"Would it not be well to consult Nature, for she is the most experienced planter of all!"

- *Henry David Thoreau*

From the Farm to the Table

-Why should we bother about Agriculture?

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Table of Contents

1. Introduction

Throughout history, humans have endeavored to achieve the impossible and the improbable. Some of the technological advancements we have witnessed from time immemorial were the result of visionary scientists and artists. Some events, on the other hand, were purely by chance, as in the case of the Big Bang itself, when the Milky Way as we know it came into existence. Agriculture too, it is believed, happened perchance.

The word 'Agriculture' is derived from the Latin word *Agricultura.* It is now defined to include the science, art, or occupation concerned with cultivating land, raising crops, and feeding, breeding, and raising livestock. Agriculture was closely tied not only to the economics of production, selling and consumption of food grains, but also to the spiritual and religious *culture* of communities.

Agriculture began in India around 9000 BCE and it gradually got embedded into her economic, political and socio-cultural life over the years. The agrarian sector continues to contribute to India's economic progress by providing livelihood to over 56% of her population and by contributing to 26% of the Gross Domestic Product.

- From being a food-deficient country during the last two centuries, India is well on her path to self-sufficiency- and this shift is credited to the Green Revolution. However we also need to consider the negatives of the Green Revolution such as:
    - Long term effects of chemical agriculture - degradation of land and water sources, depletion of water, loss of biodiversity, increasing incidence of toxins in the food chains and its impact on the health of humans and animals.
    - The widening gap between the rich and the poor, the rural and the urban and the divide between the landowning class and the landless. India ranks 24th in the Global Hunger Index and half of the people who die in the world due to hunger live in the Indian Subcontinent according to the UN World Food Program.

- Another alarming trend is the high incidence of suicide among Indian farmers. It is reported that an Indian farmer commits suicide every half an hour. If Greeen Revolution was a success, if the production numbers are to be believed, why the poverty? Why the hopelessness of the Indian farmers? And what is the root-level cause for this?

- Moreover, 'food' as we know it has undergone a dramatic change during the past few decades – from fresh home made to processed and packaged food. How has this impacted our food choices?

- At the global level, food and agriculture accounts for a whopping 35% or more of total carbon emissions. It is essential to understand the extent of the carbon footprint of this sector and how it can be reduced.

- Food security of the world is also expected to be impacted by climate change.

This paper addresses the range of issues from promised plenty on the one hand and land degradation, high carbon footprint, seed poverty and despair faced by the Indian farmer on the other. We tend to take food for granted and it is essential that all of us become aware of a reality that touches us deeply everyday – *Food*.

2. Historical Context

2.1 Land usage patterns

India is not new to agricultural practices – it is believed to have been developed in the subcontinent around 9000 BCE. Agro-pastoralism was widely practiced; excess produce were stored in public granaries. Archeological sites near Harappa and Mohenjo-Daro show evidence of this. Wheat, barley, rice were cultivated along with peas, sesame, dates, mangoes, hemp and muskmelon.

By the time the British came to India, India had well developed water management and land management systems, maintained, preserved and protected by local rajas and/or communities.

The Permanent Settlement Act of 1793 ushered in an era of zamindars gaining complete control over the land. Under the Permanent Settle Act

- The zamindar was made the sole owner of the land. He paid a fixed amount of revenue to the government every year.
- If he could not pay the revenue which was agreed upon, he could be evicted. His land would then be auctioned off.

The system of fixing the revenue in advance was extremely advantageous to the East India Company – it was assured a fixed sum of money without the hassle of collecting it. It also created a new social class of landlords, who were loyal to the British. The farmers suffered under this system. They were forced to pay more revenue and were evicted whenever they were unable to do so.

The agreement of Permanent Settlement Act only included the revenue earning but there was no mention of the use of the land. This led to the commercialization of land and disconnect between the tiller and the land.

India at independence, thus inherited a semi-feudal agrarian system where inequity existed at every level, be it ownership and control of land or distribution and control of inputs required for farming. Agricultural productivity was, hence at its lowest.

An independent India envisaged amelioration of poverty as a corner stone of a conscious nation building process. India introduced land reform acts and substantial budgetary provisions were made for the implementation of the same. The government also attempted to tackle the "poverty-issue" at two levels – both at production and distribution levels.

2.2 Production Angle

India's growing numbers coupled with a need for imports in the early 1960s convinced our planners to adopt strategies for agricultural improvements in the form of Green Revolution. Artificially created famines, such as the Bengal famine, also created a sense of insecurity and a lack of faith in traditional methods – which led to the eager adoption of the methods of the Green Revolution. This they felt will set India on a path to self sufficiency.

The main elements of Green Revolution were:

- Provision of better irrigation facilities
- Provision and utilization of key inputs such as High yielding varieties of seeds, chemical fertilizers and pesticides
- Establishment of nation-wide support services such as research and input distribution centers
- Creation of pricing policies that is favorable to producers of certain food grains.

Table 1 shows the net area sown in the past 50 years or so. The area under fallow land and cultivable waste land has come down. The hitherto open spaces, common properties held as community land seemed to have been sacrificed for cultivating more crops.

TABLE 1: PATTERN OF LAND UTILISATION - ALL INDIA

		Classification of reported area								
							Fallow land			
Year	Reporting Area for land utilization statistics ('000 hectares)	Forests	Not available for cultivation	Permanent pastures & other grazing area	Land under other tree crops & groves	Cultivable waste land	Fallow land otherthan current fallows	Current Fallows	Net cropped area	Total Cropped Area ('000 hectares)
1950-51	284315	14.24%	16.71%	2.35%	6.97%	8.07%	6.14%	3.76%	41.77%	131893
1960-61	298458	18.11%	17.00%	4.68%	1.49%	6.44%	3.75%	3.90%	44.63%	152772
1970-71	303753	21.01%	14.68%	4.37%	1.44%	5.76%	2.87%	3.49%	46.37%	165791
1980-81	304159	22.18%	13.00%	3.94%	1.18%	5.51%	3.20%	4.87%	46.12%	172630
1990-91	304862	22.24%	13.28%	3.74%	1.25%	4.92%	3.17%	4.49%	46.91%	185742
2000-01	304771	22.81%	13.61%	3.50%	1.13%	4.47%	3.24%	4.85%	46.38%	185344
2001-02	304692	22.83%	13.72%	3.48%	1.11%	4.40%	3.24%	4.81%	46.41%	189680
2002-03	304832	22.85%	13.81%	3.45%	1.11%	4.44%	3.69%	7.15%	43.50%	175530
2003-04	305068	22.86%	13.86%	3.43%	1.12%	4.32%	3.52%	4.69%	46.20%	190082
2004-05	305134	22.86%	13.93%	3.42%	1.11%	4.33%	3.37%	4.75%	46.23%	191164
2005-06	304980	22.88%	13.96%	3.42%	1.12%	4.31%	3.29%	4.52%	46.50%	192611
2006-07	304992	22.89%	13.98%	3.40%	1.13%	4.34%	3.27%	5.00%	46.00%	193723

Source: Directorate of Economics and Statistics, Ministry of Agriculture.

Table 2, given below shows yield per hectare of food grains from early 1950s to 2011. The yield as measured in kg/ha has gone up substantially in the case of rice and wheat. There is only marginal improvement in the production of coarse cereals and pulses which were traditionally consumed by the working class. Pulses have been the main source of protein for the poor, who could not afford to consume animal protein sources like milk in adequate amounts. Coarse cereals are richer sources of vitamins, minerals and fiber than rice and wheat, and have historically been the major source of protective nutrients for the poor.

Table 2: Production and Productivity in agriculture during the past 50 years

(Area: million ha, Production & Consumption: million t, Yield: kg/ha)

Crop		1960-61	1970-71	1980-81	1990-91	2000-01	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10*	2010-11**
All food grains	Area	115.58	124.32	126.67	127.84	121.05	113.86	123.45	120.00	121.60	123.71	124.07	122.83	121.37	69.05
	Production	82.02	108.42	129.59	176.39	196.81	174.77	213.19	198.36	208.60	217.28	230.78	234.47	218.20	114.63
	Yield	710	872	1023	1380	1626	1535	1727	1652	1715	1756	1860	1909	1798	1660
Rice	Production	34.58	42.22	53.63	74.29	84.98	71.82	88.53	83.13	91.79	93.36	96.69	99.18	89.13	80.46
	Yield	1013	1123	1336	1740	1901	1744	2077	1984	2102	2131	2202	2178	2130	2177
Wheat	Production	11.00	23.83	36.31	55.14	69.68	65.76	72.16	68.64	69.35	75.81	78.57	80.68	80.71	N.A.
	Yield	851	1307	1630	2281	2708	2610	2713	2602	2619	2708	2802	2907	2830	N.A.
Oilseeds	Production	6.98	9.63	9.37	18.61	18.44	14.84	25.19	24.35	27.98	24.29	29.76	27.72	24.93	N.A.
	Yield	507	579	532	771	810	691	1064	885	1004	916	1115	1006	955	N.A.
Sugarcane	Production	110.00	126.37	154.25	241.05	295.96	287.38	233.86	237.08	281.17	355.52	348.19	258.03	277.75	324.91
	Yield	45549	48322	57844	65395	68577	63576	59380	64752	66928	69022	68877	64553	66099	66922
Pulses	Production	12.70	11.82	10.63	14.26	11.08	11.13	14.91	13.13	13.39	14.20	14.76	14.57	14.60	6.00
	Yield	539	524	473	578	544	543	635	577	598	612	625	659	625	537
Coarse cereals	Production	23.74	30.55	29.02	32.70	31.08	26.07	37.60	33.47	34.07	33.92	40.75	40.04	33.77	28.23
	Yield	528	665	695	900	1027	966	1221	1153	1172	1182	1431	1459	1222	1348
Milk	Production	20.00	N.A.	31.60	53.90	80.60	86.20	88.1	92.6	97.1	100.9	104.8	108.5	N.A.	N.A.
Fish	Production	1.16	1.76	2.44	3.84	5.66	6.20	6.40	6.31	6.57	6.87	7.13	7.64#	N.A.	N.A.
Gross Irrigated area		27.98	38.20	49.78	63.20	76.19	73.41	78.15	81.18	83.94	86.50	87.26#	N.A.	N.A.	N.A.
Fertiliser consumption		0.29	2.18	5.52	12.55	16.70	16.09	16.80	18.40	20.34	21.65	22.57	24.91	N.A.	N.A.

Note : N.A.: Not Available, # provisional, * 4th Advance estimates as released on 19.07.2010. ** 1st Advance estimates as released on 23.09.2010.
Source : *Agricultural Statistics at a Glance, 2010,* Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India (Website: http://www.dacnet.nic.in/eands).

Though the increase in food production is commendable, the dependency on subsidized chemical fertilizers and pesticides is worrisome as we are only beginning to fully understand their long term repercussions on environment and people.

Even from a short term, volume angle, the benefits of Green Revolution may not be giving the full picture. Data from a study by Michigan State University and The University of Michigan says that total yield in organic agriculture can be more than in the case of chemical agriculture – which was the primary instrument of the Green Revolution. (Source: How Organic Farming can feed the world by Karthik Kumar, Eternal Bhoomi Magazine, Vol 2, Issue 2, Apr-Jun 2011.)

2.3 The Distribution Angle

To take care of the distribution of food grains, the government created Public Distribution System as a safety net. PDS provides rationed amounts of basic food items (rice, wheat, sugar, edible oils) and other non food products (kerosene, coal, standard cloth) at below market prices to consumers through a network of fair price shops disseminated over the country.

With a network of more than 4.62 lakh fair price shops (FPS) distributing commodities worth more than Rs 30,000 crore annually to about 160 million families, the PDS in India is perhaps the largest distribution network of its kind in the world.

Due to its urban bias, and structural inability to reach the poorest of the poor, the government has introduced the idea of Targeted Public Distribution System (TPDS). From the angle of agriculture, the skewed decision to supply wheat, rice and sugar (the much hyped miracle crops of the Green Revolution) completely overlooked not only the nutritional requirements of a large population, but also contributed to widening the inequities. This will be discussed later.

3. Green Revolution

The impact of the Green Revolution on the Indian economy and society is complex and multi-dimensional. Though it has changed India's status from a food-importing country to that of a food-exporting country, its impact is only now slowly being studied and understood.

3.1 The Green Revolution and its impact

3.1.1 Equity

The external input driven agriculture of Green Revolution required farmers to buy seeds, fertilizers, pesticides, tractors and other machinery for agriculture and irrigation. Traditionally, Indian farmers did not need this high amount of external inputs. Agriculture in India as in all the other indigenous communities revolved not only around cultivation but also around livestock and other cottage-artisan activities. Most farmers saved their seeds, cows and farm animals provided the manure and whatever else was needed was available locally and traded in non-monetary ways.

> "The Green Revolution was necessarily paradoxical. On the one hand it offered technology as a substitute to both nature and politics, in the creation of abundance and peace. On the other hand, the technology itself demanded more intensive natural resource use along with intensive external inputs and involved a restructuring of the way power was distributed in society. " – Dr. Vandana Shiva

- With the advent of Green Revolution, poor farmers enticed with banks loans ended up buying farm equipments and other inputs that they would not otherwise afford to buy. The ones who actually participated and benefited from the mechanized farming were rich farmers.

- In some cases, the surplus production brought down the prices of crops again adversely affecting marginal farmers. Thus the inequities widened.

- Green Revolution technology also favoured landholding of a certain size so that putting-in the external inputs becomes economically viable. Due to this, farmers with small or marginal holdings found it difficult to compete with farmers who had larger holdings. In 1974, each marginal farmer in Punjab was annually running at a loss. Table 4 given below shows the share of landholding across India

Table 3: Percentage of tenant holdings by operational holdings

categories	percentage of tenant holdings			
	60-61 (17th)	70-71 (26th)	81-82 (37th)	91-92 (48th)
marginal	24.1	27.0	14.4	**9.3**
small	25.1	27.8	17.9	**14.9**
semi-medium	23.6	24.8	15.9	**12.2**
medium	20.5	20.0	14.5	**13.1**
large	19.5	15.9	11.5	**16.7**
all categories	23.5	25.7	15.2	**11.0**

National Sample Survey report no. 407

We can hence conclude that the inequality in the distribution of operational holdings has been steadily going up over the past three decades.

- Green Revolution as most studies show benefited only particular crops (wheat and rice), particular regions (Punjab, Haryana, certain pockets of Tamil Nadu, Andhra Pradesh) and particular farmers (medium and large farms). Rather than benefiting, it only widened the inequities and detrimentally impacted the life of rural-based marginal and small farmers.

- The Green Revolution encouraged unnecessary mechanization, thereby pushing down rural wages and employment, and it spread only in irrigated and high-potential rain fed areas, so many villages or regions without access to sufficient water were left out.

- Introduction of HYV (High Yielding Variety) seeds shifted the control from farmers to agrichemicals and seed corporations. This shift implied that seeds were no longer "freely" available to the farmers; instead they constituted an important and expensive input cost.

3.1.2 Biodiversity

Most of the different and genetically distinct varieties of our major food crops owe their existence to centuries of evolution; they also owe their continuation to the local, organic and natural methods and practices passed on by our farmer ancestors. However, today, much of this diversity is being lost. Many varieties of both plants and animals are disappearing.

According to Dr. Rachharia, a well-known rice scientist, 400,000 varieties of rice existed in India during the Vedic period. Even today, 200,000 varieties of rice exist in India. This means that even if a person were to eat a new rice variety every day of the year, he could go on for over 500 years without reusing a variety. This is the genetic diversity within one species.

Table 4 : Diversity of Agriculture crops in India

Group	No of Varieties
Cereals and millets	51
Fruits	104
Spices	27
Vegetables & pulses	55
Fibre crops	24
Oilseeds	12

Source: Understanding Environment, CEE, page 165

- According to Dr. Vandana Shiva, (Violence of Green Revolution, pg 81) "The Green Revolution package was **built** on the displacement of genetic diversity at two levels: First, monoculture replaced polyculture. Secondly, the monoculture varieties "came from a very narrow genetic base compared to the high genetic variability in the population of traditional wheat or rice plants"

- Just three decades after the introduction of so-called "modern" livestock breeds, an estimated 50% of indigenous goat breeds, 20% of indigenous cattle breeds, and 30% of indigenous sheep breeds are in danger of disappearing.

- As a result of the Green Revolution in Punjab, common lands under forests and pastures have been put under agricultural area. About 84% of the geographical area of Punjab is under cultivation. Only 4% of Punjab is under 'forests', most of it being man-made plantations of eucalyptus. (Vandana Shiva, The Violence of Green Revolution, pg 82-83).

Table 5: Loss of Forest lands for various purposes (1950 – 1976)

Purpose	**Area (000 ha)**
River Valley projects	479
Agriculture	2506
Construction of roads	57
Establishment of Industries	127
Others	965

Source: The fissured land – Ecological History of India, page 196

3.1.3 Soil and water

The impact of Green Revolution can also be analyzed in terms of the chemical fertilizer and pesticide usage and soil fertility. One of the thumb rules in agronomy is the need to stabilize the consumption of N, P and K at a ratio of 4:2:1 in order to sustain soil quality. As we can see from table 6, this ratio is not maintained at an ecologically viable level. This according to Dr. Shiva, this has resulted in soil toxicity.

- Fertilizers from fields join the water run-off and pollute the aquatic ecosystem.

- Nitrate levels in groundwater have been found to be too high to be safe, in many places where intensive agriculture is practiced.

- New high-yielding varieties of seeds have an enormous thirst for irrigation water. According to Dr. Shiva, Green revolution increased the demand for water at two levels. Firstly, water-prudent crops such as millets and oil seeds were replaced by mono-cropping of wheat and rice. Secondly, also the dwarf-varieties of wheat and rice were favoured over the traditional varieties. As a result, demand for irrigation went up from 20% - 30% to 200% - 300%." This intensive use of water has resulted in water logging and salinization of land. In India, 10 Mha of canal irrigated land have become water logged and another 25 Mha are threatened by salinity.

Table 6: Use of (N:P2O5:K2O) in Indian Agriculture, 1961 - 2006

YEAR	N	P_2O_5	K_2O
1960-61	7.2	1.8	1
1970-71	6.3	2.3	1
1980-81	5.9	1.9	1
1991-92	5.9	2.4	1
1992-93	9.5	3.2	1
1993-94	9.7	2.9	1
1994-95	8.5	2.6	1
1995-96	8.5	2.5	1
1996-97	10.0	2.9	1
2003-04	6.9	2.6	1
2006-07	5.9	2.4	1

Source: Ramkumar, Indian Agriculture under Economic Reforms

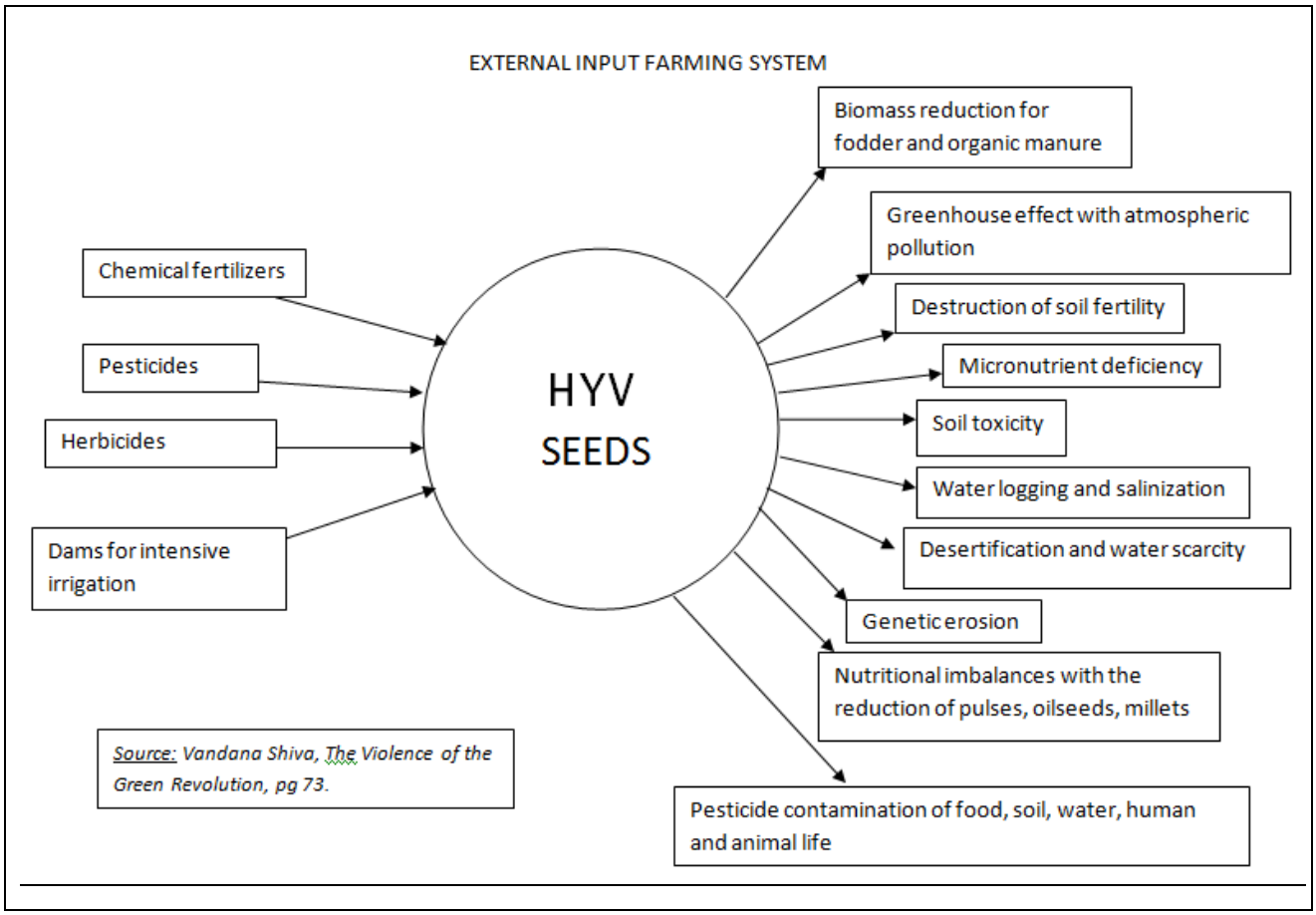
Table 7: Number of Tube wells in Punjab

Year	Tube wells (in lakhs)		
	Diesel operated	Electric operated	Total
1970	1.01	0.91	1.92
1975	3.04	1.46	4.5
1980	3.2	2.8	6
1982	2.9	3.33	6.23

Source: Violence of Green Revolution, page 141

The illustration below clearly depicts the violence of Green Revolution. The farmers had to not only contend with both expensive, external inputs but also multiple, unforeseen and long lasting consequences.

External Inputs in farming and their consequences



4. Present scenario

4.1 Poverty and Hunger

India's rapid economic growth is in contrast to the level of poverty and malnutrition among a sizeable section of its population. On the one hand we have this miraculous 8% GDP growth but on the other hand, we have 250 million hungry Indians. Dietary diversification is considered a good indicator of the nutritional status of the population. The mere consumption of an adequate number of calories may not ensure sufficient intake of nutrients, such as proteins, carbohydrates, fats and micronutrients, which are just as essential for human health.

As evident from the table given below, there has been a sustained decline in per capita calorie and protein consumption during the past 25 years; fats are the only major nutrient group whose per capita consumption is increasing.

Table 8: Mean per capita daily consumption of calories, protein and fats

		Calories (kc)		Protein (gms)		Fats (gm)	
Year	**Round**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
1983	38	2,240	2,070	63.5	58.1	27.1	37.1
1987–78	43	2,233	2,095	63.2	58.6	28.3	39.3
1993–94	50	2,153	2,073	60.3	57.7	31.1	41.9
1999–2000	55	2,148	2,155	59.1	58.4	36.0	49.6
2000–01	56	2,083	2,027	56.8	55.3	34.6	46.1
2001–02	57	2,018	1,982	54.8	54.2	33.6	46.1
2002	58	2,025	2,014	55.4	54.9	34.7	47.0
2003	59	2,106	2,020	58.0	55.5	36.4	46.7
2004	60	2,087	2,036	56.9	55.9	35.5	46.8
2004–05	61	2,047	2,021	55.8	55.4	35.4	47.4

Source: Economic & Political Weekly, Vol xliv No 7, page 43

T able 9 shows the trend in protein and calorie adequacy. From 54.6% in 1975 it has fallen to about 37% in 2002. Only 1/3rd of the preschool children meet the protein-calorie adequacy, according to the study undertaken by ICMR. The study also reports under - nutrition among Indian preschool children.

Table 9: Protein and Calorie Adequacy of Rural Households

Year	Distribution of protein and calorie adequacy status (%)			
	P+C+	P-C-	P+C-	P-C+
1975	54.6	21.27	23.31	0.8
1976	59.0	17.33	23.19	0.5
1977	55.9	20.7	22.8	0.6
1978	55.2	17.4	26.9	0.5
1979	58.1	19.1	21.6	1.2
1980	60.1	18.5	20.6	0.8
1981	60.7	15.7	23.0	0.6
1982	51.1	27.0	21.5	0.5
1983-84*	71.6	7.7	22.34	-
1985-87 (Tribal survey)	25.2	47.6	29.3	0.9
1988-90	53.3(E+)	-	83.5(P+)	-
1991-92	55.5			0.3
1994-95 (NCAER)	52.0	19.5	28.2	0.3
1996-97 (second Repeat survey)	47.2	20.1	32.3	0.4
2002	36.6	26.9	36.3	0

*NNMB-NSSO linked survey for 4 States
P+C+ protein and calorie adequate
P- C+ protein inadequate and calorie adequate
P+ C-, protein adequate and calorie inadequate
P- C-, protein and calorie inadequate
NCAER, National Centre for Applied Economic Research

If we turn our attention to the poverty scenario, we see a similar contrast. A study undertaken by ICMR shows that India's rank both in terms of Human Development Index and Human Poverty Index shows only a marginal improvement over the years.

Table 10: Trends in HDI and HPI in India

Year	Human development index	HDI rank	Human poverty index	HPI rank
1990	0.301	134	NA	NA
1997	0.545	132	35.9	59
1998	0.563	128	34.6	58
1999	0.571	115	34.3	55
2000	0.577	124	33.1	55
2002	0.595	127	31.4	54
2003	0.602	127	31.3	58
2004	0.611	126	31.3	55

NA, not available
(*Source*: Human Development Reports (UNDP)

Source: Human development, poverty, health and nutrition, ICMR, 2007

What can we conclude from this? Why is the high growth percentage not reflected in the overall well being of a sizeable section of its population? The answers lie in agriculture, which continues to be the main stay of people in rural India.

As discussed earlier, the changes in the production choices (rice and wheat) and distribution practices (PDS) have eventually led to changes in the consumption habits.

- There has been a change in the type of cereals consumed among the lowest income group. With the availability of wheat and rice through PDS, the poorer segments of population have changed over to rice and wheat as staple cereals. Coarse cereals such as bajra, ragi, maize and jowar, which are rich in fibre, micronutrients and minerals, are no longer being consumed. The consumption of *jowar* and its products appears to have dropped by over 40% in both rural and urban areas. In rural areas, consumption of *bajra* and its products, too, has fallen since 1993-94.

4.2 Farmers' Suicides

- One Indian farmer is said to be committing suicide every half an hour. The reasons can be traced back largely to Green Revolution.
- As discussed under 'Equity' (Topic 3 on Green Revolution), farmers face not only an increased input cost but also increased irrigation costs.
    - Studies show that cost has been increasing at a much faster rate than the price of the agricultural product. Thus, fertilisers, pesticides and diesel accounted for a mere 14.9 percent of total inputs in 1970–71 but 55.1 percent in 1994–95.
    - Groundwater, as opposed to surface and sub-soil (through shallow wells) water, has become the main source of irrigation. As digging of tube-wells is expensive, only affluent farmers are able to afford bore wells. They also benefit from the Government's electricity subsidy. They sell their surplus water to the adjacent small farmers at commercial rates.

- Green Revolution also took away the *seed sovereignty* enjoyed by Indian farmers for centuries. The Seed Act of 2004 only added to the worsening situation.
- Farmers also faced increased risk of crop failure and plant diseases due to mono- cropping, use of dwarf varieties of seeds and chemicals.

All these factors, made an average Indian farmer incur huge debts and get into a vicious cycle of borrowing with high interest rate to pay for the debt-incur more debt – despair and eventually suicides.

4.3 Changing attitude towards food and consumption

Since 1990s, India has embarked on a policy of liberalization which has again accentuated the problems facing the agricultural sector. Agriculture from being a family-centered, community-based endeavor has become an enterprise run by professionals. Commercialization of agriculture which began with the onset of the Green Revolution has now become the main-stay.

- The pre-liberal period of the 1970s and 1980s saw Indians switching over to rice and wheat, the post-liberalisation era of the 1990s brought in more and more of processed and packaged food.
- Another aspect of consumption is in terms of *live local, buy global* trend. The local varieties of vegetables like brinjal, bananas and melons are slowly being replaced by alien varieties like zucchini, broccoli etc. This impacts not only the genetic pool but also the intricate links in the local ecosystems in ways that we don't clearly understand.
- Today the total population of livestock on earth is about 6 times the human population. Good cultivable land is being used to raise fodder for the livestock. The switch to meat-eating will have its implications not only on the environment but also on the health of Indians. Some of the things we need to be concerned about are:
    - Like Brazil, large areas of forests may soon be cut to provide land for soya, corn etc to feed more livestock.

- Big factory farms and the large amounts of solid wastes they produce would become a environmental and health hazard.
- Chemical agriculture would soon change its attention to fodder crops. Who will then feed the population?
- The methane from the landfills and the livestock themselves as well as factory processing and transportation all add up to a huge carbon footprint. For sustainable living on earth, we cannot afford to ignore this issue of fodder crops for livestock rearing and meat eating; especially in India where meat eating is on the rise.

5.Agriculture and our experiments with food

Unless we understand the many connections between the field and our plate, our habits and our minds, we cannot see the larger picture of Agriculture. Hence we believe it is important for us to understand the food we eat, at an individual level. To this end our school decided to work on a 'food project' in 2009.

5.1 Food project

The main objective of the food project was to understand the 'food-context' we are living in . We started out by asking questions - why are there so many chemicals in our food? What is the link between the food we eat and the planet's health? Children from each class were assigned topics to research on, such as food labels, food miles, Ph balance, regional food and GM food. As we unearthed facts, watched thought provoking films and had discussions, there was surprise, disbelief, anger and with it also came the energy to do something. Most of us felt that we had taken food for granted. The only way forward was to seek and find alternatives and re-look at some of our age old practices and review our current habits in terms of food choices.

We also tried our hand at making wholesome, nutritious food and drinks.. We shared our learning and experiences through a *Food Mela* that we organised. The project made us realise that consuming food is an act of responsibility to our health and respect for the Earth.

5.2 Other practices in school

- The school canteen serves healthy local food, including organic food wherever possible. The focus is also to educate children and adults about the nutritious value of locally-grown millet varieties.

- There is an organic garden where we children participate in / understand the food-growing process. We grow some of our own fruits and vegetables, which is then served in the school canteen. We use compost and cultivate only local or native varieties of plants. We are also involved in preparing the soil, compost, and mulching.
- We also have an Eco-toilet in school.
    - An Eco-toilet unlike the regular flush toilet separates urine and faeces, thus allowing the sterile urine, an excellent natural fertilizer that can be used almost immediately. An eco-toilet is earth-friendly in three pronged ways – it saves water (15000 litres per person per year), it does not add to pollution and it completes nature's energy loop.
- We have also banned junk food from the campus and children are encouraged to bring healthy, wholesome, nutritious food in case they do not eat in the canteen.
- We recycle grey water from the canteen to our garden.

6.Towards a Sustainable Agriculture

6.1 What can individuals do?

Mindful and conscientious living can go a long way in helping our farmers. We need to relook at the way we define 'food.' Food is nutrition that we put into our mouth and it has an impact on our physical health. It also has an impact on the environment and the communities we live in. We can do the following to help ourselves and our farmer-brothers:

- Reduce our food miles by buying locally produced and /or grown food.
- Eat seasonal food.
- Visit our local Farmers' Market.
- Grow our own vegetables and fruits if possible.
- Support your local greengrocer, butcher and fishmonger, and ask them to stock more local produce.
- Walk or take the bus to your local shops. This way you won't add to the food miles already accrued.
- Live local, eat local
- Avoid or reduce eating meat which has a high carbon foot print
- Shop at Stores that label food origins
- Choose restaurants that source locally
- Every individual can make their own 'compost pit.'

6.2 What can communities do?

- To encourage farmers to move away from chemical agriculture and shift to organic farming, communities can provide markets to them by organizing *farmers markets* on a regular basis.

- Communities can get involved in organizing festivals or *melas* that celebrate the amazing diversity of crops in India.

- Boycotting GE food crops. Organizing awareness/signature campaigns against GM foods and mobilizing popular support through the media.

- Review water management practices and focus on effective recycling of waste water, collectively pledge to stop wasteful use of water

- Organize community events where the members get involved in growing some food together, get to meet organic farmers or groups involved in organic farming, form support groups to share information, resources to educate ourselves.

- Organize community events to create awareness and revive interest about locally grown coarse cereals, thereby creating a market for them.

- Organize Food Conferences and Seminars

6.3 What policymakers can do?

Sustainable agriculture puts back into earth what it takes from it, and thus is a cycle which requires no inputs from outside. Policy makers need to work with this awareness and

- Support, subsidise organic agriculture in a planned phased manner.
- Review agricultural education which is today skewed in favour of chemical industrial agriculture.
- Revive local and traditional growing and marketing systems
- Revive and build on indigenous knowledge
- Review the current policies and change it to favour sustainable agriculture.
- Undertake nation wide census on biodiversity (seeds) and indigenous practices and formulating policies that would protect the interests of the Indian farmers.
- Review policies for livestock rearing and meat and dairy production.
- Bio-piracy laws need to be formulated so that we don't repeat the fiasco of the basmati and the neem patents.

- It is argued that encouraging production of coarse cereals in dry land areas can check environment damage like degradation of soil to some extent. They also need to be supplied through PDS

7. Critical Summary

It is clear that a viable and sustainable agriculture sector is essential for a large and substantially poor country like ours. It is unimaginable for a successful India to exist without its agriculture serving its multiple stakeholders – the farmers, the consumers and mother earth itself – in a balanced and beneficial way.

Policies and practices created over the past decades have been guided by "reductionist" thinking, and the problems of this approach are only now becoming visible. There is plenty of evidence that farmers, especially the small and marginal ones, are being let down by a system that is designed to serve the profit needs of corporations that have effectively built huge monopolies on the modern inputs to agriculture. Consumers are faced with lower quality, less choice and a lack of information on the long term health impacts, environmental and social costs of their food choices. Society as a whole pays for the unseen and uncounted costs, both current and future, of loss of food security, environmental degradation, lack of diversity and deterioration of health for both the human race and the planet. A complex web of balance evolved and proven over centuries is being thoughtlessly abandoned in favor of modern cultivation practices.

The future of agriculture is too important to be left to corporations and governments to decide between themselves in closed door meetings. The people, both as individuals and as a collective society need to be central players in setting direction for the future of agriculture. As individuals, the choices we make in our everyday life need to be in balance with our vision for the whole of society and the planet. As a society, we must demand that all information about our food supply be easily available, and all policies that set future direction be subject to greater and holistic understanding of implications. It is only by the choices big and small – our food purchases, our choices in government and our involvement in the civic process – that we can have an effective say in the future of our agriculture.

> "If we don't change our direction, we are likely to wind up where we are headed."
> – Chinese proverb

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