Annual Edition'19

THE CONTRARIAN

THE DEPARTMENT OF ECONOMICS, JMC

FOOD AND ENVIRONMENT

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THE CONTRARIAN
ECONOMICS MAGAZINE

editor's note

> Behind this magazine is a team of highly motivated women, who hustled hard to help make our vision come to life.

SIMRAN GARG
EDITOR IN CHIEF

ARUNIMA SRIVASTAVA
DEPUTY EDITOR

A look at the definition of 'food' reveals that it is "any nutritious substance that people or animals eat or drink or that plants absorb in order to maintain life and growth." In today's time, however, food has increasingly started to become associated with savor, rather than subsistence, and this is where the entire debate of food versus environment stems from. Greta Thunberg, a 16 year old Swedish teenager, along with many other environmental ambassadors are making the world increasingly aware about the effects of their dietary choices on the environment.

India is currently suffering from a trend largely similar to a population explosion. With the soaring population levels, there is naturally a greater demand of food grains. This hike in demand has compelled farmers all around the nation to relentlessly use chemical fertilizers, pesticides and insecticides to increase their yields per hectares, consequently polluting soil and water. Several trade-offs such as these are present between food and environment and the task is to find a balance.

The discipline of Economics enables one to understand other aspects of food and environment such as malnourishment and even undernourishment that are caused by the relative paucity of food availability and consumption. The relation between non availability of food, health and environment degradation highlights the pertinence of the discipline in ensuring environment protection and food accessibility.

This edition of 'The Contrarian' aims to elaborate the aforementioned issues and hence establish a concrete link between food, governance and environment. Further, to substantiate our claim, we have also successfully collaborated with our learned alumnae, who, now working in various fields like research and public policy, are in a much better position to tell us what is being done, and what can be further improved in the field of 'sustainable farming'.

Collating articles, and giving a physical form to the magazine has been a very great experience, for the both of us, and has opened our eyes to issues which we never even thought about, such as the tradeoff between imported food and local produce, and how the choice might affect the environment. As the adage goes, "The most political act we do on a daily basis is to eat, as our actions affect farms, landscapes, and food businesses." This magazine has been puttogether to reflect the same.

Editor, The Contrarian

HEAD OF DEPARTMENT

Ms. Rajni Singh

The theme for this year is significant for all of us. The depletion of natural resources and threat of global warming is a big challenge before human race.

Today half of the food is wasted and half of the global population is starving. There is a serious distribution problem. Finding early solution to these challenges is imperative for all of us. However, human race has survived bigger challenges and a collective effort in this direction shall help us overcome these challenges also.

This edition of Contrarian also has contributions from our alumnae. We have also initiated the process of highlighting our alumnae's achievements. The achievements of our alumae are a source of immense pride for us, and serve as a source of motivation for the current batch, as well as for the batches to follow.

Wishing you all the best.

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ALUMNAE ACHIEVERS

DEPARTMENT OF ECONOMICS, JMC

SR. MONICA JOSEPH

was the first Indian to have been elected as the Superior General of the Congregation of the Religious of Jesus and Mary, headquartered in Rome, in 2013. She has also served as the Principal with the St. Joseph's High School in Pashan.

DR. DIVYA MISRA

is currently an associate professor of economics at Lady Shri Ram College. Her key areas of work include the fields of development political economics . Some of her works include a paper by her on the topic 'Impact of public expenditure on the relationship between income and well-being' and another one titled 'Human development inter-state dimensions'.

SUREKHA NAGPAL

graduated in the year 1999 and is currently working as a Transformation Leader with Genpact. She has traced a meteoric path in her corporate career and has set an example for those wishing to climb the corporate ladder.

ERA SAHNI

graduated in 2006. She has worked at Lehman Brothers, as a part of its Graduate Analyst class of 2008 and was handpicked by Lehman Brothers' former CEO to join their $450 million private equity fund that was started in 2009. Ms. Sahni has also evaluated new business opportunities for Disney's co-branded credit card business in Latin America and South East Asia. She is currently the Global Head of Channel Partnership, Workplace by Facebook.

DR. ALKA PANDE

completed her post-doctoral studies in critical art theory from Goldsmith College, University of London, in 2000. She is currently working as an Art Curator with the India Habitat Centre, New Delhi. She has also written many books and journals talking about the diversity of artforms in India., like her recent book, 'Body Sutra', which was released in April 2019 and has received widespread recognition since then.

DR. SHALINI SAKSENA

graduated in 1994 and then went on to complete her M.A and M.Phil. in economics from the DSE, followed by her PhD degree from JNU. At present, she is an associate professor at the Delhi College of Arts and Commerce. Her scholarly and erudite feats are a source of inspiration for all..

AMBIKA ANAND

graduated in 2001. Thereafter she acquired a Diploma Degree in Economics from Cardiff Business School. Briefly working for the NDTV television media company in 2002, she went on to work for the Department of Communication in International Labor Organization, Geneva. She is currently working as a Fashion consultant and TV anchor at NDTV HOP. Ms. Anand has several accolades to her name like hosting popular programs and shows.

PALLAK JAGGA

is a former President of the Department of Economics, JMC. She represented India at the SAARC Youth Conference held in Islamabad, Pakistan, in September 2010. Currently , she is working in Genpact as a Senior Manager in the department of Corporate Communications.

PRACHI CHHABRA

graduated in 2014. She is a former Vice President of 'Kahkasha' Street Theatre Society. She has produced two short films titled 'firaaq' and 'shabdh' and has won numerous laurels for both. Currently, she is the Assistant Brand Manager for ITC limited.

ISHA BARAK

graduated in 2015. She was a research associate in the Economics Department of the Alexis Society. She also worked as a trainee in the Advisory Department of PwC India. Pursuing her love for Economics further, she cleared the IES examination in 2018 with relative ease, and is currently an officer trainee.

RAGINI MADAN

graduated in 2007. Post her graduation, she pursued her masters from the University of Cambridge and UCL. She is currently working as an economist at Cambridge Economist in the UK energy Modelling Team..

VASUMANA PANT

graduated in 2012. Currently , she is serving in the coveted IAS cadre, after having secured an AIR of 35 in the UPSC examination. Recently , she has been promoted to the rank of assistant collector and project officer in Nandurbar, Maharashtra..

SHREYA BAJAJ

graduated in the year 2015. After this, she went on to pursue her masters in Economics from the prestigious Delhi School of Economics and cleared the IES examination in 2017. She is presently posted in the Economics Division, Ministry of Finance with the designation of Assistant Director. Not only this, she is even a part of Chief Economic Advisor's team and was closely involved in drafting the Economic Survey of the nation.She can well be regarded as a paragon for all students.

TAANYA KHANNA

graduated in 2015. She went on to pursue her Post Graduate Diploma in Management (Rural Management) from Institute of Rural Management, Anand. Ms. Khanna has interned at a plethora of government agencies like Niti Aayog and GCMMF (Amul) and Dharma Life, under the departments of agriculture, Frozen foods and Monitoring & Evaluation respectively. She is currently employed with Pidilite Industries ltd., an India based leading manufacturing company, as a Branch Manager.

ANUSHKA SIKKA

graduated in 2017. She is currently pursuing her Masters in Fashion Management from NIFT, Delhi. She has worked for Ernst and Young, one of the 'Big Four Firms' after getting in touch with the on campus placement program in her third year. She wishes to conduct regular reunions so as to have a strong touch point with the alumnae and the companies they are working for. She aspires for her fellow alumnae to impart their guidance to current undergraduates to help them shape their future.

NATASHA RAJ MEHTA

graduated in 2017. She is the perfect example of 'follow your passion to achieve success and be happy'. Ms. Mehta is currently pursuing education in film making from the prestigious Whistling Woods International institution in Mumbai. She acquired trained in the making of the movie, 'Baaghi 2'. For those who are apprehensive of changing disciplines in their formal education, Ms. Mehta is an inspiration..

MADIYA BANO

graduated in 2018. She is currently pursuing her higher studies , a Graduate Diploma in International Development, from the University of London which according to QS rankings- is one of the best universities in the world. She is an example for not just those who wish to go for higher studies, but also for those who are interested in world affairs..

PRIYANKA RAJPUT

graduated in 2017. She is a national level soccer player and has attended the Under-19 India camp. She has also played against the USA during the its team's tour of India, thereby marking JMC's territory in sports as well. Who said economists only study?

KEERATH BHANDAAL

graduated in 2017. She was a quarter finalist at the 2016 & 2017 World Snooker Championships. She also secured a Gold Medal at the 2018 Asian Snooker Championship.

ANJU KURIAN

graduated in 2017. Via the campus placement program, she got in touch with EVC Ventures. She worked there until she took to pursuing her masters in the discipline of economics, from IGNOU University, New Delhi. She has brought great pride to the college with her current achievement of working as an Account Development Consultant at EVC Ventures.

GAURIKA BISHNOI

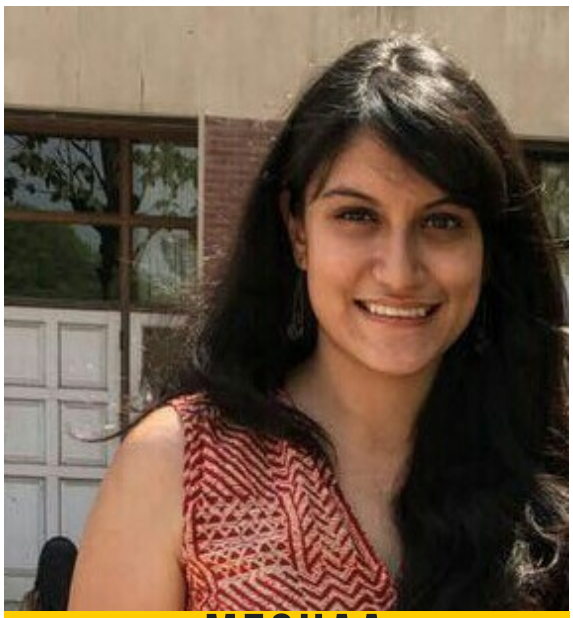
graduated in 2019. A golfer by profession, she has participated in a multitude of international competitions: 2016 World Amateur Golf Championship, Mexico., the Queen Sirikit Asia Pacific Women Amateur's Championship (3 consecutive years) . She has also been ranked number 1 Women's Professional Golfer- 2017.

HUMANS OF JMC

SUREKHA NAGPAL

Batch of 1996-99

The 3 years I spent at JMC went away in a jiffy. Wonder why those golden years had to come to an end. Can't compare the feeling and the experience of being in college to anything else in the world.Back in time I remember the anticipation and excitement of joining college overshadowed the fear of being ragged. Took some time to get used to seeing only girls on Campus and hearing screams of joy on spotting creatures from the opposite sex. Education was much richer than bookish knowledge. First had Experience in the DTC buses learning to deal with lecherous men, learning to scream back at them for their dirty looks and inappropriate moves. Attending other college events, going for dance parties. Experimenting with the new-found freedom, going to Discotheques in the day, Bunking classes and going to Chanakya to watch movies. Nirulas at Chanakya Puri was our hangout adda, needless to say the Onion Capsicum pizza and the Hot chocolate fudge were our favorites. Being frugal with our spends, we used to queue up to buy the Rs 7/- ticket of the front row at Priya Cinema.Travelling in the Youth special, playing dumb charades all along the way. Taking a hitch from the main road to the College. Each of those experiences are priceless and worth living all over again.I was elected the President of JMC Students Council with a huge margin in the 3rd year. It was just a crazy fancy that got into me and I saw no harm in giving it a try. The results were in my favor and I was hugely delighted at this feat. All the effort that i put in to give justice to my position was totally worth it and it gave me an unparalleled learning and a sense of achievement. For all of you out there make sure you live these moments and make the most of every single day. Make these years count as they will never come back.



MEGHAA GANGAHAR

Batch of 2014-17

"Jesus and Mary College provides a backdrop for some of the most memorable years of my life. Those were very crucial years in shaping the person that I am now. I'm certain that a fresh-faced first year version of me would have a hard time recognising the saree-clad version at the farewell, carrying a bucket-full of experiences. The multi-dimensional and interdisciplinary areas of study always fascinated me. After all, real-world problems have different aspects which are nestled in the overlap of the physical and social sciences. This led me to pursue a master's degree in economics at TERI School of Advanced Studies which focused on resource and environmental economics. Working on an individual thesis and defending my work in front of a panel proved to be one of the most challenging tasks I've ever gone through. During my time there I unlearned and learned many things. I now work as a Research Associate in the renewable energy sector at India Infrastructure Publishing. I have developed an interest in the field of energy, which my current job helps me to explore further."

ANTARA RAO

Batch of 2016-19

The three years I spent at JMC were the most wonderful and challenging years I have experienced. The college exposed me to a number of platforms like debating and poetry societies, along with giving me a serious class room environment which was nevertheless always encouraging towards independent growth. Most importantly, it helped undo years of work that the Male Gaze had performed on me, whether it was constantly worrying about body hair or a male presence that aligned females in competition with one another. Free from the shackles of a potential heterosexual association, a veil lifted and I dug deep into who I was as a person, beyond the gender performance with which I was supposed to identify. An incredible band of women, fuelled by their own journey towards being faithful to their honest experiences helped me achieve a new sense of self that was based in activities, ideas and conversations and not on my gender role.

SHWETA SHAJU

Batch of 2016-19

JMC had been a safe space for me; for me to grow both academically and personally. They say that school is the last place where you make genuine bonds, but I made some of my best friends here. The whole department had been very accepting with teachers and peers who felt like family. I remember how we used to break into these card games between our lectures and silly outdoor games which we used to play in the college lawn with as many people as we could gather, and how can one forget the fun department trips and the yearly Montage zest. The years that I have spent here are one of my best and I often look back at the good ole days and wish if I could relive those days. And a word of advice for the juniors, life after JMC wont be that easy! So make the most out of it.

ALUMNAE WRITE-UPS

HOW ARE FOOD AND ENVIRONMENT RELATED?

STELLA GEORGE

Batch of 2012-15

Are we killing the environment or is it killing us? When we look at what we eat and how we grow it, we find extensive evidence for damage both to our food (from pollution and soil depletion) and to our environment (from the toxicity of growing foods industrially).

How what we eat and grow impacts our planet?

It is well known that the impact of our food system on the natural world is complex. Many factors including farming method, where food is grown, what pesticides and fertilisers are used, what is fed to our livestock, and so on, contribute to the environmental impact of the food we buy and eat. For example, in the United States of America, there is demand for cheap food, so their agricultural policy for the past 30 years has focused on providing large amounts of inexpensive calories. Two of the cheapest sources of calories are corn and soy, which the federal government has long subsidized and which make up a large percentage of their caloric intake today(often in the form of high fructose corn syrup or soybean oil). Corn is also a large part of the diet of the animals that are eaten. Corn and soy are prized because they can be efficiently grown on vast farms. However, growing just one crop consistently (a monoculture) depletes the soil and forces farmers to use greater amounts of pesticides and fertilizers thus making it a vicious cycle..

Ways in which food grown can affect nature

1.One of the primary environmental concerns

with modern agriculture has to do with the chemicals put on crops and what happens when those crops end up in the watershed. Pesticides and other chemicals are often used to produce more crops, and these pesticides don't just fall on the crops and stay there.They are transported via wind and water and affect the surrounding ecosystems. Fertilizers are also used in agriculture and while they are a nutrient for some plants they end up in streams and lakes in amounts higher than would occur naturally. For example, currently, the dead zone in the Gulf of Mexico, where no fish or other animals can live, has grown to 8,543 square miles, the size of New Jersey. This is due to chemicals in the Mississippi River, particularly fertilizers, as it flows into the Gulf.

2. Agricultural practices are also known to take up a lot of land. Due to the finite amount of land on the planet, it poses as an environmental threat as forests, grasslands, and other ecosystems are converted into farmland. When we clear land for agriculture, the plant species that are native to the region are replaced with plants that aren't as effective in retaining the soil and its nutrients. Thus, the soil quality degrades over time. Besides this, it also causes flooding during heavy rainfall as the soil is not bound to the roots.

3.Another problem has to do with the amount of water some crops require. Agriculture consumes extensive amounts of water. It takes a tremendous amount of freshwater to grow crops and feed for other animals that we consume. Sometimes we use too much water and sometimes we try to grow plants in environments that aren't suited for them, using more water than we would if we had grown them in an environment more like what that crop would typically be found in. This may also be driven by the state. For example, in India, it has been observed that even though Minimum Support Prices (MSPs) [1] are currently announced for 23 crops, the most effective price support is for sugarcane, wheat and rice. This creates highly skewed incentive structures in favour of these water intensive crops. These thirsty crops are thus draining the country.

Therefore, the global food system, with different agricultural practices from choice of crops grown, area of land used for it, manufacture of fertilizers to food storage and packaging, is responsible for up to one-third of all human-caused greenhouse-gas emissions, according to the latest figures from the Consultative Group on International Agricultural Research (CGIAR), a partnership of 15 research centres around the world. Reducing agriculture's carbon footprint is thus central to limiting environmental degradation and effects of climate change.

How does the environment impact our food?

- Environmental Degradation and Climate Change

Environmental degradation caused and aggravated by pollution, over exploitation of natural resources etc. has been leading to severe, pervasive and irreversible changes for people, assets, economies and ecosystems around the world. Owing to the irresponsible actions of humans, there has been a rise in global temperature leading to climate change. Global sea levels are rising at an average rate of 3.4 millimetres per year, the Arctic sea ice volume reached record low in 2018, Antarctic ice sheet melting rate has accelerated threefold over the last five years, and exposure to natural hazards doubled in the last 40 years, affecting an increasing number of people.

- Impacts of Climate Change on Food Security across the World

Food security among others has been identified as one major and immediate implication of climate change. It has been estimated that by 2050, climate change could cause irrigated wheat yields in developing countries to drop by 13%, and irrigated rice could fall by 15%. In Africa, maize yields could drop by 10–20% over the same time frame. So, it is no secret that climate change-induced extreme weather conditions, temperature increase and sustained changes in climatic patterns have cast a shadow on the productivity of Indian agriculture thus leading to food insecurity.

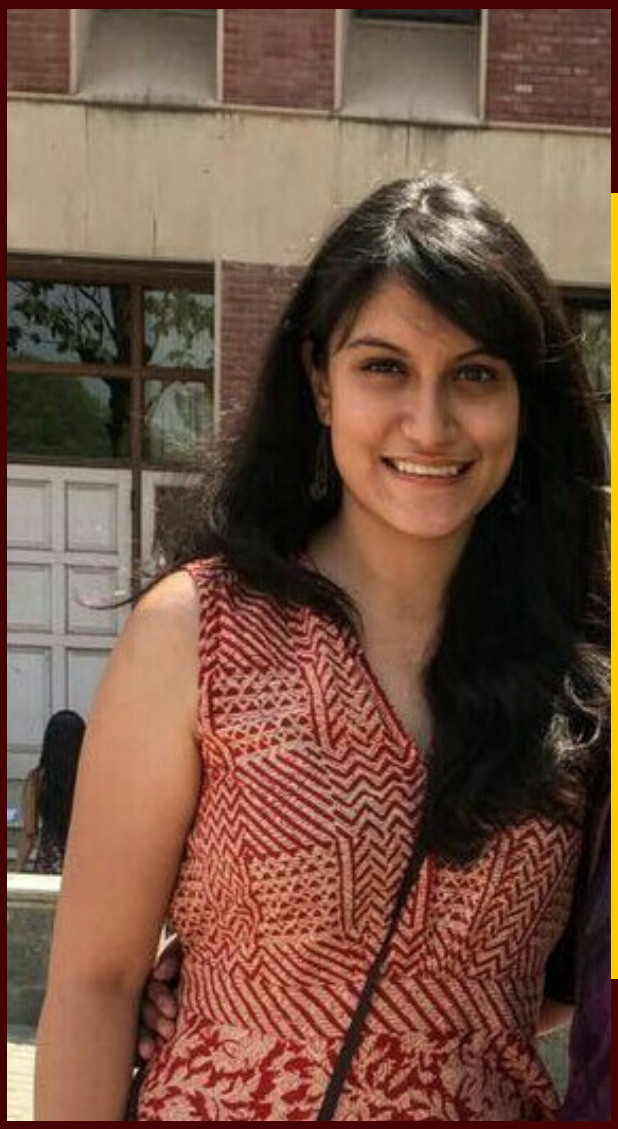
- Indian Scenario

India is one of the most vulnerable countries in the world when it comes to climate change. According to a report of the India Meteorological Department (IMD) in 2013, 18 states and two Union Territories have been observing a significant warming trend. According to estimates, India could witness a temperature rise of over 4°C by the last quarter of the century. The Intergovernmental Panel on Climate Change's (IPCC's) assessment report in 2014 says that both rice and wheat could see drops in yield by 7-10 per cent and in maize by up to 50 per cent by 2030. According to a study by the Agricultural Economics Research Review published in 2014, rice and wheat yields could witness declines of

over 15 and 20 per cent respectively by 2100. The need for adaptation to climatic exigencies has been starkly evident over the years. Recent studies reveal productivity losses of 4-6 per cent for rice; 6 per cent for wheat; 18 per cent This decline is only expected to continue. According to a report by the Parliamentary Standing Committee on Agriculture, losses due to climate change are to the tune of 4-9 per cent of the agricultural economy each year, which is an overall GDP loss of 1.5 per cent.National Innovations in Climate Resilient Agriculture (NICRA), is India's first but little known central government programme launched in 2010-11 to address the risk of climate change. The programme, run under the aegis of the Indian Council of Agricultural Research, covers 151 villages that are vulnerable to extreme weather. The objective is to provide site-specific technological demonstrations to enhance the adaptive capacity of farmers in "climatically vulnerable districts" of the country. According to officials from NICRA, about 24 interventions are being implemented to boost natural resource management, crop production, livestock and fisheries potential and farmers' financial safety nets. Though, this programme has its implementation challenges even after eight years of it being launched, it was necessary for the government to step-in and attempt to take charge of the havoc climate change was playing with agriculture.

Way Forward

There is thus a direct link between climate change, land-water management and food security more so in developing countries where climate change compounded with poverty has exacerbated the impacts. There is need for policy makers, communities and aid providers to incorporate evidence based technologies in food systems and knowledge.Policy makers must ensure that mitigation and adaptation measures must be effective, affordable and appropriate for environmental sustainability and development. Most studies conducted advocate for the integration of conventional agro-science based systems with traditional agricultural knowledge in order to mitigate the severity of climate change and its impact on food security and livelihoods sustainability. To adapt to climate change, we need crops that have greater resilience and don't need a lot of scarce natural resources. For example, millets can adapt to temperature changes, moisture-regimes and input conditions. According to the Food and Agriculture Organization (FAO) millets should be promoted as they increase soil fertility, consume less water and have a high nutritional value. Millet farmers do not burden the state, demanding irrigation or power, and that makes them the 'Future Smart Food'. Therefore, there need to be some big changes in the way the food system is governed. Departments in charge of health, agriculture, social security, the environment, trade and so on need to work together to meet many different goals, rather than pursuing different agendas. We need to be bold and creative, and truly work together to rethink food altogether. We should value its producers, and help them do things better for the natural world; we should value the food, and be mindful of where it comes from and what it does to our bodies; and we should value our food culture, sharing good food with the people around us.



BIOENERGY: FINDING A PLACE IN THE ENERGY-FOOD NEXUS

MEGHAA GANGAHAR

Batch of 2014-17

An environmentally sustainable and socially equitable path for economic development needs a multi-dimensional approach. To this end, the United Nations (UN) has established a set of sustainable development goals. Two of these goals specifically target eradication of hunger and provision of affordable and clean energy. These goals pertain to the energy-food nexus. In order to achieve these, the availability, accessibility and affordability of energy and food resources must be ensured. In essence, energy and food security is crucial.

On the energy front, fossil fuels have served as the primary source over the years. However, recent initiatives have started exploring different ways of meeting the energy requirements of society. These efforts have mostly come in response to the oil shocks which affected the world economy, as well as the rising concerns about the ill-impacts of fossil fuels on the environment and their depleting stock.

Energy and biomass

Bio-energy has emerged as a popular segment due to its appeal of being sourced from relatively cleaner and replenish able sources. While biomass can be used to produce heat and electricity, it can also be converted into fuels like methanol and ethanol. One of the fuel sources which has risen to prominence is biomass derived fuels – or biofuels. These are produced by using a variety of inputs such as wood residues, agricultural wastes, plant wastes, industrial wastes and municipal wastes.

Biofuels can be classified into generations based

on the biomass feedstock used to produce them. First-generation biofuels are derived from food sources such as sugarcane and corn starch. These are fermented to produce bioethanol and biomethanol, while biodiesel is produced from transesterification of oil. The second-generation fuels use non-food biomass sources which include perennial crops such as Jatropha and Cassava as well as agricultural and municipal waste. Given the limitations of first and second generation feedstocks, like affecting food security and land requirements, a third generation feedstock has been identified in microalgae, which does not depend on edible crops, does not emit high gaseous pollutant, and does not demand surplus fertile land.

In a step towards provision of energy security, a national policy on biofuels was announced in India in December 2009. The policy aims at utilizing indigenous non-feed stocks raised on degraded or waste lands, research and development on cultivation, processing and production of biofuels, as well as the blending of fuels with ethanol. It classifies the biofuels as basic biofuels (first generation) and advanced biofuels (second and third generation). For ethanol production, the scope of raw material was expanded and the use of surplus food grains was allowed in the 2018 update of the biofuel policy. The policy also encourages setting up of supply chain mechanisms for biodiesel production from non-edible oilseeds, used cooking oil, and short gestation crops.

Many countries have seen the adoption of biofuels over the years. On the demand side, these policies could help facilitate demand for biofuels through tax exemptions, mandates for incorporation into petroleum and user subsidies. The policies can also grease the supply side. Introducing blending and transformation subsidies can help bridge the cost difference between biofuels and petroleum, whereas agricultural subsidies can help boost production of biofuel crops used for feedstock. Other measures include financial support through accessible loans to entities in the biofuel supply chain to help in installation and infrastructure. Moreover, support in research development also facilitates the biofuel segment.

Effect on food and the environment

Biomass derived from cellulosic bioenergy crops is likely to be an important contributor in upcoming energy systems. Despite this potential, the land constraints limit the growth of bioenergy, especially when the multi-functional aspect of land is considered.

The same area of land is used to fulfil the need for food and timber as well as serve as sources of ecosystem services, especially in the case of forest lands.

In developing countries such as China and India, biofuel policies have led to concern regarding food crops and land used for food being traded off to grow biofuel feedstock. However, the degree to which promotion of biofuels compete with food production depends on various factors like choice of feedstock, the involved natural resources (especially land and water), efficiencies of different feedstocks and the processing technologies taken up. Biofuels link the food and energy markets. Through such linkages, price correlations also exist in some markets where the biofuel demand affected the food commodity prices.

Waste to energy

The concept of converting waste into energy can seem quite enamoring. However, this up-coming segment too has its disadvantages. India, along with many other regions faces a major waste problem and energy generation from waste has been proposed as a potential solution. The waste-to-energy plants currently in operation in India are either based on the thermal process of incineration or biochemical process of anaerobic digestion in the case of biogas. Incineration is a crude technology which is densely polluting, while biogas plants are facing major maintenance issues. More refined thermochemical processes are currently not technologically viable.

Way forward

The exponentially increasing populations and the consequent increase in production as well as consumption activities has led to a high requirement of food and energy. This in turn has put a pressure on the limited natural resources to support the anthropocentric demands. The issues related to food and energy security are a boon as well as a bane for the current society. The dynamics and tradeoffs at play in the context of sustainability prove to raise challenges on the supply and demand sides, as well as on micro and macro levels. The effect of bioenergy in terms of climate change mitigation remains ambiguous. Even though it can be less polluting than conventional fossil fuels, it can have adverse impacts on agricultural practices, food prices, and water resources.

Thus, integrated policies for energy, land use and water are required.

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UNDERNUTRITION, OBESITY, AND CLIMATE CHANGE: A TRI-ECONOMIC BURDEN

SANYA SRIVASTAVA
Batch of 2015-18

Malnutrition in all its forms, including obesity & undernutrition (and other nutritional risks), is the foremost source of global poor health. Traditionally, undernutrition, obesity, and climate change have been viewed as mutually exclusive concerns. However, in the close future, as climate change challenges continue to increase in severity by the day, the damage point will not only entail the environment but also global health, on which climate change has direct spill over effects.

The three challenges are positively correlated and are addressed as the "The Global Syndemic" – as it persists in most countries and shares fundamental socio-economic drivers. Global climate change is anticipated to hinder food security as it will affect crop yields negatively, thus potentially increasing the risk of malnutrition. Historically, the most widespread form of malnutrition has been undernutrition but in the past 40 years, the obesity pandemic has shifted the patterns of malnutrition from high-income countries to worldwide.

Globally, there are still 842 million people suffering from hunger and more than 180 million children affected by undernutrition. Between 2005 and 2009, investments in nutrition interventions by major donors accounted for only 1% of the need identified in the countries. It is expected that by year 2020, there would be 158 million obese children in the world, 206 million by 2025 and this figure would stretch to 254 million by 2030. Once considered a concern of high-income countries,

the problem of being overweight and obesity is increasing in low-income and middle-income countries due to some being heavily dependent on imported food supplies. The Democratic Republic of Congo, Vietnam and Tanzania are expected to reach a figure of 2 million obese children each by 2030. The steep increase in children affected by obesity is largely led by emergent economies – in South East Asia, Middle East and Latin America. Obesity is a huge contributing factor for three of the four leading causes of non-communicable diseases (NCDs) worldwide.

With a +2°C global average temperature increase, the projected warming scenario is that the rate of undernourishment in the lower strata of the population will increase by 25-90% by 2050, relative to the levels today. The paradoxical outcome of this is that maximum suffering and economic damages, which will be caused by climate change, are completely directed towards the world's poorest households who ironically, are negligible contributors to the greenhouse gas emissions and additionally, have the least capacity to align themselves witch climate change. The Global Hunger Index (1992–2017) shows a decline in child mortality in most regions of the world; however, the rates of decline in undernutrition for children and adults are still too slow to meet the Sustainable Development Goal targets by 2030. Countries transitioning from low to high income experience a higher prevalence of obesity and greenhouse gas emissions due to rapid urbanisation, a shift in transportation structure consequently lower physical activity and changes in dietary patters which are attributed to increased consumption of ultra-processed food which in turn is associated with high greenhouse gas emissions.

The tri-economic burden encompassing this syndemic is significant enough to impact the poorest strata of the population which is estimated to be 8.5 billion by 2030. The prevalent costs of undernutrition are approximately $3·5 trillion annually. Economic losses due to obesity amount to about $2 trillion annually from health-care costs and absent economic productivity. These costs represent 2·8% of the world's gross domestic product (GDP).

The fiscal effects of climate change include the costs of environmental disasters, changes in habitat, health effects, industry stress – primarily in agriculture and fisheries – and the costs of reducing greenhouse gas emissions. Continued inaction towards curbing global climate change is predicted to cost 5–10% of global GDP, whereas just 1% of the world's GDP could arrest the increase in climate change.
The World Bank assessments reveal that an investment of approximately $70 billion over 10 years is required to attain SDG targets pertinent to undernutrition and obesity, and that accomplishing them would generate an expected $850 billion in economic return. Estimates show that climate change, which will lead to a relative increase in moderate stunting of 1–29% in 2050, will have a greater impact on the rates of severe stunting, which we estimated will increase by approximately 23%. In order to reduce malnutrition, it is necessary to increase both food access and improve socioeconomic conditions, as well as reduce greenhouse gas emissions. Scientific assessments indicate that warming could place an additional 5–170 million people "at risk of hunger" by the 2080s implying food security as one of the leading concerns associated with climate change.

The causality of malnutrition is multifarious, which requires development of models that compute the prospective impacts of climate change on global health. An approach which addresses the critical situation and strong interconnection – the syndemic – and that calls for including climate change negotiations in matters of food and nutrition security, currently in the void, are the need of the hour. Climate negotiators, governments and philanthropists must focus their attention on the consequences of climate change on malnutrition, and commit urgently to help those most vulnerable to adapt, otherwise irreversible consequences can be expected.

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TRAGEDY OF COMMONS

ANTARA RAO

batch of 2016-19

Red betel juice
marks walls of public property like blood
the smell of rust invading my nostrils like snakes
and I crave an aesthetic away from this
compromised city
that continues choking on a people who call common
space a tragedy.
This contest for space; a constant war that the
colorful nomads who live under flyovers
fight with corrupt police personnel, touch
passengers repeatedly, leave roses they are
supposed to sell
in waiting autos on traffic signals, to give the well-
dressed benefactors of inheritance
a lesson in unfairness
this interconnectedness so cold, don't look out of the
window
unless a preserved tree poetically rises - prepared by
the municipality and some violence
packaged to power the colony guards
the faces who hang from the mechanized car glass
will ask for money, coins that keep them there - a
system that sucks sympathy Give those unfortunate
kids food instead, old wisdom says,
in the dashboard of your car, keep some ParleG
and before every meal, join hands and pray to God
in gratitude
God loves all - except those who lose their heads to
inebriety;
five decades of pointless begging spans before
them it is tough for them to educate their children,
women have to urinate in the wee hours of
themorning because at every other time
this polluted city doesn't t give them privacy
Rich people will consume humiliation like
fodder drum the excuse of a doomed system
swim through a sea of tar, smoke, the sound of
need, honking trucks that will die of high BP,and
the sight of people living just short of dying
They will reach their houses that are clean, open
the refrigerators
for fresh water with bottles that blur in the
slightest heat coordinate with an app to order food,
tip the delivery person ten rupees, think to
themselves, "I am a good human being"

ARTICLES

THE CONTRARIAN

INDIAN AGRICULTURE – ALTERNATIVES TO SYNTHETIC INPUTS

JASMIN SINGH

Indian agriculture has been witnessing a sluggish productivity growth, reflected in all India productivity levels of major crops below the world average. Also, there is great inter-state disparity in the crop yields and area under production. A stagnant agriculture sector poses grave questions on food security and farm incomes.

Figure 1 Productivity Gap

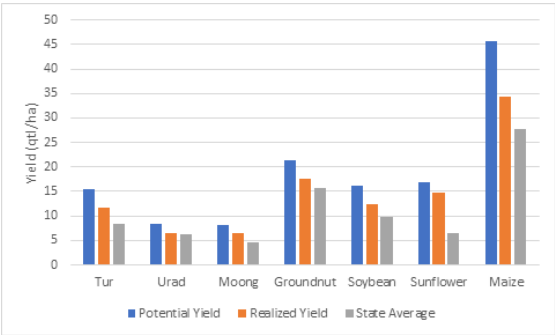

Figure 1 above, plots data for potential and realized yield as well as the state average. The data, confirms that the actual productivity for major crops has fallen short of the potential. While effective input management may help close this gap, unfortunately, farming practices adopted at the ground level have brought great damage to the environment.

Imbalance in the use of chemical fertilizers, excessive use of pesticides, rising cropping intensity have robbed the soil off its nutrients, pulling down the productivity levels. Irrational irrigation, rising number of deep bore wells have contributed a fair share to the environmental problems.

The story doesn't end here, residues of chemical inputs in food cause health hazards. To ensure that farming in India reaches its potential, for maintaining environmental sustainability, it is imperative to incorporate with modern farming practices, the traditions of organic farming.

The literature highlights several benefits of organic inputs. Organic practices help reduce environment pollution, the levels of chemical residues in the vegetation are brought down thereby reducing health hazards. The nutrients of the soil are maintained, also the cost of farming is brought down since organic farming involves using sources of nutrients, manure etc. available on-farm. It is claimed that the bio-fertilizers can supplement the nitrogen and phosphorous based chemical fertilizers by 20-25%. Also organic fertilizers when combined with compost or vermi-compost may bring down the fertilizer cost by 50%. Adoption of organic farming practices is a step towards ensuring effective utilization of natural resources. However, the subsidies extended by the government allure the farmers to use synthetic inputs, enough room has to be made to spread awareness about the benefits of organic inputs and techniques.

Organic inputs can be used for a variety of purposes; soil fertility, pest, disease and weed management, pest control in storage, cleansing agents and disinfectants. Compost, dolomite, lime, rice husk & straw, effective micro-organisms, plant material, molasses, vermi-compost are approved organic sources to boost soil fertility. Vinegar, sticking agents like soft soap, pheromones, insect traps, sulphur and certain beneficial insects could be effectively used for pest management. Pest traps, wood ash and vegetable oil are approved to be used for pest control in storage. Dish washing detergent, ethyl alcohol are widely used as cleansing agents and disinfectants. The organic inputs listed, are easily available and promise minimum damage to the quality of soil and food.

It comes as a surprise that India has the largest number of organic farmers around the globe. As of year 2018, India ranks first in the world in terms of the total number of organic farmers and 9th in terms of the agricultural area under organic farming. In 2016, Sikkim, declared that all its cultivable land had been brought under organic certification. Other states like Madhya Pradesh, Rajasthan, Maharashtra and Uttar Pradesh have made positive strides in this direction. However, the challenges faced by farmers have impeded the success of organic farming in India. Often farmers complain about a fall in productivity during the transition stage from synthetic to organic inputs, the fear of falling productivity in this nascent stage discourages the farmers to make the switch. Indian Council of Agricultural Research, reports a drop of about 6.7% in the first year of transition. Lack of awareness and training has made the adoption of organic methods exceedingly difficult, at the same time unavailability of organic inputs in the markets is also a concern. Organic produce is expensive and doesn't find enough buyers in the market, impacting the sales of the producers. Organic food in India has to undergo a plethora of certifications, making the entire process cumbersome. These roadblocks need to be removed if organic farming is to become a success.

Government has been making efforts to give a big push to organic farming. Use of Organic manures is being promoted under the scheme Paramparagat Krishi Vikas Yojana (PKVY) of National Mission for Sustainable Agriculture (NMSA). Financial assistance is being extended to promote the use of phosphorous rich organic manure, vermi-compost, bio-fertilizers, waste compost and herbal extracts. Production of organic manures is also being encouraged through 100% financial assistance at the state level. While these efforts are commendable, a lot needs to be done to ensure adequate availability of organic inputs as well as educating and training the farmers. Some mechanism of financial assistance in the initial transitional years could encourage the farmers to leap forward and go organic. At the same time improved market infrastructure will promise a strong supply chain, which might be able to bring with it expanded consumer base.

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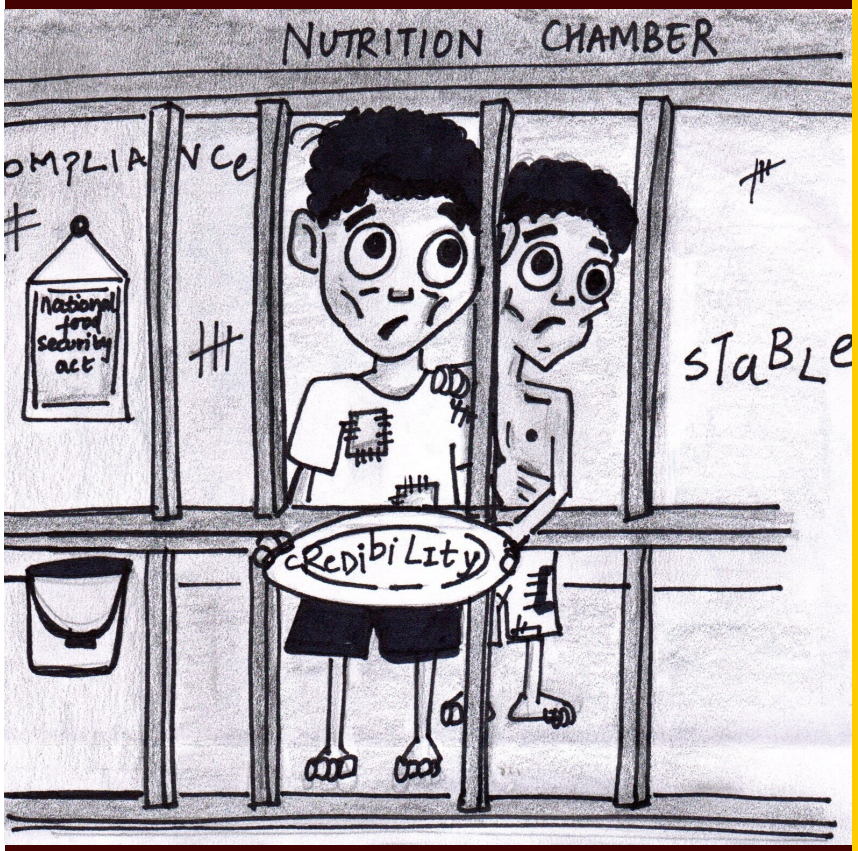
Image Source:
Price Policy for Kharif Crops, The Marketing Season 2019-20, Commission for Agricultural Costs & Prices



CARTOON BY: MICHELLE ROZARIO

NATIONAL FOOD SECURITY ACT

ANOTHER SCHEME WHICH PRIORITIZES VOTES OVER ENVIRONMENT?

SIMRAN GARG

"Food is as important as energy, as security, as the environment. Everything is linked together"

With a booming population on one hand, and a concurrent slowdown in agricultural productivity on the other, food security in India is worsening by the day. Food security, in its literal sense, means making available safe and healthy food to all the segments of the population, at all times of the year.

India is a country which has been suffering from food shortage for decades now; attributable to the country's excessive dependence on monsoons for a good harvest (which essentially stems from lags in infrastructural development in the primary sector), as well as a lack of incentives for farmers to indulge in food crop cultivation, because with commercial farming becoming relatively more profitable, in the backdrop of farm incomes being largely meagre and food inflation falling (resulting in low returns for their produce), farmers prefer cultivating other variety of crops, over food grains, and justifiably so. Various reports, released by several independent organizations reveal, that even after 59 years after attaining self-sufficiency in food grain production (post the green revolution), India has been plagued by something called the "triple affliction of malnutrition" – the coexistence of stunting and wasting, anaemia and obesity amongst the population, simultaneously. According to the GHI (Global Hunger Index) report 2013, India has a GHI score of 21.3, a decrease of only 11.3 with

reference to 1990; additionally, 17.5 percent of the world's undernourished population is in India (India ranked 103 out of a sample of 119 countries, in 2018 – indicating acute levels of hunger).

Realizing that food insecurity still runs through the length and breadth of the country, and to wage a war against starvation, the government henceforth launched a plethora of schemes and initiatives: the National Food Security Mission, Rashtriya Krishi Vikas Yojana (RKVY), the Integrated Schemes on Oilseeds, Pulses, Palm oil and Maize (ISOPOM), Pradhan Mantri Fasal Bima Yojana and the e-marketplace, to name a few. For combating malnutrition amongst kids between 6-14years, the government had introduced the mid-day meal scheme, which also impelled parents to send their children to school; Public Distribution System (PDS) and the Anganwadi system to take care of pregnant and lactating women, as well as the Antodya Anna Yojana (AAY) to serve the destitute. Despite launching enumerable, and seemingly effective schemes, malnutrition levels in India failed to budge, owing to a lack of efficiency and accountability on part of the implementing agencies, urban bias, poor beneficiary targeting, rural-urban disparities and bouts of rampant corruption.

To therefore grapple with the sluggish attempts at eradicating mass malnutrition (sound policies pulled down by poor implementation), the National Food Security Act (NFSA) was launched by the government in 2013, after several rounds of amendments and omissions. The main intent of the largest food security bill in the world was to "pursue the constitutional obligation and obligations under the international conveyance giving priority and framing policies to achieve food security." It addressed several new and unexplored avenues: implementation of the life cycle approach to ensure food security (taking care from birth till adulthood), a paradigm shift from a welfare based to a right based approach (right to food being made a basic right), replacing PDS with a 'targeted PDS' method of food distribution (to create nationwide food oriented social safety nets), empowering women (giving preference to women over their male counterparts for licenses to Fair Price Shops (FPS) et cetera) and freedom to states to implement their own subsidy schemes (independent of the central government). Under the NFSA, the target aggregate to be covered, under the rate of Rs 5/Kg of foodgrains per eligible

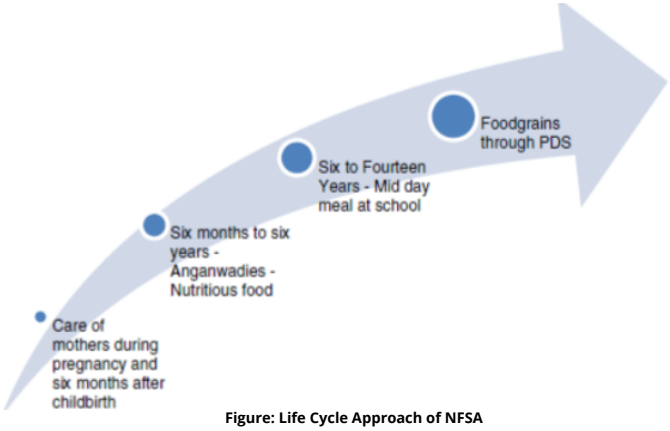


Figure: Life Cycle Approach of NFSA
(Source: Tanksale, A., & Jha, J. K. (2015)

person/month, is 75 percent and 50 percent in rural and urban areas respectively.

On top of this, the beneficiaries of AAY are eligible to receive 35 kg of foodgrains per households per month, under the Act. To meet these rather ambitious targets, foodgrain production has to be increased manifold; it also implies that the government would have to spend a minimum of 1000 billion Rupees (a conservative estimate) to procure food grains from the market and to supply it to the poorer section of the population at highly subsidized prices [Sirkar (2013)], severely distorting India's fiscal situation. This Act can also act as a bottleneck for India's commitment to free trade, via subsidies and government intervention.

Another serious outcome of the NFSA, apart from its fiscal and international implication, is the environmental impact. This has its genesis in the foreseeable overuse of chemical fertilizers and pesticides to boost the produce, discharge of pollutants by the agro-industries into air and water, conversion of forests and wetlands into pasture land, amplified food wastage, overgrazing and excessive depletion of ground water level, amongst several other environmentally detrimental activities that we will resort to for augmenting produce. While incessant use of chemicals deteriorates the soil quality, particularly messing up the 'NPK' formula required for healthy growth of crops, uprooting trees to make the land viable for agriculture makes the area susceptible to flooding and landslides. Overgrazing, pollution and not replenishing ground water levels have their own negative externalities, the brunt of which we have already started to feel.Thus, there is a dire need to strike a perfect balance between enhancing productivity and ensuring food security, while preserving the ecology; we need to know where to draw a line for the former to preserve the latter.

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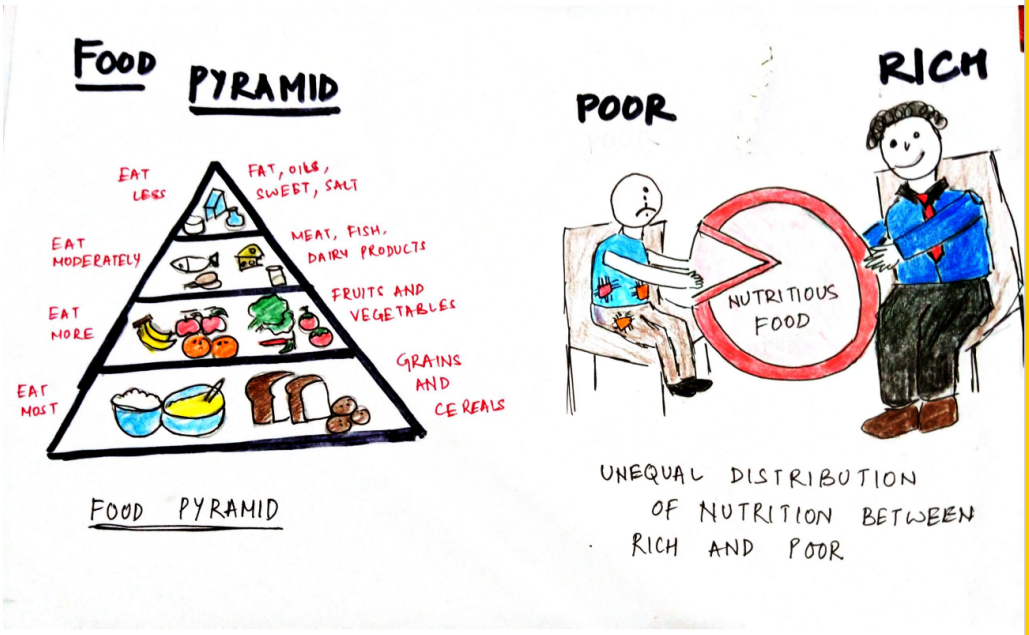
A SUSTAINABLE DIET

ARUNIMA SRIVASTAVA



CARTOON BY: JOMOL JOHNSON

Eating food, as described by Michael Pollan in his book 'The Omnivores Dilemma', is a political act. As politics is related to the way of living, if the tackling of climate change requires a radical change in lifestyles, then it also necessitates a similar change in diets.

The concept of 'sustainable diets', however goes beyond the scope of environment conservation. FAO in 2010 described sustainable diet as a diet 'with low environmental impacts' that can guarantee 'healthy life for present and future generations.' Sustainable diets are also 'economically fair and affordable', other than being 'nutritionally adequate, safe and healthy'. These diets 'optimize natural and human resources.'

The sustainable diet in India is outlined by the FBDG by NIN that consists of a pyramid. The base level of the pyramid contains cereals and legumes that are to be consumed in a sufficient quantity. Vegetables and fruits are at second level that are to be consumed liberally. Animal source foods and oils to be consumed moderately and foods high in sugar and fat to be eaten sparingly.

The definition of a sustainable diet is such that it becomes imperative to consider the economic aspect of consuming such diets also. In India, there is a disparity in the food consumption pattern of low-income level and high-income level households in both rural and urban areas.

As the income level rises, it is observed that the consumption of 'healthy' food items like fruits and vegetables increases while at the same time, consumption of 'unhealthy' food items like oils, fats and sweeteners also rises [8]. This happens because the middle-income and high-income level households adopt a 'westernized' model of diet that consists of meat and dairy products in large quantities [6]. Moreover, the effects of globalization have diversified the diet of the urban-rich category that has led to this trend [6].

The data presented by EAT Lancet Commission and acquired from NSSO 2011-12 report sheds light on the limited diet of the urban-poor and rural-poor categories. The disparity in nutrition intakes as income level rises is due to the fact that rural-poor and urban-poor categories eat less.

It is also important to analyze the diet through the lens of environment conservation. While there is a unidirectional relation between environment degradation and unequal nutrition distribution, there exists on an average a bidirectional relation between health and environment such that healthier diets are eco-friendlier and vice versa [6]. To understand this aspect, the GHGe of each food groups is considered. There are four criteria to be looked at- production, processing, transportation and preparation of the food items [2]. In India, overall food production contributes to 87% GHG emissions, contribution of food preparation is 10%, processing is 2% while transportation is 1% [2]. Of the food groups in the diet pyramid, the third and fourth food groups offer a severe trade-off between health and environment.

Cereals and legumes, that is at the base level, are an essential part of the Indian diet. Although the flavors vary regionally, the Indian diet remains similar as Indians majorly consume legumes and cereals in their meals in various forms. Cereals are a major source of carbohydrates and fats whereas legumes are a major source of proteins. While cereals are consumed in adequate amounts as per standards set by RDA, the intake of legumes is insufficient [1]. However, it is found that households with energy (carbohydrates and fats) insufficiency were greater in proportion as compared to households with protein insufficiency. In this category, of all the food items, rice contributes most to GHGe followed by wheat.

Vegetables and fruits are present in the second level of the diet.India is a major exporter of fruits and vegetables yet in the domestic market it is unable to match the demand and supply of these food items. This is largely due to technical bottlenecks in agriculture such as poor storage facilities and lack of demand forecasting [7]. This has consequences on the diets of the people as the consumption of fruits and vegetables is far below the standards set by RDA. Fruits and vegetables contribute much less to GHGe compared to other food groups in the diet.

Animal source foods especially meat contribute the most to GHGe and consumption of most meat items is generally discouraged for health related issues. There can be observed a tradeoff between environment conservation and health in the case of dairy products and fish foods. It is observed that with diets containing milk, the GHGe increases by a factor of 1.3 when compared with vegetarian diets without milk [2]. Consumption of milk in the population is low compared to the standards of RDA. The fourth food group that is foods high in sugar and fats comprise of 'unhealthy' diets that are to be eaten occasionally because for some households, eating food can also be a lifestyle choice and 'flavor' plays an important role in the type of diet that is followed.

The sustainable diet as outlined by the FBDG of NIN mainly focuses on the 'health' aspect of food consumption and not on the environmental consequences. Recently, countries across the world have started formulating sustainable diets that incorporate the issue of environment conservation as well. There can be observed a relation between the income levels of countries and the presence of government backed FBDG, that is, mostly the high-income countries adopt FBDG. Out of total, 43 high-income countries have these guidelines whereas only 2 low-income countries have FBDG [6].

This disparity exists because the high-income countries contribute most to food-based environment degradation through over consumption of food.

In the case of the Indian diet, it is observed that Indians generally eat locally produced food items and the diets are plant-based[2]. The main challenge here is to ensure an equitable distribution of nutrition across population

Currently the diet followed is such that the rich category has access to both 'healthy' and 'unhealthy' diets whereas the poor are not consuming sufficient amounts of food. There is a double whammy present in the form of mismatch in demand and supply for foods and low purchasing power of rural-poor and urban-poor categories that creates a skewed distribution. To ensure a more equal distribution, the urban-rich and rural-rich categories must be discouraged from over consumption while the diets of the rural-poor and urban-poor need to be diversified.

ABBREVIATIONS USED:

FAO- The Food and Agriculture Organization of the United Nations
FBDG- food based dietary guidelines
NIN- National Institute of Nutrition
RDA- Recommended Dietary Allowances
GHGe- Greenhouse gas emissions

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GREEN REVOLUTION

SIMRAN MANCHANDA

CARTOON BY: STEFIYA THOMAS

"Food security was one of the most critical issues that faced the great Indian policy makers, in the years immediately following India's Independence. At that time, achieving self-sufficiency in food grains production assumed priority for the government. Today, India is self-sufficient in food grains production and to a large extent has been able to achieve food security. For this phenomenal achievement, the credit, in large measure, should go to the Green revolution.

The major impediment to agricultural development in India was low productivity, which was a by -product of the Zamindari system that had been plaguing the country for decades preceding independence. Moreover, India's dependence on PL 480 seeds (US charity of low quality food grains) had essentially started to present a threat to India's national security andstainable income for farmers, and that's where the Green Revolution stepped in. and sovereignty. At the onset of the agricultural season farmers often found it difficult to get access to credit facilities, improved seeds and water irrigation facilities. The situation would deteriorate if there was a crop failure. Thus, a major technological breakthrough was needed to feed the exponentially growing population of the country, and ensure a sustainable income for farmers, and that's where the Green Revolution stepped in.

In early 1960, age-old agricultural systems began to be replaced by modern farming practices – use of high yielding varieties of seeds, increased use of fertilizers and water supply with improved irrigation facilities like wells and canals. Such practices were given the collective title of the Green revolution.

Hybrid seeds were introduced as a part of high yield variety program (HYVP) in 1960-61. These modern farming practices were introduced as a part of the intensive agricultural district programme in seven select districts. Soon, the program was extended to the entire country. Fertilizers, seeds and electricity to the farmers were subsidized. Farmers were trained on the effective use of water resources, fertilizers, pesticides etc. The reasons for providing all these facilities to the farmers were many.

The impact of the Green revolution was felt in certain states and in certain pre-selected crops. Of the high yielding seeds, wheat seeds produced the best results. Wheat farmers in Punjab and Haryana reaped rich dividends. In the case of wheat, yield per hectare increased over three folds.

While the benefits of the Green Revolution were manifold, it is also imperative that we highlight its critiques. Several researchers claim that soil fertility has declined as a result of the indiscriminate use of pesticides and fertilizers. It is also increasingly felt that the nature of farming has transformed to a market-oriented activity – more focused on reaping profits rather than ensuring food sufficiency. The Green revolution did not cover pulses which accounted for a substantial portion of the total food grains production. Relative to a spectacular growth rate in wheat and rice production, the production of bajra, maize and oilseed has staggered, creating disparities. Also, the substantial increase in food grain production could not be insured on yearly basis – Large tracts of the country were still subject to the vagaries of the monsoon and in a bad year production decreased.

In the words of renowned economist Dr VKRV Rao, "It is well known that the so-called Green revolution, which helped the country raise its output of food grains, has also been accompanied by widening of the magnitude of inequality in rural incomes, the loss of the status as tenants by a large number of small farmers and the emergence of social and economic tensions in the countryside. The challenge which Indian agriculture faces is not only of production but also that of distribution and anxiety to concentrate on production problems. We should not forget the human and social implications of agricultural developments." The Green revolution, despite its shortcomings, was a major milestone which in the long run changed India's status from a food grain importer to that of a food grain surplus nation.

Thanks to agrarian reforms there was a significant breakthrough in Indian agriculture. From an utterly backward and stagnant sector of the economy, agriculture emerged as a vibrant and developing sector.

Off late, the gains from the green revolution of the 1960s have started tapering off and India needs yet another similar revolution. Deceleration of agricultural growth remains in limelight because a mismatch between supply and demand of farm products is once again emerging to be a serious challenge. Stalling of agricultural growth in the past few years is a cause of concern. Since several decades, Indian farmers have been victims of the vagaries of nature and extensive corruption in the system. India, being an agrarian society, has almost two-thirds of its work-force relying on farming for their livelihood. However, almost 70% of farming is rain-fed, due to poorly maintained irrigation systems and lack of services like allocation of water and electricity. These conditions are threatening the conventional agricultural practices resulting in them being neither economically, nor environmentally sustainable.

The central government has spent nearly Rs 200,000 crore from the First Five-Year Plan to create an irrigation potential of around 109 million hectares. But India's irrigation efforts have lagged considerably, affecting both the country's ability to counter poor monsoons as well as agricultural productivity. Hence, all problems in the end boil down to the irrigation problems in India and a new technological breakthrough is a must to witness the same level of agricultural growth as India did at the time of Green Revolution.

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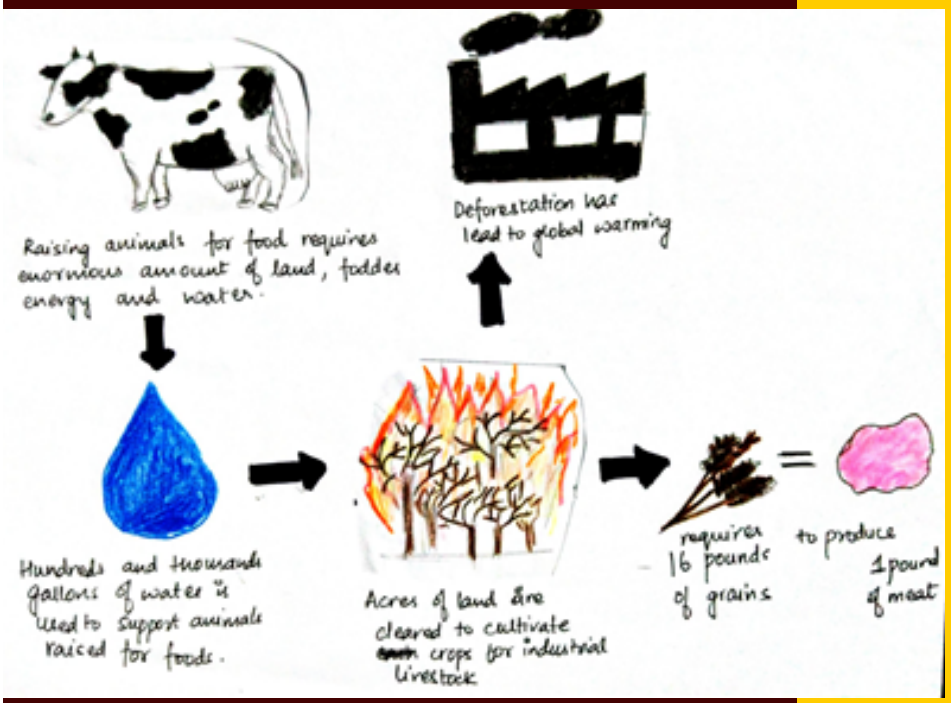
VEGAN FOOD AND ITS BENEFITS FOR THE ENVIRONMENT

OPTING FOR VEGAN DIETS CAN BE ADVANTAGEOUS IN TACKLING EVIRONMENTAL PROBLEMS.

TULIKA AGARWAL



CARTOON BY: JOMOL JOHNSON

The recent years have witnessed an upsurge in the number of people embracing plant-based lifestyles across the globe. One of the most salient features of such lifestyles are vegan diets which eschew all animal-origin food products including all kinds of meat, fish, eggs and other dairy products. Apart from health benefits, following a vegan diet can also translate into benefits for the environment.

In order to assess the environmental benefits of veganism, we first need to look at how animal-derived foods are affecting the environment. Raising animals for food requires enormous amounts of land, fodder, energy and water. Large parts of forests are cleared for space required to keep animals as well as to grow crops to feed them. Thirty percent of the earth's landmass is used for raising animals for food and that's about the same size as Asia. Of all the agricultural land in the United States, eighty percent is utilized for raising animals for food and for growing grain to feed them [1]. A major catch of consuming animal based food is that animals consume a large quantity of grain, soybeans, oats, corn and water but in return, they provide a comparatively small amount of meat, dairy products or eggs as a large proportion of energy goes into metabolic activities and movement, growth and development. This is substantiated by the fact that it requires sixteen pounds of grain to produce one pound of meat.

Chickens, turkeys, pigs and cows produce methane and deforestation for pastures for cows also leads to global warming. If every American dropped one serving of chicken per week from

their diet, it would save the same amount of carbon dioxide as taking five lakh cars off the road[2].. It was found in a study that animal feedlots produced enormous amounts of dust that contained biologically active organisms such as bacteria, mold and fungi from the feces and the feed[3]. Moreover, the meat, egg and dairy industries together are responsible for sixty-five percent of the world's nitrous oxide emissions[4]. Adding to all this are the abusive conditions of most factory farms that misuse animals and treat them with cruelty in order to produce cheap, fast and unsustainable amounts of meat, milk and eggs.

All these issues may only aggravate in near future if ongoing food systems continue to prevail when population further increases, putting even more pressure on food demand. Opting for vegan food can help to counter such effects of animal-derived foods. Land currently being used to cultivate cash crops for industrial livestock production can be replaced by food grains to feed a large number of people. The magnitude of the current industrial livestock production is unsustainable and it is not viable to continue it in the future even at the existing magnitude, let alone expand it further given the condition our environment is in. Moreover, turning vegan will reduce a person's ecological footprint by conserving water and reducing greenhouse emissions.
An Oxford University study, published in the journal Climatic Change, shows that meat-eaters are responsible for almost twice as many dietary greenhouse-gas emissions per day as vegetarians and about two and a half times as many as vegans. When scientists at Chalmers University of Technology in Sweden calculated ways to combat climate change, they found that cutting greenhouse-gas emissions from transportation and energy use alone isn't enough to curb climate change. They assert that reducing agricultural climate pollution by eschewing meat and dairy consumption is key to fighting climate change.

Veganism doesn't provide a panacea for all our environmental problems, but it sure provides a path towards a tackling some of them. The verge on which the world now stands would need a comprehensive plan which is inclusive of various conservation techniques spanning diverse spheres of life like clean energy, sustainable food habits, proper waste disposal, pollution control, et cetera. It is imperative that people become conscious of their food consumption and the effects it has on the environment. This would allow them to exercise their choice in a responsible manner. Inclusion of food in the fight towards global warming and climate change will aid the efforts being made on other fronts.

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CARTOON BY: STEFIYA THOMAS

EATING RIGHT FOR OUR ENVIRONMENT

SONU SUNNY

In 2008, Dr. Rajendra Pachauri, the then head of the United Nations for Climate Science panel, when asked about what must be done to reduce carbon footprint, gave an answer that surprised many. Instead of focusing on how we should travel less or use fewer appliances he asked to focus on what we eat. He said "Try food. Food is very polluting in terms of climate change, due to the fact that there are large amounts of greenhouse gas emissions associated with it. Eat less! [1]

Do our food habits really affect our environment? Does the food that we choose to eat every single day affect our climate?

In the past few decades the world has witnessed a drastic change in dietary habits of human beings.

From eating local and fresh to consuming packed foods, canned food items and imported vegetables and fruits, we have come a long way. Some call it the perks of globalization, technological advancement and development. But what have these perks cost us? It might have been a wonderful journey for many but it might have cost us what we are fighting against today, environmental degradation and climate change.

It's quite evident that our supermarkets and shops have more packaged food, packed vegetables, fruits and grains than ever before. From an individual's viewpoint when he/she buys it and responsibly disposes the waste materials

they might think that no harm has been done to the environment. But what is not realized, is the harm that has been done on its journey from farm to their plates. Food items that are not locally available have to be transported from its origin area to its place of sale. The transportation of food items results in usage of more vehicles, fuel and energy which further increases GHG (Greenhouse Gas) emissions and resource depletion. The materials used for packaging are mostly plastic; to make things cheaper and affordable to large number of people, but what's the other side of the story? It's said that half the plastic waste are from plastic packaging. Therefore more packaged food would mean more plastic and this adds to the already grueling situation of our planet.

However, this is not the only way in which our diet affects our planet – even local produce can be a reason for our depleting resources, like dairy and meat production. The demand for meat and dairy products has been on a rise, and this rise in demand can be attributed to the increasing number of people who prefer non-vegetarian diets. According to many studies, this has serious repercussion for the environment's health. Studies by Barilla Centre for Food and Nutrition show that to produce one kg of meat, 15,400ltr of water is required. Meat production contributes to 60% of agricultural greenhouse gas emissions and also uses 77% of farmland for livestock, either as grazing land or as land to grow animal feed. Beef production, particularly is one of the largest contributors of the same. Studies have shown that producing beef requires 28 times more land, 6 times more fertilizer and 11 times more water than producing pork or chicken. Thus beef production releases 4 times more greenhouse gases than a calorie-equivalent amount of pork, and 5 times as much as an equivalent amount of poultry. Therefore it is evident from these data, that meat production causes large scale GHG emissions and also results in depletion of water and land resources. There are many more such examples that reveal how changes in our food habits impact the environment. Now the question that we face, as a community and as individual beings is, what can be done?

A research article by Lukasz Aleksandrowicz and Rosemary Green, gives a very interesting result on how adopting a sustainable dietary habit can actually help us save our earth. It says that there can be a 60-70% reduction in GHG emissions and 50 % reduction in water usage if sustainable food habits are adopted[2]. Consumption of locally produced and seasonal food products can be the first step towards a sustainable diet.More of vegetables and less of meat and dairy products on our plates would also help in building a healthier, sustainable and clean environment. So the next time you decide what to eat, think again, am I eating right?

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Cartoon By: STEFIYA THOMAS

THE CHANGING CLIMATE OF FOOD: HOW CAPITALISM IS MAKING US FAT AND HUNGRY

TANUSHKA LAHIRI

While the link between the accelerated environmental degradation and the role of capitalist structures is often talked about, a largely unmentioned yet integral part of it is the food movement and how closely the food crises around the world are linked to certain economic structures.

The food movement, popular mostly in the Global North, argues for cultivating more nutritious, organic food and minimising wastage. Author Michael Pollan's book 'In Defense of Food' talks about how programmed we have become to industrial efficiency when it comes to food. Instead of eating whole foods that our bodies need, we have been moving towards a more processed, unhealthy diet propagated by corporations which has resulted in in any chronic health issues and a wastage of energy.

Consumers need to take a more proactive role when it comes to their food. While growing our own vegetables can be a daunting task for city dwellers like us; small steps such as cutting down on food wastage, finding local organic produce and cutting down on meat consumption can go a long way in not just saving the environment but also restructuring the misguided economic system.

In his book, 'A Foodie's Guide to Capitalism: Understanding the Political Economy of What We Eat', Holt-Giménez argues how widespread hunger, malnutrition and obesity are the very foundations of the capitalist food system. There has been a destruction of food sovereignty in the recent past with agriculture attaining an industrial efficiency. In the words of Karl Marx, "All progress in capitalist agriculture is a progress in the art not only of robbing the worker, but of robbing the soil…undermining the original source of all wealth."

This goes to highlight the important nexus between the rapid depletion of natural resources in an attempt to realise more efficient food production techniques and the rise of capitalist societies. The idea of industrialisation in the 1970s identified with being progressive and a way to make society more egalitarian, expansive and anti-hierarchical. In the fight against poverty, undernutrition and climate change, most activists have forgotten the role a country's economic structure plays in it.

"Industrial agriculture has destroyed up to 75 percent of the world's agro-biodiversity, uses up to 80 percent of the planet's freshwater, and produces up to 20 percent of the world's greenhouse gases." Capitalism turns food, a necessity, into a commodity whose prices are free to fluctuate even out of the reach of some. The food system, with its meagre wages, water scarcity problems and agrarian distress, isn't the result of a dysfunctional set-up. It is working exactly the way a capitalist food system is supposed to.

To truly understand the roots of this problem, it is important to go back to the origins of capitalism – colonialism and slavery. The role of agriculture in the development of capitalism was an important one. Cultivation of certain intensive crops were mandated to keep the rural poor occupied and accumulate capital for the bourgeoisie.

Even during the British rule in India, the colonisers forced the cultivation of indigo on the poor farmers. This not only took away freedom to grow subsistence crops but also severely eroded the soil on which it was grown. All the while profiting the Industrial Revolution in Britain. This makes one wonder whether the ubiquitous 'feed the world' narrative of more food using increased technology, is yet another capitalist device. The worst brunt of this new narrative is on landless farmers, small land holders, rural women and migrant workers.

Capitalism makes an effort to privatise all factors used in production, right from seeds to fertilisers, water and of course, land. Holt-Giménez talks of the commercialisation of farm land in developing countries quoting the example of famine-stricken Ethopia where commercial farming on conflicted land is on the rise.

The debate around agricultural subsidies is infamously skewed in favour of the developed Global North, with them being exempt from rules of the World Bank. Today the food system is monopolised and dominated by agri-food corporations like Monsanto, Syngenta, Bayer, Coca-Cola, Tesco, Carrefour, Walmart and Amazon which make huge amounts of profits off the back of poor farmers. It is these corporations that indirectly determine the rules imposed by the World Bank and International Monetary Fund on developing nations of the Global South.

Of late, many Latin American farmers and indigenous communities have risen up against corporate land grabs. However, political leadership in most developing countries tends to be more business friendly than market friendly, creating a rift between the needs of the hungry majority and the rich minority. A complete reform of industrialised food systems is only

possible when citizens are engaged in meaningful political debate and public goods are shared by all. There must be movements to recapture common property resources and to strengthen the public sphere.

Thus the first step to countering the demise of our agricultural systems and to save the environment, is to realise how deeply rooted the economic systems that prevail around the world today. The need to match up with the rapid pace of growth of the hegemon has made countries in the Global South revolutionise their cultivation patterns, moving away from the needs of peasants and towards the corporations. It is this rise of the corporations that needs to be offset by neutral governance and an informed state.

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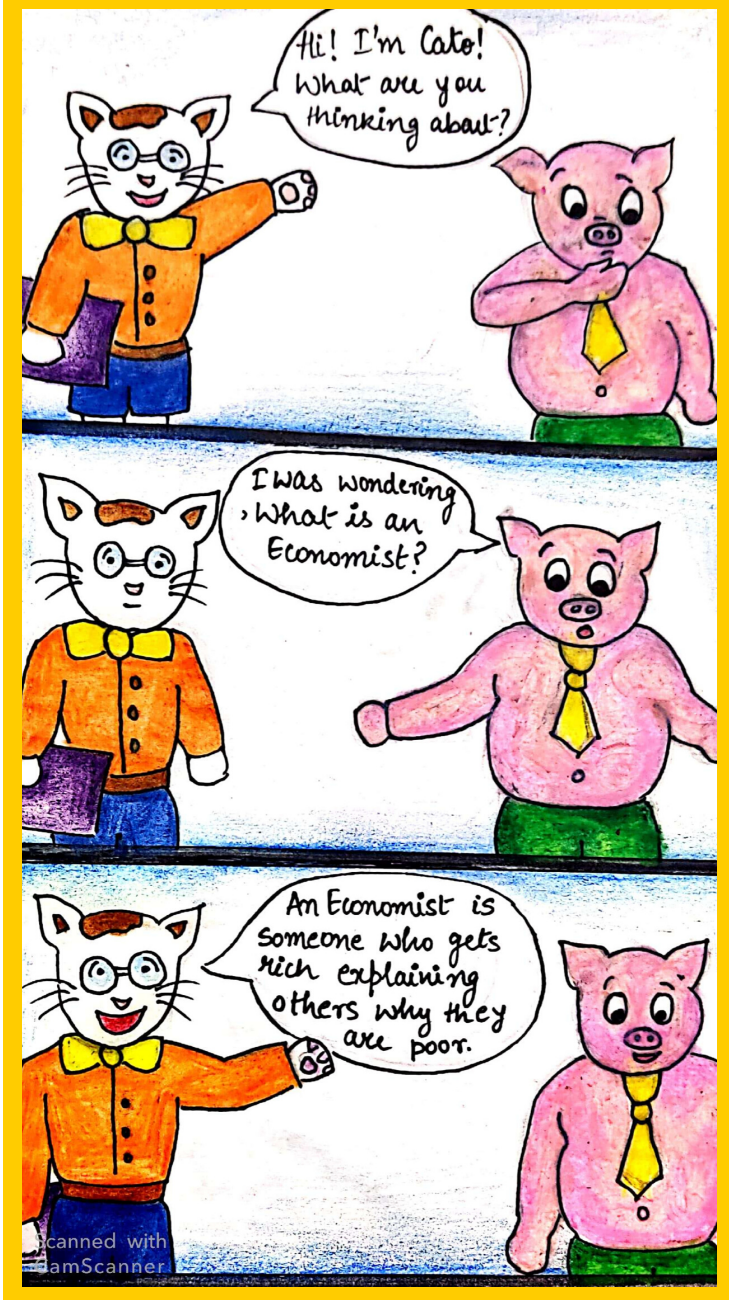

CARTOON BY: SHWETA MONDAL

CAN WE AFFORD ENVIRONMENTAL SUSTAINABILITY WHEN WE CAN'T AFFORD FOOD?

NANDNI SHARMA

CARTOON BY: MICHELLE ROZARIO

The hypothesis of the Environmental Kuznets Curve (EKC) is simple- pollute first for economic growth; clean up later. While the validity of this theory has been widely questioned, one infallible truth is that every country has some economic incentive to underinvest in maintaining adequate environmental standards. These countries maintain hope that other countries will collectively do enough to contain global warming. Like most investments, the requirement of short term expenditure for long lasting gains holds true and so countries tend to disagree on who should cover more of the upfront investments required for a global sustainable environment. This argument segregates the world into the high income developed countries and the developing nations still struggling to feed their populace.

The premise of the EKC is that the environmental quality requirements are subordinate to basic needs such as food and nutrition. Food insecurity, viewed as a lack of food safety, is inextricably linked with the problem of poverty. With India being home to the largest undernourished population in the world and 14.5% of its population devoid of adequate nutrition, it should be one of the staunchest proponents of the hypothesis. Despite this, India was ranked 22 best in the world on basis of control of emissions and use of renewable energy in the climate change performance index of 2016. To compare, America, with its dominant position in the west and better infrastructure, ranked 31. One of the indisputable flaws of theEKC is how it ignores the issue that there is no clear point after which damage to theecological systems

becomes irreversible. The developing world has acknowledged this. After seeing the frequency of climate related disasters increasing as well as the deaths resulting from these disasters despite environmental standards designed to counter climate change, it has become difficult to not face the stark and depressing truth. While climate change will affect everyone in the world, those living comparatively unstable lives in the developing world will face more disastrous ramifications.

The industrialisation of the west was based on the de-industrialisation of countries like India. In addition, developed nations experienced their growth on the backs of environmental degradation in the first industrial revolution. This is why many argue that it is unfair to the underdeveloped nations to restrict their already hampered economic growth by enforcing environmental regulations when the west never had to face the same cost. While the need of the hour is most definitely environmental protection, the onus should first fall on developed countries instead of nations struggling to feed their people. Moreover, developed countries contribute to higher levels of environmental degradation due to higher standards of livings. The average citizen of a more developed nation has a much larger carbon footprint than the average citizen in a poorer country. The counter to this ideology is that while developing countries are largely responsible for the global warming to date, the majority of future
emissions will be due to the modernisation of the emerging economies. The Paris Agreement of 2016 was designed to reconcile this very conundrum. It avoided placing onerous obligations on any country that signed on.

Developed nations have a better ability to deal with climate change with their advanced and well-funded research institutions and could share the same resources with the developing world as well as implementing strict environmental policies of their own to do their part in saving the environment. Unfortunately, with Trump's reckless threats of abandonment of the Paris agreement and his tweets about cold weather being proof against the existence of global warming, it seems the west is going to make no attempts to acknowledge, much less fulfill, its responsibilities to the environment. Since the rural poor are more dependent on, connected to, and impacted by the environment, ecological protections are an immediate need for the most vulnerable. While western nations may have a greater obligation, the developing world is suffering more harshly and since western countries are more than willing to play a game of perpetual chicken, it seems that the onus must be faced by the developing nations. Despite the best collective efforts of the developing world to combat climate change while sustaining its people, without active help from the west, it seems to be an impossible battle. How do you plan for a sustainable future when today's children aren't even fed?

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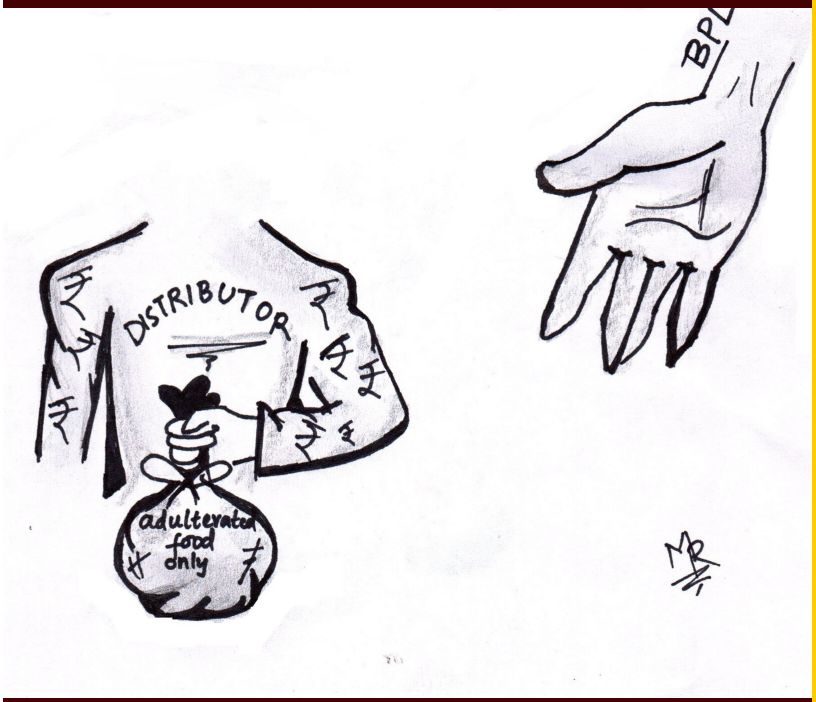
THE FAST FOOD FRANCHISE UNIVERSE

ARPITA MARY ABRAHAM



CARTOON BY: MICHELLE ROZARIO

"Our food system is an hourglass. In one chamber are tens of thousands of farmers and ranchers, but their sands are steadily receding. In the other are hundreds of millions of eaters, whose sands continue to swell. In the narrow middle between growers and eaters sit a handful of giant corporations, what economists call an oligopoly."

In the age of the Big Mac Index or even Burgonomics, it is clear that fast food giants have paved their way into influencing economics and appetites. In a better sense, they have managed to form oligopolies of their own. Be it Burger King or McDonalds, all sell a similar product and use product differentiation to attract customers.

The case of McDonalds is particularly thought-provoking. After running a drive-in restaurant for 11 years, Richard and Maurice McDonald decided to revamp it.

They wanted to sell food faster and at much cheaper rates. They closed the restaurant and redesigned the food preparation area to work less like a restaurant and more like an automobile assembly line. This method of food preparation made them famous and was copied by many more restaurateurs. This Speedee service system did not require highly skilled cooks, who were already in high demand. Instead, it employed low skilled workers, each one of whom did one small specific step in the food preparation process. These staff savings is why their food is relatively inexpensive and the food and the menu are almost same in all their branches [1] Because of this, McDonalds was also able to give enough competition to Starbucks for its coffee by setting off a price war, due to which Starbucks suffered a major hit during the economic slowdown of 2008.

Many other fast food giants follow similar concepts. They tailor their business to the diverse culture and the fast pace of city life by providing quality fast food in a short period of time. They are able to generate higher turnover every year by keeping their production costs low. Many a times, these franchise networks are strengthened by selling thousands of corporate owned stores to independent owners. They sell the rights to operate a single store, thus keeping overhead costs down, while food costs remain low and service remains fast for lifestyles that are increasingly on the move.

But being a franchise comes with its own set of Gordian knots. Considering the fact that their brands consist of thousands of locations that pull in annual revenues, it is difficult to bring in change in case of an external shock. Even though most of the franchise models were able to pull themselves out of the 2008 economic slowdown, their resilience is yet to be ascertained.

Secondly, big businesses struggle to grow quickly once they reach a certain size. It is logistically difficult to innovate or get a load of individual business concerns when such a fast food empire stretches across more than 100 countries [2] . Another issue regarding these fast food franchises is the carbon footprint that they leave on the environment. The energy required to make a standard cheeseburger converts to CO 2 emissions of somewhere between 1-3.5 kg. This combined with the waste generated by packaging, transportation or even water contamination needs to be addressed by the stakeholders [3] .

Some factors that these fast food giants need to keep in mind are the standardization mechanisms. This should also include rules and regulations that guide daily operations toward building and maintaining the desired brand image and delivering brand promise to customers. Customer satisfaction and quality control is of utmost importance, considering that customers
always have the choice of changing their preferences to that of the rival franchise. Given the fast moving urban lifestyles of people, franchises are here to stay.

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SUSTAINABLE FARMING AND ORGANIC FARMING

RABANI KHURANA

CARTOON BY: ANJELA JOSE

Sustainable farming can be defined as a way of farming which is not only profitable but is also ecologically sound and improves the quality of life of the farmers and their families. Organic Farming on the other hand is a system which avoids usage of any kind of synthetic inputs for farming and relies on methods like crop rotation and biological nitrogen fixation to maintain soil fertility. Sustainable farming and organic farming are not synonyms and don't always go hand in hand.

Organically grown produce has seen a rise in it's popularity recently. It is basically primitive farming methods that is with fewer chemicals but with the benefit of better equipment, more streamlined supply chains and modern day marketing. Organic produce is considered to have higher nutrient and vitamin content along with better taste and flavours which have aided in its recently received fame. In India organic food needs to comply with the provisions that are given by either the National Programme for Organic Production (NPOP) administered by the Agricultural and Processed Food Products Export Development Authority (APEDA) or the Participatory Guarantee System for India (PGS-India) operated by the ministry of Agriculture and Farmers' Welfare. Hence the food being certified by a government authority makes it more reliable.

However, organic Farming is not always

sustainable.The biggest drawback of organic farming is low yield per hectare. The area deforested for farming gives less yield when organic method of farming is used as compared to conventional methods of farming are used. According to an article on "Sustainability Times" a study was conducted in Sweden, looking at pea and wheat crops, as organic farming requires more land to produce the same volume of crops, more deforestation is required, leading to fall in the amount of carbon pulled out from the air. Another problem that arises with organic method of agriculture is the excessive use of natural fertilisers. According to an article on Open Mind, natural fertilisers are not always better as they are less effective and hence have to be used in comparatively higher quantities. Organic pesticides moreover are not always environment friendly as some also contain chemicals like Rotenone which is notorious for its lack of degradation. Organic farming also overlooks the fossil fuels used to transportation of the produce and heavy equipment used in production, while the produce from sustainable farming is required to distributed and sold near the farm itself. An example of shortcoming of organic farming without sustainable practices will be that of Sikkim which was India's first fully organic state was. Phasing out chemical fertilisers was not followed by an increase in organic manure and according to an article on "Down Earth" led to a fungal disease in ginger crops and the yield of all crops became one third of what it was before. Bio fertilisers and bio pesticides never reached independent farmers and moreover there was a need for training farmers after this shift to organic farming to give them a comprehensive understanding of how to use these bio inputs.

Sustainable Farming is also not always organic. Farms adopting organic farming for example, require a USDA (United States Department of Agriculture) certification in America and hence farmers can label their products "USDA Organic", however farms following sustainable practices do not always qualify for this certification. Moreover, no antibiotics can be fed to livestock under organic practices of farming, but farmers following sustainable farming may opt for antibiotics when their animals get sick which goes against the norms of organic methods.

Therefore there is a need for agriculture methods that avoid synthetic inputs, use apt amount of organic inputs and increase social, environmental and economic welfare.

This is extremely crucial for India as a major chunk of the population is employed in agriculture sector but it still does not have maximum contribution to the Gross Domestic Product. This requires techniques and equipment to increase output per acre so that agriculture dependent families are able to be self-sufficient. India is already making progress through the company BASF Corporation (Badische Anilin und Soda Fabrik) which focuses on organic synthesis, advanced process and formulation research discovery chemistry. As mentioned in the article "India's Challenges with Sustainable Farming" on "The Tech Panda" the company has an outreach program called "Samruddhi" which distributes kits consisting of protective tools and equipment and has already reached out to about 23,000 farmers in 2016. Other grass root movements also include the example of the farmers in Andhra Pradesh in 2000. An article titled "Getting Back to Nature" on "National Geographic" states how the farmers in Punkala, Andhra Pradesh were reporting various health problems and were also facing pest infestation in their crops. And due to this farmers were forced to take heavy loans to buy expensive pesticides. The villagers in the area faced loss of income due to crop failure and huge health care costs. Then with help of local organizations the farmers started to adopt the non-pesticide management techniques like planting neem and chilli plant which was planned to balance out the ecosystem and solve the problem of pest infestation.

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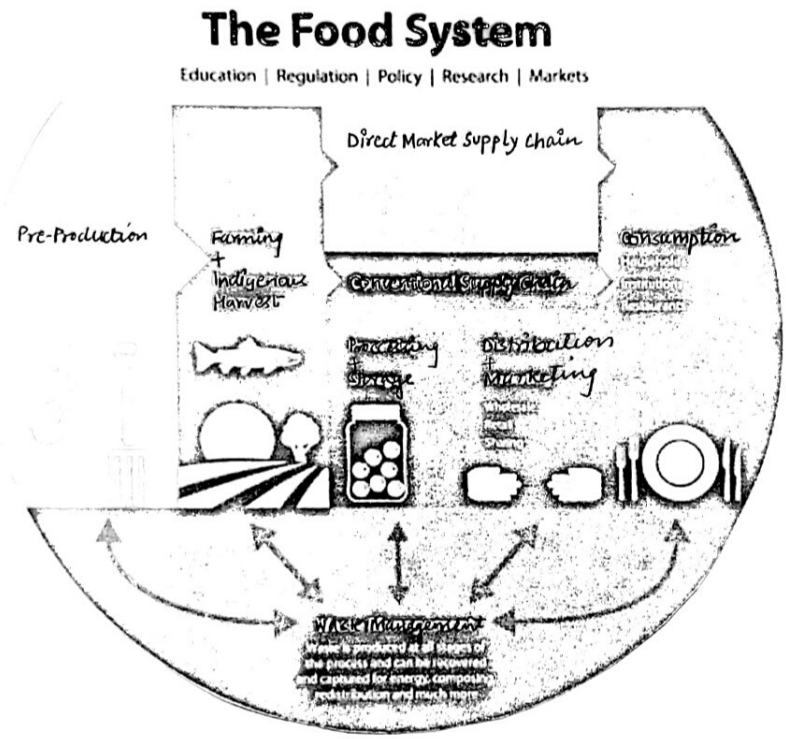

FOOD SYSTEM EDUCATION AND ENVIRONMENT

JANYA GOEL

CARTOON BY: TANYA GUPTA

"By 2050, earth will need to feed nearly 10 billion people. It is important to transform our agricultural practices and food systems so they work with and not against nature. This is the only way to ensure a healthy and nutritious diet for all," says Inger Andersen, Executive Director, UN Environment Programme.

In many ways, food is one of the most important aspects of our society and our food system is the main factor influencing public health and environmental problems. The sustainability of the food systems is a crucial issue to address as feeding a growing population amidst socio-economic problems and environmental depletion is becoming more difficult with every passing second.

Firstly, the transition of the population from low-income and rural to middle class and urban has led to the development of unhealthy dietary habits. This does not only affect the individual's health but also harms the environment. For example, the prevalence of fast food has increased plastic consumption which is one of the major threats to the environment today.

Secondly, food production can lead to land degradation,loss of biodiversity, depletion of natural resources and air, water and soil pollution. For example, food systems account for one fourth of the total anthropogenic green house gas emissions and agriculture requires 70% of the fresh water withdrawal. Additionally, one third

of the food produced is either lost or every year, which is four times the amount of food needed to eliminate global hunger. Wastage of food does not only undermine food security, it also contributes to unnecessary emissions and wastes valuable nutrients, energy and natural resources.

Therefore, in the wake of the ensuing environmental crisis, a more integrated study relating environmental impacts and certain dietary practices is needed. Food system education is an educational program to increase the awareness about sustainable food systems. Consumer education can help reduce the impact of food production, wastage and consumption patterns.

Detailed studies of food systems have brought forward the concept of agro-ecology. It deals with mainstreaming biodiversity in agriculture and doing away with monoculture. The innovations are based on combining science with traditional methods, local knowledge with practical application. The locally varied food production systems have proved to be more resilient to environmental imbalance. However over the years, 90% of crop varieties have disappeared from the farmer's field. Agro-ecological farming techniques can thus help in making agriculture more resilient.

Education is the most important catalyst to help converse the environment. Children should learn about these techniques right from elementary classes. Many countries have started initiatives to bring about a difference. For example, the 'Bento Day' in Japan is a dietary education program which involves the cooking experience of children to reduce wastage.

The food system complexity requires integrated actions and a coordinated synchronization of ideas rather than their destructive clashing, which can help in minimizing harm to the environment. Environmental surveys at Japan show that environment related knowledge influence behavior towards recycling and reducing wastage. A study at UK showed similar results.

While the world value survey of 2005-08 shows that people with higher levels of education were more likely to be concerned about the environment, the survey of 2010-12 indicated that if given a choice between boosting the economy and conserving the environment, people with secondary education favored the latter. Educated individuals can enrich and restructure their conceptions and practices continuously as they learn from their experiences and bring their ideas close to the accepted notions of science. These can be applied in various fields. Ways to utilize environmental awareness in environmental health have to be developed. The young minds can be molded very easily; hence younger children can have ideas and concepts of their own and play an important role in spreading awareness as they grow. For example, France, the most virtuous country in terms of food waste according to the BCFN-EIU Food Sustainability Index, launched a few educational campaigns which begin in a child's first few years at school. In doing so, it helped the younger generation reduce wastage and make up for its lack of progress. The younger generation is the effective source to bring about changes in the society.

The need of the hour is to have a more efficient collection and systematic analysis of data that covers various aspects of the entire food system. Better compilation and comparison of data is needed to assess the performance of the food system.

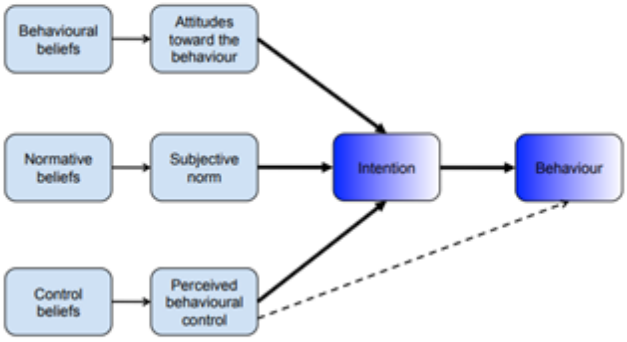

Figure 1.1: The Theory of Planned Behaviour suggests three types of attitudes that may contribute to the intention to conduct a conservation behaviour (Ajzen, 1991).

The planet is already in great danger due to our negligence. We are the last generation that can do something about the ongoing crisis. Instead of the rote learning routines taking place at schools and colleges, a greater emphasis on saving the environment needs to begin.

Both formal and informal education including raising public awareness and school environment clubs are crucial in bringing about a change in people's attitude.5 Depending on the society in consideration, a study showed that for each additional year of education that a household received, approximately between 4 and 21.5 percent less annual area of old growth forest was cut. A large number of studies have shown the positive effects of education on agricultural productivity – livelihood activities

and outreach programs can help in conservation by reducing the costs of conservation activity. An education program to achieve conservation success requires a change in attitudes, behavioral intention, and behavior at the end but most importantly.Many universities and colleges have started with courses for food system education, to help solve the problem of environmental crisis at its root. Information, awareness, communication and implementation can make the process of education in this field successful and beneficial.

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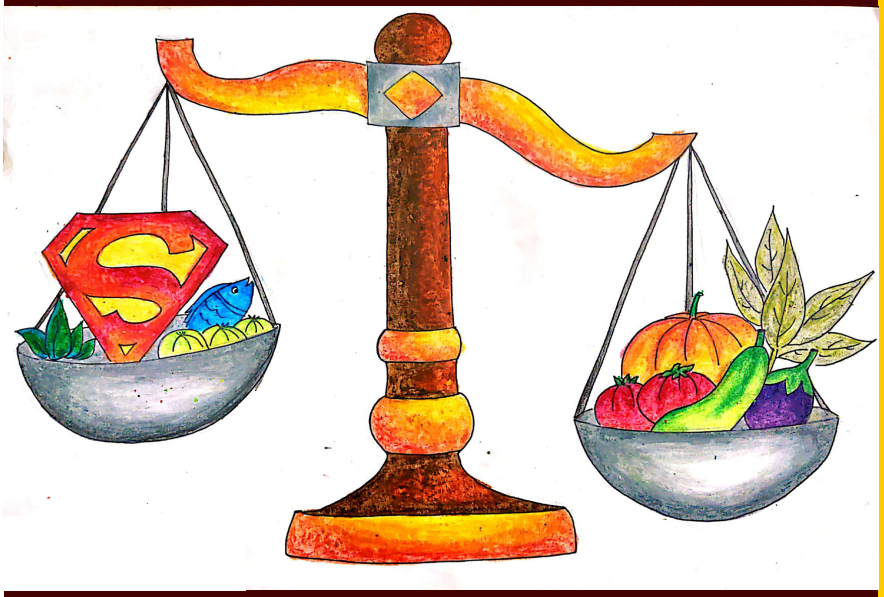
CARTOON BY JOMOL JOHNSON

THE FINE BALANCE BETWEEN LOCAL PRODUCE AND IMPORTED SUPER FOODS

PAYAL UPRETI



CARTOON BY: SHWETA MONDAL

On one of my recent trips to an upscale grocery store, I came across the term, "super food". This section included expensive imported food items that you don't hear of or see on a day-to-day basis and thus, I was curious to find out more about this exclusive food category. Upon researching about what they are, I learnt that the term "Super food" refers to food items that contain high percentages of a particular nutrient (e.g. antioxidants, vitamins, minerals). They are known for their extraordinary nutritional and medicinal value and are grown painstakingly by small farmers in far away foreign lands only to be marketed at excruciatingly high prices in the west. At times, it is not the health benefits that make a super food but the media focus that is given to it.

Despite the health benefits associated with super foods and the organic methods used in harvesting them, there are a number of drawbacks related with them: they not only pose a huge problem for the native consumers of the crop but also have hazardous implications for the environment. Since the demand for these has grown exponentially over the world, their overproduction has put a severe stress on the cultivable land. If this practice doesn't stop soon, or alternatively the farmers don't switch to proxy techniques of farming that decrease the burden on the soil, the arable land will not be able to sustain farming in the future. Soil erosion and loss of nutrients are just a few other externalities associated with excessive super food production. The loss of soil fertility is a

direct result of farmers switching to modern techniques, over their traditional ways, to keep pace with the growing demand of food. Most of these crops are heavily dependent on water for their production and over usage of water and inefficient irrigation techniques have decreased the water table at an alarming rate. They also require transportation over long distances that take up a lot of energy and increase the carbon foot print.

Another cause of concern is the commodification of staple food crops for people in developing areas without regard for the consequences for the native producers. The prices shoot up and prevents the original consumers from being able to afford it. This leads to change in the food habits of the native people, which might be detrimental for their health. With the advent of capitalism, big companies make a killing selling these luxury products, such as quinoa and avocado at very high prices and only pay the farmers a mere "fair wage" and thus exploit both, the farmer and mother nature. The substitution of local produce by imported food items, can also create a social divide between the people in a society since there is an air of exclusivity around the imported super food.

Quinoa, a gluten free grain, is a prime example of super foods and is popular because of its high percentages of iron, fibre, protein and other minerals. It is grown organically by indigenous peasants in Andes Ranges in Bolivia. Due to its high protein content, its demand in Europe and the United States has sky rocketed. Originally, farmers used traditional methods of rotating polycultural crops with llama pasture. To meet this spiraling demand, farmers had to switch to alternative modern techniques and thus, the fertility of soil has decreased by a big margin. Apart from this, the quinoa growing regions of the country faces malnourishment since the local population is not able to afford their staple grain because of the high prices. Dominance of super foods over local produces also undermines self-reliance and sustainability of traditional diets.Now, the important question that we should all ask ourselves is that - Is locally produced food not enough to meet our nutritional requirement and do we really need to rely on food items that are produces thousands of miles away. To answer this, we need to understand what we mean by 'local food'. Alisa Smith and J.B. MacKinnon, authors of 'The 100-Mile Diet', write that they chose a 100 mile boundary from the point of sale (or consumption) for their experiment in eating locally because "a 100-mile radius is large enough to reach beyond a big city and small enough to feel truly local".

Eating locally can be healthier for a number of reasons. Studies have shown that locally produced food ripens naturally and food that travels long distances is picked before its ripe. Expert dietician, Rujuta Diwekar, has pointed out that local food is a better option since it goes with the genetic make up of a person belonging to a particular demographic. Also, local food items are grown in the season and thus are more organic since they don't require the use of chemicals and use lower amounts of pesticides than industrialized farmers. Apart from health benefits, local produce is also better for the environment since it is associated with lower CO2 emissions since it is not transported long distances. Transportation of food is one of the fastest-growing sources of greenhouse gas emissions, according to the World Watch Institute. Each year, 817 million tons of food are shipped around the planet. This movement uses four times the energy and produces four times the emissions of an equivalent diet consisting of local produce. It also helps preserve green spaces since if the farmers are doing well they would not only help boost the local economy but they would also have less incentive to sell their land to builders.

In conclusion, the growing dependence on super food has numerous environmental impacts that have already become a threat to the earth. We need to look into this relation between food and environment and come up with ways so as to reduce our carbon footprint. The insatiable hunger of humans and their never ending thirst for finding alternatives to food anxieties comes at a huge cost – our future.

THE BENEFITS OF THE ZERO WASTE LIFESTYLE

SHAMBHAVI KALASH

CARTOON BY: ANJELA JOSE

A report from the World Economic Forum states that "The worldwide average amount of waste recorded as municipal solid waste is 1.2 kilograms per capita per day." Thus, it wouldn't be wrong to claim that on an average, an individual produces roughly 1 kg of waste per day today. Additionally, it has also been predicted that by 2025, the worldwide annual urban waste will get tripled due to a rapidly rising population. The planet would witness an easy addition of 1.4 billion more people. That is a lot of people and consequently, a lot of trash.

In response to the growing awareness about these alarming figures, the citizens of this planet have finally started to take matters into their own hands and have contemplated shifting to a simple and minimalist lifestyle, known as the zero-waste lifestyle.

The Zero Waste International Alliance (ZWIA) very neatly defines and describes the meaning of the zero waste movement as "The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health."

Minimalism and zero waste movements are thus essentially environmental movements that describe a lifestyle whose main goal is to send absolutely no waste to a landfill, incinerator, or the ocean. Instead, they focus on finding ways to

recycle, reuse, or refuse items.

This movement has gained a lot of momentum in recent years. Owing to the omnipresence of social media, a cult following has been created, in which people like Lauren Singer are using platforms like Instagram to showcase how they managed to produce only a jar of trash in a single year, and thus motivating others to follow suit.

One common misconception with adapting to the zero waste lifestyle is that one has to "cut down" consumption levels to a point where one can consume only bare essentials, thus having to forego the opportunity to enjoy a variety of goods. On the contrary, zero waste practitioners perfect the art of prioritizing quality over quantity: they learn to recognize the things that bring them happiness and joy and proceed to keep only the things that add a certain value to their life.

Japan, for instance, emerges as a flag bearer in the zero waste and minimalist lifestyle with their micro-apartments, capsule hotels and a general outlook for buying less. It was also noted that the Japanese way of living the minimalist life has a strong correlation with increased happiness: buying less but quality things, like a good & sturdy shirt, brought individuals more contentment than having a closet filled with numerous cheap t-shirts, and not having a particular liking for either.

While it is practically impossible for the average joe to reduce his net trash output to a perfect zero or accommodate all of his trash into a tiny mason jar, there are ways in which one can consciously and drastically limit and reduce their waste: it is by following the 7 R'S: Refusing, Reusing. Recycling, Reducing, Repairing, Rot and Rethinking.

Attachment, as per the Second Noble Truth in Buddhist philosophy, states that craving materialistic things and ignorance are the two main causes of suffering. Moreover, the Buddhist principles propagate the fact that everything in life is transitory and is constantly changing. The tendency of humans to attach themselves to items and incessantly hoard onto them for varying reasons is a major obstacle to happiness. One has to thus learn to practice the art of letting go of tangible objects. This includes detachment from material items and disciplining our psyche into believing and practicing mindfulness.

These core Buddhist principles flow seamlessly into the zero waste and minimalist lifestyle movement.

The essential takeaway from practicing minimalism is to be mindful of the purchases that one makes, both environmentally and psychologically, and purchase only those items that bring true happiness, thereby ensuring the reduction of the production of unwanted commodities (& thus waste), contribute to a better, cleaner and a healthier environment and lifestyle.

Zero-waste, from time over time, has constantly proved itself as the most cost-effective and prime solution to climate change and waste reduction and in the backdrop of an environmentally threatened planet like ours, it is crucial that the prioritization of adopting minimalism and zero waste as a lifestyle is needed for the sustenance of humankind.

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GLUTTIRE WHERE MEAT MEETS FUTURE

PRISHA SAXENA

Image sourece: https://www.downtoearth.org.in coverage/meaty-tales-of-vegetarian-india-47830

India's per-capita meat consumption stands at 4.4 kg per person, making it one of the smallest meat consumers in the world. In comparison, America, Australia and Argentina's figures average out at 110 kg per person. This minimal figure can be owed to a lot of sociological and economic factors; the prevalent culture of vegetarianism in India coupled with a large demography characterized by income insecurity.
However, the indigenous demand is set to witness an upward drift- corresponding to the global trend- that is attributed to sustained economic growth and increasing per-capita income which has induced consumers to add high value protein to their diet. This fledgling figure is also indicative of a rising middle class and strengthening of urbanization trends.

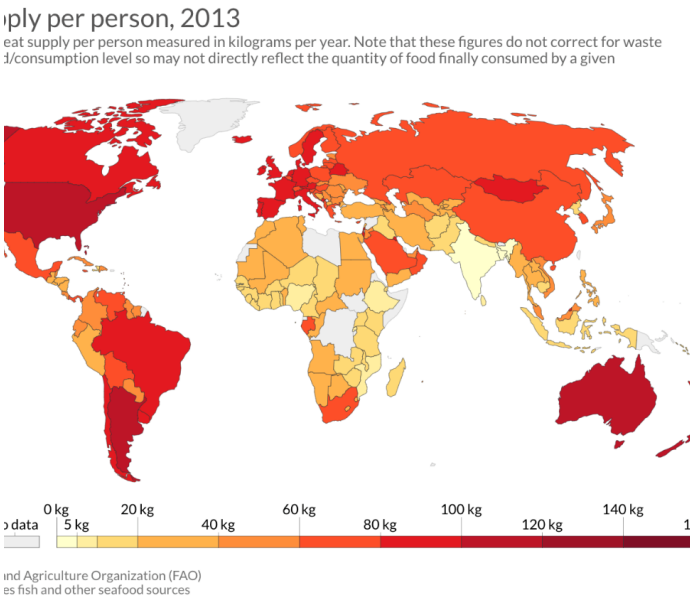
India is currently in the early stage of the diminishing returns phenomenon where high income levels and drastic leaps in addition to domestic product translate to rapid increases in meat consumption.

In contrast to global patterns, India's meat consumption patents an uncharacteristically high poultry meat consumption. Due the pluralist and secular tenets of our nation, religion(s) has a great and multitudinous say(s) in dictating eating habits; Islam and Hinduism prohibit the consumption of pork and beef, respectively.
Thus, both on a national and international level, the demand for meat and its consumption are moving along the wave of a crest.

This explains the high demand for chicken, which is largely, religiously acceptable. The increase in its consumption can also be attributed to its versatility and its relatively low cost compared to red meat. Extraordinary growth has been observed in other animal proteins, as well, like milk and eggs with projected growth rates of 10.6% and 7.4% per year, respectively.

Let's ruminate over how the supply-side is dealing with this increased consumption.
Jayson Lusk, a food and agricultural economist from Purdue University says that the prices of all meat products have considerably fallen over the past century due to the increased productivity in production of meat. This has been achieved through selective breeding, broiler production of poultry meat and other technological advancements (which are morally questionable)[1].

Pat Brown, a Stanford biomedical researcher interjects that despite these 'improvements', the process of turning animals to food is outrageously inefficient;
"The cow evolved to be a cow and make more cows and not to be eaten by humans. And it's not very good at making meat."
By this statement, Brown implies that enormous amounts of resources are exhausted to produce meat. He also considers inclusion of animals in food production to be one of the most resource-intensive and environmentally destructive technology on earth[2].



In the United States, Netherlands and Sweden, food production absorbs 17% of the total energy use. A direct relationship draws up between dietary preferences, agricultural production and environmental degradation.[3] In comparison to plant-based foods, meat production generates more emissions per unit of energy. The process is also the primary source of methane which plays a large role in warming oceans.[4]

James McWilliams argues that "every environmental problem related to contemporary agriculture … ends up having its deepest roots in meat production: monocropping, excessive applications of nitrogen fertilizer, addiction to insecticides, rain-forest depletion…"[5]
In the face of impending climate doom and loud calls for curbing massive, industrial productions, the inefficient and environmentally hefty activity of meat production seems anachronistic. However, a persuasive argument about environmental or social issues barely pushes people towards action. Moral arguments are generally ineffective and don't cause people to change behaviours [6]
Pat Brown took this in cognizance and realized the lacunae and contingent need for a meat-less substitute for meat which provides consumers satisfaction, in terms of nutrition and taste, not at par with contemporary products but better than it. He set upon the endeavor of reforming the animal-agricultural sector by tinkering around and conducting minor experiments in his lab to understand the elementary biochemical mechanisms behind the attractive features of meat like the flavor chemistry, behavior, texture et al.

In May 2019, Brown's company, 'Impossible Foods' was valued at $2 billion. After 5 years of research, Brown and his group of scientists decided that their debut product will be raw ground beef, which can be fashioned into the 'Impossible Burger', made entirely from plants. The main ingredients of the 'burger' are proteins from wheat and potatoes, coconut oil and minor amounts of amino acids, vitamins. However, the critical component that that makes the plant-based burger taste like meat is heme.

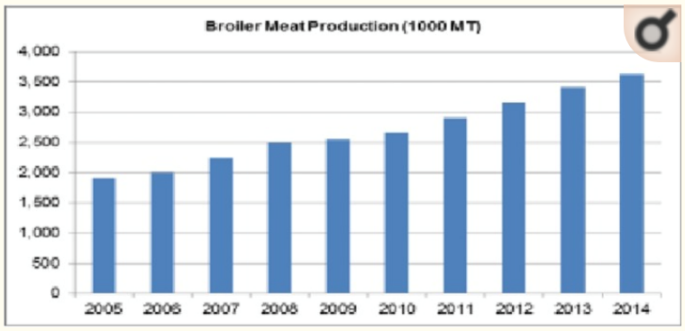


Fig. 4.
Broiler meat production in India. Source: Foreign Agricultural Service, Official USDA Estimates.

"…The system that burns calories to produce energy uses heme as an essential component, and it's what carries oxygen in your blood. And it's what makes your blood red…
Animals have a lot more heme than plants. And it's that very high concentration of heme that accounts for the unique flavors of meat that you would recognize something as meat…"[7]

The technological advent achieved by Brown's curiosity, desperation and ability to put together disparate ideas into a coherent scientific plan is deeply impressive and holds massive potential to topple the contemporary animal-agriculture industry and revolutionise what's on our plates.

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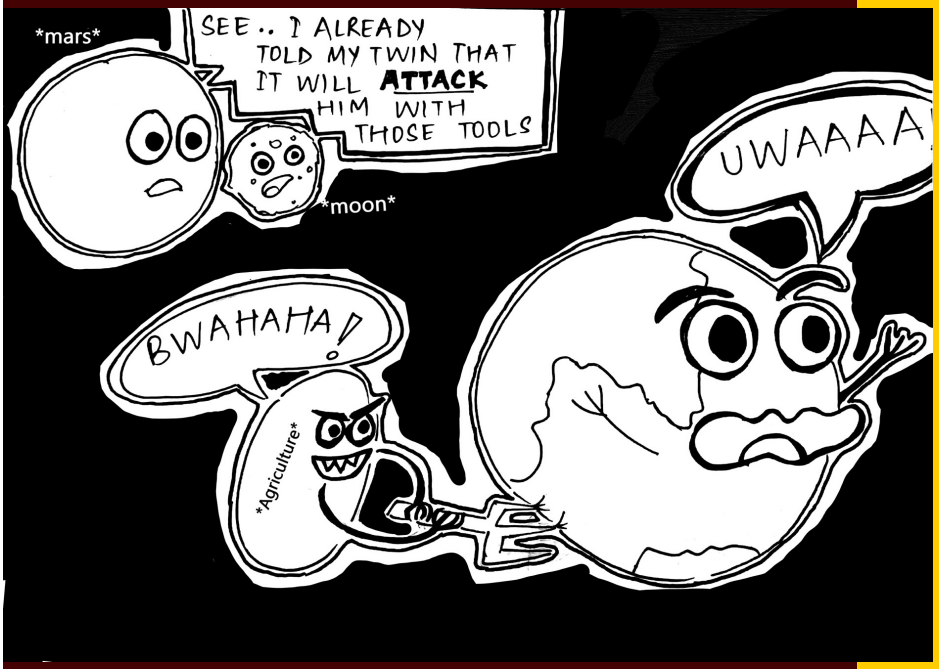
IMPACT OF INDIAN AGRICULTURAL PRACTICES ON ENVIRONMENT

AMISHA KAPOOR



CARTOON BY: ANJELA JOSE

With a majority of India's land being utilized for agricultural purposes and employment in agriculture forming more than 50% of the total employment[1], it goes without saying that agricultural practices and structures greatly influence the lifestyle of many. Another vital repercussion of India being an agrarian country is the impact of its largely unchecked agricultural practices on the environment. As a result of the green revolution, India achieved self-sufficiency in food grains [2]. However, what lies beyond the green revolution is recognition of a need to shift our aim to one focusing on ecological and environmental sustainability.

As per 2009, India's per capita availability of agricultural land stood at a 0.3 hectare per farmer as opposed to 11 hectares in the developed world [3]. This combined with the size of India's population, indicates that there exists a competitive demand for food, fiber, fuel, fodder and timber. This mismatch of proportions poses a constant threat to the overall nutritional intakes in the country and raises questions pertaining to food security. In order to achieve a desirable growth rate within the sector, it is essential to focus on improving water and soil management, promoting animal husbandry and fishery. However, considering status quo, adopting best practices to drive us towards sustainable agricultural growth seems like a distant dream.

Rainfed agriculture contributes to 44% of total food grains[4]. Due to this large scale dependence on rain, rainfed ecosystems are getting over exploited. Moreover, productivity of livestock as well as crops is adversely affected due to bio-physical and geo-political constraints. Factors such as low and erratic rainfall, land degradation, low level of input use and technology adoption, low draft power availability , inadequate fodder availability, resource poor farmers and inadequate credit availability, together exaggerate the existing issues facing the primary sector.

As a result of desperate attempts at intensification of agriculture, farmers overuse chemical fertilizers and pesticides. Nitrates and toxic substances, that are emitted as a repercussion of such excessive usage, impact surface water quality when water and soil containing nitrogen and phosphorus flow along with runoff into water bodies. Not only do these threaten the quality of drinking water, but also reduce the availability of water for agricultural use. With rising levels of water pollution in surface water bodies as well as groundwater, certain parts of India are becoming unsuitable for agricultural use. Excessive use of fertilizers, clubbed with chemical pesticides, have already led to soil degradation and erosion of its fertility, along with loss in biodiversity due to mono-cropping, buildup of toxic nutrients in soil, loss of micronutrients and loss of useful microorganisms, and further incessant use will only make the deplorable situation worse. Therefore, it may be concluded that a short term boom in agricultural productivity comes at the cost of long term damages which act as a hindrance, not only to agricultural productivity but also to overall environmental health of the country.

Along with adversaries on soil and water, methods undertaken to deal with crop residue also negatively impact the air quality, especially in North India. Crop residue burning has come to being the leading cause of air pollution. International research institutes have found that intense crop residue burning (CRB) is a leading risk factor for acute respiratory infection (ARI), especially among children less than five years.

All this leads us to a very pertinent question. Despite being in the eye of the storm, what keeps us trapped in the perpetuation of such detrimental agricultural practices? The answer lies in understanding how India's food needs are increasing with an ever increasing population and insufficient availability of alternate nutrient sources. The country will require about 300 MT of food grains by 2025 to feed its teeming millions. This would necessitate the use of about 45 MT of nutrients, which is more than what can be provided using existing organic sources[5]. The lack of nutrients will be covered by an increase in the use of fertilizers, which have its own complications, as highlighted above.

Over and above that, crop residue management technology is expensive, and even after subsidies, remains largely inaccessible to farmers. Along with these causes, due to a time constraint between harvesting one crop and planting another, the farmers of North India resort to burning crop residue as a fast and effective means to get rid of it. Therefore, environmental pollution is the trade off we make in order to sustain the much needed pace of agricultural growth.

Climate change and preserving the environment has become the need of the hour worldwide. With pollution levels in India being amongst the highest globally, it goes without saying that there is an urgent need for large scale changes. The structure of the primary sector, because of its scale, has long term and extremely tangible effects on the environment. It is necessary to factor in these repercussions and work out solutions if environmental preservation is a goal that India wishes to achieve in the future.

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URBAN ROOFTOP FARMING; THE NEWEST TAKE ON SMART URBAN AGRICULTURE

SHAROL SHIBU

CARTOON BY: TANYA GUPTA

Innovative forms of green urban architecture aims to combine food production, and design to produce food on a larger scale in and on buildings in urban areas"

In recent years, it has been witnessed that Urban Rooftop Farming (URF) has gradually seen an increasing popularity in defining urban architecture along the lines of agriculture and sustainability. Urban Rooftop Farming is a practice that is well suited to ensure the enhancement of food security in cities and reduce the environmental impact that results from long transportation distances that are common to the conventional agriculture methods. It has been frequently observed that most URF initiatives are frequently motivated by social and educational factors rather than the aim of creating large sustainable food production in the urban areas. Should they become profitable, the commercial operation of urban rooftop farms is likely to attract notable private investment thereby allowing a significant level of high quality food production to be achieved in the urban areas.

After severe analysis, urban rooftop farming can be grouped into two main types. Firstly, hydroponic systems found in greenhouses where mostly leafy greens, tomatoes, and herbs are grown; secondly, soil-based open-air farms that can usually grow a large variety of vegetables. Hydroponics is seen as the key technology for sustainable commercial urban food production. While the technology is not in itself sustainable, hydroponic farms often try to make an effort to

implement several environmentally friendly technologies and methods. In the era of an increasingly globalised and urbanised world, the food supply chain network stretches over very long distances. The production location is decoupled from the location where products are usually consumed, thus resulting in very long transportation distances and an associated environmental impact. With the increasing global population, there is a further increasing demand for food which puts more pressure on food security in urban areas.

In recent years, various forms of urban agriculture have become popular as counter movement which aim to reduce the environmental impact of the methods employed by conventional agriculture, increase food security, and enhance social cohesion in cities. Urban agricultural activities that do not use any farmland or open space can be coined under the term Zero-Acreage Farming (ZFarming). These activities includes rooftop farming, private backyard gardens, the development of community gardens on vacant land as well as agriculture in and on buildings. Like urban agriculture in general, the growing interest towards Urban Rooftop Farming (URF) has been quite exceptional. The main advantage of URF is that it does not compete with other land uses or even with the uses of a building's interior. In addition to that, it does not require a fertile farmland.

Most projects are motivated by social, educational, and quality-of-living issues associated with them. Many of the URF projects are financed through crowdfunding or through government and private grants. Since the costs are often higher than the (financial) benefits, it has been concluded that the main value of such projects is generally more social than environmental. It has been further observed that URFs need to be more commonly operated by professionals. As such, in most cases, it is required for URFs to be commercial operations. A well-executed commercial operation has great potential to attract private investment and is therefore more likely to overcome the key challenge of obtaining financing. This, therefore, allows the URFs to spread rapidly; further providing fresh products to a significant portion of the citizens of an urban area. While the method of hydroponics is often seen as the key technology involved with commercial and large scale URF operations, hydroponics is very often not considered to be naturally sustainable.

n North America, New York ranks first with the most URFs (15 rooftop farms and an installed area of 11.61 hectares), followed by Chicago (7 URFs,
1.06 hectares) and Montreal (4 URFs, 0.82 hectares). Globally over 70% of the overall projects are located in North America. It was also seen that 70% of the farms (40 farms) are open air farms. The greatest percentage (39%, 22 farms) were built with the purpose of increasing the quality of life.

Social aspects are another reason for populations to engage further in urban agriculture. A garden or a rooftop farm can be regarded as a place where people from different communities can come together for mutual benefit, providing a common social and cultural identity for many of these city residents. Urban agriculture is very often cited as a means for fostering community empowerment as well as an opportunity for urban residents- particularly in underserved areas- to directly engage with the process of food production and food procurement, which has increasingly come to be seen as a social justice issue. Engaging in various forms of urban agriculture can also help in increasing the participation of residents in community enrichment programmes such as skills development, job training and other educational prospects which end up benefiting the underserved populations in urban areas.

In conclusion, it can be observed that not only hydroponic farms but soil-based farms can also be run for profit due to certain advantages that soil-based cultivation has over that of hydroponics. There is a strong increasing trend in the use of URF's around the globe, especially in North America. More analysis and observations are needed to improve the overall operations of hydroponic farms, for further integrating them into buildings and connecting the material and energy flows from the URF with the building they are located on. This can help to further foster innovation in terms of combined energy and food production, use of waste heat in buildings and combined water treatment. In addition, future research is needed to deepen the technical and economic aspects of commercial URF's. These findings highlight the great potential with context to URF's and also show the direction in which future developments on the prospects of URF's can go.

SUSTAINABLE FOOD SYSTEMS

NIDHI SHANKAR

CARTOON BY: SHWETA MONDAL

One of the major challenges to be faced in the not-too-distant future by the global food system is to feed a population which remains to be growing and may also reach 10.5 billion by 2100. Even though the people in the later years maybe relatively richer on an average, and predominantly living in an urbanised environment, scarcity crunch of resources will be felt irrespective of this improvement. This will cause the demand for high-quality food to increase by even more than the growth in population. Hence, we need to evolve new insights and solutions to develop resilient, high-quality agriculture and food systems. These systems need to develop ways to influence consumers to make healthy choices.

Firstly, it is crucial to understand the concept of food systems. It is a term encompassing the entire range of actors and their interlinked value-adding activities involved in production, processing, distribution, consumption and disposal of those food products. In simple terms, it is the "path that food travels from field to fork". The food system comprises of (a) sub-systems e.g. farming system, waste management system, etc. (b) systems which interacts with other key systems e.g. energy system, health system, etc. Therefore, it is possible that a structural change in the food system might be induced from a change in another system (as they are inter-related); for e.g., a policy promoting more biofuel in the energy system will have a significant impact.

A sustainable food system works in a dual pronged way of maintaining food security as

well as nutrition for all. Multidimensionality of such a system ensures that the economic (profitable), social (broad-based benefits for society) and environmental (positive or neutral impact on natural environment) sustainability are adequately included and that there is no compromise on future generation's capacity. A sustainable food system lies at the heart of the United Nations' Sustainable Development goals-understanding the importance of food systems keeping in mind rapid population growth, urbanization, growing wealth, changing consumption patterns, and globalization as well as climate change and the scarcity of resources.

Recent developments in food systems can cut both ways. Developments include, providing incentive to the small and medium industries (also cottage industries & cooperatives) to promote industrial entrepreneurship among rural people; providing the necessary public utilities in such (rural) areas also play a major role in promoting industrial activities, basic infrastructure being the backbone of such operations. Therefore, establishing and strengthening facilities like service centres and institutions at local levels to provide inputs, credit, vocational education and training, etc. is crucial. Also, organizing rural works programme, developing agro-industry by promoting local production and forestry activities (for ecological protection and to meet local needs) can be done.

Positive impacts of such developments bear fruit in the form of expansion of off-farm employment opportunities, especially prevalent in developing countries. This has led to widening of food choices for consumers beyond local staples improving consumers' welfare (better in taste, form and quality).

An integrated rural development is required which in turn needs rapid growth of non-farm economic activities and opportunities for employment especially through rural industries, and expanded infrastructures for power supply, transport, marketing and storage facilities with due regard to technology and scale so as to benefit the rural poor. This would reduce rural exodus and also slow the growth of urban slums.

Food systems are inevitably linked to our environment and to us, raising certain societal and health concerns. In the recent times, food production has contributed to climate change by causing a loss in biodiversity, change in land-use pattern and being a major source of GHG emissions (example, increasing energy-intensity matter of time before it (food system) is also affected by climate change as can been seen by the uncertainty in supply of production depending on the interplay between temperature increase, the effect of increased CO2 on plant growth, extreme events (drought, flooding, etc.).

The global population is growing, and diets are changing. These trends link food with health. Food industry is controlled by a small number of stakeholders affecting how food system functions, limiting the access to viable markets for small scale producers, processors and retailers. It influences the types of foods that are marketed and available – and their price – influencing consumer habits. Such structural changes have created substantial problems i.e. consumption of many highly processed, high-calorie and low nutritional value foods that are now widely available.

The issue of Food safety as well as Food loss and waste (as a result of the societal culture that promotes extravagance) pose a major challenge. Animal & human health issues, as a result of unscrupulous actions of sellers, put people and environment at risk.Traditional food security programs follow a production-focused approach, aiming to solve food insecurity by increasing the food supply. Inadequate food production is still the major cause of food and nutrition insecurity (e.g. Sub-Saharan Africa). This approach, however, neglects areas which are root cause of under-performance of such systems.

In the recent times, moving to a more holistic approach, the food systems approach considers the food system in its totality, it includes the elements, their relationships and related effect. Although trade-offs have to be made, there will be opportunities to simultaneously accomplish multiple objectives. This approach can help identify such synergies and facilitate the coordination needed to achieve them.
The necessity of sustainable food system as enumerated by FAO are,firstly, achieving an understanding of the creation of incentives (ways to influence an actor's capacities) and produce behaviour required for performance standards. Secondly, to facilitate the emergence of positive feedback loops (creating self-sustained processes of performance improvement).

Sustainable food systems, as engines of growth, have a value-added structure that has five components:

1. Worker's salaries
2. Return on assets (profits)
3. Government's tax revenues
4. Consumer's benefit
5. Impacts on the socio-cultural and natural environment.

The four feedback loops

(1) Investment loop, (source: reinvested-profits and savings)
(2) Multiplier loop (source: spending of worker's increased income)
(3) Progress loop (source: public expenditure -on socio-cultural and natural environments)
(4) Externalities loop (source: economic, social and environmental impacts)

With the current food systems being inadequate, solution requires a multi-pronged strategy comprising of consumers, farmers, food industries & policymakers. Even though both the industry and the government attach important significance to healthy diet, realisation of these goals require a breakthrough at various levels along the supply chain. Behaviour on the part of the consumers also plays a significant role wherein knowledge encourages a healthy and sustainable consumer behaviour. Thus, with rising consumer sensitivity towards environment of the consumer habit, a revolution has begun in form of greater awareness and commitment but much still remains to be done.

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SHOONYA

Shoonya was founded in mid 2017 with the intention of increasing farmers' incomes and preserving the native Indian bovine breeds that are on the verge of extinction. These days most dairy farms in India rear European bred cows and if one keeps indigenous cows people automatically assume it's for charity. We, at Shoonya, want to bring about a change in that sentiment. And alarmingly, more than half the dairy and natural farms in India end up shutting down due to non-profitability of the farm. Our endeavor at Shoonya is to:

(i) Protect and nurture our Indian cow breeds that are rapidly diminishing
(ii) Develop a viable desi-cow based agriculture model

The agriculture we practice is fashioned around a 'Zero Budget Natural Farming' concept, which involves utilizing cow waste to enrich the soil. In a nutshell, this is an ecosystem where the farm is nourished from the by-products of cows and the cows are nourished from the products of the farm. We simply facilitate this cycle and enjoy the fruits (pun intended) of this complementary relationship. The benefits of practicing this kind of traditional, cow-based farming are: a) Increased farmer incomes by reduction in agriculture input cost and improved quality of produced) Reversal of soil desertification and degradation of environment through sustainable farming practices) Availability of unadulterated A2desi-cow milk products and chemical-free farm produce for consumers.

About the Owner

Vaishavi Sinha has represented India in golf since the age of 10. She was recruited to play on the NCAA Division I Purdue Women's Team after which she turned professional in 2013 and went on to play the Symetra Tour for 2 years.

Upon moving back to India, Vaishavi decided to pursue chemical-free, natural farming and animal husbandry because she believes, "what you eat is who you are, how you think and how you ultimately perform. As an athlete, nutrition has always been my topmost priority and providing pure, unadulterated and nutritious food to people is the mission that I've taken up."

WINNING ENTRY

PAPER PRESENTATION

DETERMINANTS OF GLOBAL RECESSION AND PREDICTIONS FOR 2020: A MONTE CARLO SIMULATION STUDY

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Key Words: Global Recession, Panel Data, Monte Carlo, Forecasting

Cycles of expansion and contraction are an inherent part of life and the world at large. Just like the expansion and contraction of the heart is a characteristic feature of human life, expansionary and recessionary phases of business cycles are a characteristic feature of the life of an economy.

With global tensions with respect to dwindling growth of key global players and adverse developments in the international trade market doing rounds at present, we direct the focus of our research towards the southward phase of business cycles, i.e. an economic recession. An economic recession is a period of significant length involving a substantial decline in overall economic activity, possibly leading to stagnation or negative growth, as signaled by various macroeconomic indicators. The world has witnessed global recessions at five instances since the advent of the twentieth century. Recent factors such as reduced GDP growth of key global players such as China and increasing trade tensions have primarily led to one unanimous belief that the overall economy is slowing down. Most economists, as well as some of the world's business elite, agree that economic growth is slowing but they have expressed some hope for a soft landing rather than an outright recession.

The purpose of our research is to forecast economic growth for the year 2020 and consequently predict the likelihood of a global economic recession in that year through detailed research of the factors that are weighing down the economy as of this instance. In this process, we have analyzed the past movement and trends of multiple macroeconomic indicators which influence economic growth as well as their relationship with economic growth based on the data acquired. This relationship was determined by running a panel data regression which would yield an equation with GDP growth as the dependent variable. This equation has then be used further to conduct a Monte Carlo Simulation and obtain the most likely scenario of economic growth for 2020, thereby helping us assign an accurate number to the probability of an economic recession in 2020. IMF classifies recession as consecutive fall in GDP for two quarters, thereby enabling us to figure out the proportion of such instances in our Monte Carlo data.

Everyone witnesses upward as well as downward trends in their life; so does an economy. While upward trends are generally associated with positivity and large-scale benefits, downward trends require a more careful analysis for appropriate assessment and reliable future predictions and decision making.

Generally, the major effects of a recession on the economy include unemployment, reduction in wage rates, budget deficit, bankruptcy, increasing bond yields, increase in poverty and political instability among others. The term recession is synonymous with jobs lost, profits cut and development halted. However, some industries, sectors and countries are hit harder relatively while others not only manage to stay afloat during this tough period but also outperform their peers. The major losers are the financial services industry, emerging economies, travel and accommodation, construction and energy industries. On the other hand, the major gainers include consumer staples, healthcare, US dollar and sin industries

Considering a wide range of factors which affect global GDP growth one by one, we have studied their effects and the magnitude of those of effects on the G20 countries (90% of global GDP) using panel data analysis. After a detailed analysis, we have been able to figure out the following factors to be the most
significant:

Investment Spending - Investment raises the production capacity directly and shows how much value added is invested rather than consumed.
Consumption Patterns and Consumer and Business Confidence -This determines the level of willingness of consumers and firms to borrow and spend. When confidence is high, there is an atmosphere which encourages borrowing and spending, thus boosting economic growth. However, a large increase in consumption implies low saving and investment which leads to pressure on the fixed capital which is not replaced and does not grow at an adequate rate which may lead to a decline in output as well as productivity.

Oil Prices and Consumption - Oil occupies a major part of the import bill of most large economies, yet, it is consumed vastly. Oil prices and consumption have a large influence on the economy, considering that two of the four Global Recessions had been triggered by Oil Price Shocks. Similarly, technological progress, international trade, unemployment, military expenditure, human capital formation, size of workforce, flexibility of labour markets and other factors such as output gap and unaccountable factors such as externalities and underground economy affect economic growth significantly.

Considering these factors, we identified 46 major macroeconomic indicators which help us to measure the effects and influence of the quantifiable factors on economic growth. Following this, data related to these indicators has been acquired from credible sources such as the World Bank, the IMF and the OECD. Checking for multicollinearity and stationarity, we narrowed the number of indicators to 8.

The results obtained at each step of the research and the final conclusion are as follows :

DESCRIPTIVE STATISTICS FOR FINAL VARIABLES

	MEAN	MEDIAN	MAXIMUM	MINIMUM	STD. DEVIATION
GDP GROWTH	3.528378	3.343332	15.19343	-14.53107	4.050642
D(FDI)	0.037378	-9.42E-05	7.720765	-10.63497	1.393617
D(OIL RENTS)	-0.18565	-0.000153	14.94231	-26.43541	2.563694
D(CONSUMPTION EXPENDITURE)	-0.03377	-0.052037	14.38199	-12.36589	2.376233
D(INVESTMENT)	-0.0094	0.0945	11.447	-13	2.198602
D(OIL USAGE)	-6.710606	-1.662624	20.58064	-221.5646	26.19194
D(MILITARY EXPENDITURE)	-0.041303	-0.016557	3.310102	-3.589742	0.467714
D(TRADE)	0.535796	0.718764	84.32036	-41.87862	6.80675
D(UNEMPLOYMENT)	0.018973	-0.0135	7.039999	-4.23	0.97033

PANEL REGRESSION RESULTS

INDICATOR (INDEPENDENT VARIABLE – Taken at 1st Difference)	COEFFICIENT	LEVEL OF SIGNIFICANCE
C	3.565918444	
FDI	0.328579276	***
OIL RENTS	0.152036383	**
CONSUMPTION EXPENDITURE	0.043862606	
INVESTMENT	0.508187596	***
OIL USAGE	0.003332086	
MILITARY EXPENDITURE	-0.153646741	
TRADE	-0.026301398	
UNEMPLOYMENT	0.254689359	
R-SQUARED		0.388268095
F-STATISTIC		11.25907987

HAUSMANN SPECIFICATION TEST

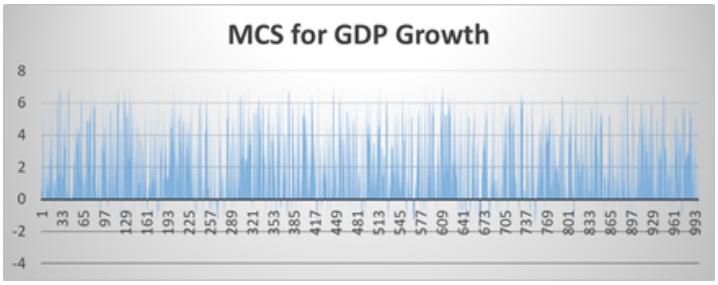
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Probability
Cross-section random	13.6675276	8	0.090853467

Monte Carlo simulations are used to model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables. It is a technique used to understand the impact of uncertainty in prediction and forecasting models. The true power of Monte Carlo simulation is in data extrapolation, or forecasting beyond the known data points and understanding the range of outcomes expected.

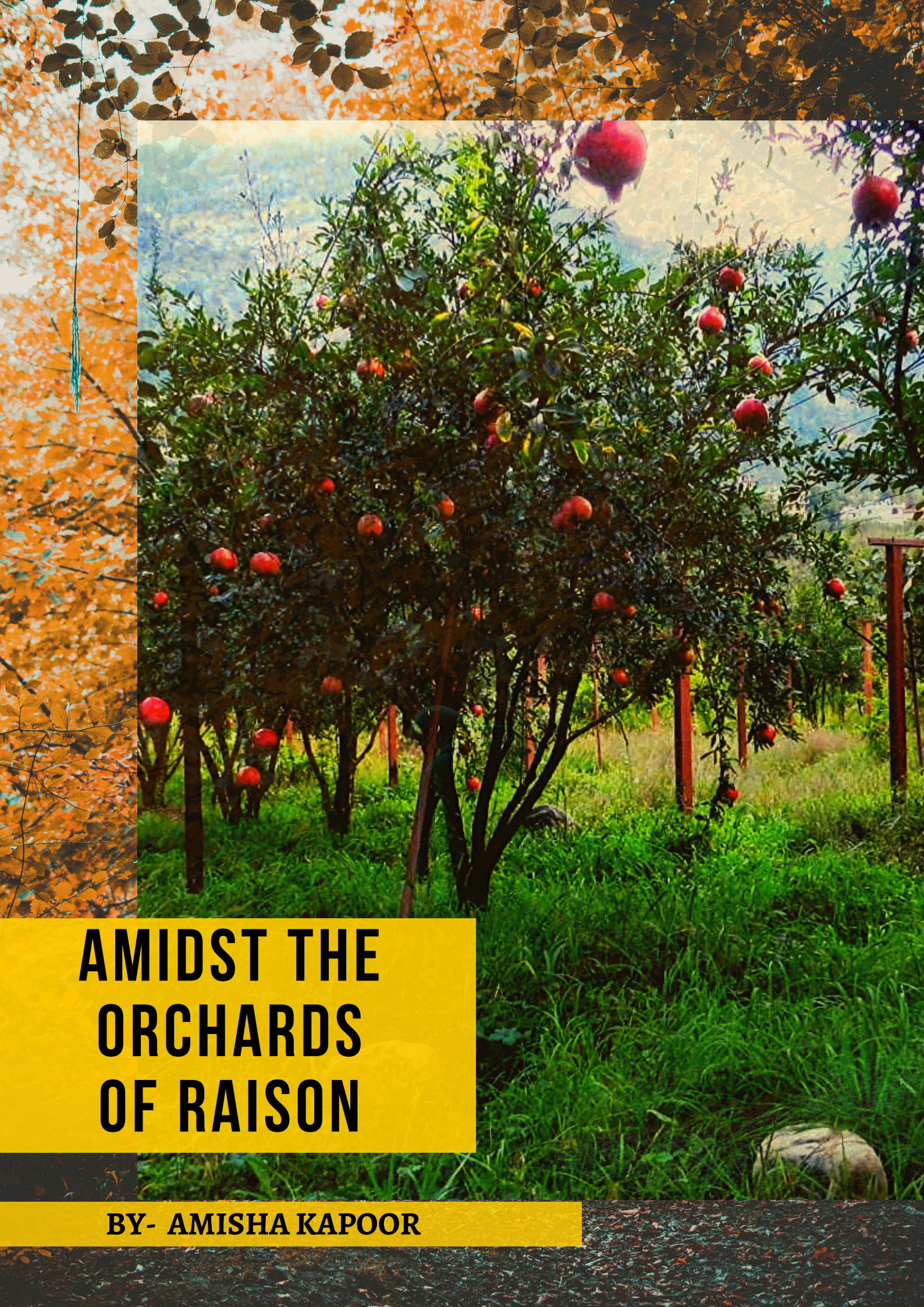
In our study, we analyzed the effects of the variables on the GDP growth rate using the panel data analysis. The findings were then interpreted in terms of the occurrences of negative GDP growth rates in the Monte Carlo population, thus suggesting a probable number to the chance of a recession. Further, through panel data analysis, we were able to successfully assign coefficients to variables, signifying their weight.

The results of Monte Carlo Simulation which are summarised in the following table and figure :

No. of Iterations	1000
Instances producing Positive Growth	812
Instances producing Negative Growth	188
Probability of Global Recession	18.8%
Mean Growth	2.67
Maximum Growth	7.120088%
Minimum Growth	-1.5851%
Variance	6.458879



As illustrated, a probability of 18.8 % was obtained by our model. Economists surveyed by the Wall Street Journal (January 2019) were seeing on average a 20 percent chance of a recession within the next 12 months. This is in line with our estimates, although certain factors which have an effect on economic growth cannot be accounted for such as externalities, non-market activities, underground economy and political stability. Incorporation of these aspects offers a promising research subject for the future studies.



AMIDST THE ORCHARDS OF RAISON

BY- AMISHA KAPOOR

The concerns of environment protection capture the imagination of those who are most intimately connected with the Earth- the farmers. To highlight their side of the story, Amisha Kapoor, 2nd year Economics Honors student, writes a report based on primary data collected from the farmers of Raison through personal interviews. The report reveals intensive information on farming practices in hill stations. It provides an insight on the struggles of farmers and paints a detailed picture of the tangible effects of climate change on food. The writer highlights the ground issues in farming that are difficult to comprehend unless explained with an understanding that goes beyond mere theoretical knowledge.

CATCH FACTORY

On the banks of Beas, about 15km away from the city of Kullu, lies a serene village by the name of Raison. The village is situated at a height of 1189m and is surrounded by the breathtaking view of peaks whose colors range from shades of green, brown and white depending on the time of the year. Adding to this scene is a network of water channels birthed from natural water springs which originate from aquifers embedded in the land. Each spring, locally referred to as chashma, becomes an important natural resource for the villagers.

Like most villages snuggled in nooks and crannies of gargantuan mountains, distant from cities, Raison too has a small population with a majority leading a simple lifestyle. The people, being mostly zamindars and farmers, build their livelihood around orchards of fruits like kiwi, plum, persimmon, apple, pear and pomegranate. Integrated with farmland, the layout of the village also accommodates a few hotels, campsites, popular Bollywood shooting locations and a mineral water unit set up by the well-known spice and beverage brand, Catch.

The prevalent family structure in the village is simple, with around an average of four residing members in each house. It is now being seen that many people are moving to cities and taking up jobs other than farming. However, the farmland of their forefathers keeps most attached to Raison. All adult members make their contributions to the land whenever they can, on holidays or post retirement. A preferred shift in profession can be credited to an increasing family size with every generation, coupled with the fixed size of land. The older residing farmers lead a fairly simple lifestyle wherein a very small portion of what they earn is consumed and sufficient, making it convenient to save the rest. On the other hand, a large proportion of the present generation desires alternate sources of income as a reliable means to self-sustenance. Aspiring students from Raison value their education as can be seen by the varied professions they wish to take. While some residents have the privilege of owning large pieces of land, others have very little or none at all. Such residents sustain themselves by working for landowners and earning daily wages. Some land owners also employ migrated workers from Bihar and Bengal who work on the fields for relatively lower wages. This difference in wages transpires due to the

All details elicited in this article were furnished by four farmers from raison. Know those farmers:

SHRI CHHAPE RAM NEGI, FARMING SINCE 1970.

Shri Negi owns one piece of land on which he grows plums, pomegranate,santa rosa and spur variety of apples. This variety is new to the village and requires merely 300 chilling hours. He lives with his sister in law. His son works in another village while his two granddaughters have moved to the city for college.

SHRI VIDYANAND NEGI, FARMING SINCE 1980.

Shri Negi owns two orchards, one on a lower height than the other. Along with orchards, he also engages in vegetative farming and owns cattle. His cattle provide him with milk and cut costs on manure. Villagers often bring crop residue to be fed to his animals.

added perks of food and shelter given to migrated workers. Such locals and workers are also soaked in by the upcoming tourism industry and the Catch factory. Though tourism in the region has grown in recent years, agro-tourism is yet to find its place.

Constantly relying on natural resources makes the farmers of Raison exceptionally particular about preserving the environment. The land, which was once red with apples, is now multicolored with young orchards of pomegranate, kiwi, persimmon and other fruits. Each fruit bearing plant requires a certain number of chilling hours in order to bear fruit. Chilling hours are hours during which the temperature lies below 7°C. Apple varieties that were grown in the region required 500 to 1000 chilling hours, however, most of them had to be replaced due to changed climatic conditions. Fruits grown now have chilling requirements ranging from 300 to 800 hours only. The apple orchards on Indian hills are moving higher on the gradient and the ones situated on lower heights- like the ones in Raison- are failing their farmers. Not only is this a very convincing proof of climate change, it also puts a lot of pressure on farm owners. Replacing entire orchards with new ones required investing time equal to the gestation period of the new fruits, along with money used to purchase and equip saplings to bear fruit. In addition to this, income was also lost till new plants reached fruit bearing age. Some farmers in the village, situated on relatively higher land, continue to grow apples, but struggle with the bearing and health of the fruit. As opposed to older practice, apple flower pollination is now done by renting bees from breeders in lower lying villages. Previously, there used to be an abundance of local bees during pollination season. Moreover, since the temperature no longer ensures timely ripening of apples, excessive chemicals are being used to do the same. In addition to this, the changes in season timings and the course of Beas and its water levels are also indicators of climate change.

The villagers' regard for the environment can be seen in all their farming practices. All their lands are irrigated by pumps drawing water either from the nearest chashma or the Beas. The water drawn from natural sources is channeled by digging a network of trenches across orchards. To preserve the purity of water against surface runoff, a majority of the fertilizers used are organic; farmers use minimal chemical fertilizers and utilize their crop residue along with cattle excreta to make compost, locally known as khad. If a fruit necessarily requires chemicals in order to boost growth, farmers ensure that the chemicals aren't applied to land rather to the fruit itself. Crop residue is also used to feed cattle and birds, leaving only a small amount of twigs to be burnt during winter evening borne fires. The higher situated localities of the village don't have access to springs or the river, therefore crops grown there have minimal water requirements easily fulfilled by rainwater.

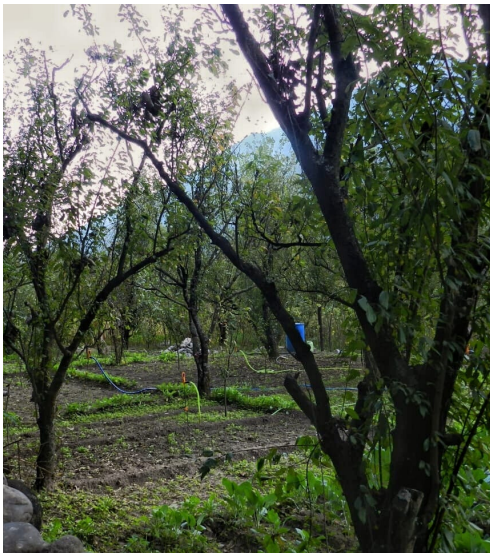
All details elicited in this article were furnished by four farmers from raison. Know those farmers:

Manoj Sahu,
farming since 2015.

Manoj came with his family from Bihar and has been residing in the village for 4 years. He has been employed by a landlord, who does not reside in Raison, in the capacity of a caretaker. He looks after a kiwi orchard while his three children go to the local school. His landlord provides him with rent along with his salary.

Sachin Sood

Mr. Sood owns land on a height where he does not get access to natural water sources. Still selling apples, Mr. Sood also drives a taxi in order to gain extra wages. He claims that the locality of his land makes it undesirable for others since it is under constant threat of landslides.



The lack of heat in these localities facilitates the long-term storage of rainwater. How personal nature is to the residents can also be seen in their contempt towards the Catch factory. The factory is infamous for periodically releasing chemical waste into water channels thereby adding to them a peculiar smell accompanied by black colored water. In an attempt to penalise this disregard for the environment,, the villagers have successfully collectivised and ensured that any further expansion of the factory is not granted the 'No Objection Certificate (NOC)', a prerequisite for expanding in the area. The farmers, however, have not been able to compromise on the use of chemical pesticides and insecticides because of the resilience insects and pests develop to the natural replacements.

Established farmers of Raison sell their produce in the local mandi where retailers from Punjab and Haryana bid for packaged boxes of fruit. The local Mandi is a relatively new establishment and has facilitated transparency in transactions. Before it was made, produce was transported to Delhi through middlemen and payment was deferred until as long as a year. Since the entire produce is bought for resale, none is left to be stored, thereby relieving farmers from the added burden of maintaining a storage facility. The Mandi, though helpful, does not always ensure fair pricing. During seasons of bad weather, roads connecting traders to the village are adversely affected. This reduces their connectivity due to which the prices of fruits go down. The government has not made any facilities to ensure a stable price for the produce regardless of weather conditions and placed bids. Villagers wish for better roads connecting bulky vehicles to their orchards. Moreover, locals believe that government subsidies on fertilizers and pesticides benefit only extremely large-scale producers and are unnecessary for both. As a more helpful replacement, they suggest better insurance schemes for their produce in order to protect them against natural disasters such as floods and unforeseen circumstances during transportation of produce. Farmers also expressed the redundancy of yojna's like PM-KISAAN by sharing how distributing a small sum of money is of no benefit and is seen as a mere appeasement tactic. However, the villagers were appreciative of certain environment corection measures taken by the government like replanting Deodar trees in deforested regions every six months.

Conversation around farmer suicides in India is often a post-crisis phenomenon. Political leaders generally resort to subsidies and loan waivers as go to solutions. Solution mechanisms undertaken by farmers of Raison, however, transcend the boundaries of political appeasement. The community showcases how adapting to ever increasing challenges is imperative to achieve longevity in the farming business. Though local farmers have collectively found ways to minimize the repercussions of climate change, their journey has not been smooth sailing. Had the government made efforts aimed at easing the adaptive process, farmers' confidence would have been positively affected. The lack of confidence boost- though immaterial to farmers in Raison because of the reliability of their natural resources- proves to be lethal to farmers in other parts of the country. Perhaps the persistence of India's farmer crisis is a strong indicator of the need to reform quality of measures taken to aid it. Measures formulated using thorough insight on root causes and self-determined correction measures may be a valuable start.

LOGO DAY

Tanya Agarwal
B. Sc. Mathematics (H)
Third year

Dogs and food over everything else the world has to offer. Pencil colors and Ed Sheeran to get some respite from humans. Math equations are sometimes fun. Mostly quiet. That would be me in 29 words.

As Oxford suggests, contrarian refers to a person who opposes or rejects popular opinion. The logo that I created seeks to demonstrate this.The yellow circle aka contrarian stands out and the black squares represent the popular opinion, aptly expressing what the Economics Magazine team attempts to do- try to explore the unconventional side of things. Looking for ideas others miss, and trying to miss ideas everyone embraces!

PHOTOGRAPHY WALL

SHARON THOMAS

VRINDA GIROTRA

GUNJAN SANGAL

PAYAL UPRITI

KAMUN THAKUR

THE TEAM WHO MADE IT POSSIBLE.....

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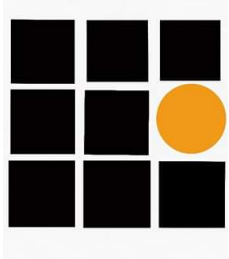

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