase in the amount of iron absorbed in the beans will lead to an increase in the fulfilling of the daily iron needs in the vulnerable populations who actually consume beans in order to get their daily intake of iron and calories.

➤ ***Humans have impacted beans too.***

Several ideologies gave rise to approaches which helped in increasing the yield of high iron rich beans. Blair (2010) developed a backcross breeding technique wherein a high quotient of iron was made available in the beans. This process included a recurrent selection and various permutations of gamete selection. This new bean hybridising technique was derived from the method of backcrossing a wild species of bean which had a high iron content within it into a commonly cultivated bean which had a regular iron concentration within it. One such example of this was by crossing the commonly cultivated red mottled bean from Africa with the Central America, tinted brownish-black seeded rich in iron bean. Central America was the test grounds for understanding the agronomic performances.

However I would argue that the proportion of zinc and iron concentrations depend prominently on the cultivation site, thus there could be a possibility that the zinc and iron concentration in the red mottled parent bean could be more. The cultivation site is a product of the environmental changes, especially during the breeding process. This to some extent also draws in the discourse of season. For instance in Rwanda, high iron genotypes (beans) will absorb more iron than low iron genotypes (beans) when grown in the same location (agro-ecological zones - low, mild and high altitude) across the same season.

➤ ***BEANing the House Down!!***

Another method undertaken by Blair and his colleagues was the interspecific crosses to boost the iron concentration in beans with *P dumosus* and *P coccineus* (Blair, 2010). Interspecific crosses were not only considered promising but were deemed as being a step forward towards the increase in the inheritance of the iron concentration found in beans. This was seen in the case of the mesoamerican beans which initially proved to be the most challenging as they lacked the ability to increase the iron concentration within them, but through the approach of interspecific crosses, the iron levels were increased to approximately double the initial amount. Thus in the case of biofortification, these findings are extremely vital because of the

genetically precise information they provide about the high marker-assisted selection of iron rich beans as well as the targeted traits possible.

Through my research I was able to draw on the fact that alternative breeding is an agronomic biofortification of mineral fertilizers applied to leaves and soils. Thus the biofortification through the fertilization of soil has helped increase the iron concentration in the cereals (beans). However, the downside of this fertilization tactic is that it proves to be more expensive as well as it poses a risk of increasing the mineral content in the soil which could thus pose the threat of leaching.

❖ **FINDINGS**

➤ ***Iron is PAYing the Price!!***

Based on a recent survey that helped determine the prices of beans, I was able to analyse the correlation between the iron intake present in cooked or canned beans and their price. This to some level throws light on the discourse of the first goal of Millennium Development Goals (MDG's) which spoke about calorie count required for an individual per day within one dollar. It is important to note that in my analysis, I will be looking at the calorie count required for an individual in terms of the Indian Rupee and not the standardised US Dollar.

➤ ***Iron comes with a PRICE tag!!***

For the longest time I have always wondered whether the bean really lives up to its label: 'peasant's food' in the pricing sector. In order to understand this better, I stumbled on some existing research papers (Zanovec, 2011) that showed the data obtained from 25 full-service supermarkets in Maharashtra. Some supermarkets were located in the city, some in the central suburbs while others were located in the outskirts of the peripheral suburbs. This study was carried out during the first two weeks of the month of April 2018. The study showed that these stores were chosen by means of an online search engine Google wherein a supermarket in so and so locality was typed in. From the stores the prices of the dry packaged and canned beans like white, Navy, Garbanzo (chickpea), black-eyed beans, Lima, kidney, Pinto beans were looked at and noted and are also represented in Figure 3.2. In the case of the dry packaged beans, the lowest priced beans were found to be those that were sold per kg or in the local language: 'sold loose'. On the other hand in the case of the canned beans, the analogy of 'size matters' could be taken into consideration as the economical value of a can of beans was sort solely on the size of the can. This showed that the canned beans shared a direct relationship with the price for which it was sold for. Apart from this factor, the prices of the canned beans also were based on the 'brand' or company manufacturing the beans (Zanovec, 2011).

Bean type	Black		Black-eyed Peas		Garbanzo		Kidney		Lima		Navy		Pinto		White										
	Can/	Drnd	Can/	Drnd	Can/	Drnd	Can/	Drnd	Can/	Drnd	Can/	Drnd	Can/	Drnd	Can/	Drnd									
(kcal/100g)	130	91	140	116	77	116	164	119	164	127	84	127	115	79	115	140	113	140	143	86	143	139	114	139	
%DV																									
Protein (g)	16.4	12.1	16.5	15.5	9.5	15.5	17.7	9.9	17.7	17.3	31.0	4.4	15.6	9.9	15.6	16.5	15.1	16.5	18.0	9.7	18.0	19.5	14.5	19.5	
Fiber (g)	21.2	27.6	42.0	26.0	13.2	18.1	30.4	17.6	24.8	25.6	62.1	2.2	28.0	19.2	28.0	42.0	20.4	42.0	36.0	18.4	36.0	25.2	19.2	25.2	
Vitamin A (IU)	0.0	0.1	0.0	0.3	0.3	0.3	0.5	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vitamin C (mg)	0.0	4.5	1.5	0.7	4.5	0.7	2.2	6.3	2.2	2.0	2.0	2.0	0.0	0.0	0.0	1.5	1.2	1.5	1.3	1.5	1.3	0.0	0.0	0.0	0.0
Vitamin E (mg AT)	4.4	0.1	0.1	1.4	1.4	1.4	1.8	1.8	1.8	0.2	0.1	0.2	0.9	0.9	0.9	0.1	3.9	0.1	4.7	2.9	4.7	4.7	4.0	4.7	
Calcium (mg)	5.5	3.5	6.9	2.4	2.0	2.4	4.9	3.2	4.9	3.5	3.4	3.5	1.7	2.1	1.7	6.9	4.7	6.9	4.6	4.3	4.6	9.0	7.3	9.0	
Iron (mg)	15.8	10.6	13.1	13.9	5.4	13.9	16.1	7.5	16.1	12.3	6.5	12.3	13.3	10.1	13.3	13.1	11.0	13.1	11.6	8.1	11.6	20.6	16.6	20.6	
Potassium (mg)	12.4	8.8	11.1	7.9	4.9	7.9	8.3	4.9	8.3	11.6	6.8	11.6	14.5	6.3	14.5	11.1	8.2	11.1	12.5	6.9	12.5	16.0	13.0	16.0	
Magnesium (mg)	12.3	8.8	13.3	13.3	7.0	13.3	12.0	7.3	12.0	10.5	6.8	10.5	10.8	9.8	10.8	13.3	11.8	13.3	12.5	6.8	12.5	15.8	12.8	15.8	
NR9	7.5	19.27	8.28	7.7	9.5	7.04	6.3	6.5	5.0	5.98	7.2	6.7	8.1	19.8	8.19	8.2	8.7	8.2	7.8	6.7	7.8	8.5	5.1	8.85	
SFA (g)	0.4	0.4	0.5	0.7	0.7	0.7	1.3	0.6	1.3	0.4	0.7	0.4	0.4	0.2	0.4	0.5	0.6	0.5	0.7	0.8	0.7	0.5	0.4	0.5	
Total sugars (g)	0.3	0.3	0.3	2.6	0.3	0.3	3.8	0.4	0.4	0.3	1.5	0.7	2.3	0.6	0.6	0.3	0.2	0.3	0.3	0.2	0.3	0.3	0.2	0.4	
Sodium (mg)	0.1	16.0	16.0	0.2	12.5	10.0	0.3	12.5	5.9	0.0	12.3	9.9	0.1	14.0	9.2	0.0	18.7	16.0	0.0	12.3	6.6	0.3	0.2	12.8	
LIM	0.2	16.11	4.01	1.0	0.5	3.17	1.1	13.75	1.54	0.1	75.76	2.88	0.8	36.23	2.96	0.1	95.74	4.01	0.2	35.14	1.77	0.2	30.24	3.28	
NRF9.3 (per 100g)	9.5	2.9	6.0	7.9	0.8	4.5	8.6	2.1	7.3	9.0	1.5	5.6	8.5	1.5	6.0	11.3	1.9	6.0	10.9	2.1	8.7	12.0	9.4	7.7	
NRF9.3 (per 100kcal)	7.3	3.2	4.3	6.8	1.1	3.9	5.2	1.7	4.4	7.1	1.8	4.4	7.4	2.0	5.2	8.1	1.7	4.3	7.6	2.4	6.1	8.6	8.3	5.6	
NTCR ⁴	65.3	31.0	3.14	62.8	3.5	12.2	41.3	5.5	14.0	61.3	5.4	13.1	55.6	4.9	13.1	71.6	6.0	15.1	74.2	8.5	21.2	75.1	27.7	18.7	

Fig. 3.2: bean types and their forms in relation to their iron and nutrient content. (*Ckd* = *cooked*; *Can* = *canned*; *Can/Drnd* = *canned/drained*) (Zanovec, 2011)

In some supermarkets, buying in bulk could avail of discounts on the sum total (retail value). While in other supermarkets, ‘the buy one get one scheme’ on canned beans of a particular brand seemed irresistible for the shoppers.

However, this study was drawn on the basis of the actual retail prices of the beans across all 25 grocery stores (that is the selling price of the dry packaged beans as well as the canned beans without the discounted rate).

The iron content composition content was analysed using two key sources:

1. The USDA National Iron and Nutrient Database for Standard Reference and
2. Centro Internacional de Agricultura Tropical (CIAT) (Zanovec, 2011)

These data bases are uploaded every four years and thus are the main sources of knowledge for the dietary intake to be consumed by people on an everyday basis.

➤ ***“Soiled but a rising Phoenix” replied Mr. Bean to Mr. Price***

From reading different scientifically spelled out papers, I was given to understand that the canned iron concentration is accessible through the consumption of liquids and solids. This understanding makes a direct comparison in terms of the iron concentration available in the canned beans and dry beans impossible as the liquid content in canned beans is infused or rather diluted with iron rich concentrations. The FAO (Thompson, 2012) has argued that iron concentration derived from canned beans after draining, allows for a more comparable comparison compared to cooked beans. At the same time it also provides an opportunity to examine differences in iron content and iron density between canned beans with solids and liquids and canned beans after draining (Petry, 2015). Depending on the form and type of the bean, in a database, an Fe content per 100 grams was calculated. In the case of the dried beans, that is, the edible beans derived after the cooking process in water without any salt or oil/butter (fat), the iron content jotted down was for 100 grams. Similarly the iron content based on a serving of 100 grams was taken down into the database on the bases of the Fe analyses of canned/drained and canned beans (the edible portion). The price in the form of the Indian rupee for each of the items was averaged and then divided by 100 to draw on the average price per 100 grams of the ready-to-eat (cooked-edible) portion of the beans. The iron density available was defined by the amount of Fe present in per unit weight of food, in this case 100 grams. According to the Food and Agriculture Organisation (FAO), the Iron (Fe) Rich Food Index (FeRFI) can be calculated as the total sum of the percentage of the daily value (DV) of iron minus the total sum of the percentage of maximum daily value (DV) of iron plus the sum total of the daily values (DV) calculated per 100 kcal (capped at 100%). Through my readings, the knowledge provided from another similar themed research paper, showed that the Iron Rich Food Index could be supported by the algorithm provided by the Food and Drug Administration (FDA) (in terms of an edible proportion per 100 grams) in figure.3.3. The algorithm provided is as follows: $FeRFI = [(\%DV \text{ protein} + \%DV \text{ fibre} + \%DV \text{ vitamin A} + \%DV \text{ vitamin C} + \%DV \text{ vitamin E} + \%DV \text{ calcium} + \%DV \text{ magnesium} + \%DV \text{ iron} + \%DV \text{ potassium}) (\%DV \text{ saturated fatty acids} + \%DV \text{ sodium} + \%DV \text{ total sugars})] / 100 \text{ grams}$ (Papanikolaou, 2005)

%DV	Cooked			Canned			Canned/Drained		
	M	±	SD	M	±	SD	M	±	SD
Energy density (kcal/100 g)	6.71	±	0.80 [‡]	4.77	±	0.86*	6.78	±	0.8
Protein (g)	17.05	±	1.35 [‡]	11.38	±	2.26*	17.07	±	1.34
Fiber (g)	29.3	±	6.72 [†]	19.6	±	4.03*	30.21	±	8.77
Vitamin A (IU)	0.11	±	0.21	0.1	±	0.16	0.11	±	0.21
Vitamin C (mg)	0.96	±	0.91	2.5	±	2.34	1.15	±	0.84
Vitamin E (mg AT)	2.25	±	2.02	1.86	±	1.56	1.71	±	1.95
Calcium (mg)	4.81	±	2.38	3.81	±	1.69	4.99	±	2.49
Iron (mg)	14.59	±	2.87 [†]	9.38	±	3.47*	14.25	±	2.86
Potassium (mg)	11.79	±	2.77 [†]	7.48	±	2.62*	11.63	±	2.77
Magnesium (mg)	12.53	±	1.65 [‡]	8.84	±	2.37*	12.66	±	1.66
NR9	7.76	±	0.75	7.62	±	1.12	7.72	±	0.91
Saturated fat (g)	0.62	±	0.32	0.55	±	0.21	0.62	±	0.31
Total sugar (g)	1.27	±	1.44	0.46	±	0.43	0.41	±	0.16
Sodium (mg)	0.13	±	0.11 [‡]	12.3	±	5.39	10.81	±	3.87
LIM	0.5	±	0.41 [‡]	4.85	±	2.02*	2.95	±	0.91
NRF9.3 Mean Score	7.27	±	1.0 [‡]	2.77	±	2.30*	4.77	±	0.77
Nutrient-to-cost ratio	63.39	±	11.20 [‡]	8.96	±	7.88	15.17	±	3.13

Fig.3.3. The percentage of DV in cooked, canned and canned/drained beans (Zanovec, 2011).

In the equation the DV% was actually the percentage of the sum total of the amount of the ‘daily value’ contributed towards that particular iron index. The main purpose of this equation was to calculate the Iron intake -to- cost ratio (FeTCR). In order to understand the (FeTCR) in its true essence, a half cup serving from a one kilo packet of beans or a can of beans has to be used wherein 100 kcal of the portion has to be divided by the average price of the beans packet/can in terms of Indian rupees. Therefore to understand this better, the average cost in rupees for the cooked beans has to be divided by the number of half cup servings available within a one kilo packet of raw dried beans. Likewise, in the case of the canned beans, the average cost in rupees is derived by dividing it by the half cup servings possible from the quantity available in a can.

➤ *Statistics Know Best!*

The statistical analysis drawn from two of the research papers on beans depicted similar results. Thus since they seemed most legitimate, I determined my statistical analysis on them. Both these research papers made use of the Statistical Package for the Social Sciences version 18.0. I would argue that this tool of statistical analysis was used to draw out not only the weight, price, price per unit weight and per serving, iron content, energy content in kcal per 100 grams but also was able to determine the variance obtained while comparing the iron content, iron density and the iron-to-cost ratio between the canned, cooked as well as the drained canned beans.

As per the 2018 survey- the weight of the beans and food prices as purchased was Rupees 85 (average - differs based on the variety of the bean) for the packet of loose beans. While on the other hand, a can of cooked beans (preserved in iron rich solution) was purchased at Rupees 140 (average - differs based on the variety of the bean). However the average size of the packet of the beans (despite the difference in the

variety perceived in the beans), remained the same. That is a standard one kilo packet of raw dried beans of any variety. While in the case of the canned beans, the average weight of the can was approximately 15.75 oz (446.3 grams). Among the eight types of beans purchased, the most expensive was found to be the loose local variety of the lima beans at a whopping 250 rupees for the canned version and 115 rupees for the loose dried beans. While on the other hand, the least expensive beans were found to be the canned version of the navy beans which were sold at rupees 145 and the dried loose version of green vatana sold at rupees 55 per kg.

Analysing the information from the three tables drawn out in the surveys presents the data slightly different based on the stores from where the canned or dry beans have been purchased from. For instance in the first table the half cup serving of all types of beans (dried or canned), across all stores was observed to be approximately rupees 110 per serving. For a better interpretation, the costing of both, the canned and the dry raw uncooked beans when taken separately draws on a costing of rupees 60 for the packaged raw dried beans and rupees 100 for the tin canned beans (Thompson, 2012).

➤ ***“Where ‘em Iron at!”... whispered Price***

My analysis of the humble bean will be incomplete without understanding the discourse of the Fe content in the beans. To understand the Fe content better I would argue that it is important to look at the whole perspective. Therefore, I would propose, looking at the nutritional value will enhance the in-depth understanding of the Fe density present in the beans. Figure: 3.4 depicts the breakup of the nutritional value in the different forms of beans available per 100 grams. From the study, I was able to understand that Iron density in the cooked beans was more. This was mainly because they were preserved in an iron rich solution which automatically increased the percentage of iron found in them. This also contributed to one of the reasons why canned beans were more expensive. While on the other hand, in a comparison between canned beans and canned-drained beans; the canned-drained beans had a higher energy content. This meant that it had a higher energy density than canned as well as cooked (without sodium) beans (Zanovec, 2011).

Bean type	Black			Black-eyed Peas			Garbanzo			Kidney			Lima			Navy			Pinto			White		
	Can/			Can/			Can/			Can/			Can/			Can/			Can/					
	Ckd	Can	Drnd	Ckd	Can	Drnd	Ckd	Can	Drnd	Ckd	Can	Drnd	Ckd	Can	Drnd	Ckd	Can	Drnd	Ckd	Can	Drnd	Ckd	Can	Drnd
Nutrient																								
Energy (kcal)*	130	91	140	116	77	116	164	119	164	127	84	127	115	79	115	140	113	140	143	86	143	139	114	139
Protein (g)*	8.2	6.0	8.2	7.7	4.7	7.7	8.9	4.9	8.9	8.7	5.2	8.7	7.8	4.9	7.8	8.2	7.5	8.2	9.0	4.9	9.0	9.7	7.3	9.7
Total Fat (g)	0.4	0.3	0.6	0.5	0.6	0.5	2.6	1.14	2.59	0.50	0.60	0.5	0.38	0.17	0.38	0.62	0.43	0.62	0.65	0.81	0.65	0.35	0.29	0.35
Total Carbohydrate (g) [†]	24.4	16.6	26.1	20.8	13.6	20.8	27.4	22.6	27.4	22.8	14.5	22.8	20.9	14.9	20.9	26.1	20.5	26.1	26.2	15.3	26.2	25.1	21.2	25.1
Fiber (g) [†]	5.3	6.9	10.5	6.5	3.3	4.53	7.6	4.4	6.19	6.4	5.3	6.4	7.0	4.8	7.0	10.5	5.1	10.5	9.0	4.6	9.0	6.3	4.8	6.3
Total Sugars (g)	0.3	0.4	0.4	3.3	0.4	0.4	4.8	0.4	0.4	0.3	1.9	0.9	2.9	0.7	0.7	0.4	0.3	0.4	0.3	0.2	0.3	0.3	0.3	0.5
Calcium (mg)	55	35	69	24	20	24	49	32	49	35	34	35	17	21	17	69	47	69	46	43	46	90	73	90
Iron (mg) [†]	2.9	1.9	2.4	2.5	1.0	2.5	2.9	1.4	2.9	2.2	1.2	2.2	2.4	1.8	2.4	2.4	1.9	2.4	2.1	1.5	2.1	3.7	3.0	3.7
Magnesium (mg) [†]	49	35	53	53	28	53	48	29	48	42	27	42	43	39	43	53	47	53	50	27	50	63	51	63
Phosphorus (mg) [†]	152	108	144	156	70	156	168	90	168	138	90	138	111	74	111	144	134	144	147	92	147	113	91	113
Potassium (mg) [†]	433	308	389	278	172	278	291	172	291	405	237	405	508	220	508	389	288	389	436	243	436	561	454	561
Sodium (mg)*	3	384	385	4	299	240	7	299	141	1	296	237	2	336	221	0	448	385	1	294	159	6	5	308
Zinc (mg) [†]	0.76	0.54	1.03	1.29	0.70	1.29	1.53	1.06	1.53	1.00	0.46	1.00	0.95	0.65	0.95	1.03	0.77	1.03	0.98	0.69	0.98	1.38	1.12	1.38
Copper (mg) [†]	0.27	0.19	0.21	0.27	0.12	0.27	0.35	0.17	0.35	0.22	0.14	0.22	0.24	0.18	0.24	0.21	0.21	0.21	0.22	0.14	0.22	0.29	0.23	0.29
Vitamin C (mg)	0.0	2.7	0.9	0.4	2.7	0.4	1.3	3.8	1.3	1.2	1.2	1.2	0.0	0.0	0.0	0.9	0.7	0.9	0.8	0.9	0.8	0.0	0.0	0.0
Thiamin (mg) [†]	0.23	0.14	0.24	0.20	0.08	0.20	0.12	0.03	0.12	0.16	0.12	0.16	0.16	0.06	0.16	0.24	0.14	0.24	0.19	0.10	0.19	0.12	0.10	0.12
Riboflavin (mg)	0.06	0.12	0.07	0.06	0.07	0.06	0.06	0.03	0.06	0.06	0.05	0.06	0.06	0.03	0.06	0.07	0.06	0.07	0.06	0.06	0.06	0.05	0.04	0.05
Niacin (mg)	0.53	0.62	0.65	0.50	0.35	0.50	0.53	0.14	0.53	0.58	0.41	0.58	0.42	0.26	0.42	0.65	0.49	0.65	0.32	0.29	0.32	0.14	0.11	0.14
Pantothenic acid (mg)	0.26	0.18	0.27	0.41	0.19	0.41	0.29	0.30	0.29	0.22	0.14	0.22	0.42	0.26	0.42	0.27	0.17	0.27	0.21	0.14	0.21	0.23	0.19	0.23
Vitamin B-6 (mg)	0.08	0.06	0.14	0.10	0.05	0.10	0.14	0.47	0.14	0.12	0.07	0.12	0.16	0.09	0.16	0.14	0.10	0.14	0.23	0.07	0.23	0.09	0.08	0.09
Folate (DFE) [†]	86	61	140	208	51	208	172	67	172	130	36	130	83	50	83	140	62	140	172	60	172	81	65	81
Vitamin B-12 (mcg)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vitamin A (IU)	0	4	0	15	13	15	27	21	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vitamin D (IU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vitamin E (mg AT)	0.87	0.01	0.01	0.28	0.28	0.28	0.35	0.35	0.35	0.03	0.02	0.03	0.18	0.18	0.01	0.78	0.01	0.94	0.57	0.94	0.94	0.79	0.94	
SFA (g)	0.09	0.08	0.10	0.14	0.14	0.14	0.27	0.12	0.27	0.07	0.14	0.07	0.09	0.04	0.09	0.10	0.11	0.10	0.14	0.17	0.14	0.09	0.08	0.09
MUFA (g)	0.03	0.03	0.14	0.04	0.05	0.04	0.58	0.26	0.58	0.04	0.38	0.04	0.03	0.02	0.03	0.14	0.04	0.14	0.13	0.16	0.13	0.03	0.03	0.03

Fig.3.4: Break up of Nutritional value in the different form of beans (canned/drained) (Zanovec, 2011).

Figure.3.5 is a summary of the FeTCR between the raw package beans which were cooked and the canned beans. The cooked beans proved to be not only more iron rich but also more nutrient dense. While on the other hand, the drained canned beans which were soaked in a solution of brine not only had a lower iron density but also lacked the essential nutrient content compared to their counterparts, the dry packaged beans. Thus, fig.3.5 neatly put forth the fact that raw uncooked packaged beans when cooked had more iron content in them while at the same time were more reasonably priced while compared to drained canned beans.

Bean type	Black		Black-eyed Peas		Garbanzo		Kidney		Lima		Navy		Pinto		White	
Bean form	Cooked	Canned	Cooked	Canned	Cooked	Canned	Cooked	Canned	Cooked	Canned	Cooked	Canned	Cooked	Canned	Cooked	Canned
Price (\$)	1.341	1.070	1.298	1.108	1.523	1.113	1.387	1.168	1.589	1.396	1.358	0.990	1.235	1.006	1.376	1.044
Weight (oz)	16.00	15.38	16.00	15.44	16.00	16.90	16.00	15.96	16.00	15.19	16.00	15.67	16.00	15.84	16.00	15.38
Weight (g)	453.6	436.0	453.6	437.7	453.6	479.1	453.6	452.5	453.6	430.6	453.6	444.2	453.6	449.1	453.6	436.0
Price (per oz)	0.084	0.070	0.081	0.072	0.095	0.066	0.087	0.073	0.099	0.092	0.085	0.063	0.077	0.064	0.086	0.068
Price (per 100 g)	0.296	0.245	0.286	0.253	0.336	0.232	0.306	0.258	0.350	0.324	0.299	0.223	0.272	0.224	0.303	0.239
Price (per 100 kcal)	0.228	0.270	0.270	0.247	0.329	0.329	0.205	0.195	0.195	0.241	0.307	0.307	0.305	0.410	0.410	0.214
½ cup servings (per package or can)	12.0	3.5	12.0	3.5	12.0	3.5	12.0	3.5	12.0	3.5	12.0	3.5	12.0	3.5	12.0	3.5
Price per serving	0.112	0.306	0.108	0.317	0.127	0.318	0.116	0.334	0.132	0.399	0.113	0.283	0.103	0.287	0.115	0.298

Fig.3.5: Comparing the prices and the Fe intake of canned and cooked beans (Zanovec, 2011).

❖ DISCUSSION

This analysis of the beans was crucial as it played an important role in understanding the fact that despite the availability of beans in cans or in packets, the iron concentration within them was still an essential aspect of a diet. Although beans are one of the most cultivated, produced and consumed foods all over the world, they are particularly popular in Latin America, Asia and Africa. For most people, especially those who live in these areas, beans are extremely fundamental in their lifestyles. This is because for them, beans are a major source of protein i.e. a major source of energy (Goenka, 2017). It is important to note that the flip side portrays the protein concentration available in beans does not fulfill the essence of providing all the necessary amino acids, like meat. However, at the same time, in light of a vegetarian or Vegan substitute, beans is the only (vegetarian-cereal) substitute that can be compared to meat as it proves to be the best source of iron. While at the same time it is not only fat-free but it is also less expensive and digestion friendly compared to meat.

Despite the fact that beans are cultivated all over the world, in December 2017, it was recorded that beans are not appreciated and have a low rate of consumers flocking to purchase them and include them in their daily diets (Goenka, 2017). This could be owed to the economic discourse which has stepped in, hampering the lifestyles of people. The working population is challenged with the norms of ‘productivity’ to the extent that they rely either on ready to eat meals or fast food. The reason for this is not only the strong economic capital they have in their favour but also the way in which they have been impacted by the commercialization industries. Another factor which has played an important role is the anxiety factor.

Beardsworth (2010) has argued that food anxiety is a fear that people have of their food choices being judged, which has led them to operationalizing the take-out option or the internet facility of online (one day) delivery, thus 'technologising' food.

This thus sheds light on the notion that food choices are not only determined by available, cost and taste but also by convenience, comfort and to some extent the amount of preparation time required. For instance studies have shown that dried beans need to be soaked in water for sometime not only for them to grow tender in consistency due to the hydration process but also for them to grow triple in size before the actual one to one and half hour cooking procedure. While on the flip side, this is not the same in the case of canned beans as they are already hydrated and precooked.

➤ ***Hu(man) BEAN mentality!***

Drawing from research papers (Swalin, 2015) (Sifferlin, 2014), the most prominent fact that my analysis drew upon was that women regardless of their relationship status (i.e. single or married) spent most of their average time cooking compared to men. According to Ann Cooper (2008), this could be owed to the fact that in India, a woman is supposed to constantly prepare fresh food I.e. to prepare a separate meal for breakfast, lunch and dinner. Therefore the average time a non working woman spends in the kitchen ranges between 2 hours to 3 and a half hours per day. While in contrary, a full time working woman spends 40 to 45 minutes to cook food for the whole day (Sifferlin, 2014) (Cooper, 2008). This throws light on the vitality of preparation time in the cooking process, thus making it a major concern (Goenka, 2017).

Canned beans, in most cases are used as an easy (ready to use) ingredient be it in the form of an ingredient to be added to a curry/soup or an ingredient that poses to be a ready to eat meal in the form of baked beans. Baked beans, an easily available beans preparation in a rich tomato sauce is not only relished as a breakfast staple but is also mixed in spaghetti/pasta to prepare a wholesome meal, that a working mother deems fit to provide for her kids.

➤ ***Let's talk about BEANS!!***

Surveys have uncovered the fact that the consumption of canned beans accounts for a total of 65% due to its accessibility, availability as well as low preparation time required. Research reveals the phenomenon of iron density is a vital topic as several techniques have been proposed to increase the iron intake within beans. However the downside to the formation of these techniques is that key factors such as food pricing, food preference, diet costs, etc are not taken into consideration. Drewnowski (2008) added that initially beans along with seeds and nuts were ranked as being iron rich as well as portrayed an economical front.

The study concluded by shedding light on the fact that the iron concentration found in dry raw packaged beans was more than that which was found in drained canned beans. This difference was found to be strong because of the sodium levels present in the canned beans even after draining, thus, portraying the fact that sodium to some extent kills the iron (Fe) index within beans.

Sodium acts as a necessary preservative to increase the shelf life of a can of beans. An increased sodium intake is a vantage point that leads to Health conditions, high blood pressure, strokes, etc. Therefore the only solution to refuse the sodium content in the canned beans without actually cutting down their shelf life was by rinsing the drained beans. Thus nutritionists like Ishi Khosla, Shikha Sharma, Dr. A. Laxmaiah, etc preach this practice of draining the sodium rich solution from the canned beans and then rinsing it (Goenka, 2017). This not only washes off the sodium content but at the same time it subtly helps to increase the iron concentration within the beans.

The Food and Agriculture Organisation (FAO) has defined healthy food as those food commodities that are rich in iron (Fe), fibres, vitamin A, C or calcium while simultaneously being low in sodium, fat, cholesterol and SFA. Therefore iron profiling is a fundamental tool for both dietary guidance as well as nutritional education. This is the reason why many consumers flock to seek the advice of dieticians or nutritionists regarding foods which are economical while at the same time have a rich iron density. Healthy professionals are found to have provided solutions to some extent by helping individuals learn how to make use off and prepare dried beans. But in case wherein the economic discourse is strong and productivity is the main goal, professionals tend to encourage the use of canned beans to increase the iron intake in ones diet.

➤ ***Eating Beans not BEINGS!***

In retrospectively this research had many restrictions which have hampered the final result. I would first critique it through the pricing lens. The prices found in the study were derived from 25 supermarkets within the metropolitan city and some were scattered across in the peripheral suburbs. However it is important to note that not all individuals patronize the supermarket as a potential place for buying groceries. This study ignored and excluded a whole section of individuals who generally make their purchases of beans from the small local retail shops (dukan's) because of the trust relationship based on dependence they share with their vendor. This study regarding the pricing also fails to recognise the fact that supermarkets usually tend to provide a standardized price yearly without any price fluctuations compared to smaller retail shops (Swalin, 2015).

Another limitation this study sheds light on is that when the study focuses on the iron (Fe) density in the bean it excludes the larger picture of the overall nutrition density of the humble bean. It therefore fails to take into consideration any 'nutrient scoring methodologies, like especially the Nutrient Rich Foods Index (NRF 9.3).

➤ ***It's all about the BEAN!!***

Finally, an overall analysis derived from the study was that cooked beans offered a higher amount of iron density at a more economical cost compared to canned beans. While simultaneously these results also indicated that canned beans are iron rich provided they are drained and rinsed off their brine solution.

In conclusion, I would argue that like in the book 'Jack and the Beanstalk', all beans have a powerful dynamic paradigm that shows signs of fulfilment and growth of the human body. All beans regardless of their form or type are iron rich and contribute in a special way in achieving the most fundamental balanced healthy diet.

➤ ***Reflection: Going beyond the surface level.***

• ***Negligence towards the farmer***

In the entire discourse of drawing the comparison between the iron content found in raw/canned beans and their pricing, we failed to acknowledge a major issue. We failed to look or recognise the farmer as a human being responsible for the production of the bean crops. We begin to perceive the farmer as being outside the narrative and existing at the very ends of the peripheral.

Through this discourse, we are in Foucault's terms 'normalised' into seeing the farmer only as an individual who strives towards sustaining himself and his family, rather than a discourse that could allow a farmer to earn profits (as a business oriented discourse). Due to this prevalent philosophy, farmers are often trapped in the viscous cycle of poverty mainly because of the fact that farmers are expected to cultivate an iron (Fe) rich bean crop on a fragmented scattered piece of land while simultaneously being indebted to moneylenders who helped them produce these high iron yielding seeds. The sad trajectory of the farmer is that even if he is able to churn out a profit, the money is invested again by the farmer to buy back the same piece of land from the land lords.

At the time of natural calamity like a drought or a failure in the monsoons, etc; which leads to crop failure (in this case failure in the bean crop), despite the fact that there are some schemes made available to

the farmer to wave off a part of their losses, the farmers still continue to be exploited at the hands of the moneylenders and landlords. For instance, the government waves off the loans of the farmers (landlords) with a large portion of land. They fail to acknowledge the fact that the poor farmers rent out smaller scattered patches of land from the larger land owners for bean production. Thus in Durkheim's words, this hindrance in the lives of the bean producing farmers leads to farmer suicide.

❖ EVALUATION

*Can the **Bean** be used as a tool?*

➤ *Global fight for food security*

An abandonment of cash crops like gherkins, quinoa, dragon fruit, etc. now would perhaps not be an option. However, I would put forth the argument that pulses are going to be crucial to our global fight for food security, particularly in the face of climate change.

In a world where 892 million people are malnourished and famished, pulses - the edible seeds of plants in the legume family such as beans - offer an extraordinary source of nutrition. Although lentils are among the least expensive/costly protein-rich foods to buy (especially the raw dried beans), they are also high in iron and zinc, while being low in fat (Solh, 2016).

Beans are one of the most environmentally friendly crops to be grown. They require very little water compared with rice and wheat, and consume up to 25 times less water than animals raised for meat, thus they even help in maintaining the carbon footprint.

Given that global water demand is likely to increase more than 45 percent by 2030, less water-intensive food solutions are going to be vital. This is similar in the case of trying to reduce the carbon footprint.

Pulse crops also have the special ability to absorb nitrogen from the air, and fix it to the soil through their roots. Since nitrogen is essential for healthy plant growth, beans constantly nourish themselves as well as the soil in which other crops grow (Solh, 2016).

➤ ***Funding and Investing in pulse crop research***

As an undergraduate student, without funding or the backing of an 'influential institution', it will not be possible for me to per say ask the food industry for funds or ask them to improve the use of beans, unless we can ensure their reliable supply.

International Centre for Agricultural Research in the Dry Areas (ICARDA) scientists, are helping farmers see good bean harvests once more (Solh, 2016). For example, in West Bengal, new lentil varieties have been released. These varieties of lentils have the capacity to germinate and mature in a short span. They have the potential to grow between one and a half to two rice-growing seasons (Solh, 2016). This will make 11 million rice-growing hectares more productive than before, and could thereby help in reducing South Asia's (India's) dependence on foreign imports for this key crop. This would thus play a major role in boosting the prosperity in the region (Solh, 2016).

Beans may be a small part of the puzzle now, but with the right investment and funding, they can become a huge phenomenon in bringing about change (Solh, 2016).

➤ ***Fair Trade: A Possible Solution.***

Using the growing popularity in the vegan discourse, the bean farmers could benefit from the fair trade policy at least in the urban settings. Usually, the gaze towards farmers has always been a rather inhuman one, as we perceive him/her as not having a life apart from farming. This is the general attitude towards them. Farmers are unable to make huge profits, especially in India either because they have scattered fragmented land and thus lose a lot of money on tax payment to the landlords as well when there is a calamity, the loans given by the banks don't get waved off of them as they still are indebted to the landlords and moneylenders. Thus, through their lens, banks are only for the rich.

However, today there is a growing sensitisation and farmers are cashing in on the concept of guilt, to earn a small profit. This strategy was devised under fair-trade. Fair-trade can be termed as neoliberal because consumers are rich enough to consume beans but vogue enough to think about the farmers. This is based initially on social justice and environmental sustainable movement (Murray, 2006).

Fair-trade was set up to ensure that bean farmers receive a fair and stable price for their coffee that covers their costs of production. Fair-trade assures farmers the stability and confidence to budget for next farming season and household expenses and drive development in their communities.

Drawing from *Fair-trade Canada* (2019), Fair-trade Premium is a valuable additional source of income that allows farmer organizations to reinvest in improving infrastructure, services to farmers such as training on better farming practices or credit and financial services, but also to support cash payments to farmer members who are struggling with food security or other basic needs (Murray, 2006). Fair-trade Standards are designed to deliver against all three pillars of sustainability – economic, social and environmental.

Beyond the Fair-trade Minimum Price and the Fair-trade Premium, Fair-trade provides essential training and support to farmer organizations to help them thrive. One of the main focus areas is to train farmers on how to better adapt to a changing climate and weather conditions. Eg: legume farmers in Peru share the lessons with other farmers as they adapt to climate change. Despite this, keeping the next generation engaged in the bean sector is one of the challenges facing the industry (Murray, 2006).

➤ ***Fiscal Intervention: A possible solution***

Today, due to the exoticising of beans as an important ingredient of the vegan diet, the once considered poor man's food has today transformed into a status marker of the rich elite. This growing diet fad has resulted in the prices of food (beans) to go sky rocketing. The poor man now finds it difficult to buy these 'exoticised beans'. They are now not able to seek their nourishment for a day and thus without fuelling their engines they have to go hungry to work or to sleep.

I would argue that at this time, fiscal interventions can prove as a possible solution to provide food security for the poor in India. This can be done by taxing the beans got from elitist super markets like Natures Basket, Waitrose, etc. as this is the best way to distinguish the rich (upper middle class) from the middleclass. *This tax could be in the form of GST with Cess directed towards food security for the poor.* Through a post modernistic gaze, this will then ensure that the poor will not be left out of the narrative and thus to some extent transform the 'NEED FOR FOOD' to the 'RIGHT TO FOOD'.

CHAPTER FOUR

CONCLUSION

➤ *BEAN. BIN. BEEN.*

“Food tells you a lot about people. It is known and recognised to be the only language which is not only universal but also has the ‘power’ to bring the world together, irrespective of one’s colour, race, caste culture, etc”. “Where there is food, there are people and people will get together and eat”. - Guy Fieri (Rodhouse, 1990)

Primitive societies derived their integral need of food through the noble action of our predecessors, in the form of food scavenging. Today we have moved away from scavenging and adopted a more systematised process to obtain our food. Recent studies (Goenka, 2017) (Solh, 2016) (Swalin, 2015) have proved that aquaculture seems to be a rather resourceful way of sourcing protein rich food, but that is no reason to conclude that there has been a shift away from land-based agriculture of crops and livestock, in the case of human food consumption.

Food is classified as one of the basic needs of the human body. Nutritious and iron rich food guarantees a healthy diet throughout ones growth phases (infancy, childhood, adolescence and adulthood). Food is of prime importance in the accomplishment as well as fulfilment of the bodily functions. Thus, in this case, a nutritious food such as beans will cease to never be neglected in the prevention of disease and promotion of good health.

For instance, a study in the Canadian Medical Journal (Goenka, 2017) found that eating one healthy serving of beans or legumes daily would reduce a person’s LDL levels by 4.63% and simultaneously it would reduce a person’s chances of developing cardiovascular disease by 7 to 8%. Apart from this, another ancient Chinese study (Bauer, 1995) proved that a greater intake of B6 in ones diet gave rise to a lower count of deaths in men and women, especially deaths caused due to heart failures or cardiovascular events. (Swalin, 2015).

To understand this better, an analogy drawing in the a comparison between a human body and a complex machine can be used; just as the engine of a machine charges up by burning up coal or oil in order to create its energy, similarly, using the same notion, it is vital to shed light on the fact that the human body requires food in order to produce the forces which keep the blood pumping, the oxygen flowing and the

body functioning. However, it was only at the turn of the present century that the essence of the novel discovery of Fe and nutrients, that embarked on the 'rediscovery' of the science of nutrition.

Since then noteworthy advances have been pursued in the field of nutrition. Research (Papanikolaou, 2005) has shown that slowly and steadily India is cashing in on the nuances made in the genre of nutrition, especially in the case of the modification of the course of almost any clinical disorder (Hatch, 2012). Through a medical scientific discourse, investigations are still being actively carried out as a connection had been made in the field of mental retardation and mal-nutrition (Thompson, 2012). While on the flip side, in the Global North, the nutritional problems vary differently as there is an increased rate of over nutrition triumphing.

The jeopardy caused by over nutrition is at the peak in mortality. One of the most crucial influencing factors is the consumption of raw beans. The cases of raw bean consumption were mainly recorded in the western countries and were perceived predominantly among children in kindergarten. This is because in these play schools, the children were kindled with the skill of counting numbers through the tool of the humble bean. Since children at that age have a knack of putting everything into their mouth, they did the same with the beans (Rodhouse, 1990). Teachers never saw this as alarming because they were convinced about the iron rich nutritional content present in the beans and saw the consumption of the raw beans as a nutritional intake (Bell, 2013).

The terms 'nutrition' and 'food' are many a times used interchangeably. This is wrong synonymously. The word Food is encapsulated of a composite mixture of various substances, to form a balanced diet, wherein most of the times the quality of each ingredient varies in quantity- from a fraction of a gram in certain cases to hundreds of grams in other, hence the term "foodstuff" is defined as anything which can be used as food' (Gale, 2008). While on the flip side, nutrition indicates a mechanical process which marks nourishment of the human body.

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