Clear and Present Challenges before 21st Century Bharat

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Hunger continues to exist in India despite the commendable growth in foodgrain production. The numbers of malnourished, undernourished and stunted children in India form a substantial proportion of the world total. Increasingly land earlier under foodgrains is being diverted to other crops and uses. Agriculture is becoming unsustainable at many levels. There are many challenges to be faced in an endeavour to ensure equitable access to food for all.

During the launching ceremony of the Oxfam-IDS Sussex Bulletin entitled *Standing on the Threshold: Food Justice in India* at the Constitution Club on July18, 2012, the then Minister of State (Independent Charge) in the Ministry of Consumer Affairs, Food and Public Distribution Prof. KV Thomas talked about the importance of Green Revolution in making India self-sufficient in foodgrain production. It is true that foodgrain production has increased by five folds from 50.8 million tonnes in 1950-51 to 257.4 million tonnes in 2011-12, as shown by the Economic Survey 2012-13. Yet the country is struggling hard to fight the scourge of hunger and malnutrition despite running programmes like the Integrated Child Development Services (ICDS) Scheme, Mid Day Meal Scheme (MDMS), and Public Distribution System (PDS) etc. There are many who doubt that India can improve food production without making its agriculture sustainable.

The United Nations has estimated that global population will rise by 2.3 billion or 34 per cent from the present time to reach 9.1 billion by 2050. Most of the increase in population will be contributed by the developing world, "with the greatest relative increase in the least developed countries (120 per cent)". Due to acceleration in rural migration, a significant majority of the population will be living in urban areas (compared with about 50 per cent today), and they will be dependent on purchased instead of home-produced food. The FAO has estimated that agricultural production needs to be raised by 60 per cent globally (and nearly 77 per cent in developing countries) by 2050 so as to cope with a larger, more urban and wealthier population, and to enhance average food consumption to 3070 kcal per person per day. Since farmland area is expected to expand only slightly in the coming decade, additional production will need to come from increased productivity. The FAO has predicted that from the 2005-07 base-

periods to 2050 only 10 per cent of the global growth in crop production (21 per cent in developing countries) is expected to come from land expansion, while the remainder would be contributed by higher yields and increased cropping intensity. Arable land is projected to expand by 69 million hectares (less than 5 per cent), with an expansion of about 107 million hectares in developing countries being counterbalanced by a decline of 38 million hectares in developed countries. Productivity has to be improved to contain food prices in the presence of rising resource constraints (OECD-FAO, 2012). It is in this context that sustainable agriculture becomes important in the medium to long-run.

Hunger Ranking

The Global Hunger Index 2013 report *The Challenge of Hunger: Building Resilience to achieve Food and Nutrition Security* informs that India has improved its GHI score from 32.6 in 1990 to 21.3 in 2013, and presently ranks 63rd. India's 2012 GHI score was 22.9 (rank: 65). The country presently lags far behind many of its neighbours such as China (GHI: 5.5; Rank: 6), Sri Lanka (GHI: 15.6; Rank: 43), Nepal (GHI: 17.3; Rank: 49), Pakistan (GHI: 19.3; Rank: 57) and Bangladesh (GHI: 19.4; Rank: 58).

India's proportion of undernourished in the population declined from 26.9 per cent during 1990-1992 to 17.5 per cent during 2010-12. Its proportion of underweight children under five years declined from 59.5 per cent during 1988-1992 to 40.2 per cent during 2008-12. The proportion of children dying before the age of five declined from 11.4 per cent in 1990 to 6.1 per cent in 2011

Table 1: Data Underlying Calculation of GHI scores 1990, 1995, 2000, 2005 and 2013

Proportion of undernourished in the population (%)				
1990-92	1994-96	1999-2001	2004-06	2010-12
26.9	25.2	21.3	20.9	17.5
Prevalence of underweight in children under five years (%)				
1988-92	1993-97	1998-2002	2003-07	2008-12
59.5	45.9	44.4	43.5	40.2
Proportion of children dying before the age of five				
1990	1995	2000	2005	2011
11.4	10.1	8.8	7.5	6.1
Global Hunger Index score				
1990 (with data from 1988-92)	1995 (with data from 1993-97)	2000 (with data from 1998-02)	2005 (with data from 2003-07)	2013 (with data from 2008-12)
32.6	27.1	24.8	24.0	21.3

Source: Global Hunger Index 2013 report *The Challenge of Hunger: Building Resilience to achieve Food and Nutrition Security*

The GHI 2013 report finds that most of the countries with alarming GHI scores are in Africa south of the Sahara with the exception of India, Haiti, Timor-Leste and Yemen.

As per the *Progress for Children: A Report Card on Adolescents* (UNICEF-2012), more than half of Indian girls aged 15–19 are anaemic. Nearly, 39 per cent of Indian adolescent girls are mildly anaemic, 15 per cent are moderately anaemic, and 2 per cent are severely anaemic. Nearly, 47 per cent of adolescent girls aged 15–19 in India are underweight, with a body mass index (BMI) of less than 18.5.

The 2013 UNICEF report *Improving Child Nutrition* points out that in 2011, the number of stunted children in India was 6.17 crore approximately, and its share in the world total of stunted children was 37.9 per cent. In Maharashtra, the wealthiest state in India, 39 per cent of children under age 2 were stunted in 2005–2006. However, by 2012, according to a statewide nutrition survey—Comprehensive Nutrition Survey in Maharashtra—the prevalence of stunting had dropped to 23 per cent.

The FAO report *The State of Food and Agriculture 2013-Food Systems for Better Nutrition* mentions a study by Headey (2011), which shows that agricultural productivity growth was associated with reductions in the prevalence of child malnutrition in most countries, including India, during the period of rapid adoption of Green Revolution technologies and up until the early 1990s. Since 1992, however, agricultural growth has not been associated with improved child nutrition in many Indian states. By using Deaton and Drèze (2009) and Headey (2011), the same FAO report states that various explanations have been offered for the persistence of high levels of undernutrition in India. These include economic inequality, gender inequality, poor hygiene, lack of access to clean water and other factors beyond the performance of the agriculture sector. However, the phenomenon of undernutrition remains largely unexplained and additional research is needed.

The newly released *Statistical Year Book, India 2014* while presenting India's MDG score card, tells that the country will completely fail to reach the Target 2 of the MDG-1 i.e. halving, between 1990 & 2015, the proportion of people who suffer from hunger. All the available data from National Family Health Survey-NFHS (various rounds) suggests that India is going slow in reducing malnutrition among children.

The *2012 Global Hunger Index (GHI)* report and the *Nutrition Barometer report (2012)* previously had criticized the Indian Government for not monitoring the condition of malnutrition and hunger since the time the last National Family Health Survey-3 (NFHS-3) got published in 2005-06. However, Annual Health Survey (AHS) done under the aegis of Ministry of Health and Family Welfare in collaboration with the Registrar General of India (RGI) is in place of NFHS to cover all the districts in nine states of India so as to assess health and nutrition status of Indian population. The District Level Household and Facility Survey (DLHS) will be undertaken in rest of the states/ UTs, where AHS is not being done.

Combating Undernourishment

A new report by the National Academy of Agricultural Sciences (NAAS) reveals that despite the nutritional value of millets, otherwise known as coarse cereals (barring some varieties)[1], there has been a drastic reduction in the area under its cultivation from 36.34 million hectares in 1955-56 to 18.6 million hectares in 2011-12 thanks to the wrong agricultural and price policies adopted by the Government. Based on previous National Nutrition Monitoring Bureau (NNMB) surveys, the report entitled *Role of Millets in Nutritional Security of India* estimates that sharp reduction in the intake of iron and calcium since mid-1990s is due to the declining trends in the production and consumption of millets.

As per the NAAS report, an entire gamut of factors are responsible for decline in the area under cultivation of millets such as low remuneration as compared to other food crops, lack of input subsidies and price incentives, subsidized supply of fine cereals through Public Distribution System (PDS), and change in consumer preference (difficulty in processing, low shelf-life of flour and low social status attached to millets).

It is surprising that India, which will completely fail to reach the Target 2 of the MDG-1, has been unable to reap the benefits of millets, which are otherwise known as nutri-grains since they are rich in micronutrients like minerals and B-complex vitamins as well as health promoting phyto-chemicals. The NAAS report gives the nutritional value of various types of millet such as pearl millet (bajra), which has the highest content of macronutrients, and micronutrients such as iron, zinc, Mg, P, folic acid and riboflavin. The reader of this report is informed that finger millet (ragi) is an extraordinary source of calcium.

Responding to the urging of social activists, the National Food Security Bill has included millets in the basket of foodgrains to be given at subsidised rates so as to fight malnutrition among children and women from income poor background.

Sustainable Agriculture

Water Shortage: Since nearly 70 per cent of irrigation is dependent on groundwater, declining water level is a major impediment concerning agricultural production in the country. *The State of Indian Agriculture 2012-13* report, informs that a decline in water level is noticed mostly in northern, north western and eastern parts of India in the states of Uttar Pradesh, Rajasthan, Bihar, Jharkhand, West Bengal, Punjab and Haryana. Decline in water level has also been observed in parts of Tamil Nadu and Andhra Pradesh. Significant decline in water level of more than 2m is seen in parts of Rajasthan, Haryana, Punjab, and western Uttar Pradesh, western Andhra Pradesh and North West part of Tamil Nadu. Out of 5842 numbers of assessed administrative units (Blocks/ Taluks/ Mandals/ Districts), 802 units are Over-exploited, 169 units are Critical, 523 units are Semi-critical.

There are numerous studies that indicate over-exploitation of groundwater. A study by Shah (2009), mentioned in the report *Water in India: Situation and Prospects (2013)*, shows that every fourth cultivator household has a tubewell; and two out of the remaining three purchased irrigation services are supplied by tube well owners. The growing demand for water along with unreliable public supply schemes has led to an increasing dependence on groundwater sources whereby it is being extracted not only through the municipal water utilities but also by private owners through borewells and pumps. The Twelfth Five Year Plan (Volume 1) document, therefore, has suggested a participatory approach to sustainable management of groundwater based on a new programme of aquifer mapping.

Table 2: Source of Irrigation in India (in '000 hectares)

Year	Canals			Source of Irrigation				Net Irrigated Area
	Govt.	Private	Total	Tanks	Tube-wells	Other Wells	Other Sources	
2001-02	14993	209	15202	2196	23245	11952	4342	56936
2002-03	13867	206	14073	1811	25627	8728	3659	53897
2003-04	14251	206	14458	1916	26691	9694	4299	57058
2004-05	14553	214	14766	1734	25235	9956	7538	59230
2005-06	16490	227	16718	2083	26026	10045	5966	60838
2006-07(P)	16802	224	17027	2078	26942	10699	5999	62745
2007-08(P)	16531	217	16748	1973	28497	9865	6107	63190
2008-09(P)	16686	195	16881	1981	28367	10390	6020	63639
2009-10(P)	14789	188	14978	1587	28368	9993	7013	61939
2010-11(P)	15496	171	15667	2004	28550	10510	6871	63601

Note: P means Provisional

Source: Directorate of Economics & Statistics, Ministry of Agriculture

Based on data from the *Statistical Year Book 2014* (sourced actually from Directorate of Economics and Statistics, Ministry of Agriculture), it can be seen that 40.8 per cent of India's net irrigated area in 2001-02 was dependent on tubewells for irrigation, which increased to 44.9 per cent in 2010-11 (See Table 2).

The State of Indian Agriculture 2011-12 report provides a scary estimate that by 2050 about 22 per cent of the geographic area and 17 per cent of the population will be under absolute water scarcity in India. The per capita availability of water, which was about 1704 cubic metres in 2010, is projected to decline to 1235 cubic metres in 2050.

Soil Erosion and Land Degradation: It has been mentioned by the *State of Indian Agriculture 2011-12* report that about 120 million hectare land is degraded in India,

and about 5334 million tonnes of soil is lost annually through soil erosion. Out of 120 million hectare degraded area, water erosion accounts for 68 per cent, chemical degradation 21 per cent, wind erosion 10 per cent and the rest physical degradation. As per the State of Environment 2009 report, excessive soil erosion with consequent high rate of sedimentation in the reservoirs and decreased fertility has created serious environmental problems with disastrous economic consequences.

The State of Indian Agriculture 2012-13, by using estimates provided by Indian Council of Agricultural Research (2010), shows that out of the total geographical area of 328.73 million hectare, about 120.40 million hectare is affected by various kind of land degradation resulting in annual soil loss of about 5.3 billion tonnes through erosion. This includes water and wind erosion (94.87 million hectare), water logging (0.91 million hectare), soil alkalinity/ sodicity (3.71 million hectare), soil acidity (17.93 million hectare), soil salinity (2.73 million hectare) and mining and industrial waste (0.26 million hectare). Besides, water and wind erosions are widespread across the country. Nearly 5.3 billion tonnes of soil gets eroded every year. Of the soil so eroded, 29 per cent is permanently lost to sea, 10 per cent is deposited in reservoirs reducing their storage capacity and rest 61 per cent gets shifted from one place to another.

Another estimate by Directorate of Economics & Statistics, Ministry of Agriculture based on the latest Land Use Statistics data (2010-11) shows that the total arable land in the country is 182.0 million hectares. As per the information provided by the Indian Council of Agricultural Research (ICAR) around 104 million hectares arable land of the country is subjected to land degradation [2].

The State of Environment 2009 report finds that in India soil pollution from heavy metals due to improper disposal of industrial effluents, along with excessive use of pesticides and mismanagement of domestic and municipal wastes, is a matter of concern. The *Twelfth Five Year Plan (Volume 1)* document has noted that subsidies given by the Centre and states actually led to excessive use of nitrogenous fertilizers and over-drawing of water, thus, affecting sustainability of soil and water ecosystem.

It has been alleged that due to the implementation of the Nutrient Based Subsidy (NBS) Policy on decontrolled Phosphatic & Potassic fertiliser with effect from April 1, 2010, there has been distortion in the application ratio of N:P:K, which is ideally 4:2:1. The *Twelfth Five Year Plan (Volume 2)* finds that the NBS roll-out was seriously flawed because urea was kept out of its ambit. Urea prices remain controlled with only a 10 per cent rise at the time of adoption of the NBS in 2010. However, in the meanwhile prices of decontrolled products doubled.

Many studies have found that farm soil in many Indian states is deficient in micro-nutrients like zinc, boron and sulphur apart from known macronutrients such as nitrogen and phosphorus (Wani et al, 2009).

Agricultural Land: Diversion and Availability

During the period 1950-51 to 2009-10, the percentage of land used for non agricultural purposes over reporting area has increased from 3.3 per cent to 8.6 per cent, *(State of Indian Agriculture 2012-13)*. During the last decade (1999-2000 to 2009-10), area under non-agricultural uses has increased by 2.57 million hectare i.e. by 11 per cent. The states where proportion of land under non agricultural uses is higher than all India average (%) are West Bengal, Tamil Nadu, Bihar (including Jharkhand), Sikkim, Assam, Tripura, Goa, Andhra Pradesh, Kerala, UP, Haryana and UTs like Chandigarh, Delhi, Pudduchery, and Daman & Diu. The per capita availability of land has declined from 0.89 hectare in 1951 to 0.32 hectare in 2001, and is projected to further move down to 0.20 hectare in 2035. As far as agricultural land is concerned, per capita availability of land has declined from 0.5 hectare in 1951 to 0.18 hectare in 2001 and is likely to decline further. The average land holding size, which was about 1.33 hectare in 2000-01, has declined to 1.16 hectare during 2010-11.

According to the *Standing Committee Report on the Land Acquisition (Amendment) Bill 2007*, total cultivable land in India has decreased from 185.09 million hectare in 1980-81 to 182.57 million hectare in 2005-06, and total wasteland has decreased from 16.74 million hectare in 1980-81 to 13.16 million hectare in 2005-06.

Data from the *Statistical Year Book 2014* (sourced originally from Directorate of Economics and Statistics, Ministry of Agriculture) shows that India's permanent pastures and other grazing lands has declined from 10.53 million hectares in 2001-02 to 10.3 million hectares in 2010-11. Current fallow land has declined from 15.34 million hectares in 2001-02 to 14.27 million hectares in 2010-11 (See Table 3).

Table 3: Pattern for Land Utilization ('000 hectares)

		Classification of reported area									
Years	**Reporting area for land utilization statistics (Col. 3 to 10)**	**Forests**	**Not available for cultivation**	**Permanent pastures & other grazing lands**	**Land under misc. tree crops & groves (not included in net sown area)**	**Culturable waste land**	**Fallow lands other than current fallows**	**Current Fallows**	**Net Sown Area**	**Total Cropped Area**	**Area sown more than once**
2001-02	305127	69720	41328	10528	3442	13520	10513	15343	140734	188014	47280
2002-03	305357	69821	41636	10450	3431	13651	11966	22459	131943	173889	41947
2003-04	305566	69968	41982	10484	3381	13241	11313	14489	140708	189661	48953
2004-05	305587	69960	42229	10452	3362	13272	10878	14792	140642	191103	50461
2005-06	305447	69994	42323	10444	3391	13225	10696	14213	141162	192737	51575
2006-07(P)	305650	70025	42731	10418	3351	13274	10516	15512	139823	192381	52558
2007-08(P)	305667	69965	42901	10362	3400	13044	10333	14646	141016	195223	54207
2008-09(P)	305843	69978	43061	10344	3343	12735	10290	14192	141899	195314	53414
2009-10(P)	305834	69988	43323	10339	3214	12952	10833	16008	139177	188991	49814
2010-11(P)	305903	70006	43564	10301	3207	12657	10321	14267	141579	198969	57390

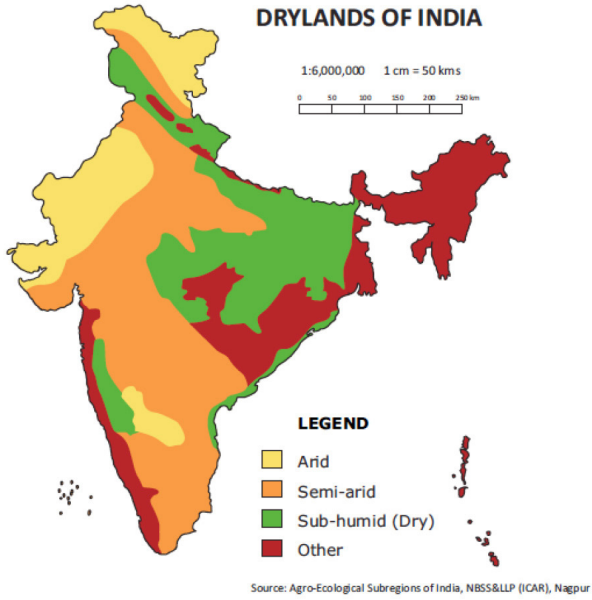
Note: P means Provisional

Source: Directorate of Economics & Statistics, Ministry of Agriculture

Dry Land Farming

Since the mainstay of majority of the rural population is agriculture and allied activities including livestock, according to some experts, the cure to reducing poverty lies in developing and promoting dry land farming. According to the report entitled *Elucidation of the 4th National Report submitted to UNCCD Secretariat, 2010*, by the Ministry of Environment and Forests, India has a total geographical area of 328.2 million hectare with dry lands covering 228.3 million hectare (i.e. 69.6 per cent) of the total land area. Rain fed agriculture supports 60 per cent of livestock population and supplies roughly 40 per cent of India's food demand of roughly 1.2 billion people. It plays a key role in ensuring food and livelihood security of the rural poor. It is often associated with high risk farming due to low and erratic rainfall. Droughts occur frequently in the areas affected by desertification. As per the *State of Indian Agriculture 2011-12*, majority of the drought prone areas lie in the arid (19.6 per cent), semi-arid (37 per cent) and sub-humid (21 per cent) areas of the country that comprise 77.6 per cent of its total land area of 329 million hectare

Figure 1: Dry Land Areas in India



Source: Elucidation of the 4th National Report submitted to UNCCD Secretariat, 2010

Since rain fed agriculture done in alluvial, black and red soils is susceptible to water erosion, there is a need for soil and water conservation measures. Leading agricultural

R&D institution—International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in partnership with Indian Council for Agricultural Research (ICAR) and various state universities is engaged in developing drought tolerant, pest resistant and climate change ready crops for dryland farming regions.

Table 4: Drought Tolerant Varieties of Field Crops

Variety	Traits	Zone
Cereal Varieties		
Rice Sahabhagi Dhan	 Drought tolerance	 Upland rice areas
Wheat VL 892 PBW 527 HI 1531, HI 1500, HI 8627 HD 2888	Medium Fertility and restricted irrigation condition Drought tolerance Drought tolerance Drought tolerance	Hills of Himachal Pradesh and Uttarakhand North west plains Central Zone Eastern India
Maize Pusa hybrid Makka 1 HM 4 Pusa hybrid Makka 5	 Drought tolerance Drought tolerance Drought tolerance	 Rajasthan, Gujarat, Madhya Pradesh Punjab, Haryana, Uttar Pradesh, Maharashtra, Tamil Nadu and Goa Whole of India
Sorghum CSH 19 R, CSV 18 CSH 15 R	 Drought tolerance Drought tolerance	 All Rabi Sorghum Area Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu
Pearl Millet HHB 67	 Drought tolerance	All dry areas of Western Rajasthan and Gujarat
Barley RD 2660, K 603	 Drought tolerance	 North west plains region
Pulses		
Chickpea RSG 14, RSG 88 COI, ICCV 10 Vijay, Vikas	 Drought tolerance Drought tolerance Drought tolerance	 North west plain Zone Southern Zone Central Zone
Mothbean CZM 1, CZM 2, CZM 3	 Drought tolerance	 All India
Oilseeds		
Soyabean NRC-7, JS 71-05	 Pod shattering and drought tolerance	 All soyabean growing zones
Groundnut Ajeya, Girnal 1, TAG-24 G, TG 37 A, ICGS 1	 Drought tolerance Drought tolerance	 Central and Sounth Zone Northern Plain

Commercial Crops		
Cotton LRA 5166 KC 3	 Tolerance to drought Tolerance to drought	 Central Zone South Zone
Sugarcane Co 94008 (Shyama) Co 98014 (Karan-1) CoLk 94184 (Birendra)	 Tolerance to drought and salinity Tolerance to drought, water-logging Tolerance to drought, water-logging with good rationing	 Peninsular Zone North West Zone North Central Zone
Variety/Hybrid		
Jute JBO 1 (Sudhangsu)	Drought tolerance	Tossa jute belt of West Bengal, Assam, Bihar and Odisha

Source: National Bureau of Soil Survey and Land Use Planning (ICAR) Nagpur, 2009

The Economic Survey 2012-13 reports that the Rainfed Area Development Programme (RADP) was launched by the Government as a pilot scheme under the Rashtriya Krishi Vikas Yojana (RKVY), focusing on small and marginal farmers and farming systems. It has adopted a holistic 'end-to-end approach' covering integrated farming, on-farm water management, storage, marketing, and value addition of farm produce in order to enhance farmers' income in rainfed areas. During 2012-13, the RADP was implemented in 22 states and during the Twelfth Plan; it will be substantially upscaled as a programme component under the National Mission for Sustainable Agriculture (NMSA). NMSA is one of the eight Missions under National Action Plan on Climate Change (NAPCC), and seeks to transform Indian agriculture into a climate resilient production system through suitable adaptation and mitigation measures in domains of both crops and animal husbandry.

Efforts required in dryland areas include: improving in-situ moisture conservation through ground water recharge; adopting dryland farming approach-raised bed, ridge furrow, zero tillage, mulching; convergence with various watershed development programmes; diversification towards livestock, horticulture, silviculture, fodder production; integrating farming systems with livestock and fisheries etc.

Watershed Development as a Solution

The State of Indian Agriculture 2012-13 report informs that various Watershed Development Programmes (WDPs) are being implemented by the Ministry of Agriculture and Ministry of Rural Development for development of degraded lands. Some of these programmes are: National Watershed Development Project for Rainfed Areas (NWDPRA), Soil Conservation in the Catchments of River Valley Project & Flood Prone River (RVP & FPR), Reclamation and Development of Alkali & Acid Soils

(RADAS), Watershed Development Project in Shifting Cultivation Areas (WDPSCA) and Integrated Watershed Management Programme (IWMP). It is informed that under these WDPs, since inception till the end of Eleventh Five Year Plan, an area of about 58 million hectare has been developed.

A World Resources Institute working paper written by Gray and Srinidhi (2013) finds that the early WDPs since the 1970s administered by the Ministry of Rural Development (MoRD), like the Drought Prone Areas Programme (DPAP), the Desert Development Programme (DDP), and the Integrated Wasteland Development Programme (IWDP), focused on technical interventions so as to promote soil and water conservation measures in drought-prone areas and on installing water-harvesting structures. Gray and Srinidhi (2013) show that watershed development positively impacts food security and water management.

References

Census 2011: Presentation on Annual Health Survey Fact Sheet First Updation Round (2011-12): Key Findings census, http://censusindia.gov.in/2011-common/AHSurvey.html

Deaton, A & Drèze, J (2009): 'Food and Nutrition in India: Facts and Interpretations'. *Economic & Political Weekly,* 14 February, XLIV(7): 42–65.

FAO (2013): *The State of Food and Agriculture 2013-Food Systems for Better Nutrition,* http://www.fao.org/docrep/018/i3300e/i3300e.pdf , http://www.fao.org/docrep/018/i3301e/i3301e.pdf

Ghatak, Shambhu (2012): *Standing on the Threshold: Food Justice in India,* 23 July, 2012, http://talkative-shambhu.blogspot.in/2012/07/standing-on-threshold-food-justice-in.html

GHI (2013): The Challenge of Hunger: *Buildng Resilience to Achieve Food and Nutrition Security* (published in October 2013), brought out by International Food Policy Research Institute, Concern Worldwide, Welthungerhilfe and Institute of Development Studies http://www.im4change.org/siteadmin/tinymce//uploaded/GHI%202013.pdf

GHI (2012): *The Challenge of Hunger: Ensuring Sustainable Food Security under Land, Water, and Energy Stresses,* IFPRI, Concern Worldwide & Welthungerhilfe, http://www.ifpri.org/sites/default/files/publications/ghi12.pdf

Government of India (2007): Standing Committee Report on the Land Acquisition (Amendment) Bill 2007 http://prsindia.org/uploads/media/Land%20Acquisition/scr1226484896_SC_Report_Land_Acquisition_Bill__2008.pdf

Gray, Erin and Srinidhi, Arjuna (2013): *Watershed Development in India: Economic Valuation and Adaptation Considerations,* World Resources Institute, December, http://www.wri.org/sites/default/files/wsd_in_india_0.pdf

Headey, D (2011): Turning economic growth into nutrition-sensitive growth. Conference Paper No. 6. 2020, Conference on Leveraging Agriculture for Improving Nutrition and Health, 10–12 February, New Delhi, India

Ministry of Agriculture (2013): State of Indian Agriculture 2012-13, http://www.indiaenvironmentportal.org.in/files/file/State%20of%20Indian%20Agriculture%202012-13 pdf

____ (2012): State of Indian Agriculture 2011-12, http://agricoop.nic.in/SIA111213312.pdf

Ministry of Environment and Forests (2010): Elucidation of the 4th National Report submitted to UNCCD Secretariat, 2010, GoI, http://envfor.nic.in/sites/default/files/unccd-report_0.pdf

Ministry of Environment and Forests (2009): *State of Environment Report 2009,* http://envfor.nic.in/soer/2009/SoE%20Report_2009.pdf

Ministry of Finance (2013): *Economic Survey 2012-13,* http://indiabudget.nic.in

Ministry of Statistics and Programme Implementation (2014): *Statistical Year Book India-2014,* http://mospi.nic.in/Mospi_New/upload/SYB2014/index1.html

Ministry of Statistics and Programme Implementation (2013): *Statistics related to Climate Change-India,* GoI, http://mospi.nic.in/Mospi_New/upload/climate_change_29nov13.pdf

National Academy of Agricultural Sciences (2013): 'Role of Millets in Nutritional Security of India', Policy Paper 66, December

OECD-FAO (2012): *Agricultural Outlook* 2012-2021, http://www.agri-outlook.org/dataoecd/4/10/50679839.pdf?contentId=50679840

Planning Commission (2013): *Twelfth Five Year Plan* (Volume 1, 2 and 3), http://planningcommission.gov.in plans/planrel/12thplan/welcome.html

Save the Children and World Vision (2012): *Nutrition Barometer: Gauging National Responses to Undernutrition,* http://www.savethechildren.in/images/resources_documents/nutrition_barometer_asia.pdf

Shah, T (2009): 'India's Groundwater Irrigation Economy: The Challenge of Balancing Livelihoods and Environment', in U.Badarayani, H. Kulkarni and D. U*pasani Groundwater Management: Typology of Challenges, Opportunities and Approaches,* Chapter 1. Pune: ACWADAM.

Standing Committee Report on the Land Acquisition (Amendment) Bill 2007, http://prsindia.org/uploads/media/Land%20Acquisition/scr1226484896_SC_Report_Land_Acquisition_Bill__2008.pdf

UNICEF (2013): *Improving Child Nutrition: TheAchievable Imperative for Global Progress,* http://www.unicef.org/publications/files/Nutrition_Report_final_lo_res_8_April.pdf

UNICEF (2012): *Progress for Children: A Report Card on Adolescents,* Number 10, April http://www.unicef.org/media/files/PFC2012_A_report_card_on_adolescents.pdf

UNICEF, FAO and SaciWATERs (2013): *Water in India: Situation and Prospects,* http://www.im4change.org/docs/656water-in-india-report.pdf

Wani, SP, Sreedevi TK, Rockström, J and Ramakrishna, YS (2009): 'Rainfed Agriculture-Past Trends and Future Prospects', in Wani, Suhas P, Rockström, Johan and Oweis, Theib, *Rainfed Agriculture: Unlocking the Potential,* Chapter 1, CABI, ICRISAT and IWMI, http://www.iwmi.cgiar.org/Publications/CABI_Publications/CA_CABI_Series/Rainfed_Agriculture/Protected/Rainfed_Agriculture_Unlocking_the_Potential.pdf

[1] Coarse cereals=Jowar+Bajra+Maize+Ragi+Small Millets+Barley; Millets=Jowar+Bajra+Ragi+Small Millets As per Department of Agriculture & Cooperation, http://agricoop.nic.in/imagedefault/whatsnew/4th_advest%202012-13.pdf

[2] Negative impact of chemicals and fertilizers in farming, http://www.indiaenvironmentportal.org.in/content/387670/negative-impact-of-chemicals-and-fertilizers-in-farming-question-raised-in-rajya-sabha-06022014/