Agricultural crisis in India and its impact on nutrition

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Abstract

India is currently in the grip of an unprecedented agricultural crisis, which has led to the suicide of over 300,000 farmers over the past two and half decades. The crisis has been caused by multiple factors including lack of a sustainable agricultural policy, globalization, and decreased state investment in agriculture concurrent with an increased role of private players and climate change. This has led to reduced income for farmers and increased farmers' indebtedness, which in turn affects the nutritional status of farming families, particularly women and children. In 2017, India was ranked 100 out of a total of 117 countries by the Global Hunger Index. The focus of state schemes related to nutrition has been on ensuring food security rather than nutrition security.

The agrarian crisis is increasingly making agriculture an unviable occupation and hundreds and thousands of farmers are opting out of working on the land to move to urban areas, where jobs are scarce, further deepening the nutritional crisis. The long-term sustainable solutions include sustainable use of resources of land, seed, and water through promotion of low-input agriculture that is tailored to the nutritional and income needs of farmers and their families, and to the agro-ecological conditions of the region. Agricultural policy must enable the small and marginal farmer to earn a fair income and to be free of debt by ensuring access to procuring agencies, an adequate price for produce, and low-interest micro-loans.

Introduction

On 30th November, 2018, over 50,000 subsistence farmers and landless peasants, agricultural laborers and trade unionists marched to the Indian Parliament (FirstPost, 2018) to focus on the agrarian crisis in the country, a crisis epitomized by the suicides of over 300,000 debt-ridden farmers in the past 25 years (Majumdar, 2018). The deep-rooted causes for this crisis include non-remunerative support prices, land and forest rights, drought relief and pension schemes and usurious lending practices ((Majumdar, 2018; The Indian Express, 2018).

During the same period, the nutritional status of India's population, particularly children and women, has been abysmal. In 2017, the Global Hunger Index ranked India 100 out of a total of 119 countries (International Food and Policy Research Institute (IFPRI), 2017). India is home to the greatest number of malnourished children in the world (Livemint 2017). Stunting and undernutrition among under 5 children in India have improved over time (National Family Health Survey (NFHS) 3, 2006; NFHS 4, 2016), but the improvement is slow; and the incidence of wasting and severe wasting has slightly increased (NFHS 3, 2006; NFHS 4, 2016). 23% of women and 20% of men have below normal body mass indices (NFHS 4). Both undernutrition and anemia are more prevalent in rural than in urban areas (NHFS 3, 2006; NFHS 4 2016).

Ironically, over half the total workforce of India derive their livelihoods from growing food and agricultural commodities (Census of India, 2011). When such a large proportion of food growers are undernourished, it behooves policy makers to seek the reasons for it.

Agricultural crisis in India

Agriculture remains an extremely critical element of the Indian economy even though it contributes only a little over 14% to the GDP (2012-2013 estimates of Central Statistics Office), its direct and indirect impact being undeniably significant and multifaceted. With 70% of rural

households surviving on agriculture (Food and Agriculture Organization), it accounts for a very large share of consumption vital for the health and wellbeing of the other sectors of the economy. Besides, it accounts for nearly 13% of total exports of the country (Agricultural Statistics of India 2017).

In spite of its criticality for the livelihoods of millions of Indians, agriculture is in a deepening state of crisis. Yet another sign of farmers' distress besides the number of suicides is the decrease in the number of cultivators accompanied by the concurrent increase in the number of agricultural laborers (Agricultural Statistics at a Glance, various issues). When seen against the decline in the contribution of the agricultural sector to the Gross Domestic Product (GDP) from 51% in 1951 to just 14% in 2011-12 (Central Statistics Office), this signifies that the agriculture sector is absorbing too many people in order to produce less value. It is oversaturated with workers and farmers who are depending on ever smaller returns from it. Further, there is massive migration rural to urban areas. The last census of 2011 indicated that 2300 people on an average are abandoning agriculture and migrating every day to the cities (Census of India 2011); most are desperately looking for work.

The State of agrarian economy

Agriculture is the slowest growing sector of the Indian economy. Table 1 shows the trends in Growth Rates in Gross Value Added (GVA) from 2004-005 to 2017-18 of different sectors of the economy at factor cost and real prices as provided in the Economic Survey presented by the Government of India.

The low growth rates of the agricultural sector, which sustains over half the workforce in the country, have also been extremely volatile, adding to its vulnerability. The very fact that all other sectors have been growing substantially faster while employing the remaining 30% of the population (mostly urban) reflects a policy bias that seems undeniably stark.

As shown in Table 2, the picture regarding production and yields is also far from encouraging. At the same time, the per capita availability of cereals, pulses, oil and other fats and sugar has increased (Table 3).

While the per capita availability of cereals hovered at a level just above the level recommended for Indians as set by the National Institute of Nutrition (NIN) and the Indian Council for Medical Research (ICMR) for the past decade (2005 to 2016), the per capita availability of pulses has been at a level which is literally half of the recommended level during the entire period. As for edible oil the per capita availability has exceeded the recommended level only in recent years (NIN, 2011).

Table 1: Annual Growth Rates of real GDP at factor cost by industry of origin

Year	Agriculture	Manufacture	Trade	Finance & Insurance	Common Services	GVA at Factor Cost
2004-05	1.1	10.0	9.5	7.7	6.8	7.1
2005-06	4.6	10.7	12.0	12.6	7.1	9.5
2006-07	4.3	12.7	11.6	14.0	2.8	9.6
2007-08	5.5	10.3	10.9	12.0	6.9	9.3
2008-09	0.4	4.7	7.5	12.0	12.5	6.7
2009-10	1.5	9.5	10.4	9.7	11.7	8.6
2010-11	8.3	7.6	12.2	10.0	4.2	8.9
2011-12	4.4	8.5	4.3	11.3	4.9	6.7
2012-13	1.4	3.6	9.8	9.7	4.3	5.4
2013-14	4.8	4.2	6.5	11.2	3.8	6.1
2014-15	1.5	7.0	9.0	11.1	8.1	7.2
2015-16	2.2	8.6	10.5	10.8	6.9	7.9
2016-17	4.4	6.0	7.8	5.7	11.3	6.6
2017-18	2.3	4.5	8.7	7.3	9.4	6.1

Source: Economic Survey (Various Issues from 2004-5 to 2017-18), Ministry of Finance, Govt. of India.

GDP is gross domestic product

GVA is gross value added

Nutritional status

The percentage of stunting in children under 5 was 31 in 2015 (NFHS 4) and that of underweight was 29.1 in 2015 (NFHS 4). Further, as mentioned earlier, the percentage of children under 5 who are wasted increased from 19.8 in 2006 (NFHS 3) to 20 in 2015 (NFHS 4), and that of those who were severely wasted from 6.4 in 2006 (NFHS 3) to 7.5 in 2015 (NFHS 4). 59% of children age 6-59 months have anemia (hemoglobin levels below 11.0 g/dl) (NFHS4); in 21 of India's 36 states and Union territories (UTs), over 50% of the women suffer from anemia. The

Table 2: Annual average growth in production and yield of major crops (percentages)

Crop group	Production (million tons)				Yield (Kg/hectare)			
	1980-81 to 1990-91	1990-01-2000-01	2000-01 to 2009-10	2009-10 to 2015-16	1980-81 to 1990-91	1990-01-2000-01	2000-01 to 2009-10	2009-10 to 2015-16
Foodgrains[a]	3.61	1.15	1.08	2.55	3.49	1.78	1.05	2.26
Cereals[b]	3.62	1.46	0.95	0.65	3.76	1.74	1.26	2.54
Coarse cereals[c]	1.28	-0.49	0.80	2.49	2.95	1.41	1.58	5.05
Pulses[d]	3.49	-2.30	3.36	1.93	2.22	-0.59	1.58	0.69
Oilseeds[e]	9.79	-0.11	3.53	0.27	4.49	0.51	1.83	0.17

Source: Economic Survey (various issues), Ministry of Finance, Government of India.

[a] *includes cereals, coarse cereals and pulses*
[b] *includes wheat, rice and coarse cereals*
[c] *includes maize, jowar, ragi, bajra, small millets and barley*
[d] *Includes tur, urad, moong, gram, lentils and other pulses*
[e] *Includes groundnut, rapeseed & mustard, sesamum, linseed, castor seed, niger seed, safflower, sunflower and soyabean.*

percentage has increased in Haryana, Assam, Himachal Pradesh, Delhi, Tamil Nadu and Kerala, with the highest increase in Punjab from 60.1% (NFHS 3) to 89.1% (NFHS 4). Stunting and anemia in early childhood are key determinants of productivity in adulthood, and anemia in women a leading cause of maternal mortality.

Nutrition programs

India is home to the world's largest supplementary feeding program - Integrated Child Development Scheme (ICDS) - which provides a hot cooked nutritious meal and two nutritious snacks to children 6 months to 5 years of age (Ministry of Women and Child Development). The program is intended to reach all children in rural India. The Mid-Day Meal (MDM) scheme provides children in government and government-aided schools with a hot cooked meal during school hours (Ministry of Human Resource Development). Both these schemes, though often inefficient and riddled with corruption, have, to some extent, contributed to the improvement of the nutritional status of young children. While both these schemes have become children's entitlements through the National Food Security Act (NFSA) of 2013, many children are excluded from them for a variety of reasons including lack of adequate infrastructure, inadequate availability of grains, distance, terrain, caste and class

Table 3: Per Capita Availability of cereals, pulses, edible oil, vanaspati[a] and sugar.

YEAR	CEREALS (gms/day)	PULSES (gms/day)	TOTAL FOOD (gms/day)	EDIBLE OIL (Kg)	VANASPATI (Kg)	SUGAR Nov-Oct (Kg)
2005	390.9	31.5	422.4	10.2	1.1	15.5
2006	412.8	32.5	445.3	10.6	1.1	16.3
2007	407.4	35.5	442.8	11.1	1.2	16.8
2008	394.2	41.8	436.0	11.4	1.3	17.8
2009	407.0	37.0	444.0	12.7	1.2	18.8
2010	401.7	35.4	437.1	13.1	1.1	18.6
2011	410.6	43.0	453.6	13.0	1.0	17.0
2012	408.6	41.7	450.3	13.8	1.0	18.7
2013	358.1	43.3	401.4	15.8	0.7	18.7
2014	442.9	46.4	489.3	16.8	0.8	19.5
2015	421.4	43.8	465.2	18.3	0.8	20.3
2016	443.7	43.6	487.3	17.7	0.8	19.4
2017 (p)	431.6	53.8	485.4	NA	NA	NA

Source: Economic Survey (various issues), Ministry of Finance, Government of India.

[a]*hydrogenated fat*

discrimination, and child labor (SPREAD, 2017; Action Aid 2017). NFHS 4 informs that only 48% of eligible children received food supplements through ICDS (NFHS 4, 2015). Moreover, the schemes provide only a part of the nutrients required by the children, and MDM is not operational during the long summer and winter holidays. The basic source of nutrition continues to be the household.

The Public Distribution System (PDS) is also an entitlement where households falling into specific low-income categories get specific quantities rice, wheat, pulses, oil and sugar per person at a discounted rate (NFSA, 2013).

Food consumption and expenditure

The consumption of food grains has gone down, and that of pulses has increased, as can be seen in Table 4.

Table 4: Per capita consumption of cereals, pulses, oils, and other foods in 2004-05 and 2011-12 – all India

Food category	Year	Per capita kg consumed in 30 days	
		Rural	Urban
Rice	2004-05 2009-10 2011-12	6.38 6.00 5.98	4.71 4.52 4.49
Wheat	2004-05 2009-10 2011-12	4.19 4.24 4.28	4.36 4.07 4.01
Jowar[a] & its products	2004-05 2009-10 2011-12	0.43 0.29 0.20	0.22 0.18 0.13
Bajra[b] & its products	2004-05 2009-10 2011-12	0.39 0.26 0.24	0.11 0.09 0.08
Pulses	2004-05 2009-10 2011-12	0.705 0.651 0.783	0.824 0.788 0.901
Edible oil	2011-12	0.674	0.853
Milk (liters)	2011-12	4.333	5.422
Eggs (no.)	2011-12	1.94	3.18
Fish	2011-12	0.266	0.252
Goat meat/mutton	2011-12	0.049	0.079
Beef/buffalo meat	2011-12	0.042	0.064

Chicken	2011-12	0.178	0.239
Vegetables including GLVs (value in Indian rupees)	2011-12	94.62	121.70
Green leafy vegetables (grams)	2011-12	0.59	0.528
Fruits (value in Indian rupees)	2011-12	40.52	90.12

Source: National Sample Survey Office. Survey Report 68. 2014

a & b Varieties of millet

National Sample Survey Office (NSSO) Survey Report 68 of 2014 also notes that the calorie intake in 2011-12 was about 2100 Kcal per person per day in the rural sector and about 2060 Kcal in the urban, which is much lower than the recommended intake. Since 1994, there has been a definite decline in the intake of protein per person per day, with Rajasthan now having the highest decline of around 11g, followed by Haryana (10g) and Punjab (8g.) (NSSO, 2014). Ironically the last two states are the food baskets of India.

Khatkar et al note that millets, maize and sorghum, contributed 1kg per person per month in rural India and 0.8kg per person per month in urban India in 2011-12. However, in spite of the projection of lower per capita consumption for all food grains in the coming decades, the demand will rise from 201 million tons in 2000 to about 291 and 377 million tons by 2025 and 2050, respectively to meet the demand for feed grain (Khatkar, 2016).

In rural India, 53% of household expenditure is for food, with cereals accounting for 11%, milk and processed foods for 8% each and vegetables for 6.5%. The urban Indian spends slightly less on food, but beverages and processed foods lead at 9%, followed by milk at 7% and cereals at less than 7% (NSSO, 2014). One probable reason for the low expenditure on cereals could be the PDS which makes it available at a highly subsidized price.

Reasons for the agrarian crisis

There are several causes of the current agricultural crisis in the country. The first and perhaps the most important is the small and rapidly decreasing size of land holdings, steadily declining over the past 40 years. Smallholders now cultivate 42% of operated land and constitute 83% of total farm land, with the maximum increase being in small and marginal farmers. Nearly 67% of the farmers operate on land less than 1 ha and 18% of farmers own between 1 - 2 ha of land, while only 0.7% of farmers own more than 10.5% of agricultural land (Report of Committee on Doubling of Farmers' Income, Vol. I, 2017). While several studies have shown that smaller farms are more productive than larger ones (Sen, 1962; Sen 1964; Hanumantha Rao, 1966; Saini 1971; Bardhan

1973; Chand et al, 2011), the per capita productivity tends to drop in the long term due to over intensive cultivation of the land in order to maintain labor productivity, when more and more people need to survive on the same small area of land (Dyer, 1997; Havnevik and Skarstein, 1997). Small and marginal farmers lack the resources to either buy or lease more land or invest in farm infrastructure—improved soil fertility, irrigation, power, farm machinery, etc.—to compensate for the scarcity of land or to withstand the impact of a single crop failure which can destroy them.

In addition, the government has been procuring farmland for developing urban infrastructure, mining and setting up of industries without paying adequate remuneration, or considering the impact on the livelihood of farmers (Bajoria, 2018).

Water and irrigation

In India, rainfed agriculture accounts for 60% of the cropped area, and supports an estimated 40% of the human population. It contributes to about 42% of the rice production, 77% of pulse production, 66% of oilseeds production and 85% of production of coarse cereals like millet; it also supports 78% of cattle, 64% of sheep and 75% of goats, which cater mostly to the meat market (11th Plan Working Group on Natural Resource Farming and Rainfed Agriculture, 2011). Rainfed farming has traditionally been associated with multi cropping with drought-resistant seeds to meet basic requirements including that of food, fuel, clothing, shelter and fodder, and thus has the potential to decrease poverty. Multi cropping with drought-resistant seeds may also reduce the impact of climate change, which, according to the Economic Survey of India, can result in 12% decline in farmers' income (Economic Survey of India 2018).

Over decades, rainfed agriculture has been neglected by policy makers (11th Plan Working Group on Natural Resource Farming and Rainfed Agriculture, 2011); instead, the emphasis has been on cultivation of high-yielding varieties (HYVs) and hybrids, principally of rice, wheat, barley, sorghum and cotton, all of which require a high input of water. The irrigated area in the country increased by 11% between 2006-07 and 2013-14 (Committee on Doubling of Farmers' Income, 2018). According to a 2012 World Bank report, India is the largest user of groundwater in the world, using an estimated quarter of the global total (World Bank, 2012). Groundwater use accounts for more than 60% of irrigated agriculture and 85% of drinking water supplies (World Bank, 2012), leading to a rapid decline in groundwater levels, especially in northern India, in the food basket states of Punjab and Haryana (Economic Survey of India 2018). Yet, the Survey recommends that, given the declining trends of rainfall across the country and the increase in drought-like conditions, there is an urgent need for providing irrigation facilities across the country, especially to small and marginal farmers; it further recommends substantial increase in the investment for irrigation (Economic Survey of India 2018).

Lack of Infrastructure and Price Support

Another major impediment causing uncertainty and stress for Indian farmers, particularly small and marginal cultivators, is poor infrastructure. Lack of irrigation and access to markets are serious constraints. With a fairly large segment of agricultural land being rain fed, farm gate prices are volatile and incomes unpredictable (Banik, April 2017). Low physical access to markets due to poor road transportation and other logistical deficiencies also lower farm incomes (Banik, 2017). There are severe shortfalls in proper and scientific storage facilities leading to distress sales by farmers to private traders and middlemen (Banik, April 2017).

The Minimum Support Price (MSP) offered by the government through agencies such as the National Agricultural Cooperative Marketing Federation of India Limited (NAFED) and the Food Corporation of India (FCI) for 24 crops is supposed to ensure markets for the farmer as well as meet the costs of production. However, successive governments have calculated the cost of production as actual paid-out costs plus an imputed value of unpaid family labor, and have not included rentals and interest forgone on owned land and fixed capital assets, thus distorting and lowering their calculations of the actual cost of production. While the earlier budgets were not farmer-friendly, they fixed the MSP at rates higher than the current one, which has reduced it to 50% over the cost of production, a decrease of 42% for some crops..

Although rice, wheat, pulses are included in the Public Distribution System (PDS), the majority of farmers sell their produce to either local private traders or at the Mandi[1] (NSSO, 2014), which renders them vulnerable to volatile prices. Firstly, typically the procurement agencies purchase wheat and rice principally from the states of Haryana, Punjab, Uttar Pradesh, Andhra Pradesh, Madhya Pradesh and Chhattisgarh; there are few centers of procurement in other major food producing states like Bihar and West Bengal (Banik, 2017). Secondly, the lack of infrastructure such as connectivity and cold storage facilities prevents small and marginal farmers from selling to the procurement centers. This is particularly critical in the case of perishable products like fruits and vegetables (Pandey, 2018). According to the Committee on Doubling of Farmers' Income, "At the all-India level, the proportions of the produce that farmers are unable to sell in the market are 34 per cent, 44.6 per cent, and about 40 per cent for fruits, vegetables, and fruits and vegetables combined" (Committee on Doubling of Farmers' Income, 2018). In such a situation, small and marginal farmers are forced to sell at very low prices to intermediaries.

Farmers' Indebtedness

The increasing indebtedness of Indian farmers is perhaps the leading determinant of agrarian stress. It is like a malignancy that is fast corroding and destroying the farm sector, as documented by field investigations by Dandekar and Bhattacharya in two districts in Maharashtra and Punjab (Dandekar and Bhattacharya, 2017).

Nearly 70% of agricultural households are indebted; in some states the figure rises to 90%. The majority of the indebted farmers having holdings of less than one hectare (NSSO, 2014). The primary reasons for indebtedness are the need for ready cash for farming operations and health care (IANS[2], 2017). The 70th Round of NSSO further informs that the average monthly income of an agricultural household during the period July 2012 to June 2013 was Rs.6,426 (approximately US$ 106 based on average exchange rate for year 2013[3]), as against its average monthly consumption expenditure of Rs.6,223 (approximately US$ 102), leaving savings of just Rs. 203 (less than US$ 4) per month. The lowest outstanding loans were in Jharkhand – Rs. 5700 – an amount which even the savings by the national average of Rs. 203 per month could not repay in a year. About 60% of loans were obtained from banks and institutions and the rest from village money lenders or private sources (NSSO, 2014), who charge usurious rates of interest. However, banks and other formal sources of credit require paper work, proof of cultivation, land lease and rent proof, and collateral, which is often in the form of mortgaged land (Reserve Bank of India,

[1] Grain market

[2] An Indian news agency

[3] The average exchange rate was higher in 2012

2013). Moreover, their procedures are inflexible, and debt defaulters cannot access bank loans. Thus, farmers turn to private money lenders, who are easier to access and often do not require collateral (Nair, 2018).

Though it is only a short-term solution to the crisis of their indebtedness, farmers are demanding loan waivers, something that is being questioned by several policy makers as it requires a huge outlay of public money. Ironically, as Indian agricultural expert Devinder Sharma points out, the total outstanding loans of public sector banks stands at Rs. 6.8 lakh crores (over US$ 9.5 billion at the current exchange rate). Of this, 70% belongs to the corporate sector who get long term loans at 0.1% annual interest and 1% to farmers, while farmers have to pay a minimum of 4% interest. In fact, the interest on loans for buying tractors can reach 12% and from micro-finance institutions for buying goats it can go up to 30% or more. He further informs that while the previous Chief Economic Advisor to the government stated the bad debts of the corporate sector should be waived in the interest of capitalist economy, the Chairperson of India's premier public sector bank – State Bank of India – believes that a waiver of outstanding loans of farmers will encourage credit indiscipline (Sharma D, 2017). Public sector banks are said to have restructured crop loans worth only 38,646 crores during the last three years as compared to the restructuring of corporate loans worth 6,09,661 crores (Kumar Vikram, 2018).

How does agriculture impact nutrition?

As seen earlier, not all the food produced is consumed by people. Food consumption and nutrition are linked to agriculture in several direct and indirect ways. Gillespie et al identify six links or "pathways" between agriculture and nutrition (Gillespie et al, 2012).

1. Agriculture as a source of food is the most direct link where producers consume what they produce
2. Agriculture as a source of income either through wages or through sales of food produced
3. Agricultural policy and commodity prices, including the price of food
4. How agricultural income is spent
5. Women's socio-economic status and their ability to influence decision making on health and nutrition
6. Women's nutritional status, particularly when linked to their diet and work-related energy expenditure

In the following section, we examine the first four of these pathways.

Agriculture as a direct source of food—the impact of government policies

Government policies have been the primary driver of hunger in India. Tax-related colonial policies created the institution of large landholders, pushing the small and marginal farmers towards debt. While the institution of large land holdings or *Zamindari* was abolished after independence,

inequitable land ownership continues as land reforms have not been fully implemented. At the same time, the promotion of monoculture, increasing cash crop cultivation, the withdrawal of agricultural extension services and the promotion of the role of the private sector in agriculture, resulting in high costs of seeds and pesticides, have aggravated the indebtedness of the farmer.

Adequate dietary diversity is essential for proper nourishment. The Indian plant gene center is among the 12 mega diversity regions of the world. While about 25 species have been domesticated, there are more than 18,000 species of higher plants which include 160 major and minor crop species, and more than 1500 wild edible plant species including roots and tubers, leafy vegetables/greens, buds and flowers, fruits and seeds and nuts (Sivaraj et al, 2016). In many parts of India, especially in the hill regions, traditionally, fields extend to the forest, and forests provide not only wild plants, but insects, wild poultry, crabs, fish, and birds that contribute to meeting nutritional needs. (RFSTE, 1996; Sathyamala, 2016). However, forest laws have often reduced the access of local people, especially indigenous communities and lower castes and classes, to these sources of nutrition.

Prior to the government-supported Green Revolution and its emphasis on monoculture, even small and marginal farmers, growing diverse foods through multi-cropping and use of farmers' saved seeds, as well as the use of low-cost biodiversity-based inputs, mostly grew enough food for the family. Similarly, the survival of agricultural labor was ensured by their being paid in kind – food grains and other farm produce. However, today, these farmers have moved from the survival economy to a more complex economy that is market-oriented, leaving them in deep debt (Centre for Education and Documentation, 2009).

While the Green Revolution and the establishment of the Public Distribution System went a long way towards meeting increasing needs for food for assuaging hunger, its emphasis on wheat and rice cultivation led to the displacement of more nutritious crops like legumes and coarse grains. Monocultures reduced planting of nutritious plants such as Chenopodium, formerly planted with wheat and millets, but now considered to be weeds and destroyed (Shiva, 1993). These changes have to some extent reduced the nutritive value of what small farmers grow and have local access to.

Consumption of home produce is an efficient method of improving nutritional intake. Besides staples, consuming vegetables is essential, providing balanced nutrition as they are rich in micronutrients and complement staple foods, improving the nutritional quality of the diet (Hughes et al, 2012; Keatinge et al, 2015; Weinberger K et al, 2006). Increased dietary diversity through multi-cropping with micronutrient rich vegetables, fruits and flesh foods is one of the most practical and sustainable ways to alleviate micronutrient deficiency (Ali & Tsou, 1997; Keatinge et al, 2010).

Almost all farmers in India consume a part of the agricultural commodities they produce; however, this quantity is too low to meet the nutritional needs of the household. According to NSSO 2014, about 29.4% of total cereal consumption and 10.3% of total pulse consumption in rural India in 2011-12 came from home-grown stock. Only around 33% households consumed home-produced milk. For eggs, chicken and vegetables, the percentage ranged from 13.5 for pumpkin/gourd to 4.0 for potatoes; 4.4% of households consumed home-produced chicken and 8.4% consumed home-

produced eggs. Consumption of home produce decreased from 2009-10 except for rice (NSSO 2014), deepening dependency on the market for meeting nutritional requirements.

Agriculture as a source of income

Farming households in India purchase most of their food from the market. While cultivation is the primary source of income for farmer-cultivators, wages are the main source of income for agricultural labor. As mentioned earlier, small and marginal cultivators typically earn the bare minimum necessary to survive, with income directly related to the size of landholdings. Agricultural households with the smallest landholdings are more dependent on wage/salary employment than farm business (cultivation and raising of animals) for their income, with animal raising bringing in more income than cultivation. According to the Dalwai Committee report, 22.5% of farmers live below official poverty line (Committee on Doubling of Farmers' Income, 2018).

Factors that limit farmers' ability to maintain higher savings are soil degradation, resulting in reduced arable land, inadequate irrigation, climate change, rising costs of price of inputs not commensurate with yields, lack of infrastructure and non-remunerative returns from the market. According to the Socio Economic and Caste Census of India, only around about 37% of agriculture land is under assured irrigation, with 70% of farmers dependent on the southwest and northeast monsoons to provide needed water for their crops (Livemint, 2015). Climate change has made the quantity and timing of rain unpredictable, and droughts are a recurring feature in several districts in Karnataka, Tamil Nadu, Maharashtra, Andhra Pradesh and Rajasthan.

The per hectare real value of output increased for most crops during the period 2004-05 to 2013-14, but was much less than the increase in the cost of inputs. Thus farmers may often receive a negative value for their farm gate sales (Committee on Doubling of Farmers' Income, 2018).

The rise in the price of seeds, fertilizers, pesticides, water, and electricity as well as inadequate MSP and lack of low interest institutional credit are further aggravated by rising land rents. There is an increased presence of transnational corporations like Monsanto and Novartis especially in the seed and pesticide sector, as well as a growing push towards use of Roundup Ready seeds that make it imperative for the farmer to purchase a certain brand of pesticide for a certain brand of seed. This entails high costs. It is increasingly clear that farmers are barely able to meet this rising cost of inputs leave alone generate a profit sufficient to sustain the household (Sainath, 2018; Todhunter C, 2017; Shiva V, 2007; Shiva & Jalees, 2006). There is no commensurate increase in the Minimum Support Price (MSP) for major cereals such as wheat and rice (Pattanaik et al, 2008).

Contract farming is seen by many policy-makers as the answer to increasing farmers' incomes. Though India is in the process of drafting a law to regulate it, contract farming poses several challenges for the farmer. Firstly, contractors are mainly from the food processing industry, who usually also sell the farmers seeds and pesticides, deepening dependence on agribusiness, which also may act as a money lender. Secondly, agribusiness is not keen to enter into contracts with farmers with small land holdings, who comprise 80% of the Indian farming community. Thirdly, farmers have little control on grading of produce, which often leads to the farmer getting less than the pre-harvest rates agreed to (Swain, 2012). Predetermined prices can at times deny farmers the benefits of higher prices prevailing in market for the produce. Finally, contract farming encourages capital-intensive monoculture and increased use of chemicals.

The rising price of food

Even as the real income of farmers is falling, the price of food has been rising. A 2017 report from Newsclick informed that the retail price of mung gram rose by 75% from 2014 to 2017, from Rs. 49 per kilo to Rs. 86 per kilo, of white pulse (urad dal) by 46% from Rs. 68 per kilo to Rs. 99 per kilo, and pigeon pea by 24%. In the last case, the price had actually dropped from Rs. 200 per kg in 2015 (Newsclick, 2017). This price increase, however, does not mean that farmers get a better price for their produce. For instance, while the wholesale price of vegetables has shown a huge increase from 2006 to 2017 (Statistic, 2018), this is the price that is given to the middleman. The price the farmer gets from the middleman is often lower than cost of production. In 2017, Bera informed that the farmers in Rajasthan were getting much less for pulse crops than the MSP, in spite of a low harvest (Bera, 2017). At the same time, the retail price of food (at which the farmer has to buy to feed the family) has been increasing astronomically. The prices of agricultural commodities rose by almost 300 percent from wholesale to retail (Business Standard, 2013). In 2018, Yadav & Sehran note that even when farmers reach them directly, bearing the expenses of transportation, wholesalers are offering them very low prices, citing lack of demand, causing many farmers to leave their products with them for free as they cannot afford to transport the produce to other markets. Retailers sell the same produce to the consumer at a price that can be as much as 500% higher (Yadav & Sehran, 2018).

Given the importance of pulses and vegetables as sources of protein and micronutrients in a predominantly vegetarian diet, the price rise made them unaffordable for the poor and the marginalized many people of the country. Inadequate incomes and rising retail prices are an important reason for the decline in food consumption among farming families. For instance, rural per capita pulse consumption per day, which had reached around 80g in 2011-12, fell to 44g in 2015 (Newsclick, 2017). Further, as PDS supplies cereals at highly subsidized prices, they have become the largest constituent of the food basket as they assuage hunger, even if they do not provide the necessary nutrient balance required for optimal health. The lack of adequate amounts of iron and vitamin C, easily obtained from fruits, in the diet is a leading cause of iron-deficiency anemia. Though currently there are no reliable studies showing the link between the rising price of food and malnutrition, the unaffordability of vegetables could be significant reason for the increase in anemia in the predominantly farming states of Punjab and Haryana.

How agricultural income is spent

Larger farmers spend more of their income on food and productive assets for their farms, while for small and marginal farmers non-farm expenditure, especially expenditure on food, was higher (NSSO 2014). Given the low savings, there is little money to be spent on other goods.

One important factor causing agrarian stress is the diversion of farm loans to non-farm household expenditure such as out of pocket medical expenditure, education, and housing. Health care expenses were the highest among non-farm expenditure. More than half of India's rural population uses private healthcare services, which are several times as costly as public healthcare.[4] Health care expenses are also important reasons for indebtedness. Expenses are also incurred for ceremonies and household expenditure may be influenced by aggressive product promotion and consumerism. The demonstration effect constantly transmitted from their better off urban

[4] Personal observation of 1st author.

counterparts through media has transformed rural aspirations. For example, Punjab ranks first in purchase of consumer goods such as mobile phones, cycles, television sets, refrigerators, washing machines, motorcycles and cars. A substantial part of the farm loans is thus diverted to satisfy these nonfarm aspirational desires. Moreover, apart from arthis[5], the educated service class, as well as contractors have all graduated to being lenders. The strong urge to emulate others has led to lavish spending on marriages, flush toilets, expensive cooking ranges and even sending children to Australia for higher education (Shergill, 2015).

Conclusions

The combined impact of agricultural stagnation and unemployment have among other things led to lumpenization, caste conflict, communal parochialism and increasing destitution and suicides specially in India's farm sector. The persistent crises in agriculture accompanied by increasing inequality, unemployment and migration into urban areas are fundamental problems that the government has failed to effectively tackle. Policy blunders such as de-monetization have added fuel to the fire by incapacitating the large informal sector thereby affecting the lives of millions who sustain their livelihoods from it.

The on-going intensification of the agricultural crisis in the face of accelerated growth of the Indian economy is symbolic of the dichotomy that exists in the country, where the top 1% of the population now holds 73% of the country's wealth; ordinary workers saw their incomes rise by an average of just 2% a year while billionaire wealth rose almost six times faster in the period between 2006 and 2015 (OXFAM, 2016). The crisis is clearly a result of neglect of the agricultural sector by policy makers over several decades. Land reforms have not been adequately implemented, nor has the agro-ecological conditions of the region been taken into account when promoting crops. Government schemes to reduce hunger have led to declining cultivation of nutrient-rich crops. Farmers have shifted from producing for nutritional security to cultivating cash crops in order to free themselves from debt; however, this has not worked in their favor because of the high price of inputs like seed, fertilizer and pesticides; the volatility of the market, especially when private agri-business and other traders determine the price for the produce; and because of climate change, especially inadequate rainfall, or rainfall at the wrong time. Further, monoculture does not maintain soil fertility, and, especially in the case of rice, is water-intensive. The Johl Committee Report (1986) had clearly warned about rice being a problem crop, later suggesting shifting at least 20% of wheat and paddy to other crops through a Crop Adjustment Program (Johl, 2002).

The above factors have a significant impact on the nutritional status of farming families, whose nutritional status is already low. Data from various governmental sources shows that while the farmers' income is falling in real terms, the price of food that the family is forced to buy from the market is rising, resulting in reduced consumption of protein and micronutrients from flesh foods, pulses, eggs, milk, vegetables and fruits.

[5] Middlemen dealing in grain

The way forward[6]

The government needs to have in place a policy that promotes nutrition-based agriculture that is responsive to the income and nutritional needs of farmer families and to the agro-ecological requirements of the region. There is an urgent need to make agriculture viable for the small and marginal farmer.

Policy should lay special emphasis on the following:

1. Amendment of the Land Acquisition, Rehabilitation and Resettlement Act, 2013 to protect the land resources of small and marginal farmers and the agricultural livelihood options of landless laborers.

2. Amendment of agriculture policy to prevent the transfer of agricultural and forest land to corporations and ensure that farmers are not locked into unfair agreements with corporations that violate farmers' rights to independently decide on crops to be grown.

3. Making agriculture nutrition sensitive, with production decisions based on household nutritional requirements. Incentivize mixed crop farming that are not cost and input intensive, that rejuvenate soil fertility and provide food and nutritional security to the farmer's family. Create a cadre of women Change Vectors to assist households shift to mixed crop farming and kitchen gardens.

4. Measuring productivity should not just be based on the yield of one crop, but on the yields of all the crops grown in one agricultural season in a multi-cropped farm. This includes yields that provide adequate amounts of fodder and fuel. This requires a sharp turn-around from monoculture to multi-culture.

5. Strengthening irrigation facilities by increasing investment substantially especially for schemes such drip irrigation. Concurrently, promoting resilience to climate change by building check dams on rivers known to flood, encouraging use of native drought and flood resistant seeds, watershed management and tree planting.

6. Increasing investment for public sector initiatives to prevent wastage. Incentivize initiatives by farmers' associations/community to prevent wastage.

7. Promoting community-managed grain banks at the local level to ensure that the poorest do not suffer from hunger in times of distress.

8. Creating policy for Farmer Managed Seed Systems to ensure that all farmers have access to seed. Incentivize creation of local, decentralized community seed banks.

[6] These recommendations are based on the recommendations made by participants at the Workshop on Agricultural Crisis in India organized as part of the 3-day International Conference on Critical Public Health Consequences of the Double Burden of Malnutrition, March 28-30, 2018 at New Delhi, India.

9. Creating policy to further decentralize procurement and create infrastructure allow small and marginal farmers and farmers' associations easy access to procurement centers; ensure that procurement happens at the farmgate across the country, and that payment is made immediately to the farmer; MSP should include rentals and interest forgone on owned land and fixed capital assets and should be enforced on private traders.

10. Requiring that a high percentage of the food used in government institutions and schemes such as ICDS (Anganwadis), Mid Day Meals, government run hostels, be purchased from small farmers and farmers' associations. (Brazil has been doing this for years.)

11. Setting up cold storage at the Panchayat[7] level to enable farmers to store their perishable products.

12. Creating policy for sustainable forest harvesting and MSP for forest products, collective buying of forest products from the Federation of CFR Gramsabha[8] as directed by the Forest Rights Act.

13. Compensating farmers for loss of income/food products due to droughts, fires, and so on.

14. Enabling farming families and those involved in allied agricultural activities like fisheries and livestock rearing to access institutional loans from nearby locations with low interest rates with the least amount of paperwork/delay.

15. Minimizing the number of loan defaulters by making it possible for farmers to repay through smaller installments over a longer period of time. The system of hypothecation that locks in the farmer's entire holding should be replaced by a system of proportionate loan-land ratio, freeing the rest of the land for creating further liquidity. Cashless loans must be introduced to avoid the diversion of crop loans for non-farm expenditure.

Conflict of Interest Declaration

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[7] The lowest administrative level comprising of a few close-by villages.

[8] Decision-making village body comprising of the entire village community

References

1. "Farmers Protest in Delhi LIVE Updates: Crop insurance policy floated by Centre is fraudulent, says Arvind Kejriwal". FirstPost, December 01, 2018
2. "Farmers' Knock". The Indian Express. 01st December 2018
3. "India has largest number of malnourished children in the world: Report". Livemint November 1, 2017
4. Action Aid 2017. "Community Assessment of Entitlement Programmes: A Study on the Implementation of Five Central Government Sponsored Schemes in Six Districts of Northern India". Available at https://www.actionaidindia.org/wp-content/uploads/2018/06/Community-Assessment-of-Entitlement-Programmes-e-book-1.pdf. Accessed on 30th October 2018.
5. Ajay Dandekar and Sreedeep Bhattacharya (2017). 'Lives in Debt: Narratives of Agrarian Distress and Farmer Suicides', Economics & Political Weekly, Vol. LII, No. 21, May 27, 2017.
6. Ali M, Tsou SCS (1997). Combating micronutrient deficiencies through vegetables—a neglected food frontier in Asia. Food Policy 22(1):17–38.
7. Alok Sheel (2018). 'Economic Revival or Dead Cat Bounce?" Economic & Political Weekly, Vol. 53, Issue No. 9, 03 March 2018.
8. Bajoria J (2018). "Indian Farmers Call for Action over Agricultural Crisis". Human Rights Watch News. November 28.
9. Banik N (2017). "Decoding the Agony of the Indian Farmers". The Wire. April 25.
10. Bardhan, PK (1973). "Size, Productivity and Returns to Scale: An Analysis of Farm-level Data in India Agriculture", Journal of Political Economy, Vol 81 (6): 1370-86.
11. Bera S (2017). Farmers sell pulses at a loss as wholesale prices dip below MSP. Livemint. October 11, 2017. Available at https://www.livemint.com/Politics/3LQAz8YAcCI6CWkKhkH0LL/Farmers-sell-pulses-at-a-loss-as-wholesale-prices-dip-below.html. Accessed on December 24, 2018
12. Business Standard (2013). "The costly stretch from farm to table." January 20, 2013. Available at https://www.business-standard.com/article/markets/the-costly-stretch-from-farm-to-table-112072700042_1.html. Accessed on December 24, 2018
13. Census of India (2011). Office of the Registrar General & Census Commissioner, India. Ministry of Home Affairs, Government of India.
14. Central Statistical Office. (undated) GDP Of India And Major Sectors Of Economy, Share Of Each Sector To GDP And Growth Rate Of GDP And Other Sectors Of Economy 1951-52 Onward. Ministry of Statistics and Programme Implementation. Government of India. Available at https://data.gov.in/search/site?query=gdp. Accessed on 20th December 2018
15. Centre for Education and Documentation (2009). Agriculture, food and small farmer in India. Available athttp://base.d-p-h.info/en/fiches/dph/fiche-dph-8104.html. Accessed on 16th July 2018.
16. Chand R, Lakshmi Prasanna PA, Singh A (2011). "Farm Size and Productivity: Understanding the Strengths of Smallholders and Improving Their Livelihoods". Economic & Political Weekly Supplement; vol xlvi nos 26 & 27, pp.5-11.

17. Committee on Doubling of Farmers' Income (2017). Report of the Committee on of Doubling Farmers' Income. Volume II - "Status of Farmers' Income: Strategies for Accelerated Growth" - Inter-linkages between Input Costs, Diversification, Capital Formation and Income. Ministry of Agriculture and Farmers Welfare.
18. Department of Agriculture (2017). Pocketbook of Agricultural Statistics 2017. Available at http://agricoop.nic.in/recentinitiatives/pocket-book-agricultural-statistics-2017. Accessed on 20th December 2018.
19. Department of Agriculture. Agricultural Statistics at a Glance. Various issues.
20. Department of Food and Public Distribution. (Undated). Website: http://dfpd.nic.in/nfsa-act.htm. Accessed 18th October 2018
21. Dyer Graham (1997). Class, State and Agricultural Productivity in Egypt: A Study of the Inverse Relationship between Farm Size and Land Productivity (London: Frank Cass Publishers)
22. Economic Survey of India 2018 (2018). Chapter 06 – Climate, Climate Change and Agriculture. Available at http://mofapp.nic.in:8080/economicsurvey/pdf/082-101_Chapter_06_ENGLISH_Vol_01_2017-18.pdf. Accessed on 17th October 2018.
23. Food and Agriculture Organization. India at a glance. Available at http://www.fao.org/india/fao-in-india/india-at-a-glance/en/. Accessed on 20th December 2018.
24. Gillespie S; Harris J; Kadiyala S (2012). The Agriculture-Nutrition Disconnect in India: What Do We Know? IFPRI Discussion Paper 1187. Washington, D.C.: International Food Policy Research Institute (IFPRI). http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/126958.
25. Government of Punjab (1986). Expert committee report on diversification of Punjab agriculture (Chairman: S. S. Johl). Published by Government of Punjab, India.
26. Hanumantha, Rao CH (1975). Technological Change and Distribution of Gains in Indian Agriculture (New Delhi: Macmillan).
27. Hanumantha, Rao CH (1966). "Alternative Explanations of the Inverse Relationship between Farm Size and Output Per Acre in India", Indian Economic Review, Vol 1(2)
28. Havenevik JK, Skarstein R (1997). "Land Tenure, State-Peasant Relations and Productivity in Tanzanian Agriculture" in Amit Bhaduri and Rune Skarstein (ed.), Economic Development and Agricultural Productivity (Cheltenham: Edward Elgar), pp 183-212.
29. Himanshu (2018). India Inequality Report 2018. PPT produced for OXFAM. Available at https://www.oxfamindia.org/sites/default/files/himanshu_inequality_Inequality_report_2018.pdf. Accessed on 20 December 2018.
30. Hughes Jd'A, Keatinge JDH (2013). The nourished millennium: how vegetables put global goals for healthy, balanced diets within reach. 24–26 Jan 2012, Chiang Mai, Thailand. In Holmer RJ, Linwattana G, Nath P, Keatinge JDH, editors. ASEAN regional symposium on high value vegetables in Southeast Asia: production, supply and demand (SEAVEG 2012); 2013. pp 11–26, Shanhua, Taiwan: AVRDC.
31. IANS (2017). Family debts main cause of Indian farm suicides. Financial Express, 28 June 2017.

32. IFPRI (2017). Global Hunger Index – The inequalities of hunger, IFPRI, New York
33. International Institute for Population Sciences (IIPS) and ICF (2017). National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS.
34. International Institute for Population Sciences (2007). National Family Health Survey (NFHS-3), 2005-06: India. Mumbai, India: IIPS.
35. Jha P, Negre M (2007). "Indian Economy in the Era of Contemporary Globalisation; Some Core Elements of the Balance Sheets," http://www.macroscan.org/anl/may07/pdf/Indian_Economy.pdf.
36. Johl SS, et al. (2002). "Agricultural Production Pattern Adjustment Programme in Punjab for Productivity and Growth," Johl Committee Report submitted to Government of Punjab.
37. Keatinge JDH, Waliyar F, Jamnadass RH, Moustafa A, Andrade M, Drechsel P, et al. (2010). "Re-learning old lessons for the future of food: by bread alone no longer-diversifying diets with fruit and vegetables". Crop Sci. 2010;50:51–62.
38. Keatinge JDH, Wang J-F, Dinssa FF, Ebert AW, Hughes J, Stoilova T, Nenguwo N, Dhillon NPS, et al. (2015). "Indigenous vegetables worldwide: their importance and future development". Acta Hortic. 2015;1102:1–20.
39. Khatkar B, Chaudhary N, Dangi P (2016). "Production and Consumption of Grains in India". Reference Module in Food Science. 10.1016/B978-0-08-100596-5.00044-5.
40. Kumar V (2018). 'Banks prefer Corporate Sector over Agriculture', Indian Express, February 25, 2018.
41. Majumdar R (2018). "Enough! Why 1,00,000 farmers are marching to Delhi on November 30". The Telegraph, 21 November 2018.
42. Ministry of Agriculture (2014). Agriculture Census 2010-11. All India Report on Number and Area of Operational Holdings, Agriculture Census Division, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India.
43. Ministry of Human Resource Development. Website: http://mhrd.gov.in/mid-day-meal. Accessed on 18th October 2018
44. Ministry of Women and Child Development. Website: https/www.wcd.nic.in. Accessed on 18th October 2018
45. Nair S. "In Year Of 8 Elections, India's Rural Debt, Distress & Death Crisis". IndiaSpend. January 4, 2018.
46. National Institute of Nutrition (2011). Dietary Guidelines for Indians: A Manual, 2011, National Institute of Nutrition, Hyderabad.
47. National Sample Survey Office (2014). Report No. 560. Nutritional Intake in India 2011-2012.
48. National Sample Survey Office (2014). Report No. 565. Public Distribution System and Other Sources of Household Consumption, 20Il-12
49. National Sample Survey Office (2014). Key Indicators of Situation of Agricultural Households in India - January -December 2013.
50. Pandey K (2018). "Poor post-harvest facilities, transportation to cost farmers dearly". Down to Earth. 28 August, 2018.

51. Pattanaik et al. (2008). Contract Farming System in Punjab: An Appraisal Centre for Research in Rural and Industrial Development, Chandigarh.
52. Pradhan NC (2013). RBI WPS (DEPR): 05/2013: "Persistence of Informal Credit in Rural India: Evidence from 'All-India Debt and Investment Survey' and Beyond". RBI Working Paper Series No. 05. May 2013
53. Report of the 11th Plan Working Group on Natural Resource Management and Rainfed Agriculture (2011). Available at http://planningcommission.nic.in/aboutus/committee/wrkgrp12/agri/wg_NRM_Farming.pdf. Accessed on 17th October 2018.
54. Research Foundation for Science, Technology and Ecology (1996). Seed Keepers. RFSTE, New Delhi
55. Sainath P (2018). "Mega Crisis in Agriculture due to Corporate Hijack". Eenadu. 20 November 2018.
56. Saini GR (1971). "Holding Size, Productivity and Some Related Aspects of Indian Agriculture", Economic & Political Weekly, Review of Agriculture, Vol VI (26): A 79-A85.
57. Sathyamala C (2016). Nutrition: contested meanings – A theoretical and empirical enquiry. Unpublished PhD thesis International Institute of Social Studies, Erasmus University Rotterdam.
58. Sayantan Bera (2015). "What the SECC says about farming in India". Livemint. July 06, 2015.
59. Sen, AK (1962). "An Aspect of Indian Agriculture", The Economic Weekly, Vol 14 (4-6): 243-46.
60. Sen, AK (1964). "Size of Holdings and Productivity", The Economic Weekly, Vol 16 (5-7): 323-26.
61. Sharma D (2017). "Does the Banking System Really Want to Help Farmers?" The Wire. March 17, 2017.
62. Shergill HS (2015). "Has Punjab Lost Number One Position in level of Development", Journal of Agricultural Development and Policy, Vol. 25, No. 1, pp 1-10.
63. Shiva V (1993). Monoculture of the Mind. Zed Books, London.
64. Shiva V, Jalees K (2006). Seeds of Suicide: The Ecological and Human Costs of Seed Monopolies and Globalisation of Agriculture. New Delhi: Navdanya.
65. Shiva V (2007). Cargill: the corporate hijack of India's food & agriculture. New Delhi: Navdanya/RFSTE.
66. Shyam (2017). "3 Years of Modi Government: Steep Price Rise Everywhere". Newsclick. 5th May 2017. Available at https://www.newsclick.in/3-years-modi-government-steep-price-rise-everywhere. Accessed on 12th August 2108.
67. Sivaraj N, Pandravada SR, Kamala V, Sunil N et al. (2016). "Indian Crop Diversity". National Bureau of Plant Genetic Research. Available at http://millets.res.in/books/chapter/Indian_crop_diversity.pdf. Accessed on 14th July 2018.
68. SPREAD. "NFSA Social Audit Report of Nandupala Gram Panchayat, Khaparkhol Block, Balangir District". Available at

http://www.spread.org.in/document/NFSA%20Social%20Audit%20Report_Nandupala_Khaprakhol_Balangir.pdf. Accessed on 30th October 2018.
69. Statista. Wholesale Price Index (WPI) of vegetables across India from FY 2006 to FY 2017. Available at https://www.statista.com/statistics/685098/wholesale-price-index-of-vegetables-india/ . Accessed on 15th August 2018.
70. Swain PK, Kumar C, Raj Kumar CP (2012). "Corporate Farming vis-a-vis Contract Farming in India: A Critical Perspective". International Journal of Management and Social Sciences Research (IJMSSR) ISSN: 2319-4421 Volume 1, No. 3, December.
71. Todhunter C (2017). "A Grain of Truth: RCEP And The Corporate Hijack Of Indian Agriculture". Countercurrents. June 21, 2017.
72. Weinberger K, Swai I (2006). "Consumption of traditional vegetables in central and northeastern Tanzania". Ecol Food Nutr. 2006;45:87–103.
73. World Bank (2012). India Groundwater: a Valuable but Diminishing Resource. Available at http://www.worldbank.org/en/news/feature/2012/03/06/india-groundwater-critical-diminishing. Accessed on 17th October 2018.
74. Yadav A, Sehran S. Farmers drop prices of vegetables, no respite to consumers. India Today News. May 30, 2018. Available at https://www.indiatoday.in/india/story/farmers-drop-prices-of-vegetables-no-respite-to-consumers-1246175-2018-05-30. Accessed on 24th December 2018.