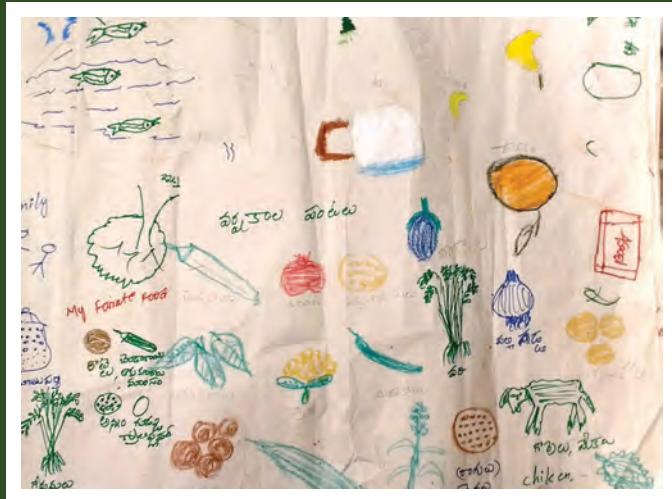


Exploring the Potential of Diversified Traditional Food Systems to Contribute to a Healthy Diet



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Executive Summary

Nutrition and health of a people, particularly in an agrarian country like India, rests on its food and agricultural system. India's traditional diets are complex, nutritionally diverse and have evolved from self-reliant, decentralised food systems embedded in a local socio-ecological and political context. Present day food systems in India, as in the rest of the world, are largely shaped by a centralised, extractive, fossil-fuel based, industrial agriculture and food systems. The nutritional and biological diversity of traditional diets have been steadily eroded through degradation of the natural resource base on which it rests.

The most recent United Nations global analysis on nutrition, 'The State of Food Security and Nutrition in the World 2017' states "As large companies increasingly dominate markets, highly processed foods become more readily available, and traditional foods and eating habits are displaced." The report identifies changing food systems and diets as one of the many driving forces behind global increase in malnutrition and hunger in 2016 after over a decade of steady decline. The report finds that in 2016, 815 million people or 11% of the global population were reported undernourished. In India, 14.5% of the total population are undernourished, 21% of all children in the age group 0-5 suffer from wasting, 38.4% of all children in this age group range suffer from stunting, and 51.4% of women in the reproductive age-range, suffer from anaemia (FAO, IFAD, UNICEF, WFP and WHO. 2017).

To address malnutrition both globally and in India, technical and market-based solutions (supplementation, fortification of staple food and highly processed food, bio-fortification), are being offered as the most effective approaches. These are primarily top-down and uniform solutions that do not consider the political, cultural, economic and socio-ecological context of malnutrition. In India, technical 'fixes', particularly biofortification, are increasingly becoming central to policies and programmes to address hunger and malnutrition. The role of communities and their traditional, nutritionally diverse food systems with knowledge and practices based on lived experience, does not form a part of the decision-making process of these approaches.

Globally, there are a few voices such as Olivier de Schutter, former UN Special Rapporteur on the Right to Food who are calling for "clear exit strategy to empower communities to feed themselves." Another prominent voice is that of Fabio da Silva Gomes, Officer of the National Cancer Institute of Brazil, Ministry of Health, External Affairs Secretary of the World Public Health Nutrition Organisation who has expressed that "all forms of malnutrition are expressions of food systems' failures. Adopting artificial and simplistic measures to fix one of these expressions might result in the perpetuation and production of old and new problems. Policies of adding nutrients to foods, culinary ingredients or ultraprocessed products are biologically and socio-politically artificial ways to mend the failure of a food system. When a country decides to adopt them, it means that they are endorsing that its food system and biodiversity have collapsed and are no longer able to solve the expressions of malnutrition resulting from this failure."

Given the findings of the United Nations 2017 analysis on nutrition, the efficacy of technical 'fixes' in addressing malnutrition need to be questioned. In this context, rural and indigenous communities from different parts of Andhra Pradesh and Telangana States of South India wanted to examine the validity of these technical proposals, through a comprehensive nutritional assessment of their own local traditional food systems and diets. They were keen to understand whether (i) their traditional food systems provide a balanced diet, (ii) their traditional diets warranted fortification. Based on this examination they wanted to offer a set of collective proposals to address the troubling questions of malnutrition. These communities, members of the Food Sovereignty Alliance (FSA), India, joined hands with the Catholic Health Association of India (CHAI), to carry out this enquiry.

Findings of the Study

To set the context for the community enquiry a historic review of India's agricultural and food policies was carried out through a desk study. Some of the salient observations made by the review are as follows:

- i. the trajectory of food and agricultural policies from the colonial period, through the post-Independence period to economic liberalisation in 1991 and thereafter, has severely compromised India's nutritional security. On the one hand the policies during the pre-liberalisation period put in place safety nets such as the public distribution system (PDS), mid-day meal scheme and Integrated Child Development Schemes to address malnutrition and hunger while on the other they laid the foundation for the industrial food system. The focus was on a production-calorie strategy to eradicate hunger starting with the Green Revolution. Whilst calorific deficiencies showed a declining trend during the pre-liberalisation period, it intensified the protein energy

malnutrition and micronutrient deficiencies by destroying the local, traditional diets and food systems. The shrinking public financing of public food procurement and distribution systems, post-liberalisation, has deepened the nutrition crises.

- ii. structural inequalities due to unresolved land ownership issues in India and the embedded inequalities of caste, class, gender and geography have prevented access to resources (land, water, forests and the commons in general) that have led to serious malnutrition, chronic hunger and starvation. This is compounded by an erosion of cultural and genetic diversity (in seeds, breeds, ways of production, accessing, preparing, sharing and consuming food). This fallout of the larger economic agenda which has privileged industrial agriculture and agri-business has severely compromised the resource base of the traditional food systems;
- iii. the economic growth dominated model and associated policies have led to a degradation of the resource base on which diverse food systems and cultures have evolved over time. It commoditised food crops, milk and fish taking them out of the reach of those on whose labour the industrial food system was being built. Economic liberalisation and the associated trade policies have led to an increased corporate takeover of the food system. This has severed the interconnections and dependencies that characterise 'whole food' systems necessary to sustain health;
- iv. to address the problems caused, the industrial food system shifted the focus to nutrients and nutritionism. By framing the problem as one of nutritional composition, poor eating habits etc., rather than poverty, lack of access to resources, marginalisation of communities, the food problem has been de-politicised once again. It is promoted as a technical rather than a structural problem. Health education and supplementation which were largely implemented by the Government have been replaced by fortification and biofortification which are more market driven and technology intensive, a shift termed by some analysts as "trade in nutritional health."
- v. whether it is the production-caloric view or the nutritionism view, both perpetuate the idea that food is primarily a vehicle for delivering nutrients. The richness of the cultural, social, ecological and spiritual meaning of food has been replaced by a reductionist view that deems local, traditional diets as inferior, inadequate and nutrient-deficient. This systematic appropriation of the idea of food has put the corporate food system at the helm of affairs, which is dictating what we eat, and our understanding of health and well-being;
- vi. across communities women are keepers of knowledge around food, nutrition and agriculture. The industrial agricultural system which is inherently patriarchal has reduced women to labour. It is disempowering them through token measures in the name of land rights and rejecting their knowledge by supporting an external input-based, technocentric food and agricultural model;
- vii. consumption patterns are being dictated by the 'supermarket revolution' and a food retail business that is increasingly being dominated by multinational agribusiness corporations – both international and domestic. What this has done is created increasing dependence on 'convenience' and processed foods ostensibly to ease the woman's 'burden'. Added sugars, salts, preservatives, synthetic fortifiers, hormones and antibiotic fed processed meat and eggs have destabilised the nutritional balance of a large section of the population. The affluent urban and rural Indians, as well as poor Indians who are being supplied unhealthy palm oil as the primary source of cooking oil via the PDS, and also forced to buy this global trade-subsidized cheapest oil in the market, are beginning to experience the diseases of affluence – obesity and obesity-linked complications including hypertension, diabetes and skeletal disorders.

The disconnect between agricultural and food policy and India's nutritional challenges continue. The State continues its increasingly aggressive push towards further integration into the international market and corporatisation of the agricultural system. This is compounded by the State's absolving of its Constitutional responsibility of "raising the level of nutrition and standard of living of its people and improvement in public health".

Hope however is visible in the form of several communities of resistance across the country working at shedding the spectre of deprivation and malnutrition.

The community enquiry involved communities of adivasis and marginal farmers, landless and agro-pastoralist from dalit, backward castes and Muslim communities, examining their own traditional food systems and diets. It was spread across six villages of Sangareddy district, Telangana and Chittoor, East Godavari and Srikakulam districts of Andhra Pradesh. The enquiry provided clear evidence of the following:

- i. the communities' food systems are nutritionally diverse and rich in nutrients. For e.g., over 80 to 100 different kinds of seasonal, wild, cultivated and uncultivated foods form a part of their regular diet. These continue to be strongly embedded in the local ecological and cultural context. Nutritional analyses of these diets shows that the foods can meet and counter malnutrition including micro-nutrient malnutrition such as Vitamin A Deficiency (VAD). An important aspect of these diets is that they do this in a holistic and comprehensive manner;
- ii. communities are a rich repository of knowledge around resilient food systems (production, storage, nutritional and medicinal properties) built on lived experience. This is of significance particularly in the context of challenges to food production and nutrition from climate change;

In light of the above, communities strongly and emphatically reject the introduction of fortified foods and other similar technical fixes (e.g., genetically engineered fortified rice – Golden Rice) in their diets, which are redundant given the comprehensive base of their own food systems. The communities propose that the State should support policies and programs that will nurture and strengthen their holistic socio-ecological systems of food and agriculture.

Way Forward

The communities and everyone involved in this enquiry, strongly asserts that the way forward, to comprehensively address macro and micronutrition deficiencies, is to focus on nurturing the diverse traditional food systems, enriching their potential to contribute to nutritionally complete dietary patterns. It must also nurture the associated transgenerational, knowledge system and its uses within the community as well as the ease of assimilation of these foods into the routine diets of the communities.

The foundation for such a strategy to build holistic health must open and expand the spaces for people's dialogue and participation: spaces that have been closed by the expert-driven 'nutritionism' approach who know the problem and prescribe technical solutions. Such a strategy must also break the silence of women who are at the heart of the traditional food system, who provide the lived experience of hunger and malnutrition, as also the knowledge to overcome the same. To understand the political and social landscape of food the voices of the people, must be made audible so that the dialogue around food is moved away from the privileged spaces dominated by academic, technical, and medical credentials and corporate control and become embedded in communities and in practice.

Integral to this strategy is the governance of the resource base, particularly the urgent correction of unequal land-ownership, as also socially just governance of the commons, on which the food system rests. Self-governance by local communities who know these areas intimately – cycles, access, availability, scarcity/abundance etc. - is critical to sustain these diets and systems rather than State rules and top-down Government regulations.

To nurture the traditional diets and food systems described through this study, public investment and Government support is critical. The support required is to facilitate communities to transition from a largely chemical-based system of monocrop commodity production, to cultivating for consumption first, traditional foods without chemicals. This will automatically also bring in the natural wild and uncultivated greens and vegetables back onto the fields.

What is important to recognise is that in the absence of this transformative strategy, it is impossible to eliminate malnourishment and ensure holistic health and nutrition. The idea of nutrition and therefore food and agricultural systems are a product of the socio-technical system – one which needs to dominate geopolitically. These include (i) agribusinesses which are using nutrition as a differentiator in the market, (ii) Governments that are subsidizing via public resources the advance of corporate agribusiness to expand quick-fix responses to health problems, and (iii) the nutrition science and technology complexes responsible for both magnifying nutritional risks and marketing their industrial solutions.

Traditional knowledge and food systems together with developments in agroecological systems with their diverse and contrasting systems of resource governance, knowledge, innovation, distribution and access are the basis for a future of holistic health. Where they are at the heart of the struggle for a sovereign and just food and health system they are providing the basis for (i) challenging and resisting further erosion of our food and agricultural system and (ii) building healthy communities. These are the seeds of hope and resilience for the future.

1.0 Introduction

Globally, every third person is affected by one or several forms of malnutrition (undernutrition, micronutrient deficiency, over-nutrition (obesity). Whilst 1.9 billion people are obese, 795,000 people continue to live in unacceptable conditions of endemic hunger.

Worldwide, 2 billion people are affected by hidden hunger (micronutrient deficiency), of which 225 million (or 9%) are from India alone'. Hunger is usually understood as the discomfort associated with the scarcity of food. The FAO defines it specifically as the consumption of fewer than about 1,800 kilocalories a day – the minimum that most people require in order to live a healthy and productive life. The term 'undernutrition' signifies deficiencies in energy, protein, essential vitamins and minerals, or any or all of these. Hunger is often broadly categorized as either acute or chronic hunger. Acute hunger is a sudden shortage of food resulting from a human or natural disaster. Hunger is also seasonal, being related to cycles of food production. Chronic hunger is endemic, persistent and is the silent killer, described as being in a prolonged state of malnourishment. Food, for families suffering from various forms of hunger, lacks essential nutrients, and people are chronically undernourished. It shows up as malnutrition, illness and shortened life expectancy. Chronic hunger weakens the immune system and makes people extremely vulnerable to all kinds of diseases (John and Bansari 2009: 9).

The most recent United Nations global analysis on nutrition titled 'The State of Food Security and Nutrition in the World 2017', reports a distinct rise in global hunger after a steady decline over this past decade, affecting 815 million people in 2016, or 11% of the global population. Over 155 million children aged under five are stunted and 52 million suffer from wasting, according to the report. At the same time, around 41 million children are now overweight. The report also points to how the presence of anaemia amongst women is a continuing cause of concern, as is the issue of rising adult obesity. In the context of Asia, the report states that 63% of the world's hungry population are located here. In India, 14.5% of the total population are undernourished, 21% of all children in the age group 0-5 suffer from wasting, 38.4% of all children in this age group range suffer from stunting, and 51.4% of women in the reproductive age-range, suffer from anaemia.

The report points to several driving forces behind these trends in food insecurity and malnutrition including how food systems and diets are changing: “As large companies increasingly dominate markets, highly processed foods become more readily available, and traditional foods and eating habits are displaced.” It also points to weather-related events linked to climate change as contributing to food insecurity, and to an economic slowdown in countries highly dependent on oil and other primary- commodity export revenues. An emerging factor is, conflicts in countries, which is resulting in high levels of food insecurity and malnourishment. It continues to underscore interlinked factors including inadequate access to resources and services, drinking water, hygiene and sanitation and quality healthcare, as factors that drive malnourishment. Patriarchy is flagged once again as a deep structural cause for significantly higher malnourishment amongst girls and women (FAO, IFAD, UNICEF, WFP and WHO. 2017).

Technical and market-based solutions to address malnutrition (supplementation, fortification of staple food and highly processed food, bio-fortification), are increasingly becoming the focus of global food and nutrition policies to address the widespread prevalence of global malnutrition (Berti, C et al. 2014; Welthungerhilfe and Terre de hommes. 2014; WHO 2017; FSSAI, 2017). In this context, rural and indigenous communities in India, wanted to examine the validity of these technical proposals, through a comprehensive nutritional assessment of their own local traditional food systems and diets. They were keen to understand (i) whether their traditional food systems provide a balanced diet, (ii) whether their traditional diets warranted technical fortification and (iii) offer a set of community proposals to address the troubling questions of malnourishment. Communities from different parts of South India, members of the Food Sovereignty Alliance, India, joined hands with the Catholic Health Association of India, to carry out this enquiry.

'Overnutrition in India is a significant issue that deserves mention in the holistic context of good food. The rural, tribal and socio-economically deprived populations in India are being exposed to the same deleterious lifestyle and nutrition changes in urban areas due to erosion of local food systems.

- a. Prevalence of obesity in urban and rural India <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4613435>
- b. India is the third most obese country [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)60692-4/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60692-4/abstract)
- c. Obesity in 9 tribes in 3 states of India <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4726542/>
- d. Obesity in North East Indian tribes
- e. Andhra Pradesh tribes picking up urban maladies http://epaper.timesofindia.com/Repository/getFiles.asp?Style=OliveXLib:LowLevelEntityToPrint_TOINew&Type=text/html&Locale=english-skin-custom&Path=TOIH/2012/05/24&ID=Ar00406

2.0 Study Objectives

To explore the role of diversified traditional food systems in providing a balanced diet with the necessary micronutrients, and contributing to food, health, nutrition security and food sovereignty in an ecologically sustainable way.

3.0 Methodology and Study Area Description

3.1 Approach and Methodology

The study has three components: (i) a desk study to set the context including a critical review of India's agricultural and food policies impacting food systems and nutritional security and (ii) a community enquiry spread across six villages, of Sangareddy district, Telangana and Chittoor, East Godavari and Srikakulam districts of Andhra Pradesh, where diverse communities took the lead to enquire into their own traditional food systems and diets (Figure 1 shows the geographical location of the study area) and (iii) a laboratory-based nutritional analysis of the community findings.

As part of the collaborative effort between the CHAI and FSA, the Desk Study was carried out by FSA and the Community Enquiry facilitated by FSA while a quantitative nutritional analysis of the findings from the Community Enquiry was done by CHAI.

The desk study was based on a historic review of India's food and agricultural policies drawing on literature from secondary sources such as policy documents from Government sources, peer-reviewed publications and earlier studies carried out by the Food Sovereignty Alliance.

The community enquiry involved adivasi, dalits, small and marginal farmers and agro-pastoralist communities located in diverse agro-ecological regions of Andhra Pradesh and Telangana, exploring their own food practices. These included semi-arid agro-pastoral landscapes with sparsely forested (primarily dry mixed deciduous and thorny scrubs) areas of Chittoor and Sangareddy districts, as well as tropical moist and dry deciduous forests of East Godavari and Srikakulam districts.

The framework of participatory action research (PAR) was used to carry out the community enquiry facilitated by community volunteers. This included various participatory methods of collective analysis, to explore the questions within their own communities. Villages, wherein the community dialogues happened, were selected by the communities, to ensure representation of diversity in ecology and communities. Elders, adults, youth and children both woman and men participated in the enquiry.

Dialogues began at the family level to enable the participation of all members of the family. They visualised, in detail, the staple foods that they eat over the year, across seasons. These family level discussions were shared at village meetings where the rest of the community members participated allowing for a collectivizing of experiences and practices as also community validation. In these meetings, debates and discussions, further consolidated the information of the food consumed by the village over the seasons. The dialogue between youth and elders encouraged exploration of the past and present, with elders sharing their deep knowledge of their food, medicinal herbs and their nutritional and medicinal values.

Some of the tools which communities used to deepen analysis included seasonal calendars, matrices, focused group discussion, transect and observational walks in the village, visiting the fields, forests, other common lands and local markets.

Based on the Colombian academic-activist Fals Borda's proposals on Participatory Action Research (PAR). Fals Borda, Orlando and Muhammad Anisur Rahman (Editors). 1991. Action and Knowledge: Breaking the Monopoly with Participatory Action Research. The Apex Press, New York. Intermediate Technology Publications. London.

The community analysis concluded with all the communities meeting to share their enquiries, resulting in an interesting cross-cultural and cross-ecologies dialogue as also consolidation of the enquiries. The information was collated, and local names were identified by their botanical names. This data was subsequently shared with the CHAI, who then carried out a nutritional analysis.

4.0 Setting the Context: Food and Agricultural Systems in India

4.1 A Historical Timeline

Food systems are best understood as a way of life and an experience, as they are deeply embedded in and shaped by the landscape, ecology, culture, social exchange, economy, politics and people's lived experience. Agricultural systems are a part of food systems as recognised even in mainstream definitions of food systems: "a system that embraces all the elements (environment, people, inputs,

processes, infrastructure, institutions, markets and trade) and activities that relate to the production, processing, distribution and marketing, preparation and consumption of food and the outputs of these activities, including socio-economic and environmental outcomes.”High level Task Force of Global Food and Nutrition Security, October 2015. (Zero Hunger Challenge, 2015)

Historically, since the times the human species inhabited this region the geography, culture, political, social, ecological and economic landscape of this land has evolved to provide a complex and diverse mosaic of food systems: often deeply intertwined and co-existing. Today, India continues to have communities that hunt and gather their food, practice traditional forms of fishing, pastoralism, animal husbandry, shifting cultivation and settled agriculture in the form that has evolved over centuries. At the same time, food and agricultural systems today, are dominated by the industrial, agribusiness food model which has, and continues to, erode the complex, rich and diverse food cultures that have existed and evolved over thousands of years. The erosion has been even more rapid, post-1991 with the onset of economic reform through liberalisation policies, resulting in severe malnutrition and more recently the twin burden of malnutrition and obesity (See Box 1).

Box 1: India's Twin Burden of Malnutrition and Obesity

The Global Hunger Index (GHI) 2016 ranked India 97 among 118 developed countries for which the GHI was calculated. In 2017 it further declined to 100 of 119 countries. At a national level, the National Family Health Survey is carried out to assess the health status of the country. While the focus was always on family planning, maternal and child health, nutritional makers of health, and communicable disease risk factors, due to the changes observed in morbidity patterns, the NFHS began monitoring metabolic health as well. The NFHS 2016 reports that in 10 years the number of obese people have almost doubled in India increasing from 13% (NFHS 2006) to 21% (NFHS, 2016).

To set the context for this study, a brief presentation of the historical timeline of the agricultural system in India is provided in Table 1. The timeline will focus on the systems rather than the policies since a review of the latter is being presented in Section 4.2. The purpose of this timeline is to highlight the following: (i) agriculture in India started almost around the time that the human species is recorded to have begun the practice of agriculture – 10,000 years ago (ii) a reasonably sophisticated understanding and practice of soil fertilisation, land and water management, agroecology (collectively termed agriculture techniques) existed well before these techniques were developed in Europe during the agricultural revolution in the 18th century (iii) this experiential knowledge is an integral part of the food system and continues to reside in small farmer and indigenous communities across the country. This is the knowledge and practice that should form the foundation of any holistic approach to health and nutrition.

Historical evidence points to the beginnings of agriculture in India around 9000 BCE. Evidence also shows that agriculture flourished during the pre-colonial period in India. European colonization of India from the 16th century onwards and its acceleration following the industrial revolution in England, brought several influences that impacted the food and agricultural systems in India: a resource gathering, food production economy was transformed into a commodity-oriented economy (Cullet and Gupta, 2009). Commentaries by the Centre for Policy Studies, India (CPS, India), based on observations made by several British and European observers in the 17th and 18th centuries, report that techniques such as crop rotation, integral to indigenous Indian agriculture were developed in Europe only during the agriculture revolution in the 18th century.

Table 1 : Brief Timeline of Agricultural Systems in India (CPS, 2011, Fuller1 2006)

| S.No. | Period in History | Developments |
|-------|---|---|
| 1 | Early History (9000-2000 BCE) | <ul style="list-style-type: none"> • Domestication of wheat, barley, horse, sheep, goat, elephant and cattle; • Agro pastoralism in India included threshing, planting crops in rows—either of two or of six—and storing grain in granaries; • Cultivation of cotton, hemp, sugarcane followed by rice; • Development of irrigation which lead to planned settlements in turn development of drainage systems; • Further evolution of irrigation and water storage systems including constructed reservoirs by the Indus Valley civilization; • Practice of mixed farming and animal drawn ploughing; • Harvesting turmeric, cardamom and pepper. • Forest-based shifting cultivation systems of food production exist and sustain right through to date • Hunter gatherer societies as the primary source of food |
| 2 | 1500 BCE to the Beginning of the Common Era | <ul style="list-style-type: none"> • Cultivation of jute and manufacture of ropes and cordage; • Production of sugar from sugarcane juice • Beginning of animal worship – those that were considered vital for survival; • Domestication and worship – specifically <i>Ficus religiosa</i> and <i>Ficus bengalensis</i>; • Cultivation of a wide range of cereals, vegetables and fruits; • Extraction of oil from oilseeds known; • Meat and milk products were part of the diet; • Animal husbandry a significant part of the food system; • Soil ploughing, broadcasting of seeds, fallowing of land and a sequence of cropping practiced; • Cow dung provided the manure; • Categorisation of soils, meteorological observations for agricultural use made in some parts; • Construction and maintenance of dams, and provision of horse-drawn chariots to replace traditional bullock carts; |

| S.No. | Period in History | Developments |
|-------|------------------------------------|--|
| 3 | Start of the Common Era to 1200 CE | <ul style="list-style-type: none"> • Cultivation of rice, sugarcane, millets, black pepper, various grains, coconuts, beans, cotton, tamarind, sandalwood, Jackfruit, coconut, palm, areca and plantain trees in South India; • Systematic ploughing, manuring, weeding, irrigation and crop protection was practiced; • Kallanai (1st-2nd century CE), a dam built on river Kaveri during this period, is considered as one of the oldest water-regulation structures in the world still in use; • Trade gained momentum during this period: spice trade in cinnamon and black pepper to the Mediterranean, trade with the Romans and Chinese; • Discovery of crystallized sugar with the earliest reference of candied sugar come from India; • Evidence of land transfer practices from the Chola Period in South India. Collective holding of land giving way to individual plots of land, each with their own irrigation system (875-1279 CE); • Reduction in areas of dry cultivation; • Water distribution systems organised and supervised during this period, particularly the distribution of water by tank-and-channel networks to the drier areas. |
| 4 | 1200 – 1757 CE | <ul style="list-style-type: none"> • Diffusion of Indian and Persian irrigation technologies giving rise to irrigation systems which brought about economic growth; • Agricultural 'zones' broadly divided into those producing rice, wheat or millets. Rice production dominated Gujarat and wheat dominated north and central India. • Irrigation systems developed to suit local geology and water resources; • Extensive practice of manuring including penning of cattle and sheep on farmland; • Traditional Ghani processing of oil seeds; • Use of meal from pressed oilseeds as cattle feed and for manuring; • Land management particularly strong during the latter part of the Mughal Period. Formulation and implementation of elaborate methods for agricultural management on a rational basis; • Cotton, sugar, and citric fruits spread throughout North Africa, Islamic Spain, and the Middle East. |

| S.No. | Period in History | Developments |
|-------|--|--|
| 5 | 1757 – 1947 (British Colonial Period) | <ul style="list-style-type: none"> Transformation of agrarian social order through introduction of British notion of private property, severing of agriculture-manufacture linkage at the village and local levels, imposition of high land revenue policy and appropriation by the State of all local and common resources – grazing and other common land, forests and water resources; Forest-agriculture linkage severed by forest policy leading to loss of grazing areas, access to food, fuel, raw material for shelter and medicine; British Forest policy criminalise shifting cultivation, forcing the shortening of shifting cultivation cycles in the territories of indigenous (adivasi) peoples. Setting up research institutions to acclimatise exotic crops of commercial importance and to make Indian agriculture 'scientific'; Introduction of European high-yielding exotic breeds of cattle for increased milk production and to cross-breed with local indigenous breeds. Import of nitrogenous fertilisers (1925-26); Active move away from food to cash crops including tea, coffee and other commercial crops and establishment of plantations; Export of oilseeds to Britain increased steadily contributing to transport of soil fertility out of the country; Export of foodgrains paving the way for malnutrition and famine; Destruction and neglect of traditional irrigation systems including inundation canals, tanks, reservoirs leading to famine conditions due to lack of water; Strong push for introduction of European agricultural implements and machinery and 'scientific' agricultural methods based on the premise that Indian agricultural methods were primitive; |
| 6 | 1947 – 1990 (Post-Independence) | <ul style="list-style-type: none"> Manifestation of Public Sector driven Green Revolution technologies consisting of: <ul style="list-style-type: none"> ➤ Groundwater extraction via bore wells, even in rain-fed areas . ➤ Enhanced access to irrigation via large dams and canal irrigation ➤ High input Industrial agriculture – hybridisation and high yielding varieties of crops, mechanised crop production, synthetic fertilisers, pesticides, weedicides; fossil-fuel driven agricultural; ➤ Shift away from inter-cropping, mixed-cropping, rotational cropping systems to intensive monocrop cultivation of a few select food crops (rice, wheat, corn); industrialised production in fisheries, dairying and oil seed production (Green, Blue, White and Yellow Revolution); ➤ Declining role of livestock as draught animals |

| S.No. | Period in History | Developments |
|-------|--|--|
| | | <ul style="list-style-type: none"> ➤ Public Sector Extension Services providing advise on technologies to farmers, and production and distribution of seeds and other technologies ➤ Credit for Agriculture Production to farmers from Public Sector banks ➤ Public Sector Procurement of key food grains such as rice and wheat, at Minmium Support Prices ➤ Government subsidies for green revolution technologies promote its adoption by farmers. <ul style="list-style-type: none"> • Rain-fed areas retained some of the local agricultural and food systems in the early years but were pulled into the green revolution industrial mode of production later; |
| 7 | 1990 onwards (During and Post-Economic Liberalisation) | <ul style="list-style-type: none"> • Decline of direct role of public sector in production and distribution of technologies, knowledge and procurement of food stocks. Government financial support for growth of private sector (corporations and agribusiness) to market technologies, information, inputs (seeds, chemical fertilisers, pesticides, weedicides, herbicides) and procure and market produce. <ul style="list-style-type: none"> ➤ Expansion of Green Revolution Technology to rainfed regions, indigenous peoples territories, Eastern and North East India. ➤ Agriculture and food systems dominated by agro-processing and biotechnology; ➤ Genetic engineering technology for pest resistance, weeds, micronutrients in diet; ➤ Fortification of food as a nutrition enhancing process; ➤ Vertically integrated systems of farming, including contract farming with corporations and agri-business; ➤ Intellectual property rights of Breeders (Agribusiness Corporations) gain precedence and acquire legal protection and manifest as genetically engineered, high-yielding and hybridised seeds and other agronomical inputs. ➤ Food processing, convenience foods and aspiration to 'global' lifestyles shape nutrition and health of Indians; ➤ Organic farming practices in niches with Government support predominantly for export. ➤ Shift to commodity crops – whether they are food or non –food crops such as cotton, tobacco, or organically cultivated crops. |

4.2 Policies that have shaped trends of production and consumption

Trends in production and consumption of food in India must be understood in the context of policies around land, water, forests, seeds, breeds, technology, human energy (labour), trade and markets. Additionally, in the context of consumption it is important to look at policies around food procurement, food processing, food distribution, food security and nutrition. This section attempts at providing an overview of the policies rather than a detailed review since its purpose is to set context for the present study to (i) understand the impact of this trajectory on traditional, diverse food systems and (ii) its consequent impact on health and nutrition of the population.

Government policies on (i) land and land ownership (ii) methods of production (the Green Revolution followed by the White and Blue Revolution) and (iii) economic policies on food production, procurement and distribution are critical milestone in the food and agricultural history of India. They have had a profound impact on land (its ownership and its fertility), water, technology and the nature of human labour. This has significantly impacted food systems and therefore the health and nutritional status of the country.

4.3 Indian Agriculture Post-Independence

At Independence, with about 85% of the country's population deriving its livelihood from agriculture, India was recovering from the Bengal Famine of 1943, facing severe grain shortage. This was in spite of there being no shortfall in food production (Sen. A. 1981). The agrarian system, during the colonial period, was shaped to serve the business, trade and political interests of the British. The policies led to:

- concentration of land ownership in feudal landlords, fragmentation of operated land, insecurity of tenures, increase in agriculture workers in the workforce and landlessness;
- alienation of people from water resources and forests by centralising resource ownership and management with the State. Policy of Government control over surface waters was introduced;
- the diverse irrigation systems (tanks, wells, inundation canals etc.) particularly the decentralised small-scale systems developed and maintained by communities to suit local geology, topography and agricultural systems were neglected and/or destroyed;
- water logging and increase in salinisation of soils; control over water and rights of access to water with landowners through common law principles. For groundwater, landowners had unlimited right to access water under their landholdings (Cullet et al, 2009)
- loss of people's access to and people's governance of forest produce, forest based shifting cultivation, diverse food sources, medicinal plants, grazing areas and raw materials for shelter, particularly in indigenous territories.
- Post-independence, the Indian state embarked on a system of national planning for the economy.

4.3.1 Land and Land Ownership

For the agrarian economy to grow rapidly the State placed the land question at the centre of policy planning. To a large extent this was a response to the militant struggles of landless and tenant farmers across the country in the 1930s, 40s and 50s. Land Reforms were intended to (I) abolish the feudal systems of landlords and land ownership (II) bring in tenancy regulation to ensure security of tenure (III) impose a ceiling on the size of landholdings to redistribute land to the landless and (IV) consolidate disparate landholdings. Overall the land reforms in India were a major failure except in the States of Kerala and West Bengal. Tenancy reforms largely benefited bigger and more powerful tenants of higher castes (social groups), to free themselves from landlord control, and in turn join the class of dominant landholders (Balagopal, 1988). Thousands of smaller tenants were evicted and converted to unrecorded tenants/ farm servants/wage labour.

The second phase of land reforms by the mid-50s, saw the enactment of Land Ceiling Acts, where a ceiling on landholdings was fixed. However ceiling laws primarily existed on paper, and there was limited political will to resume land ceiling and distribute this land to the landless. According to various studies as of 2003, a total of 73.73 lakh acres was declared as surplus land obtained under the ceiling laws, and 53.93 lakh acres distributed to 56.47 lakh landless poor, at the rate of less than one acre per person (Balagopal, 1988). Of the recipients, 20.30 lakhs were scheduled castes and 8.30 lakhs scheduled tribes, accounting for about half the total number of beneficiaries. The total land resumed, amounts to barely 2% of the total cultivable land in the country. It is also evidently clear that this amounted to an average of less than $\frac{1}{2}$ acre per beneficiary, amounting to tiny parcels of land. Having failed to resume land ceiling and

distribute surplus land, the 1980s, 90s and 2000s saw the Government embark on an easier “no-conflict with the powerful” path, of distributing public lands owned by Government, to the landless. Consequently, the structural inequalities were perpetuated post Independence.

There has been a steady increase in the number of small and marginal operational holdings between 1960-61 and 2010-11. Box 2 provides details about the increasing trend in reduction of land holding sizes and landlessness in the country. This trend has intensified post 1990 with the onset of economic liberalisation in the country (Section 4.4 discusses this in greater detail).

Box 2: Increasing Structural Inequalities leading to Shrinking Landholdings and Landlessness

In 1960-61, 35% of all operational holdings were small and marginal, and cultivating 9% of the total land. However 85% of farmers in India were reported to be small and marginal by 2010-2011 according to the agriculture census report 2010-2011 (GOI, 2012). These farmers owned between less than 1 hectare - 2 hectares of land, and operated 44.3% of the total land under agriculture. 14% of the farmer are reportedly landless, owning less than 0.05 acres of land.

The 70th National Sample Survey Office's (NSSO) survey 2012-2014 estimates 84% of agriculture households as being small and marginal (0.05 acres - 2ha) and 2% of households without any land. Small and marginal operational holdings have witnessed a steady increase between 1960-61 and 2010-11. In 1960-61, they comprised a mere 35% of all operational holdings cultivating 9% of the total land. Some researchers have argued how this is a complete under representation of the true extent of landlessness (Basole et al, 2010).

The 70th NSSO survey (2012-13) on Land and Livestock holding describes how nearly 90% of the land owned by those who own less than 1 acre of land is mostly used as homestead land and not for cultivation. Hence researchers like Basole and Basu (2010)

have coined a category they term 'effective landlessness', which includes all those with less than 1 acre of land, who derive maximum income from agriculture wage labour. They have estimated 60% of rural households to fall in this effective landless category. The Socio-Economic and Caste Census 2011 confirms the persistent overlap between caste and land ownership, with the historically privileged upper castes continuing to control the majority of land, and the majority of landless belonging to historically discriminated and oppressed Dalit and backward caste communities. According to Socio-Economic and Caste Census-2011, 56% rural families are landless. 55% of Dalit households and 36% adivasi households are landless according the census. NSSO data of 2012-2013 corroborates this. The pattern of land holdings as it has emerged in 2013 shows that 54.9 percent of the Scheduled Castes have only homestead lands and out of this 4.4 percent do not even own homesteads. About 84.1% of the Scheduled Castes own less than 0.2 hectares of land other than the homestead lands. Of these 21.2 % have no access to any land apart from their hutments. The rest of the 62.9 % are virtually (or in effect) landless as they largely depend on labour for their livelihood.

Tenancy farming persists and whilst it declined between 1971 and 2002-03 [as reported by successive decadal NSSO data (NSSO, 1992, 2003, 2014)], it has witnessed a distinct increase in the last decade according to the most recent NSS survey on landownership carried out in 2012-2013. The NSSO data also reveals how the terms of lease arrangements have changed drastically with a rapid rise through the decades in fixed money payments which comprises 42% of all lease agreements (as reported in the NSSO 70th round data), and decline in sharing-produce/ share-cropping arrangements. Micro-studies point to an underestimation of tenant farming in NSSO data. The data also reveals how the extent of tenancy leasing in of land is minimal amongst the landless and maximum amongst the small and marginal farmers - a point deeply connected to changing terms of agriculture production which will be discussed in Section 4.4.

Government policies over the last twenty years, since the onset of India's neo-liberal economic reforms in the early nineties, has been directed towards freeing up land for corporate investment. This is being done by amending land laws, thereby facilitating the easy conversion of agriculture land to non-agriculture land, as also legislating new laws such as the creation of Special Economic Zones. Another colonial legislation that has impacted land has been the Land Acquisition Act, 1894, which protects the States right of eminent domain to land, and empowers the State to acquire land from landowners for what is termed 'public purpose.'

This legislation was used by the State to acquire and in effect 'subsidise' land for large businesses. The Act was amended in 2013 and termed the Land Acquisition Rehabilitation and Resettlement Act, 2013, which brought in provisions to protect the rights of citizens to their

land. However, several features of the central act have subsequently been watered down in State level versions of the Act that are being legislated across the country, facilitating the easy take over of land by State and private corporations.

Within this unequal landownership landscape, amongst cultivators / farmers and agriculture workers in India, there is another important aspect that must be understood: this is a gendered land-scape. Landownership amongst rural agrarian communities continues to be highly gendered and patriarchal. According to the Agriculture Census 2010-11, the percentage share of female operational holdings in total operational land holdings is only 12.79% and the share in operated area is only 10.36%. According to recent reports, only 6% of rural Indian households have at least one-woman owning land. A more detailed discussion on agricultural policy and its impact on women is presented in Section 4.5.1.

Water and land are intertwined in food and agricultural systems. In post-Independence India, the planning process clearly identified that next to land, water was critical to agricultural growth. Increase in public investment in irrigation was a focus of the planning process during this period. In the first 5-year plan, 20% of the plan outlay was allocated for irrigation. However this share fell from the second plan onwards to 8-10% of the plan outlay. This significantly impacted the growth of agriculture during the 1950s and early 1960s. Yields were low and most of the increase in production between 1949-50 and 1964-65 reportedly originated from an increase in the area under cultivation (Ramkumar, 2009)

As in the case of land, the Government continued with some of the 'inherited' colonial legislation perpetuating the structural inequalities that vests power over resources with large landowners. In spite of the evolution of common law principles of the Indian Easements Act 1882, the landowners continued to have near absolute right to exploit groundwater on their landholdings (Cullet et al, 2009). This basic structure linking land rights to water rights has till date not been comprehensively overhauled even in the states where groundwater regulations have been enacted. The landless and small and marginal landholders unable to afford the technology to access groundwater and those prevented from accessing water on the basis of caste, the Dalits, thus faced a double deprivation – land and water. Limited or lack of access to water not only shapes food growing capabilities of sections of the population but has a strong bearing on health and nutrition. Access to clean, safe and adequate water and sanitation is a pre-requisite for assimilation of whatever nutrition is provided by food.

4.3.2 Methods of Food Production

Food scarcity was a strong fear post-Independence following the impact of the Bengal Famine of 1943 and the food-grains scarcity, post World War II. There was also a perception among the planners, economists and some political leaders at that time that the low production of Indian agriculture was due to 'primitive' farming techniques and the ignorance of farmers, rather than the structural inequalities created by decades of exploitative policies around land, water and forests. Some of the efforts taken to increase food production included:

- revival in 1947 of the Grow More Food programme that was first launched in 1943 to support the 2nd World War encouraging extensive and intensive cultivation. This was introduced through the planned development programme with a drive to self-sufficiency;
- due to continued food scarcity, the Government imported wheat from the United States under the PL 480 programme. Since wheat was made available cheaply

at subsidised prices, it began to influence consumption and production in multiple ways (Cullather, 2010). From a production perspective, there was a deepening of import dependence, increased investment in irrigation to bring greater acreage under wheat cultivation to the detriment of coarse cereals as well as pulses. Consumption of and demand for the cheaper wheat increased. This impacted local diets particularly of the rural and urban poor. Consumption of wheat translated into increased caloric intake but reduced and often eliminated maize, barley, millets and pulses thereby reducing dietary diversity thus impacting nutrition. This shift in diet hit growers of traditional grains and pulses hard, and total food production dropped triggering spot shortages and price fluctuations.

By the mid-60s, the centralised planned development approach led the Government to conclude that it was becoming increasingly difficult to expand cultivated area which in turn impacted large-scale agricultural production required to support industrial labour. The PL-480 terms of repayment of loan, essentially financed the US Government driven project of Green Revolution in India. This set the stage for the entry of the new agricultural strategy that focused on intensive agricultural development by adoption of a technology-centric approach.

As is well documented, this new agricultural strategy shaped the entry and subsequent entrenchment of industrial agriculture into India. Extensive studies and reports are available on the impact of the Green Revolution policies on the ecological, economic, social and cultural landscape of the country (Pingali, 2012; Patel, R. 2013; Perkins, 1997). In this section an overview of the Green revolution policies will be provided to understand how it has contributed to undermining the traditional food system and eroding the resource base that sustains this system.

Characterised by hybrid seeds, chemical fertilisers and pesticides, mechanised farming and irrigation equipment, India's agricultural and food systems became energy intensive and fossil-fuel dependent. This also marked the shift from an agrarian strategy based on institutional reform to one based largely on technology. The foundation for this shift was laid by a report prepared in 1959 by Ford Foundation and USDA called India's Food.

Crisis and the Steps to Meet It which was submitted to the then Prime Minister of India, Jawaharlal Nehru. The report "urged the identification of farmers who had access to enough land and a secure water supply. To these growers, India was urged to deliver improved seeds, fertilizers, better irrigation equipment, credit, technical advice, and a guaranteed price that would be sufficient to provide an incentive in production. With state assistance, these growers were to unleash the productive might of capitalism to increase India's agricultural yields." (Perkins, 1997).

This report was followed by a specific plan to launch the Intensive Agricultural District Programme (IADP) which served as the organisational framework for the Green Revolution. The plan promoted the "package" approach to increasing India's agricultural yields using intensive high-yielding practices supported by adequate credit facilities, technical advice and a guaranteed price that would provide the farmers selected for this programme, an incentive to take the risk of trying new technology. The program was also heavily supported and financed by the Ford and Rockefeller Foundations through which Agriculture Universities were established and research on high-yielding varieties of wheat, rice, corn initiated.

Since the Green Revolution technologies were resource intensive, input subsidies were provided by the Government to enhance the foodgrain production in the country. Its intent was to encourage the adoption of specific technology and benefit small producers. Fertilizer, electricity, irrigation and bank credit at nominal charges are the major input subsidies besides HYV seeds and other facilities to help farmers encourage food production. However in practice it was very different. From its inception the policies of the Green Revolution benefitted large farmers rather than subsistence farmers. The State's resources were directed at building this industrial agricultural base and strengthening access to resources for the larger farmers.

With availability of credit the 'credit worthy' large farmers were able to increase production through private irrigation using wells leading to uncontrolled exploitation of groundwater in Punjab, Haryana, , Western Uttar Pradesh, parts of Gujarat , Maharashtra, Karnataka, Tamil Nadu and Andhra Pradesh. Groundwater irrigation was also supported by energy policies particularly in the power sector.

This period also saw the creation of scientific establishments and research institutions to further and firmly establish Green Revolution modes of production in the Indian agricultural landscape. The necessary training and institutional support required to develop a strong cadre of Indian agronomists and agricultural experts was supported by the Rockefeller Foundation. This cadre would then establish the "architecture necessary to embed, transmit and propagate this knowledge in government policy-making" (Patel, 2013). All of these developments paved the way for the entry of US based agricultural corporations into India during this period.

Strongly linked to and influenced by production policies are the Government of India's programmes aimed at addressing hunger, poverty and ensure food security. This included the PDS together with the Integrated Child Development Scheme (ICDS) and the Mid-Day Meal Scheme (MDMS). They were an important part of the State's policy towards ensuring food access at the household level. The ICDS was launched in 1975 to provide balanced nutrition for children under 6 and for pregnant and lactating mothers.

4.3.3 Food Procurement and Distribution Policy

In the post-Independence period the basic goal of various agriculture and food policies was food security, particularly in the light of the severe food scarcity. This was to be achieved through self-sufficiency in food production, stability in foodgrain prices and assurance of an equitable distribution of foodgrains at reasonable prices aimed at ensuring access to food. The food procurement and distribution system was key to achieving these objectives. There were three major points of intervention by the Government: procurement of food grain from cultivators; storing and managing stocks of grain; and delivering grain to different parts of the country through the Public Distribution System (PDS) and other welfare programmes. To implement the policies of procurement and distribution the Food Corporation of India

(FCI) and Agriculture Price Commission (APC) were established in 1965.

The PDS was evolved to safeguard the interest of the consumers particularly the more vulnerable section of the society. From its inception till 1991, the PDS was a universal welfare programme whereby all households were entitled to purchase of specific quantities of select commodities (typically rice, wheat, sugar, flour, cooking oil, cooking fuel in the form of kerosene etc.) at subsidised prices through a network of fair-price shops.

The universal PDS ensured that the State procured paddy, wheat and other produce at Minimum Support Prices (MSP) (below market prices) declared by the Government each year based on the recommendation of the APC. The MSP was aimed at covering the farmer's cost of production and acted as insurance and direct incentive to the farmers to increase agricultural production.

Grain was centrally procured by the FCI in collaboration with numerous state agencies and was done through different mechanisms: procurement from producers under price support and through the statutory levy imposed by the State Governments on the millers and traders. The procured grain was centrally stored in FCI godowns and distributed through the PDS.

The FCI was thus responsible for procurement, import, distribution, storage and the sale of foodgrain, while the APC was to control and guide the cropping pattern, land use and profitability through minimum support price mechanism. This policy continued till economic liberalisation in 1991.

Although the system had several problems as a result of being strongly centralised, studies at the time indicated a steady decline in food insecurity and the numbers of hungry people. In 1970, the per capita per day average intake was 2100 calorie/ day, and by the end of the 1980s it was 2300 calorie/ day. This is attributed to the growth of domestic production and based on that the building up of buffer stocks of adequate level. The PDS ensured availability of and accessibility to a minimal quantity of foodgrain (albeit only wheat and rice) at reasonable prices to consumers in all parts of the country.

Several researchers have also pointed out the role of buffer stocks, regulation of open market operations and distribution through the PDS in achieving price stabilisation even when international prices were volatile.

4.3.4 White and Blue Revolution

Similar resource-intensive, industrial approaches were also adopted in policies designed to boost milk production (White Revolution) and to develop an export-oriented fisheries sector (Blue Revolution).

In 1970 the White Revolution or Operation Flood was launched to focus on intensification of production, procurement and distribution in the dairy sector. Developing dairying became the focus of livestock production in the 1970s and 80s continuing well into the mid-1990s. This was a natural progression from the mechanisation of agriculture that took place with the Green Revolution. Rearing animals for multiple purposes (work, manure, milk, meat) was replaced with breeding them purely for dairying.

Technologically, emphasis was placed on replacing local, indigenous breeds of cattle with resource-intensive, high-yielding cross-bred cattle (Jersey and Holstein Friesians). Local buffalo breeds were replaced with high producing breeds such as the Murrah buffalo from Haryana, and the Surti from Gujarat. To support this industrial scale milk production, composition of feed ingredients were also changed. This model of dairying also required structural changes in production, distribution and marketing. Prior to 1960, farmers sold their milk predominantly through localised markets. A policy shift was seen in the 3rd Five Year Plan to develop organised dairying through farmers' milk producers cooperatives to market milk to urban consumers. The policy was institutionalised through the establishment of the National Dairy Development Board (NDDB) in 1965, with the mandate to make "dairying the means for a better future for millions of grassroots milk producers". Operation Flood was a 26 - year programme implemented by NDDB and financed by the World Bank to operationalise the growth of the dairy cooperatives and dairy development.

Public investment built the centralised cooperative dairy system that protected producer prices and regulated consumer prices. Domestic production under cooperatives grew by protecting the sector from cheap subsidised imports of dairy products (milk powder and butter oil) through various import restrictions, as well as by the state financing dairy processing capacity. India adopted an import substitution policy in 1989, whereby protection to the domestic dairy sector from imports was provided by imposing tariff and non-tariff barriers. Competition with the cooperative sector was controlled through provisions of industrial licensing under the Industrial Development and Regulation Act of 1951 to prohibit new entrants into the milk processing sector.

Whilst all categories of farming households owned animals and dairy animals, the small and marginal farmers owned the largest percentage of animals, and hence were considered the base of milk production.

As in the case of the Green Revolution, dairying under the White Revolution using cross-bred cattle was resource intensive. Inputs requirements were much higher: water, feed and healthcare. This not only exacerbated the already existing overexploitation of the groundwater under the Green Revolution but as pointed out by several academics the socio-economic impact was severe on small and marginal farmers. The input-intensive high yielding cows and buffaloes placed great resource stress on the small and marginal farmers. In addition, commoditising milk made it too expensive for the small farmers to consume milk in their homes. They preferred to sell almost all their milk in exchange for money. As a result the family's nutritional status was severely impacted (Observations made in an ongoing study by the Food Sovereignty Alliance (FSA), India, 2018).

Industrialisation of another food system – the fisheries – began in 1951 with a policy thrust by the Government of India that set the stage for the Blue Revolution which peaked in the mid 1990s. Starting with the motorization of fishing in coastal Tamil Nadu and Gujarat it expanded to a high export earner in the mid-1990s. Customary laws for the management of resources, governance, dispute resolution etc., were replaced with legislation and institutional arrangements that impacted the social, economic and ecological resource base of artisanal fishing and fishing communities who had been engaged in this way of life and livelihood for hundreds of years.

The pattern of industrial, high production based, resource-intensive food production seen both in the Green and White Revolution was evident in this sector as well. Inland and coastal aquaculture was mechanised with preference for certain species and overfishing through industrial approaches. This has led to the destruction of mangrove and other coastal ecosystems which has significantly altered the food system and economic options available to local fishing communities and in turn to their livelihood or survival strategies. While the Blue Revolution was a significant export earner till the mid-1990s, its impact on local food systems has been similar to that of the Green and White Revolution.

Aquaculture particularly commercial shrimp farming has displaced local communities, exacerbated conflicts and provoked violence involving property and tennurial rights. Non-fisher-folk, outsiders, including businesses, politicians operating through local non-fisher-folk, have forcibly occupied fishing resources for shrimp culture. This has been significant both in coastal and inland aquaculture. In this process, the fisher-folk were gradually squeezed out of the resources with the money and power of the outsiders. In addition the quality and quantity of drinking water has been impacted by the chemical-intensive production practices, exotic species have replaced local diverse species of fish and prawns leading to increased local food insecurity (Pattnaik, S. 2006).

4.3.5 Major Impacts on Farmers, the Environment, Food Systems and Nutrition

In the context of the present study it is important to understand the impact of this period in India's agricultural history on farmers, natural resources and therefore the food systems and nutrition.

(i) Farmers: The policies during this period did not go all out to correct deep structural inequality that prevailed in India at independence. This was the driving factor for persistent severe and chronic hunger and malnutrition among those on whom the bulk of agricultural production of this country depended. It was offset to some extent because of the Universal PDS (see section iii below).

Several studies bring to light how this capital and technologically intensive agriculture strategy, hugely subsidized by Government of India, primarily befitted the landed gentry, and the rich and middle peasantry. Whilst small and marginal farmers did participate in adopting Green Revolution technologies it was to a far lesser degree. Their primary constraints were the absence of secure land tenures, capital, credit, and infrastructure. It also intensified capitalist industrial agriculture production and capitalist relations of production in the agrarian economy. Large farmers emerged as a 'provincial propertied class' investing the capital gained through surplus production, into agriculture and other non-agricultural ventures both in rural and urban areas. They also began to play an important role in mainstream politics, business, education etc., thus further enhancing class inequalities (Balagopal, 1986). Commenting on this inequality and pattern of growth, the noted economist and political commentator Prabhat Patnaik said in 1975 that the Green Revolution was a "region-wise, crop-wise and class-wise concentration" of power.

As discussed above, caste was deeply embedded in this resultant inequality. Caste determined or rather dictated access to resources - land and land ownership, water - and as a result to institutional credit. This phenomenon together with the relegation of agrarian reforms and support to small farmers to the background, further destroyed the food growing capacity of small farmers and their access to adequate, safe and nutritious food. This was more stark in the case of the landless particularly the marginalised Dalit and other scheduled

caste communities.

The State facilitated the industrial take-over of the agricultural system leading to a move away from farm-based inputs (farmer saved seeds, manure, animal power, shared human labour) to external inputs (purchased seeds, irrigation technologies, mechanised equipment, external credit) thus shifting from self-reliance to dependency on external inputs. Cropping pattern and choice of crops were dictated by the States priority to select crops such as wheat and rice. Multi-cropping was replaced with monocropping necessitating use of external support inputs and the animal – land connection was severed. The experiential knowledge and practices that had evolved over centuries to produce a diverse and robust food system was considered 'ignorance' and 'primitive'.

Another development that undermined the knowledge base and capacity of small farming and local food systems was the focus on development of University-trained agronomists and agricultural scientists. This was the beginning of the privatisation of 'common' and shared knowledge which moved from the hands of peasants, small farmers and local farming systems to multinational corporations and financial institutions.

(ii) Environment: Green Revolution technologies and cropping practices have resulted in widespread destruction of the resource base (land, soil, water, forests and people) on which a robust food and agricultural system can be sustained. This has been extensively documented in various studies by academics, Government Departments such as the Central Groundwater Board, and field research institutions including the Indian Soil Science Institute etc (Singh, 2000; Bahattacharya et al, 2015). Intensive cultivation, excessive and long-term use of chemical fertilisers have led to erosion of soil organic matter and therefore soil fertility. Poor irrigation and water management practices have led to waterlogging and soil salinisation particularly in canal irrigated areas in Punjab, Haryana as well as Gujarat. These intensive farming practices, particularly with wheat and rice in India, have virtually mined nutrients from the soil.

Replacement of traditional multi-cropping practice with monocropping, excessive tillage and use of heavy machinery for harvesting, and stripping soil of vegetation cover have led to erosion of top soil and the nutrients from soil and loss of moisture. Application of chemical pesticides to already compromised soil has resulted in further nutrient loss and accumulation of toxic chemical residues. This has been compounded by lack of adequate soil conservation measures, inadequate crop residue and/or organic carbon inputs, and poor crop cycle planning.

Plant, animal and microbial diversity have been extensively impacted by land clearance, extensive chemical application, and significant reduction in seed diversity for food crops brought about by the push for HYVs and agribusiness promoted hybrids. The Green Revolution changed the 'evolutionary history of crops by changing the fundamental nature of seeds.' (Shiva, 1991)

Water-intensive technologies have led to over-extraction of groundwater, pollution of surface water bodies due to the drainage from chemically farmed soils and a rapidly depleting water table. The focus on 'major' cereals led to reduction in crop diversity to the detriment of hardy, resilient, water conserving traditional micronutrient-rich food crops such as millets, pulses and other local foods leading to micronutrient deficiencies in the Green Revolution states.

When viewed from the perspective of climate change, the Green Revolution technologies escalated the dependence of Indian agriculture on fossil fuels by aggressively promoting chemical farming, monocropping and mechanisation. This was further intensified by the economic liberalisation process after 1991.

(iii) Food Systems and Nutrition: The transformation of food production systems into resource-intensive, monoculture practices began the erosion of cultural and genetic diversity (in seeds, breeds, ways of production, accessing, preparing, sharing and consuming food). The reduction in diversity led to vulnerability to pest, loss of soil fertility which impacted the entire food system.

The shift from a complex, diverse, self-reliant, decentralised food system embedded in a local context to a homogenous, centralised, extractive, industrial food system that began during the colonial period deepened with the Green, White and Blue Revolution. Food crops, milk and fish were commoditised taking them out of the reach of those on whose labour the entire industrial food system was being built. The policies that enabled this shift deepened the malnutrition prevalent in the marginalised section of the population. It also intensified the protein energy malnutrition and micronutrient deficiencies by destroying the local, traditional diets and food systems.

The Green Revolution programme's strong bias on what were termed 'major cereals' – maize, wheat, rice – had a serious impact on the country's health and nutrition. The productive cereals such as rice and wheat, which were the basis of increased food production under the Green Revolution, displaced other diverse local crops that were rich in and important sources of critical micronutrients such as iron,

vitamin A, and zinc (Pingali, 2012). This period for instance, saw the rapid decline in cultivation of millets and their replacement by rice and wheat. For example, intensive rice monoculture systems led to the loss of wild leafy vegetables and other uncultivated greens that were earlier harvested from animal manure fertilised fields. Studies have reported that price effects of such supply shifts also limited access to micronutrients, because prices of micronutrient-dense foods increased, relative to staples in many places (Kataki, 2002).

The adivasi areas, the rainfed regions, which were not covered by the Green Revolution during this period, were able to continue cultivation of diverse local traditional grains, pulses and oil seeds. As a result they retained access to traditional, diverse food systems.

In the immediate to short-term there was overall improvement in hunger and caloric sufficiency through safety nets such as PDS, ICDS and the Mid-Day Meal Scheme. This period also saw substantial public investment in food production, procurement and distribution as well as in social welfare policies and programmes. However marginalised communities in rural areas. This has led to a deepening of the micronutrient malnutrition which is a serious problem facing India today. Also termed the "hidden hunger" studies have shown that it has become more conspicuous in countries since the introduction of the Green Revolution cropping systems (Welch, 2000). In addition these grains supplied under the Public Distribution System (PDS) were milled and refined further stripping the diet of nutritional value.

4.4 Liberalisation and Post Liberalisation (1990s onwards)

During the mid to late -1980s, the Government of India's balance of payments and external debt steadily worsened. Some commentators believe that this was an outcome of the "competitive politics of populism" and the related pattern of Government expenditure during that period (Nayyar, 2017). The balance of payments was made worse by the increase in world crude oil prices in late 1990 sending the Indian economy into a state of acute fiscal crisis. It was in this environment that the Government of India began negotiations with the IMF and World Bank which lead up to the economic reforms of 1991. These reforms led to a fundamental change in India's approach to and objectives of development. It was largely shaped as a short-term response to the economic crisis rather than by long-term development objectives and priorities for its people.

4.4.1 Overview of Changes in Economic Policy

The economic reforms and policy focussed on economic growth and efficiency with pursuit of growth being the priority. Poverty, unemployment and addressing the already existing social and economic inequalities did not feature as a priority in the discussion on liberalisation. When these issues did feature in the discussion it was based on the deeply faulty premise that economic growth would reduce poverty and create employment.

Some of the key changes in India's economic policy brought about by the economic reforms of 1991 included (Nayyar, 2017):

- Prioritising resources for the traded goods sector with a focus on export in contrast to earlier focus on import substitution, self-sufficiency and what was considered economic protectionism;
- Reduction in the role of the state in the process of development and shift of resources from the public sector to the private sector and eventually close down the public sector;
- Changing the incentive structure to rely more on the market and reduce the role of the Government;
- Opening the economy to trade, foreign investment and technology which would have a significant impact on agriculture, the food system and natural resources;

Thus the focus of the economic reforms were on the industrial sector, international trade, foreign investment and the private sector. They found no priority for allocation of resources for agriculture, food and nutritional security, health services, education, water supply and sanitation, electricity, mass transport.

4.4.2 Changes in Agricultural and Food Policy

During the period drawing up to liberalisation, several Indian economists and the international Bretton Woods financial institutions led by the World Bank, extensively criticised India's official agricultural policy (Pursell et al, 1993). As part of the larger process of economic reforms and structural adjustments committed to by India in 1991 some of the main recommendations in the context of agricultural policy included (i) stabilisation of food prices and improvement of food security through 'reliance on international trade', 'more liberal import policy' 'removing subsidies on irrigation, electricity and credit'. It was argued that the earlier policies were protectionist and deliberately

skewed the terms of trade against agriculture; (ii) liberalisation of agricultural trade necessary towards imparting efficiency to Indian agriculture.

While these reforms promised to make the agrarian sector 'competitive, efficient and productive' (Sahay 2010), it must be noted that they did not include any package specifically designed for agriculture. It was believed that "freeing agricultural markets and liberalizing external trade in agricultural commodities would provide price incentives leading to enhanced investment and output in that sector, while broader trade liberalization would shift inter-sectoral terms of trade in favor of agriculture (Ghosh, 2005)".

In 2005, IFPRI developed a strategy paper on reform options for consideration by India's policy makers "to put rural India on a higher growth trajectory that would cut hunger, malnutrition, and unemployment at a much faster pace than has been the case so far." In keeping with the overall push towards privatisation, the paper also recommended that Government should gradually withdraw from the functions of procurement of food in the interest of greater efficiency of commodity management and buffer stocks of food, which formed the bedrock of the PDS, should be gradually brought down. The recommendations strongly argued for privatisation of food stock holding and moving away from universal to targeted food subsidies.

Based on these recommendations various fiscal and structural reform measures (which directly and indirectly impacted India's agriculture and food systems) were taken as discussed below:

(i) direct production subsidies to farmers, specifically for fertilisers and other inputs such as seeds, irrigation facilities (e.g., tube and bore wells) were withdrawn and /or scaled down further. Public resources were channeled away from food crops and towards high-value export-oriented crops and commodity monocrops;

(ii) a related reform was removal of land ceiling limits thus putting an end to any State - led effort towards land reform (Sahay, 2010). This was closely tied to the new policy objective of crop diversification, where India shifted its cropping pattern from the low-value food grains to high-value and export-oriented cash crops. This was to be achieved through economies of scale in agriculture for which land concentration was required: purchase or leasing of land needed to be eased.

(iii) other associated processes that would allow for a smooth export-oriented agricultural system included setting up agro-processing facilities and facilitating the development of private post-harvest and marketing infrastructure in rural areas. All this also required large tracts of land for private enterprise. Constraints imposed by the ceilings on land possession in the land reform laws of States were lifted through these new policies. The States of Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu and Gujarat were among the first to implement these amendments in land reform laws.

(iv) the domestic seed sector was liberalised by re-classification of seed and biotechnology firms as core industries making the entry of large firms easier. This was done through the new industrial policy of 1986. The Seed Policy of 1988 further liberalised this sector with considerable incentives offered to private players to enter into seed production. After 1991, 100% foreign equity was allowed in the seed industry and seed imports were allowed for research purposes under the Open General License (OGL).

(v) public investment in research extension services, seeds and other inputs were reduced, although official policy often reaffirmed commitment to encourage public agricultural research. Private research institutions and investments entered these areas which in turn are R&D arms of large agribusiness corporations. Agricultural extension systems were reorganised by encouraging more public-private ventures and NGO-based extension networks. NGO-based extension networks also replaced Government based services. All this was accompanied by shrinking public investment in social welfare responsibilities of the State: education, health, energy, housing.

(vi) State support to farmer's cooperatives (e.g., Dairy cooperatives) was withdrawn and resources were allocated to support formation of farmer producer companies – a move towards greater role of the market and increased privatisation in agriculture. Under the new agricultural policy after 1991, deregulation of the marketing system was undertaken with the stated objective of supporting the shift to high-value export-oriented crops and enabling farmers to interact directly with buyers of their choice which would enable them to obtain a higher price, than in the pre-reform period;

(vii) regulations were amended to facilitate the liberalization of the dairy sector and industrialise livestock production. This led to entry of private dairy processors, foreign direct investment, exports of dairy products and meat, particularly buffalo beef;

(viii) a related measure was the legalisation of private corporate or contract farming which was implemented through an amendment to the APMC Act and Essential Commodities Act in different States. In addition, direct purchase of agricultural produce from farmers by global

retail chains was made possible. This bypassed the regulated markets. Private players were also permitted to open and control new agricultural markets;

(ix) Green Revolution technology continued to drive and define the framework of agriculture production as did the period prior to liberalisation. This trend later was to provide the basis for introduction of the Gene Revolution. Green Revolution technologies were further spread deeper into rainfed dryland regions, eastern India, and other marginal regions of India, including the Adivasi territories. These areas were characterized by a large number of small and marginal farmers and tenant farmers. The Government of India's policy thrust shifted to promote genetically modified crops with Bt cotton entering the market in 2002, as India's first GMO which now dominates the country's cotton market. Genetically modified food crops received a slight setback with the moratorium on Bt Brinjal in 2007. However at present strong efforts are underway to commercially release India's first GMO food crop - mustard.

(x) in keeping with the overall increase in openness of the economy trade liberalisation reforms were implemented (Section 2.2.3 discusses this in greater detail since this has had far-reaching and long-term impacts on food systems, the lives and livelihoods of small and marginal farmers and on the nutritional status of the country);

(xi) reforms that had a significant impact on food security of a large section of the population included a shift from universal to targeted PDS for food which was done in two stages.: a revamped PDS in 1992 and the targeted PDS in 1997. This also meant a reduction in public procurement of food stocks and reduced role of the State in ensuring food security for the marginalised and poorer sections of society.

4.4.3 Liberalisation of Trade

Liberalisation, opening of markets and external trade were considered to be the panacea for the growth of agriculture and to address its challenges. IFPRI's 2005 policy paper urged liberalisation of marketing and trade policies "to encourage vertical coordination between farms, firms, and forks (super- markets); facilitate increased flow of rural credit, especially to smallholders, through, say, non-banking financial intermediaries; and withdraw any special concessions in support of foodgrain policies". The paper also recommended that "India should also introduce new institutions such as futures trading that can reduce market risk and promote investments.

Trade liberalisation was expected to improve the prospects of an export-led growth process in agriculture. A series of policy measures were implemented beginning from the rupee devaluation of 1991. Subsidies on the exports of some commercial crops (tea and coffee), were withdrawn. India signed the WTO agreement in 1995 after which export controls on almost all the crops were gradually phased out. This was followed by removal of quotas as an instrument of trade policy. Quantitative restrictions on import of commodities like wheat and wheat products, rice, pulses and oilseeds were removed from 2000 onwards. Following this tariffs began to be used as the primary instrument of regulation in trade policy. Right through the late-1990s and 2000s, the tariffs on the imports of most crops significantly declined and were kept much below the bound levels of tariffs set by the WTO agreement (Ghosh, 2005).

Free trade and membership into the WTO brought with it the privatisation of knowledge and genetic material. Patent law reforms protecting corporate controls on knowledge and genetics manifested in Indian legislation through the Protection of Plant Varieties and Farmers Rights Act, 2001, and the Seed Bill, 2014. a related reform was the introduction of an intellectual property (IP) regime in agricultural research when India became a member of the WTO. These trade and patent regimes have infringed the rights of farmers and indigenous plant breeders leading our agricultural and food systems 'from biodiversity to genetic slavery' (Ramachandran et al., 2009).

Initiatives like the Knowledge Initiative on Agriculture (KIA), have paved the way for US Corporations to interfere in agricultural policy and policy-making institutions in India. KIA is meant to support agricultural research, education and extension to bring forth an 'evergreen revolution'. Specifically, the KIA focuses on 'capacity-building' for education (including curriculum revision), food processing, biotechnology (particularly aimed at making transgenic crops the focus of Indian agricultural research) and water management (with emphasis on precision and high-tech agriculture) (Ramachandran et al., 2009).

After the mid-1990s, there was a sharp fall in domestic prices of many commodities: the most significant impact of trade liberalisation in agriculture. There was a sharp fall in domestic prices of cotton, tea, coffee, spices and many fruits and vegetables due to a corresponding fall in international prices. Since the quota controls were eliminated, and the tariffs were low, there was a surge in the imports of various crops leading to different degrees of decline in domestic prices. For instance, the import of oilseeds increased from 1 million tonnes in 1995-96 to 4 million tonnes in 1999-2000 and continues to be high.

Continuing with the trade liberalisation policies, India has entered into a number of free trade agreements over the last 15 years. Almost all

these agreements demand extensive reductions in import duties on the remaining agriculture goods, which India continues to protect through high tariffs. In addition the last decade has witnessed India inviting foreign capital to invest directly into food and food processing, dairying, seed breeding, logistics, infrastructure, communications and other aspects of agriculture research, production, procurement, processing and markets.

4.4.4 Impacts on Farmers, the Environment and the Food System

The economic 'reform' after 1991 significantly weakened institutional support structures in agriculture. The Green Revolution was built on State support (price supports, subsidy for technology inputs, credit and market supports) and creation of institutional support structures, albeit unequal across crops, class, caste and region, in rural areas. However the new economic policies explicitly rejected transformation of the institutional framework of Indian agriculture. The impacts that these reforms have had and continue to have are discussed here in the context of food production and the lives and livelihoods of farmers, the environment and the overall food system and nutrition.

(i) Farmers – Production, Income and Purchasing Power: Technological push during the Green Revolution has forced increasing number of small and marginal farmers to shift out of their traditional diverse food grain based farming system. In the dryland areas, the millet-pulse-oilseed mixed rainfed cropping patterns have been largely taken over by intensive monocrop commodity cultivation for cash. Depletion of soil fertility, salinization, greater susceptibility to pests, and a rapidly receding water table forced small farmers into a technological debt trap: more external inputs were required to generate the same output requiring more capital. All this paved the way for the Gene or Evergreen Revolution. The agribusinesses that had supplied the chemical fertilisers and pesticides during the Green Revolution were now in the business of genetically modified crops with the promise of reducing pesticide consumption.

The increasing control of private firms over agricultural research and extension has led to development of technologies that were mainly suited to “capital-intensive forms of commercial agriculture with high value-added aspects off the farm.” Private sector research has focussed mainly on the development of herbicides, insecticides and technologies related to food storage, transport and processing technologies. In India too, private sector agricultural research is confined to a few crops, such as maize, sunflower, cotton, pearl millet, oil seeds and sorghum, where the expected profit levels are high. In most food grain crops like paddy and wheat, private agencies have had very little presence.

Governments continue to announce minimum support prices for a variety of food crops but the actual procurement is limited to rice, wheat, sugar, oil, pulses. Targetted PDS has also resulted in accumulation of grain in the godowns of the Food Corporation of India (as there are now limits to the amount of grain that can be lifted by different states and supplied at subsidised rates to consumers). In several instances grain has rotted in these godowns. This needs to be contrasted with large sections of the population suffering from chronic hunger due to non-accessibility of grain: agrarian crises and chronic hunger even at times when food production is high.

Land reforms witnessed further reversal during this period when land ceiling limits (Sahay, 2010). Studies by the Indian Institute of Soil Science shows that, the per capita availability of agricultural land declined from 0.48 ha in 1951 to 0.16 ha in 1991 and is likely to decline further to 0.08 ha in 2035 and even less by 2050 due to growth in human population and infrastructure required for tourism, transport, industry, and mining sectors etc (IISS, 2013).

These developments further encouraged absentee farming by landlords and corporations while reducing the extent of ceiling-surplus land that would be available for distribution to the landless: this at a point when substantial number of households were and are still landless. The policy measures around land was closely tied to the new policy objective of crop diversification, where India shifted its cropping pattern from the low-value food grains to high-value and export-oriented cash crops. This was to be achieved through economies of scale in agriculture for which land concentration was required: purchase or leasing of land needed to be eased. Once again it was the large landowners and private agribusiness firms who made these investments for the cultivation of high-value crops. It is also linked to its policies of encouraging land-markets and real estate

Small and marginal farmers, who have become trapped in completely non-food cash crop production (cotton, sugarcane, maize, soya), sell everything, purchase their food, and expend on other consumption. In addition to purchasing food from the market, all these families depend critically on PDS to access food. Small farmers are thus engaged in multiple relations of production for survival: owners of their own small properties and means of production (including labour), working as hired labour, either on each other's lands, or on the lands of larger landowners, or working in industries. On their own lands, they use family labour and hired labour when necessary. Researchers have reported that over the last 30 years, the average income of the farmer has increased by only 19%, compared to 370% for a

Government employee and by more than a 1000% of a person employed in the corporate sector (Vasavi, 2016).

In the late 1970s and early 1980s, the focus of the State was on employment creation programs: wage employment through state-sponsored rural employment schemes and self-employment by means of loans-cum-subsidy schemes targeted at the rural poor. During this period credit was to be directed towards 'the weaker sections' of society. However, during the post-liberalisation period, social and development banking stopped being the focus. The expansion of public-sector rural banking was ended, and a large number of rural branches of commercial banks were actually shut down after 1995 (Ramachandran et al, 2009).

Priority-sector advances fell, and, with that, so did the shares of credit to agriculture, to cultivators owning two hectares or less, and to Dalit and Adivasi households. Financial liberalisation of the public sector banks thus halted expansion of rural credit. Researchers have reported that public sector banks had made a significant dent through their lending, in challenging the unfair terms of moneylenders, during the pre liberalization era.

The reduction in public financing of extension services, seeds, and other inputs made it very difficult particularly for small, marginal and tenant farmers to access credit pushing them increasingly to have to depend on their own private resources and non-banking institutions. These included input dealers and moneylenders who charged exorbitant interest rates. These sources of credit were largely agents of domestic and multinational agri-business companies selling seeds, fertilisers, pesticides etc.

Privatisation of agriculture through policies promoting contract farming has led to increase in labour displacement in farms, intensified casualisation of labour, increased use of low-paid women workers and child labour and a propagation of monoculture in search of quick profits.

The National Commission for Farmers (NCF) noted the following major impacts of a contract farming system:

"The first is that the purchaser is quite likely to be interested in short-term gains/profit maximization and may, therefore, suggest practices, which in the long run are not good for the land/other assets of the producer. The purchaser has the option of 'moving on' after a few years of 'exploitation' of an area. The second issue relates to possible shifts in favour of export-oriented crops at the cost of crops providing basic food. The third is the preference for the larger producers in choice of partners by the purchaser, ignoring the small landowners. Such practices over a long time could encourage the small farmers to enter into sub-agreements with the larger farmers there by adding a tier between the grower and buyer or to sell/lease out their land and work as labourers (NCF, Vol. 2, p. 422)".

An essential part of the liberalisation of trade was membership into the WTO (as discussed in Section 4.4.2), entering into free trade and multilateral agreements. Indian farmers had to therefore operate in a highly volatile international environment. They had to compete against highly subsidised large producers in the developed countries, whose average level of subsidy amounted to many times the total domestic cost of production for many crops. Price volatility and unpredictability created uncertain and often misleading signals for farmers who respond by changing cropping patterns which often can be ecologically unsuitable and economically unviable in the long-term. It has directly affected soyabean and groundnut farmers due to palm oil imports. Import of fruits and other commodities has also similarly affected the farmers. Indian agriculture and as a result small farmers are being exposed, in a new and unprecedented way, to volatility in the international prices of food and non-food crops and, in the case of several commodities, prolonged periods of steep declines in prices (Ghosh, 2005). As a result it is impossible for small and marginal farmers to ensure adequate incomes. Most small farmers, today, are net buyers of food grain, and thus victims of inflation in food prices as well.

In addition, the Minimum Support Prices (MSP) announced by the Government to ensure remunerative prices have not compensated for the actual costs of production per unit of output for most crops in a majority of States. Further, the very policy of MSP has not been implemented in most States.

The pattern is similar in animal production systems as well, particularly milk. Farmers are being pushed towards industrial milk production as a commodity. In 2015 with the global collapse of skimmed milk powder prices, domestic milk procurement prices fell, leaving small farmers in a desperate situation (FSA, 2017).

Introduction of IPR in agricultural breeding was an important component of the WTO agreement in 1995. Patent law reforms protecting corporate controls on knowledge and genetics have manifested in Indian legislations such as the Protection of Plant Varieties and Farmers Rights Act, 2001, and the Seed Bill, 2014. This requires farmers to (i) purchase seeds which compounds the already crippling input costs of agriculture (ii) pushes them deeper into debt with non-institutional credit sources (iii) and erodes their control over their seeds and

genetic diversity.

(ii) Environment: Ecologically the economic reforms of 1991 have accelerated the degradation of the natural resource base of the food and agricultural system, that started with the Green Revolution. Rapidly depleting water resources, polluted water bodies, salinisation, reduced soil fertility, high dependence on fossil-fuel based agricultural systems are once again driving the vulnerable section of population deeper into malnutrition. Intensification of biotechnology, particularly genetic engineering are likely to have more unpredictable and irreversible damages on ecological and human health.

Stress on water resources brought on by the Green Revolution production systems has deepened with the concentration of land for water-intensive commercial crops. Contract farming also has severe implications for the rapidly declining water resources in the country. Increasingly privately held large landholdings also control the associated groundwater resources. These landholdings owned and operated by private individuals or international agribusinesses are using more sophisticated technology to access deeper aquifers. In addition there is contamination of water resources by the chemical-intensive production practices. This is not only fossil-fuel energy intensive but is also depriving surrounding communities of their only source of water for drinking and other essential uses. Increasing water scarcity (**see Box 3**) is perhaps the most crucial challenge to agriculture production today in India.

In a 2012 study, the International Water Management Institute point out that power subsidies and flat tariffs provided from the beginning of the Green Revolution were responsible for the rapid increase in groundwater irrigation.

Box 3: Stress on Water Resources

- Decline in water availability per capita from 5000 cubic metres / annum in 1950 to around 2000 cubic metres/annum in 2011-12. Projected to decline to 1500 cubic metres/annum by 2025 leading to far less water availability for agriculture.
- 83% of available water resources used by Agriculture sector. Demand from other sectors may reduce availability for agricultural use to 68% per cent by 2050. Inefficient and dilapidated canal irrigation systems have led to overexploitation of groundwater. India is the largest user of groundwater in the world with over 60% of irrigated agriculture and 85% of drinking water supplies dependent on aquifers. (GOI, 2016; India Water Portal, <https://factly.in/per-capita-water-availability-down-70-in-60-years/>).
- 54% of India faces high to extremely high water stress (WRI, 2015)

Technology and chemical intensive production systems are also increasing toxins (both chemical and biological) in the food chain further undermining health and nutrition.

The commons, deeply embedded in the food, agriculture and life of large sections of rural India serve as an 'insurance' for food, fibre and shelter, particularly in the dryland areas. In an increasingly uncertain changing climate, privatisation and destruction of the commons (water, forests, pastures and grazing lands etc.) will lead to greater inequality. This together with the technology-centric approach to food systems and the increasing 'safronisation' of the food agenda is severing the animal – land – farmer connection. Manure and animal energy are both necessary for agroecological, renewable energy driven food systems. This severing, deepens the risks posed by climate change, more so for the vulnerable, marginalised populations.

(iii) Food Systems and Nutrition: The economic reforms that started in the 1990s resulted in another shift in consumption patterns - from cereals to high-value products like fruits, vegetables, dairy products, meat, eggs and fish. This was put forth as one of the important reasons for the thrust towards a shift in cropping pattern from food grains to high-value and export-oriented crops. This shift, as discussed earlier, was made possible by the combined policy changes, that forced farmers to shift away from cultivating food to commodity production. Reforms were put in place to incentivize and encourage investments from private sector and large agribusinesses leading to growth of market chains and retail supermarkets. This shift in diet patterns however needs to be viewed with the associated sharp fall in the levels of per capita calorie consumption.

In an extensive analysis of this shift in consumption patterns in the context of the health and nutrition of the rural and urban poor, Utsa Patnaik (Patnaik, 2001; Patnaik, 2004) points out the following critical issues:

- There was a slowdown in cereal production in the 1990s and a steep fall in per capita availability of foodgrains for human consumption. Between 1951 and 1991, the per capita annual food grain availability (the sum of domestic output, net imports and change in stock) had risen from 144 kg to 186 kg. However from 1998-99 to 2000-01, the average annual availability fell from 173.5 kilograms annually per head, to 160 kg. This drop in availability increases deprivation manifesting itself in the form of starvation typically concentrated among the poorest segments of society;
- Per capita per day calorie intake in rural areas fell from 2266 Kcal in 1972-73 to 2183 Kcal in 1993-94, and 2149 Kcal in 1999-2000. This fall was sharpest for the lowest 30% of households in respect of consumer expenditure. Given that overall calorie intakes, especially of the poor, has been falling and the extent of malnutrition that persists in rural India is appalling, the fall in food grain consumption has been widely interpreted as led by distress, and not by choice;
- Industrial livestock production began placing greater demand on foodgrains leading to diversion of cereals to animal feed. This was to meet the demand for animal products by the affluent domestic population as well as for export. The effective market demand of the affluent consumers outweighs the needs of subsistence consumption of the millions of people whose share of income is small and may be falling. The diversion of food to feed increases as inequalities worsen and incomes become more concentrated under reform policies;

The availability per head of pulses and coarse cereals also fell in the period after 1991-92. Although the emphasis on rice and wheat during the Green Revolution had led to a reduction in the availability of pulses per head in the 1960s and 1970s, this was partly reversed in the 1980s. However the absolute fall in the production of pulses in the 1990s had reduced availability to levels lower than in 1951. 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 fibre than rice and wheat, and have historically been the major source of protective nutrients for the poor.

Other studies have also shown how the shift in cropping patterns and the prioritisation accorded to rice and wheat have resulted in reducing access to micronutrients. This has happened because (i) prices of micronutrient-dense foods have increased, relative to staples in many places (Kataki, 2008). For e.g., the increasing price of pulses are believed to have been associated with a consequent decline in pulse consumption across all income groups and (ii) intensive chemical farming has destroyed the availability of 'uncultivated greens' an integral part of the manure-based agroecological farming practices.

What is evident from all these analyses is that the shift in consumption patterns as a result of the new economic reforms has manifested itself as India's double burden of undernutrition and obesity.

The changing food and agricultural policies have also significantly impacted the food supply chains both in rural and urban areas. Consumption patterns, food security and nutrition as well as the livelihoods and incomes of millions of people have been affected by the transformations taking place in the food supply chains. Studies carried out on the impact of the 'supermarket revolution' in Asia since the early 1990s and in India from the late 1990s to early 2000s, point to the role of economic liberalisation in accelerating this process: structural adjustments, entering the WTO regime, multilateral trade agreements and retail FDI (Reardon et al., 2012). In India however domestic retail investment has also been a powerful force. Large business houses and conglomerates set up retail divisions using the 'investable funds' that they accumulated from the rapid growth in telecommunications, construction, oil, information technology etc., facilitated by the new economic reforms. Rise of modern private retail in India since 2000 has been reported to be among the fastest in the world, growing at 49% on average. The great majority (around 75%) of modern private retail arose from 2006 to 2010 (Reardon et al., 2011).

This has spurred the food processing sector leading to massive FDI and competitive domestic investments to support the supermarkets. The food processing ministry, created in 1988 was set up with a view to "develop a strong and vibrant food processing industry, to create increased employment in rural sector and enable farmers to reap the benefits of modern technology and to create a surplus for exports and stimulating demand for processed food." What this has done is created increasing dependence on 'convenience' and processed foods ostensibly to ease the woman's 'burden'. Added sugars, preservatives, synthetic fortifiers, hormones and antibiotic fed processed meat and eggs have destabilised the nutritional balance of a large section of the population.

The affluent urban and rural Indians are beginning to experience the diseases of affluence – obesity and obesity-linked complications including hypertension, diabetes and skeletal disorders.

Together with the supermarket phenomenon came the spread of fast-food chains. Structural changes to support this include incentives for the creation of food parks and other large processing facilities. Both domestic investments and FDI are rapidly expanding these facilities in the form of “rural business hubs” which means land acquisition and consolidation of smaller holdings. The capital accumulated by large farmers and the rural rich is being heavily invested in these facilities. While supermarkets entered India initially in the Southern States and were middle-class centered with domestic–foreign joint ventures, by the mid-2000s it spread across the country. Domestic capital in this sector has driven the markets to smaller towns and to rural areas. The promise that these modern retail outlets are bringing is: cheaper staple foodstuffs as well as non-food goods.

Sourcing of grain and produce for these supermarkets is primarily from (i) farmers who have land, irrigation facilities, farm equipment and technology to provide the volumes needed (ii) have access to paved roads for easy transportation or (iii) large and medium farmers' associations. This automatically marginalises and eliminates small farmers from the supply chain, deprives them of water land resources which are appropriated by the agribusiness operations. In situations where companies need to source from small farmers who do not have access to credit or extension services there are specific conditions imposed through contracts. Farmers have to grow only specific varieties of crops which have commercial or processing value. The inputs such as seeds, fertilisers and pesticides are company provided and the price of the produce is fixed irrespective of market prices.

Most supermarket shelves are populated largely with processed and semi-processed food, which as discussed earlier is loaded with sugars, additives and synthetic preservatives that significantly reduce the bioavailability and assimilability of nutrients.

The safety nets like ICDS and MDM created to safeguard the health of children, pregnant and lactating women have been reduced to centralised, fragmented, supplement-based chemical units rather than whole foods. Further liberalisation is paving the way industrial takeover of these safety nets. Although the Supreme Court directed that hot cooked meals must be provided as part of these programmes there are several ready-to-eat therapeutic foods (RTF), nutrition pastes etc., that are being promoted in the form of pilot projects in various States. The National Food Security Act (NFSA) was enacted in 2013 to “provide for food and nutritional security in human life cycle approach, by ensuring access to adequate quantity of quality food at affordable prices to people to live a life with dignity”. The provisions of the Act promoted cereal diversity by integrating millets into the food basket. It also has a special focus on the nutritional support to women and children. The Act's focus continues to be on staple grains, caloric intake without much focus on diet diversity and micronutrient consumption. It is therefore unlikely to successfully address the 'hidden hunger' malnutrition.

A mid-term appraisal of the 11th five-year plan (2007-12) raised serious questions about the effectiveness of the MDMS programme in reducing child nutrition in spite of its 34-year long presence. The MDMS was introduced in 1995 to address hunger for school-going children between the age of 6–14. In all these cases, as pointed out by several researchers, the safety nets were cereal or staple grain based. They benefited producers of these cereals and since they were by and large a 'one-size fits all' centralised programme did not allow for local preferences of culture, tastes and most importantly adequate nutritional requirements. Hence, they did little to address the problem of malnutrition through improved access to a balanced diet (Pingali, 2017).

The disconnect between agricultural and food policy and India's nutritional challenges continue. The State continues its increasingly aggressive push towards further integration into the international market and corporatisation of the agricultural system. This is compounded by the State's absolving of its Constitutional responsibility of “raising the level of nutrition and standard of living of its people and improvement in public health.” Hope however is visible in the form of several communities of resistance across the country working at shedding the spectre of deprivation and malnutrition.

4.5 Agricultural Policies and their Impacts on Women, Adivasis and Dalits

The agricultural policies have very distinct implications for the lives and rights of women across rural India and the urban poor and specifically their health and nutrition. This holds true for marginalised communities as well, particularly the Adivasi and Dalit communities.

4.5.1 Impact of Agriculture and Food Policies on Women

Policies impacting land ownership, access to credit and the erosion of local knowledge systems and genetic resources have compounded the structural injustice that women experience in a patriarchal, caste and class ridden society.

Of significance to this discussion on nutrition is the rendering of women as “invisible farmers” by the Green Revolution. (Satyavathi et al. 2010). Several researchers also point to the disproportionate physical burden borne by women as a result of the policies (Agarwal, 1992;

Patel, 2009). To cover the costs of external inputs, the need for cash incomes in rural household has been reported to have increased. This is forcing women to work as agricultural laborers. It has also increased the need for unpaid female labor for farming tasks, thereby augmenting women's already high labor burden. Mechanisation resulted in women's labour being replaced with male labour thus displacing their wage-earning opportunities.

Women's key role in achieving food security through food crop production and selection has also been affected since crop selection increasingly began to be dictated by the State and market. This together with the expansion of industrial food processing and the 'supermarket revolution' has also effectively eroded women's decision-making role in agriculture, food processing and food consumption.

In the liberalisation and post-liberalisation period where unequal land ownership has increased and land reforms relegated to the background, women continue to own limited land. Land ownership is largely restricted to men in the patriarchal structure. As a result access to credit is difficult, since most women are not asset holders and do not own property, which is a prerequisite for lending agencies. Thus, access to some of the most important factors of production, land and capital, is denied.

During the economic liberalisation period, a new narrative that emerged in the context of land from the World Bank and other Institutions pushing for liberalisation was about gender inequalities around land and how this was the fundamental land contradiction. The suggested policy measures included: (i) distribution to women of 'homestead farming' land measuring a couple of cents, (ii) collective farming by women on common lands which they can collectively cultivate, or on leased land and (iii) State to finance land purchase from landowning farmers and distribute to women.

In States like Telangana and Andhra Pradesh where these measures have been implemented, it has been done without impacting the large landowners: the land provided is typically of poor quality or uncultivable and is usually common lands or other 'government lands' not intended for cultivation. Often these are 'assigned lands' which means that the Government can take these lands at any point for 'public purpose' (SEZs, irrigation projects, etc.) without compensation.

All these fragmented policies or 'handouts' effectively served to divert any serious addressal of the larger question of land rights and social justice, either by the State or by social movements.

Across communities women are keepers of knowledge around food, nutrition and agriculture. The industrial agricultural system which is inherently patriarchal has reduced women to labour. It is disempowering them through token measures in the name of land rights and rejecting their knowledge by supporting an external input-based, technocentric agricultural model.

Several researchers have pointed to the discounting and devaluing of women's agricultural knowledge as a result of Green Revolution policies and subsequent economic liberalisation (Patel, 2009). The International Assessment on Knowledge, Science and Technology for Development points to the importance of such knowledge in the creation of sustainable food systems (IASTD 2009).

Structural policies of the State and the dominant role of the market and industrial agribusiness in our food systems intersect with caste/class and patriarchy leading to extensive damage to women's health and nutrition and in turn that of children.

4.5.2 Impact of Agriculture and Food Policies on Adivasis

The Green Revolution Policies had not impacted Adivasi food systems significantly. Studies indicate how upto the 1990s, the adivasi areas, and the rainfed regions, were able to continue to cultivate diverse local traditional grains, and oil seeds. However economic liberalisation and agriculture and food security policies post 1990s extended the impact geographically as also structurally primarily into the rainfed regions.

The policies around land during this period further eroded the land and forest rights of the Adivasis which in turn destroyed the resource base of their food and agricultural systems thus deepening the extent of malnutrition. Whilst the land alienation issues continue unresolved and unaddressed in Scheduled V and VI areas across India, there are constantly new emerging threats to the land rights of adivasi communities. Lands are being acquired by the State, for 'development and public purpose' (dams, sanctuaries and wild life parks, industries and mining projects). Estimates of the number of displaced persons or project affected persons from such projects built since independence, ranges from 25 million to 60 million, of which nearly 30 - 47% are adivasis (GoI, 2014. NSSO 70th Round - 2012-2013). According to the Socio-Economic and Caste Census 2011 and the Land and Livestock Survey 70th Round, 2013 at the all-India level, 56% rural families are landless and in the case of Adivasis, 34.8% of them are landless.

Most Adivasis were recognised by the Indian State under the Constitutional term “Scheduled Tribes” derived from a schedule (Schedule V and VI) in the Constitution Order of 1950. Almost every state with Schedule V regions, have enacted special land laws that prevent the alienation of land from Adivasis to non-advasis and also ensures the restoration of land to Adivasis. However the State's, inability to enforce the laws to ensure transfer of land illegally held in possession by Non-tribals to Adivasis, in turn compromised the robust adivasi food cultures.

Although the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights), Act, 2006 enacted to undo the historic injustices against the adivasis recognizes the individual and community/collective rights of communities to their forests, forest lands continue to be appropriated. Under the aegis of several State run poverty alleviation, conservation and climate change mitigation programmes, there is unilateral implementation of plantation programs on adivasi forest lands without seeking prior consent. This denies them their customary rights to shifting cultivation, forest foods, accessing forest produce, grazing their animals as also exercising their customary knowledge of governance of their forests.

A World Bank brief on poverty and social exclusion in India highlights this as follows (World Bank, 2012):

“Mortality outcomes for tribal children in India need to be looked at in the light of larger changes experienced by Scheduled Tribes, especially in the past two or three decades. Land and forests are the mainstay of tribal livelihoods but the relationship of tribals to land is not restricted merely to subsistence cultivation. It extends to their dependence on natural resources for livelihoods and for food security. Over time, the average landholding has declined more rapidly among Adivasis than among other groups. This reflects the 'alienation' of Adivasis from their traditional lands largely through displacement (by infrastructure projects) or fraudulent private transactions. The government's 10th Five-Year Plan noted that between 1951 and 1990, 21.3 million people were displaced; 40 percent of them—or 8.5 million—were tribal people. This alienation explains, to a large extent, the poor outcomes among tribals. The loss of control over their jal, jungle, and zameen (water, forest, and land) has alienated Adivasis from public schemes, affected their traditional food practices and forced them to migrate to cities to work under harsh conditions”.

4.5.3 Impact of Agriculture and Food Policies on Dalits

Both the Green Revolution policies and even more the economic liberalisation process have left a growing class of landless, marginal and small farmers, primarily from dalit, adivasi and backward caste (BC) social groups. Lives of Dalit families, particularly the landless are characterized by impoverishment, hunger, high food, health and financial insecurity. Suicides too have been found to occur maximally amongst these landless agriculture workers, small and marginal and frequently, tenant farmers. Land is at the heart of the Dalit struggle in the context of agriculture, food and health. According to the Socio-Economic and Caste Census 2011 and the Land and Livestock Survey 70th Round, 2013, 58.4% of rural Dalit households are landless, much higher than households in any other social group. The Census also reports that 54.9% of the Scheduled Castes have only homestead lands and out of this 4.4% do not even own homesteads. In cases where Dalits were assigned lands, they received the most uncultivable and barren parcels of land, as much of this was public lands, and not cultivable surplus ceiling lands.

Post 1990s when the Green Revolution technologies advanced to the rainfed dryland regions, Dalit communities were doubly hit because it became entirely a private investment enterprise: largely upper caste driven. Structural inequalities of caste and class, the steady withdrawal of the State from welfare programmes and the erosion of the PDS have further impacted access to nutritious food. The knowledge and practice that Dalit communities had of accessing food through foraging and cultivating on marginal lands was also completely eroded.

Financial liberalisation and the cessation of social and development banking (a crucial part of the safety net in the 1970s and 80s) have had a severe impact on incomes of rural Dalit families. Priority-sector advances fell, and, with that, so did the shares of credit to agriculture, to cultivators owning two hectares or less, and to Dalit and Adivasi households.

Research studies in Andhra Pradesh showed that annual incomes among Dalit and Adivasi households were substantially lower than the corresponding incomes among others. For example in Ananthavaram, a multi-caste irrigated village in south coastal Andhra Pradesh, the mean annual income from crop production alone was negative (minus INR 624) for Dalit households and INR 27,892 for other cultivators (Ramachandran, et al., 2009). The situation is not very different in other parts of the country.

The continued social discrimination of Dalits in various States compounds the fiscal and economic policies of the State. A 2014 study in Madhya Pradesh by the Dalit Adhikar Abhiyan and ActionAid reports the prevalence of more than 70 kinds of discrimination in all the 30

villages surveyed in 10 districts of the State. These include: (i) Dalits not allowed to touch food and water in common gatherings, (ii) 79% dalit children sit in back rows in classes, none of them allowed to drink water from common facility (iii) 79% cannot touch mid-day meals and are made to sit separately (iv) 27% dalit kids cannot enter anganwadis; (v) Health field staff does not visit 65% dalit settlements and (vi) 47% dalits are not allowed entry in ration shops with 64% having been given less grains and 52% given grains from a distance (Sarkar, 2014).

In an already reduced scope of the PDS (from universal to targeted PDS) such discrimination makes it impossible for poor Dalit families to even access minimal calories. This is compounded by complete lack of access to minimal health care.

Thus the combined effect of failure of land reforms, land acquisition policies, the State's 'disinvestment' from food security and safety nets and the continuing and deepening caste inequalities have prevented a large section of the Dalit communities from accessing basic calories contributing to chronic hunger and malnutrition among these populations.

4.6 Major Health Conditions, Micronutrient Deficiencies and Technical Fixes

Post-Independence agricultural policies started with a push towards food sufficiency through modernisation of agriculture. The technology-centric approach was cereal-based and adept at providing calories but in the process increased hidden hunger by displacing traditional diets and making micronutrient-rich plant foods and local sources of protein less available to the poor.

The structural adjustments which were a part of the economic reforms since 1991, led to rapid economic growth but at the cost of the health and nutrition. The economic and socio-cultural deprivation so prevalent in India has been magnified by these reforms as reflected in the nutritional statistics. Hunger in India has a clear gender, caste and age bias. Women, children and old people are less likely to receive the full nutritious meals that they require, as compared to adult men.

As articulated by the Right to Food campaign in India, “the structural underpinnings of hunger include the interlinked elements of: deepening agrarian crisis, the continuing neglect of infants and children in public policy, persistent gender discrimination (together with absence of maternity entitlements), the dismantling of the public distribution system, and the disempowerment of Dalits, Adivasis and other disadvantaged groups (including the urban poor). The dangers of growing corporate interests in food and agrarian policy, and their promotion of processed baby foods, genetically modified seeds and untested biotechnology at the cost of food safety and nutrition”.

Malnutrition in all its forms is prevalent in India: Child stunting, child wasting, anaemia, low birth weight, micronutrient (iron, folic acid, iodine, Vitamin A and zinc) deficiency, child and adult overweight, adult obesity and non-communicable diseases (IFPRI, 2016; Raykar et al, 2015).

The Global Hunger Index Report of 2016, produced by IFPRI, ranks India 97 of 118 countries on the hunger index and, at a level 'serious'. The index estimates 15.2% (195 million) of the population as undernourished and 38.7% of children under 5 years as stunted. As discussed above, hunger in India has a clear gender, caste and age bias. Women, children and old people are less likely to receive the full nutritious meals that they require, as compared to adult men.

Although there has been a decline in the rate of child malnutrition over the years particularly from 2006 to 2014 (23% reduction in the number of stunted children and 35% in the number of underweight children). In spite of this child undernutrition in India is among the highest in the world with nearly half of all children under 3 yrs of age being underweight or stunted. India continues to be home to over 40 million stunted children and 17 million wasted children under 5. What this average masks is the significant disparity across the states, with UP, Bihar, Jammu & Kashmir, Manipur and Jharkhand not having any significant change over the years (IFPRI, 2016).

Recent reports in 2015 and 2016 by IFPRI and the PHFI present the following status based on analysis of data from the WHO, NHF-3 and the Ministry of Women and Child Development, GOI :

- Stunting which is a measure of chronic malnutrition shows a prevalence of 38.7% among children under-5 years of age;
- Wasting, a measure of acute malnutrition is prevalent among 15.1% children. The MoWCD reports a prevalence of 19.8% among children under -5
- Underweight is a composite of the figures for stunting and wasting. 42.5% of children under the age of 5 are underweight;
- Overall prevalence of overweight and obesity are low in India compared to other countries. However this masks the rapidly increasing occurrence of obesity particularly among the urban affluent.

- Adult overweight prevalence - 22%
- Adult obesity prevalence – 4.9%
- Adult Adult diabetes prevalence – 9.5%
- Overweight prevalence among under-5 children – 1.9%

A less visible but important measure of nutritional well-being is micronutrient status. Micronutrient malnutrition, is often called “hidden hunger,” and several studies report that it has become more conspicuous in many countries since the introduction of Green Revolution cropping systems (Welch et al., 2000).

The micronutrient deficiencies prevalent in India include Vitamin A, iodine, iron, zinc and folic acid. The status of some of these deficiencies as provided by IFPRI and the PHFI in their 2016 and 2015 studies are presented below:

- Anaemia in women of reproductive age shows 48.1% prevalence while 75% children under the age of 5 are anaemic.
- The poor nutritional status of adolescent girls, combined with child marriage and multiple pregnancies even before becoming an adult, lead to another dismal fact, that 30% of all children are born with low birth weight leading to an intergenerational cycle of malnutrition (The Hindu, 2016).
- Protein energy malnutrition and anaemia among nearly 70% of school-going children challenges the capacity for physical growth and cognitive development;
- Vitamin A deficiency is prevalent among 57% of children under 5
- Goiter caused by iodine deficiency is prevalent in 26% of the overall population and among 19% of school – aged children
- Despite India's economic dominance in the sub-continent, nutritional status as well as access to improved sanitation are the lowest in the region.

Improvement in nutritional status has not kept pace with the economic growth or improved agricultural productivity since the Green Revolution. The theory that economic prosperity will reduce malnutrition is not borne true even across the States of India. For example Tamil Nadu and Gujarat have similar levels of income but the stunting rate in Tamil Nadu is 23.3% compared to 41.8% in Gujarat. Similarly Kerala and Goa have comparable stunting rates of 19.5 and 21.3% respectively. However Kerala's per capita net State Domestic product is less than half of Goa. It therefore appears that it is not income but other development drivers that are responsible for stunting.

Several global and India-specific analysis have identified the poor status of health among women in India as an important driver of health and nutritional outcomes both for women and children with low maternal height, low BMI and anaemia compromise child health at birth.

Child malnutrition is one of the most serious problems facing the future generations. Early childhood represents the peak growth and development period for the musculoskeletal system, brain and nervous system. Undernutrition increases susceptibility to infection and disease thereby compromising health of the individual. It not only results in short-term and long-term consequences for the affected children but also leads to undernourishment in the next generation to children born particularly of undernourished mothers.

4.7 Technical 'Fixes'

India's official strategy to address malnutrition has largely been technology-centric. The 'technical fix' to address hunger in the form of the Green Revolution, (and the continuing industrial agricultural system) led to the burden of malnutrition. The creators of the problem – chemical, pharmaceutical and crop protection chemical manufacturers as well as philanthropic Foundations and Institutions that were spearheading the Green Revolution – responded by providing 'technical fixes' to address the problem. This New Green Revolution came forward with solutions for malnutrition with a focus on normalizing “a policy approach based on deficits in blood chemistry, rather than inequalities in power” (Patel, 2013). This move by nutrition planners and advocates of nutrient specific 'fixes' led to a strong shift away from any effort at addressing structural inequalities which in turn would have lead to long-term reduction in malnutrition. Rather the fragmented silo-based approach to nutrition became entrenched in planning leading to what is often termed “nutrition isolationism” (Levinson et al, 2013). Instead of adopting a multi-sectoral sustained approach to addressing the problem, it was preferable to frame it strictly in nutritional terms and provide nutrient-specific fixes. Single-nutrient approaches thus provided the perfect opportunity for increased involvement of the private sector and ensure the continued role of the industrial machinery that dominated the Green

Revolution and economic liberalisation policies in the country.

The most widely practiced technical strategies used in India to address micronutrient malnutrition include: (i) pharmaceutical supplementation (ii) Food (chemical) fortification (iii) Biofortification (iv) ready-to eat therapeutic foods (Indian National Science Academy, 2013; Sukla et al., 2017).

4.7.1 Supplementation

In this technique, pharmacologic preparations of nutrients are provided as capsules, tablets or by injection when immediate benefits are necessary for a group at risk. At the FAO Conference on Nutrition in 1992, supplementation was recommended to be restricted to vulnerable groups, which cannot meet their nutrient needs through food (women of childbearing age, infants and young children, elderly people, low socio-economic groups, displaced people, refugees, and populations experiencing other emergency situations) (FAO, 2001). In India, supplementation is used mainly to address iron, folic acid and Vitamin A deficiencies. Supplementation is considered to be the fastest and cheapest way to control micronutrient deficiencies in individuals or population groups. Government surveys (National Family Health Survey – 3) and other reports point to the failure of iron- folic acid supplementation in reducing incidence or severity of anaemia. Some of the reasons attributed include: lack of awareness regarding its importance leading to poor compliance and poor geographic outreach, uniform dosage of one tablet of IFA (which is meant for preventing anaemia in non-anaemic women) regardless of the severity of anaemia (Welthungerhilfe & Terre de hommes, 2014; Berti et al., 2017).

Similarly in the case of Vitamin A supplementation as well, poor outreach, inadequate and irregular supplies have been identified as reasons for ineffectiveness of the technique. In spite of this the severity of vitamin A deficiency has reduced which is leading to nutrition scientists questioning the continuation of Vitamin A supplementation. The criticism of supplementation is that it is a temporary solution since it does not address the underlying cause of nutrient deficiency: shift away from a diverse, local diet to a cereals based caloric approach to food and nutrition.

4.7.2 Fortification

Fortification consists of adding vitamins and minerals (called fortifiers) to common foods (called vehicle foods) through industrial processes. The FAO defines it as: “the addition of one or more essential nutrients to a food, whether or not it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups” (FAO, 1995). In India, salt, wheat flour, rice, milk and oil have been identified as appropriate vehicles for fortification (FSSAI, 2017). For this intervention to be effective, it is important to choose the food vehicle carefully to ensure that the vehicle is consumed locally by a large section of the population (Berti et al., 2014). Fortified food can be in the form of a single micronutrient added to food (e.g., iodised salt in India to address deficiency of the micronutrient iodine) or multiple micronutrients added to food (e.g., iron and iodine fortification of salt or Vitamin A and D fortified oil).

Fortification as a technical 'fix' for malnutrition in India dates back to 1953 when vanaspati or hydrogenated oil was mandatorily fortified with Vitamin A. Subsequently in 1986 the country adopted a policy of universal salt iodization followed by legislation in 2005 at the national and state levels prohibiting the sale of non-iodised salt for human consumption. The National Nutritional Policy 1993, placed fortification of essential foods with appropriate nutrients as a short-term direct nutritional intervention. The push for fortification as a key strategy to address micronutrient malnutrition continues with the Food Safety and Standards Association of India bringing out a regulation on fortified foods – Food Safety and Standards (Fortification of Foods) Regulation, 2016 covering the production, manufacture, distribution, sale and consumption of fortified foods.

Standards for voluntary fortification of wheat flour was available in India in the 1970s. Several States across the country have been providing fortified wheat flour (with iron, folic acid, Vitamin B and in the case of West Bengal, Vitamin A as well) as part of the PDS, ICDS and MDM programmes as well as in the open market. Micro-level studies indicate improvements in iron deficiency and iron deficiency induced anaemia, however prevalence of anaemia continues to be among the highest in the world.

Milk has been fortified with Vitamin A since the 1980s when the Government subsidised the dairies to promote milk fortification. More recently in 2013, Rajasthan Cooperative Dairy Federation has started fortifying milk with Vitamin A and D. The Task Force on Micronutrients, organised by the Department of Biotechnology and National Institute of Nutrition in 2007 recommended that all toned and double-toned milk should be fortified with Vitamin A to replace the amount of Vitamin A lost during the process of toning.

Fortification of edible oils with Vitamin A, E and D3 are increasingly prevalent across the country both as Government and private sector efforts. In fact agribusiness corporations such as Cargill have developed a competitive advantage (helping fight micronutrient malnutrition) in the Indian market by fortifying their brands of edible oils with Vitamin A and D.

Community level projects are underway in various States to test the efficacy and operational feasibility of iron fortified rice through the Government's food security and nutrition security schemes.

Medical bodies such as ICMR are also pushing for the fast-tracking of fortification in India as a way to fight micronutrient malnutrition.

While fortification is being used as a tool to fight hidden hunger, the opinions of various stakeholders in the nutrition community around this are significantly polarised. Governments, UN agencies, donors, some researchers and academics and the private sector advocate fortification as a safe, cost-effective strategy that has a large reach and can be quite easily integrated into existing dietary habits. Others, mainly civil society and some academics and researchers and social movements view fortification as a threat to human rights and traditional diets, with particular concerns around private sector's leading role in fortification. Typically fortification pushes the Green Revolution staples such as rice and wheat leading to consumers choosing an inferior product (e.g., maida or refined wheat flour that is fortified) over one that is naturally a better source of nutrients such as millets and other local grains, pulses etc. In addition when it is provided through PDS or any of the Government's social welfare schemes it exacerbates this shift. The other argument is about the push towards processed and packaged food and away from more natural and whole foods. A prominent critic of fortification is Dr. Veena Shatrugna, former deputy director of National Institute of Nutrition, Hyderabad. She warns that "Micronutrient fortification of our food will create a nutritional mess, and the body will face a new range of burdens and problems. It will stem any attempts to improve diets of children, both qualitatively and quantitatively." (Boga, D. 2015).

Globally, fortification is being promoted and coordinated extensively by collaborations between private sector, Governments, NGOs, researchers and philanthropic foundations. These include Micronutrient Initiative (based in Canada), Flour Fortification Initiative (based in Emory University), and the Global Alliance for Improved Nutrition (GAIN, based in Geneva) (Welthungerhilfe & Terre de hommes, 2014). Efforts are also underway to set regional standards for fortification. The FAO, WHO and the Scaling Up Nutrition (SUN) movement have also included food fortification at the heart of food-based solutions to micronutrient malnutrition, particularly for improved maternal and infant nutrition and health in the first 1,000 days. The renowned medical journal Lancet series, has also endorsed food fortification (See **Box 4** for more on GAIN and SUN).

Box 4: Industrial Nutrition - GAIN and SUN (Source: Welthungerhilfe & Terre de hommes, 2014)

GAIN – Global Alliance for Improved Nutrition was launched in 2002 to focus on micronutrient deficiencies. This is an independent non-profit foundation which focusses on mobilising public-private partnerships to address malnutrition. It supports market-based nutrition solutions to address malnutrition among people and populations most at risk. GAIN's main strategies include: large-scale food fortification, maternal, infant and young child nutrition and agriculture and nutrition. It is the major convening vehicle for governments, international NGOs and private-sector stakeholders to promote food fortification. As of May 2014, GAIN was working with over 600 companies and civil society organisations across almost 40 countries, reaching an estimated 859 million people with nutritionally enhanced food products. In India, GAIN's interventions focus primarily on expanding food fortification initiatives to address micronutrient deficiencies across the country. It has made investments in the ICDS and MDM programmes. It is also in partnership with Public Health Foundation of India and engages with Ministry of Women and Child Development, Food and Civil Supplies and many other to ensure strong support for the programs.

GAIN's Business Alliance for Food Fortification (superseded by the Scaling Up Nutrition – SUN – business network, launched in 2014, of which GAIN and the World Food Programme are co- hosts) included corporations such as Coca-Cola, Unilever, Cargill, Danone and Kraft Foods, many of which have been indicted by civil society organisations with breaches of human rights and code violations that contribute to malnutrition.

70% of GAIN's budget for fortification focuses on partnerships in India, Brazil, Indonesia and China. Both SUN and GAIN prioritise technical interventions. Funding sources for GAIN include the Gates Foundation, USAID, UN agencies and several others.

In a report to the Human Rights' Council the UN's former Special Rapporteur on the right to food, Olivier de Schutter, highlighted his concern (echoed by others) that SUN and GAIN failed to “explicitly align their initiatives with human rights, including the right to food”, and overlooked the “entitlements that have been established under international law for women, children, minorities, refugees and internally displaced persons and other groups that may be subjected to marginalisation and discrimination.

4.7.3 Biofortification

This refers to the use of traditional crop breeding practices or applications of modern biotechnology (e.g., tissue culture, mutational breeding, molecular breeding and genetic engineering) to increase the micronutrient concentration in crops. This type of intervention aims at improving the specific micronutrient deficiencies of a target population. The WHO differentiates biofortification from conventional fortification as: “biofortification aims to increase nutrient levels in crops during plant growth rather than through manual means (unlike conventional fortification) during processing of the crops. Biofortification may therefore present a way to reach populations where supplementation and conventional fortification activities may be difficult to implement and/or limited” (WHO, 2017).

Biofortification is promoted as a technique of delivering nutrients naturally (as opposed to chemically processed) fortified, to poor people in rural areas who have limited access to commercially marketed fortified foods. It is also considered to be a cost-effective and sustainable, long-term solution to micronutrient deficiencies: a one-time investment in plant breeding that can yield micronutrient-rich varieties for farmers to grow for the future (Welthungerhilfe & Terre de hommes, 2014).

In India, biofortification is being promoted extensively to address micronutrient malnutrition. Both internationally and in India a leading effort in the promotion of biofortification is the Harvest Plus Challenge Programme. The programme is extensively supported by USAID and foundations such as the Gates Foundation. Local in-country partners include private and public agricultural research institutions, private seed companies, CGIAR etc. Biofortified varieties of rice, wheat, maize, cassava, pearl millet, beans, and sweet potato are currently being developed under the Programme with conventional breeding being the primary focus to increase the content of iron, zinc, and provitamin A carotenoids. Research using genetic engineering techniques is also underway with various food crops.

The programme supports the National Agricultural Research System in India to breed, test, and release biofortified pearl millet and wheat developed through partnership with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Maize and Wheat Improvement Center (CIMMYT). In India, the focus is on improving the iron and zinc status of households through pearl millet and wheat, respectively. Work is also underway on high-zinc wheat, with three varieties already commercialized and more still being developed or undergoing testing. In 2014, farmers in Uttar Pradesh, Bihar, Chhattisgarh, and Uttarakhand received and planted seeds of two of the zinc wheat varieties. ICAR's Biofortification programme has developed a high – Zn rice variety and is working on other nutrient rich varieties of wheat, maize and millets (Balasubramanian, 2016).

While its implementation is in early stages in India, Harvest Plus supported randomised trials in India report efficacy in improvement of iron status in iron deficient individuals (Finkelstein et al. 2017).

The Indian National Science Academy has identified biofortification as a priority area for research and action to reduce micronutrient malnutrition. It lists bio- fortification of rice, wheat and maize as projects currently being implemented by ICAR Institutions, state agriculture universities and National Institute of Nutrition. INSA also recommends the following as high priority areas for research and action to address micronutrient malnutrition: Golden Rice (for pro-vitamin A) to improve Vitamin A related malnutrition, high- iron rice (high ferritin gene from mangrove) and development of other micronutrient - enriched food grains, vegetables and fruits. INSA further suggests that the “GM (genetic modification) route with genes from other plant species, preferably edible varieties, is faster and with suitable safe guards regarding safety to health, protection of biodiversity, and cost; is a useful option for a country like India. While the conventional strategies of food fortification and plant breeding to improve nutritional quality should be pursued, the GM technology despite some concerns needs to be vigorously investigated.” (Indian National Science Academy, 2011).

Compared to chemical fortification and supplementation, biofortification delivers lower amounts of micronutrients. It is also a function of the amount of the biofortified food consumed per day. The various features that are necessary for a biofortified crop to be successful in reducing micronutrient malnutrition include: high yield, profitable to the farmer, demonstrable efficacy and effectiveness at reducing micronutrient malnutrition, and acceptable to both farmers and consumers in target regions.

Critics of biofortification term it as yet another centralised, top-down, 'technical fix' to the problem of hidden hunger. It is seen as an approach that fails to address social, economic and cultural issues underpinning food systems. In addition it also undermines dietary diversity, by aiming to concentrate more nutrients in a few staple foods, further simplifying diets: a process that began with the Green Revolution.

4.7.4 Ready to Eat Therapeutic Foods

The UNICEF describes RUTFs as “energy- dense, micronutrient enhanced pastes used in therapeutic feeding. These soft foods are a homogenous mix of lipid rich foods, with a nutritional profile similar to the World Health Organization-recommended therapeutic milk formula used for inpatient therapeutic feeding programmes. Typical primary ingredients for RUTF include peanuts, oil, sugar, milk powder and vitamin and mineral supplements”. Often these are recommended for routine use in India, replacing freshly cooked meals as part of the ICDS and MDM programmes.

Some of the main criticisms of RUTFs are that: (I) they potentially displace adequately nutritious and affordable local foods by commercial fortification of processed complementary foods, particularly for children below 2 years of age and (II) like all technical 'fixes' it is a narrow, ad-hoc approach to a complex social problem of deprivation and structural inequity. In addition it is also seen as yet another 'corporate capture' of food and nutrition systems.

In India the promotion of RUTF as a means to address severe malnutrition has been challenged extensively by doctors, health and right to food activists. In 2013 when the Lancet series on nutrition was launched in London and New Delhi, an independent and transparent review of the articles was carried out by a team of over 60 Indian scientists and policy makers. This team had rejected four 'Key Interventions' (mega-dose Vitamin A supplementation, preventive zinc supplementation, multiple micronutrient supplementation in pregnancy and management of moderate acute malnutrition) recommended in the Lancet Series. This was also supported by the Cochrane Collaboration's findings. Conflicts of interest were also pointed out since GAIN supports the Series, and GAIN lobbies Governments and the UN to open up markets for its corporate partners. In fact GAIN pushed for the Bill on fortification in India. In addition a lead author is a member of a board created by Nestle (Gupta A. 2013).

The Jan Swasthya Abhiyaan and the Right to Food Campaign have strongly opposed the use of RUTF. In a position paper by the Working Group of Children Under Six, the authors highlight the push for commercially produced RUTF by the UNICEF. Imported RUTF (manufactured by a French company) was unilaterally pushed in some states, bypassing due process of discussion, by UNICEF. The authors point to this as a violation of the directions by the Supreme Court to provide one hot cooked meal to children under six years of age to supplement their nutrition. In addition it also completely disregards the guidelines for community and home- based treatment of SAM formulated by a large group of experts and supported by the Indian Academy of Pediatrics recommending the use of home-based food (modified from the family pot). It specifically warns that commercially available international RUTF may not be suitable, acceptable, cost effective and sustainable (Working Group for Children Under 6, 2009).

The Working Group also describes RUTFs as disturbing the concept of self reliance in food security while creating “an unnecessary dependence upon a product upon which families and communities have little control”. The other strengths of community based treatments include: promotion of local agricultural practices (e.g., millets) and locally available foods); support to local livelihoods for families where children may be suffering from malnutrition and an opportunity to raise economic status as well as promote local women's groups and small scale operations.

More recently however, in June 2017, the Women and Child Development Department in Maharashtra has proposed introduction of an RUTF in the form of a nutrient paste for malnourished children across the state. This is being questioned by activists, Ministers and other related Government Departments. While the State has cut down its ICDS budget by 31 per cent from the 2016-17 budget, a significant allocation has been made for market-based “solutions,” such as “take home ration” (THR) packets provided to families of children under three (Barnagarwala, T. 2017). These powders are to be mixed with warm water or milk and fed to the child. Moreover the company that may supply RUTF packets on a large scale in Maharashtra is a Norwegian company, G C Rieber Compact, which has a subsidiary in India with a manufacturing plant in Gurgaon, Haryana (Sukla et al. 2017).

Overall, RUTFs are a 'fix' that have demanding specifications which can only be produced by technically equipped corporations.

5.0 Community Enquiry into Their Traditional Diets and Food Systems

To realise the objective of the study, it was critical for communities to understand the ground reality of food, hunger and malnutrition in their locations. Communities of adivasi, dalits, small and marginal farmers and agro-pastoralist communities located in diverse agro-ecological regions of Andhra Pradesh and Telangana enquired into their own food practices. As discussed in Section 3.0, the community enquiry, involved community facilitators using a framework of participatory action research (PAR) to explore the questions within their own communities.

5.1 Brief Description of the Study Area for Community Enquiry

5.1.1 Village Badampet, Sangareddy district, Telangana State

Badampet village in Panyala Panchayat, Hathnoora Mandal, Sangareddy district consists of 129 households. The majority (104) are small and marginal farmers from Backward Caste (BC-88), Muslim (15) and dalit (SC-1) communities. There are about 4 families who are completely landless, 3 families are agro-pastoralist and rear sheep and goat in addition to farming while 17 households own bullocks, 2 own cows, and 15 own buffaloes. The remaining households belong to Other Caste (OC) communities who are middle and large farmers. Of 800 acres of cultivable land, 200 acres was erstwhile grazing land, which over the years has been assigned to various landless communities as cultivable land. There are 3 large lakes in the village. The crops grown in the village currently include rice, red gram, sorghum, green gram, ragi and vegetables. Cotton and maize for poultry feed is also grown. The village has a government primary school, a ration centre where rice is distributed under the government public distribution system (PDS). Services such as the Public Health Centre, E-Seva, and other facilities are located at a distance of 2-3 km from the village. The nearest weekly market is in Hathnoora, at a distance of 2 km. BC, SC and Muslim families participated and led the dialogue in their village.

5.1.2 Village Sikandlapur, Sangareddy district, Telangana State

Sikandlapur village and panchayat, is located in Hathnoora Mandal, Sangareddy district. It has 549 households, with a population of 2644 according to Census 2011. The total geographic area of the village is 1081 hectares. BC (Murthiraj, Kurma, Gouds.), Dalit (SC-45) and OC (Reddy) communities live in the village. The dalit community specifically carried out the enquiry within their group of 45 dalit households. The average landholding amongst dalit households is 1 acre, with some families being completely landless. Some of the dalit families rear buffalos, chicken and goats. Agriculture labour is their main livelihood. Families work on their own land too, and grow crops, most of it to sell to the market.

5.1.3 Village Mandemvaripalli, Chittoor district, Andhra Pradesh State

Mandemvaripalli located in Thettu Panchayat, Kurabalakota Mandal of Chittoor District is a hamlet consisting of 206 households. 180 families of these are pastoralist and farming families of the Backward Caste communities (Golla, Vaddera, Kummari, Chakali). There are 21 OC (Reddy) households and 5 Muslim households. The primary livelihood is dairying, Sheep and Goat Rearing, and agriculture. About 100 farmer families own cows that produce about 700 litres of milk a day. The weekly nearby local markets are on Monday, Tuesday and Wednesday. The closest forest is Thettu Reserved Forest, that is part of the Horsely Hills forest range of Madanapalli forest block, where the community has secured their rights to graze sheep, goat and cattle. From these forests, the people collect tamarind, medicinal plants, wild fruits, honey, wood for cooking and bamboo. There are man-made percolation tanks in the region and if there is enough rains, the water is replenished which in turn charges the water table. Sometimes these tanks also breed fish used as a source of food. The shepherd-goatherd families in the village own about 1-3 acres of land per family. There are a few landless families as well. The main crops grown here are millets (finger millet, pearl millet, foxtail and kodo millet), paddy for home consumption when irrigation is available, pigeon pea, tomatoes and other vegetables, fodder and forage grass for cattle and flowers.

5.1.4 Village Rayapedu, Chittoor district, Andhra Pradesh State

Rayapedu village and panchayat, is located in KVB puram mandal, Chittoor district. The village consists of 610 households: 400 BC (Golla Kurma), 10 OC (Reddy, Balji, Shetty) and 200 Dalit families. Of the Dalit families, 10 families own 50 acres of wetland / irrigated land, 46 families own 60 acres of assigned lands (DK titles), or little over 1 acre per family while 144 families are landless. Of the BC families, 14 families own 28 acres of DK titles or assigned lands, 200 families own about 700 acres of permanent land or roughly 3.5 acres per family. The remaining 186 families are landless. Nine of the OC families own 45 acres of land or roughly 5 acres per family while one family is landless. The families with land, carry out agriculture and labour work. Some families rear goats, chicken, sheep, and local and jersey

breeds of cattle. Gorrepakonda is the closest forest from where the communities collect wood for cooking, home construction, broomstick grass, and other wild fruits and leaves. The animals also graze in the forest. Rayapedu is named after the Ragi (finger millet), that used to be grown in abundance in the past.

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5.1.5 Village Muslimetta Hamlet, East Godavari district (Schedule V Region), Andhra Pradesh State

Muslimetta Hamlet is one of 7 other villages in Dhalipadu Panchayat, Y. Ramavaram Mandal located in the Scheduled V regions of East Godavari district. The hamlet falls under the Vedullakonda forest beat of Kakinada forest division. It consists of 30 households, of whom 2 are landless, 19 are small and marginal farmers and 9 are medium farmers. 28 families are Kondareddy adivasis, 1 family is Konda kamara and 1 is a non-tribal family. Agriculture, livestock rearing, collection of forest produce and wage labour are the primary sources of livelihood. Agriculture comprises shifting agriculture (podu) on the hill slopes, as also settled agriculture in the valleys between the hills. Agriculture is entirely rainfed and the crops include dryland paddy, bajra, foxtail millet, finger millet, jowar, maize, black gram, green gram, cowpea, sesame, and local tobacco. Cashew and rubber are the plantation crops grown, introduced through various government schemes. Families own cattle, goats and poultry.

5.1.6 Village Bondiguda, Srikakulam district, Andhra Pradesh State

This village is located in Garulapadu Panchayat, Hiramandalam Mandal, Srikakulam district. The village is home to the Savara adivasi tribe, and 45 families live in Bondiguda. The primary occupation is agriculture through shifting cultivation and the sale of minor forest produce. Collective agriculture is also practiced. The community rears, goats, sheep, pigs, chicken and cattle. The weekly local market is in Seethampeta on Mondays and in Kusmi on Saturday. Bondiguda is surrounded by forests and is located on a hill. Fifteen families do not have land titles and their claims for titles submitted via the Forest Rights Act, are in the process of being re-surveyed. Despite their land not being recognised by the government, they continue to cultivate crops on this land which is inherited from their ancestors. The remaining families have land titles. The name Bondiguda originates from the water source that lies under a boulder. Ancestors who founded the village, named it to mark the importance of water.

5.2 Findings and Analysis

The community enquiry in 6 villages across four districts (East Godavari, Srikakulam, Chittoor and Sangareddy) of Andhra Pradesh and Telangana States covered varied socio-ecological systems. As described above, the study area included diverse agroecological regions: semi-arid agro-pastoral landscapes with sparsely forested (primarily dry mixed deciduous and thorny scrubs) areas (Chittoor and Sangareddy districts) as well as tropical moist and dry deciduous forests (East Godavari and Srikakulam districts). The communities who carried out the study to enquire into their own food systems and practices included adivasis from Scheduled V and non-Scheduled V regions and landless, small and marginal farmers and agro-pastoralists from Dalit, BC and Muslim communities. As part of the family level enquiry, individual families mapped yearly food consumption practices over seasons, source of food, type of food, as well as local knowledge of the nutritive value of the food, method of preparation and storage.

The composition of the traditional diets of the communities which are in practice today in the study areas are summarised in Table 2. The various food items have been categorised into broad food groups e.g., cereals, pulses, vegetables, meat/milk etc., to provide an overview.

Table 2 : Composition of the Traditional Diets of the Communities in the Study Areas - Summary

| | | Andhra Pradesh | | | | Telangana |
|----------------|-------------------------------|----------------|------------|-----------------------------------|--|---|
| | | East Godavari | Srikakulam | Chittoor (E) Kalahasti | Chittoor (W) Madanapalli | Sangareddy |
| | Community | Adivasi | Adivasi | Small & Marginal Farmers Dalit | Small & Marginal Farmers Dalit, BC, | Small & Marginal Farmers Dalit, BC, Muslim |
| | Ecology | Forests | Forests | Semi-arid with scanty forest | Semi-arid with scanty forest. | Semi-Arid 2 hrs from a metropolitan city |
| C | Cereals | 8 | 7 | 3 | 10 | 4 |
| U C | Cereal / Grass | 1 | 1 | | | |
| C | Legume / Nuts / Pulses | | | 6 | 8 | 7 |
| U C | Wild Nuts | 1 | 8 | | | 2 |
| C | Oil Seeds | 3 | 2 | 6 | 2 | 1 |
| C | Vegetables | 15 | 11 | 22 | 23 | 15 |
| C | Leafy Vegetables | 3 | 1 | 5 | 6 | 12 |

(i) the study demonstrates that a wide diversity of both cultivated and uncultivated foods are part of the traditional diet of all the communities, cutting across all the agro-ecological districts. The composition of the diet clearly reflects the agroecological landscape e.g., presence of a high proportion of foraged leafy vegetables, uncultivated fruits, tubers and diverse sources of meat in the diet of the adivasi community from Bondiguda Village in Srikakulam located in a forest dominated landscape and the absence of milk and dairy products vs milk and dairy products and dominance of cultivated foods in the small and marginal farmers' diets located in semi-arid landscapes with sparse forests. As expected, much greater diversity was observed in the traditional diets of forest-based adivasi communities;

(ii) Even today, over 100 different items constitute the diet of adivasi communities even today in Srikakulam and East Godavari. Even in the

| | | | | | | |
|----------------|---------------------------------|-----|-----|----|----|----|
| U C | Foraged Leafy Vegetables | 18 | 13 | 3 | 4 | 6 |
| C | Tubers | 0 | 7 | 1 | 2 | 1 |
| U C | Foraged Tubers | 7 | 8 | 1 | 2 | 1 |
| C | Fruits | 8 | 14 | 8 | 14 | 9 |
| U C | Wild Fruits | 25 | 15 | 11 | 3 | 13 |
| U C | Flowers | 3 | 4 | | | |
| U C | Nectar / Toddy | 3 | 2 | 1 | | |
| | Meat/Eggs/Milk | 6 | 7 | 9 | 7 | 8 |
| | Insects | 3 | 1 | 1 | | 1 |
| | Total | 112 | 106 | 76 | 79 | 80 |

The following salient observations emerge from the findings presented in Table 2:

semi-arid areas in Chittoor and Sangareddy district small farming and pastoralist communities report close to 80 different food items as part of their diet. It is also important to note that uncultivated foods / foraged leafy vegetables and wild fruits continue to be part of communities diet. This is a significant finding given that these villages are close to towns and cities and are likely to be impacted by the 'supermarket' culture and presence of processed foods in the market;

(iii) In all the communities food continues to be sourced from the natural environment both by gathering/foraging and through cultivation. Forest-based adivasi communities continue to forage a fair share of their vegetables, tubers and fruits from the forests; Nuts too are a critical component of the diets in adivasi areas.

(iv) A high level of cereal diversity, other than the Green Revolution staples (wheat, rice and maize), can be seen in the diet of several communities. This diversity is encouraging, particularly in the light of the uncertainty and vulnerabilities due to climate change;

(v) Cultivation of oilseeds and extraction of oil from locally grown oilseeds as a source of edible oil is a significant observation particularly in the context of making micronutrients such as Vitamin A assimilable from the abundant leafy vegetables and fruits such as papaya and mangoes. Another important to note, in this context is the consumption of meat particularly folate and iron rich organs from beef and goat meat;

(vi) Specifically, a number of micronutrient rich plant and animal foods (Beta-carotene - precursor to Vitamin A, folates, iron etc.) are part of the daily dietary intake in all the communities. Box 5 presents the Beta-carotene levels of select vegetables and meat which are part of the diet of these communities. This data provides clear evidence of the presence of rich sources of Vitamin A in these existing traditional diets.

A more detailed examination of the findings from each district is necessary to understand the interconnections and interdependencies between food systems, the agro-ecological landscape in which they exist and the cultural and socio-economic conditions that shape access to these food systems (Annex 1: Tables A1-A5). Such an examination is also essential to understand that addressing malnutrition requires a context (ecological, social, cultural and political) specific approach drawn from and embedded in the context in which the community is based.

5.2.1 Chittoor District: Landless, Small and Marginal farmers, Agro-pastoralists– Dalits and Backward Castes (BC)

The study shows how the largely agro-pastoral landscape has shaped the traditional diet in both the villages of Mandemvaripalle and Rayapedu. A wide diversity of cereals, particularly millets and pulses in the diet reflects the crop choices and agricultural practices of this community best suited to the semi-arid landscape, its rain patterns and soil types.

Season-specific millets are consumed throughout the year e.g., finger and little millet primarily in summer while pearl, kodo and proso millets in the cooler months. This reflects a deep understanding of the role of seasonality in overall health and nutrition. In both the villages studied, the diet has a high proportion of leafy vegetables (cultivated and foraged). These are rich sources of folates, iron and Vitamin A. Moringa, which is being termed a 'superfood' today, has been and continues to be an integral part of the food system. The leaves (considered to be rich in calcium), pods and flowers are part of the diet. The access to uncultivated leafy vegetables comes from the use of animal manure for agriculture and also the community's knowledge of nutritional and medicinal properties of plants that grow in uncultivated lands and forest areas. Large varieties of gourds which form a part of the diet particularly in the summer season reflects the strong influence of season on the diet in both the semi-arid, hot dry landscapes.

Animal products in the form of milk and diverse types of meat form a part of the diet in both villages. While goat, sheep and chicken dominate the meat in the diet of the community in Mandemvaripalle, beef is absent from their diet. Occasionally they have access to foraged wild boar meat. Beef, an important source of protein, iron, folates and Vitamin A is a significant part of the diet of the Dalit community in Rayapedu village. This highlights the role of food cultures of different communities in shaping the sources of food.

As seen from Table A1 and A2, different parts of both vegetables and animals are consumed. Discussions revealed how each part was consumed for specific nutritional benefits in various seasons or for various health conditions. This reveals a complex and sophisticated understanding of health and nutrition evolving from lived experience in a particular socio-ecological setting.

Proximity to towns and markets in the case of both villages allows access to diverse fruits. In addition access to local commons and the nearby forests allows foraging of naturally growing wild fruit as well.

It is important to note that although subsidised palm oil is provided through the Government's PDS and cheap palm oil in the open market, in both the study villages oil extracted from locally grown oil seeds such as gingelly, groundnuts and sunflower also continue to be consumed.

5.2.2 Sangareddy District : Landless, Small and Marginal Farmers and Agro-pastoralists – Dalits, Backward Castes (BC) and Muslims

In Badampet and Sikandlapur villages in Sangareddy District the diet is characterised by a lower diversity of cereals as compared to Chittoor. Rice, wheat, jowar, maize and ragi continue to be widely consumed here on a regular basis. In Chittoor district, except for jowar and maize, people consume rice, wheat, ragi, bajra, sama, korra and areka. While traditionally, diverse types of millets formed a significant part of the diet (korra, sama, areka and traditional maize used to be consumed till up to about 20 years ago), the State's agricultural policies have systematically forced a shift to commodity crops such as cotton and feed crops (e.g., maize) which has led to a reduction in this cereal diversity. It has also led to a substantive reduction in the extent of cultivation of seasonal pulses such as green gram, black gram, red gram and chickpea as also oilseeds such as sesame, safflower and flax. Many farmers are today purchasing the latter, rather than cultivating them, as they did earlier. As seen in Table A3, a wide variety of micronutrient rich leafy vegetables (cultivated and uncultivated) are part of the diet, including the nutrient rich Moringa. Further more, there is evolved knowledge amongst elders in the community on how cultivation of certain crops such as jowar (sorghum), facilitate the complementary presence of certain uncultivated leafy vegetables like jonnagadlakura.

Several farmers cultivate green leafy vegetables and other seasonal vegetables (ladies finger, brinjal, beans, tomatoes, onions, etc) and sell these in the local markets, where other local farmers purchase the same. The nutritional value of the diet is enhanced by various kinds of meat consumed in these villages: from fish, crab, goats, sheep, and beef. Meat is a rich source of vitamin A, folates and iron for these families. Beef an important source of retinol crucial for Vitamin A metabolism, is a significant part of the diet of mainly Dalit and Muslim families. This has particularly nutritional significance for several landless families working whose primary source of livelihood is labour. Various greens and their flowers are particularly consumed during the summer months, as they are considered to be cooling for the body.

Fish from the village tanks/lakes/ponds, forms an important part of the diet, as seen in Table A3. Proximity to an urban area has also increased the access to non-locally grown fruits such as bananas, oranges, melons and apple. The collective understanding of

seasonality of foods, nutritional and medicinal properties of the various leafy vegetables, wild fruits and types of meat and the interdependence between the food system and livelihood emerged strongly during this exploration.

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It is important to note that although subsidised palm oil is provided through the Government's PDS and cheap palm oil in the open market, in both the study villages oil extracted from locally grown oil seeds such as gingelly, groundnuts and sunflower also continue to be consumed.

5.2.3 Srikakulam District: Adivasi Communities

The traditional diet of the Savara Adivasi families in Bondiguda village is shaped by their lives and culture being embedded in a hilly and forested landscape. As seen from Table A4, the diet has a significant proportion of uncultivated and foraged vegetables, tubers, fruits and nuts, as well as diverse varieties of meat. The presence of a diverse number of tubers rich in macro and micronutrients are unique to Adivasi communities whose lives are strongly tied to the forests. The diet includes almost all parts of the Moringa tree including its flowers as seen in the rural villages. In addition the diet of the Savara families here includes flowers of Bauhinia racemosa. Millets form a significant part of the grains consumed by the community which practices the traditional shifting cultivation for food production. The fertile soil, access to water sources and the surrounding forest make for a diverse and nutritious diet. The diverse varieties of meat that form a significant part of the diet of these families include: beef, pork, chicken and goat.

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In exploring their diets as a part of this study the knowledge, based on generations of lived experience, of access to suitable foods and medicinal plants, practices of sustainable harvesting, preparation and storage of food, emerged during the sharing at a family level as well as during the village and larger community level validation.

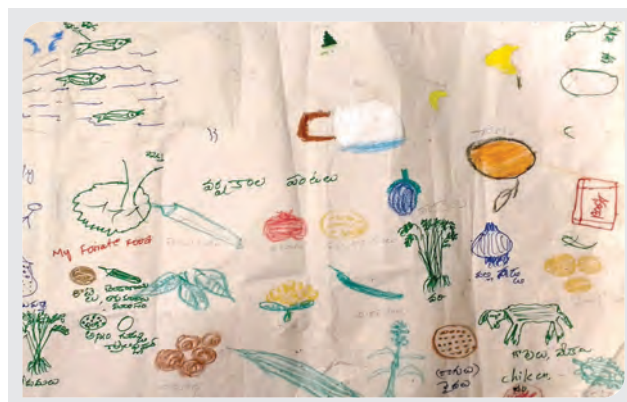
5.2.4 East Godavari District: Adivasi Communities

The diet of the Adivasi families in Muslimetla hamlet, as also in other villages of the Dhalipadu Panchayat, in East Godavari exhibit extensive diversity similar to the Savaras in Srikakulam (Table A5). There is a greater proportion of cultivated foods including vegetables, fruits and oilseeds. Rice, wheat, bajra, jowar, ragi and korra are the primary cereals and millets consumed. Proximity to the forest and the community's knowledge and practice of foraging has led to a variety of diverse tubers continuing to be part of the diet. Over 18 wild and non-cultivated foraged leafy vegetables are consumed at different points through the year. Unique to this area is the Palmyra and Elephant palm trees, which are central to the life, culture and food system of the communities. Toddy, the palm fruit, palm roots, are all consumed as food. As in the case of the Savaras, every part of the Moringa plant including flowers are consumed. Meat is a rich source of nutrition and includes meat of goat, pigs and chicken. Whilst the Konda Reddy adivasis do not consume beef, the latter is an important part of the diet of the Koya adivasis, who also live in these villages. Insects like flying ants, ant eggs and larvae, larvae that are found inside the toddy palm, are also consumed.

Photos of Community Enquiry Process



Photos of Community Enquiry Process



[illegible]46

5.3 Nutritional Analysis of the Traditional Diets and Food Systems

A quantitative nutritional analysis (Annex1 – Tables A1-A5) of the data obtained from the community enquiry is presented in this section.

From a nutritional perspective, forest environments offer sources of animal foods (vertebrate and invertebrate) rich in highly bio-available iron, zinc and vitamin B12 (as well as protein and fat) and diverse options for obtaining leafy vegetables, fruits, nuts and other plant foods important for intake of vitamin A, iron, folate, niacin and calcium.

Table 3 below mentions the proposed servings (amount) per day to meet the recommended dietary allowances for an average Indian man performing moderate level of physical activity according to ICMR (NIN, 2011). However, as indicated from the primary data, a recommended intake of the different food groups commonly consumed across the 4 districts is projected:

Table 3 : Interpretation of Primary Data From the Community Enquiry

| Food Groups | ICMR Recommendations | CHAI's Recommendations | Interpretation of primary data received across the 4 districts |
|--------------------------------|-------------------------------|------------------------|---|
| | Serving Size (Amount in g/ml) | | |
| Cereals and Millets | 425 g | 425 g | Ragi was most popular among all. |
| Pulses and Legumes | 50 g | 50 g | Red gram/Field beans were most popular |
| Milk and Milk Products | 300 ml | 0 | Very poor consumption across 4 districts hence not included |
| Egg and Egg Products | 25 g | 50 g | Very good consumption pattern with different varieties hence the amount can be increased to 100 g |
| Poultry/Meat/Fish Preparations | 30 g | 50 g | to make up for deficit faced due to poor milk consumption |
| Nuts and Oils Seeds | 45 g | 60 g | Variety of nuts like almonds, cashew nuts, groundnuts and coconuts are consumed along with |
| | | | different oilseeds and hence the amount can be increased to 60 g per day |
| Green Leafy Vegetables | 50 g | 100 g | A wide variety is consumed by either buying from the market, foraged from the forest or cultivated. The intake can be increased for green leafy vegetables to 100 g, other vegetables to 300 g and roots and tubers to 100 g per day. |
| Other Vegetables | 285 g | 300 g | |
| Roots and Tubers | 50 g | 100 g | |

| | | | |
|---------------|-------|-------|---|
| Fruits | 100 g | 250 g | The wide variety and diversity was indicated in the primary data and can be increased to 200-300 g per day |
| Fats and Oils | 30 g | 30 g | The data indicates diverse oils used in cooking and we would keep the visible intake on oil same since the invisible good fats are already increased through nuts and oilseeds and animal/poultry/fish consumption. |

5.4 Strengths and Concerns Around Traditional Diets and Food Systems

The extremely diverse and nutritious diet of the communities in their exploration of their diets, provides evidence of a robust food system in these communities. As presented above, both in the enquiry and in the quantitative nutritional analysis, the preferred and commonly consumed food items are not only a source of macronutrients but are rich in important micronutrients such as iron, calcium, vitamin A (See Box 5), vitamin C and folate. The diet in each of these communities is unique to the ecological, cultural and social context which has allowed people's physiology to adapt to local conditions. While the forest-based Adivasi communities in Srikakulam and East Godavari have a traditional diet with a significant proportion of uncultivated / foraged foods, the traditional diet of villages even in districts such as Sangareddy and Chittoor, proximal to large towns and cities and where there is influence of green revolution technologies as well as processed foods, continue to have close to 80 different types of food items.

Box 5: Traditional Diets, a Rich Source of Vitamin A

A preliminary assessment of some of the foods that form a part of the diets of the communities showed high levels of total carotenoids¹³ (precursor to Vitamin A production in the body).

Quantity of total carotenoids in ug per 100 g of edible portion of the food item

| S. No. | Food Item | | | Total Carotenoids 1ug/100g edible portion |
|--------|-------------------|--------------------|--------------------|---|
| | Telugu Name | English Name | Botanical Name | |
| 1 | Sajja/Ganti | Pearl Millet | Pennisetum glaucum | 293 +/- 55.7 |
| 2 | Jonna | Sorghum | Sorghum sp. | 212 +/- 48.9 |
| 3 | Ragi/Taida/ Cholu | Finger Millet | Eleusine coracana | 154 +/- 25.6 |
| 4 | Mokka Jonna | Local tender maize | Zea mays | 1428 +/- 225 |

| | | | | |
|----|----------------------------|-------------------------------|---------------------------|--------------------------------|
| 5 | Chenaga pappu | Bengal Gram dal | Cicer arietinum | 1018 +/- 16.9 |
| 7 | Avisi | Vegetable hummingbird leaves | Sesbania grandiflora | 36087 |
| 8 | Dantaku/Thottakura | Green Amaranth Leaves | Amaranthus viridis | 20473 +/- 1060 |
| 9 | Dantaku/ Erra Thotakura | Red Amaranth Leaves | Amaranthus cruentus | 21449 |
| 10 | Dantaku/Thotakura | Red and Green Amaranth Leaves | | 20181 +/-1961 |
| 11 | Bachhalaku | Malabar spinach | Basella alba | 5824 |
| 12 | Chema aku | Colocasia leaves green | Colocasia esculenta | 26820 +/- 3413 |
| 13 | Monagaaku | Drumstick leaves | Moringa oleifera | 38765 +/- 7172 |
| 14 | Menthaku | Fenugreek leaves | Trigonella foenum-graecum | 12755 +/- 1221 |
| 15 | Kanda mullem | Brown skin sweet potato | Ipomoea batatas | 8653 +/-749 |
| 16 | Dhaniyalu/ Kothamiri | Coriander leaves | Coriandrum sativum | 13808 +/- 2107 |
| 17 | Karivepaku | Curry leaves | Murraya koenigii | 21862 +/- 2168 |
| 18 | Gongura Puntikura | Roselle | Hibiscus sabdariffa | Beta carotene – 4135 ug/100g** |
| 19 | Chinta aku | Tender tamarind leaves | Tamarindus indica | 4002 +/-389 |

Source: Indian Food Composition Tables, National Institute of Nutrition, Hyderabad, 2017

** Source of this data: Hibiscus sabdariffa L. – A phytochemical and pharmacological review. In: s Da-Costa-Rocha, Bernd Bonnlaender, Hartwig Sievers, Ivo Pischel, Michael Heinrich Food Chemistry 165 (2014) 424–443. <https://www.sciencedirect.com/science/article/pii/S030881461400692X>

Organs such as liver and kidney of beef and goat have high levels of retinol, the precursor to Vitamin A.

Goat liver – 156555 +/-972 ug/100 g of edible portion

Sheep liver – 14106 +/-866/100 g of edible portion

Beef liver – 9119 +/- 707/100 g of edible portion

In two studies carried out in India, one in adults and the other in children absorption of β -carotene from green leafy vegetables was found to be much higher, ranging from 50 to 99%. Lower figures were obtained for the absorption of β -carotene from other sources such as carrots and papayas.

This is of particular significance when fortified foods including biofortified foods such as the genetically engineered Golden Rice are central to the biotech industry and the Government of India's strategy to address Vitamin A deficiency. The latest version of Golden Rice (GR2E) has only 3700 ug of Beta-carotene / 100 gms of rice. Thus nutritionally the traditional diet is significantly superior to address VAD than Golden Rice. A recent report from a consultation by the USFDA on Golden Rice supports this point when it states in its memo: "the concentration of β -carotene in GR2E rice is too low to warrant a nutrient content claim."

Vitamin A is a fat soluble vitamin and so the combination of animal fats and diverse tubers, leafy vegetables etc. which are a part of the traditional diet ensures bioavailability of the micronutrient(s). When provided in isolation as a 'technical fix' in a food environment where the complex and interconnected grain-oilseed-pulse-vegetables-animal protein is destroyed and where refined grain is provided in the PDS/MDM/ICDS micronutrients are ineffective and will only lead to chemical load in the body.

Many of the foods identified by the community in their exploration of their own diets and food systems, also have medicinal properties which was known to the local community based on practical knowledge and traditional wisdom.

The irony is that many of the foods consumed by the communities e.g., Moringa, is now considered a superfood and is priced steeply in urban markets, so it is surprising that rather than promoting traditional diets as the strategy to address malnutrition, the Government is seeking technical fixes and industrial agricultural solutions.

The availability of a wide array of foods is evidence enough to indicate that the existing nutrient potential must be at the heart of reducing the risk of micronutrient deficiencies. Meat, fish and crabs, pulses/legumes and certain leafy vegetables such as Amaranthus, are the main contributors of protein and iron while a variety of available leafy vegetables, tubers, seeds and fruits contribute to micronutrients like vitamin A, folic acid, vitamin C and iron including the phytonutrients.

The significance of the findings of this study is even more when seen in the context of global agriculture, food and nutrition policies which are homogenising food systems and enabling the hegemony of industrial agricultural food products (fortified foods, ready to eat foods), which are being pushed even into Mid-Day Meals and the Integrated Child Development Schemes as a solution for hunger and malnutrition in all these areas. These findings are also significant given that Adivasi and Dalit communities are reportedly suffering from high rates of chronic malnourishment which compromises the health and well-being of women and children in particular and also the community at large, as also increasing their susceptibility to several diseases.

Community dialogues revealed holistic and not fragmented knowledge based on lived experience over long periods of time in a way that is directly connected to the web of life: knowledge of not just what to eat, when and where to access but embodied in this is also knowledge of soils, weather patterns, seeds, adaptation to changing conditions. Therefore, implicit in the diversity of the diet and access to cultivated and uncultivated foods, is the embedded knowledge of habitats, fruiting, flowering and breeding cycles, seasonality and specific methods of sourcing the food, and complementarity of cultivated and uncultivated plants. In addition there is also the collective and practical knowledge base of nutritional and/or medicinal properties of the various plant and animal species sourced. The presence of distinct local varieties of cultivated foods including grains, pulses, oil seeds, and vegetables and location specific consumption of meats also indicates

knowledge and practice of cultivation practices, and access to seeds. There is also rich knowledge on preparations of the food, so as to retain maximum nutritive value, including ways in shade drying and storing food items, so as to utilise them during the unseasonal months, in their dry form, thus retaining and accessing their nutritive values.

The findings of the study thus point to the existence of a well balanced and nutritious diet (both in terms of macro and micronutrients) particularly amongst Dalit and Adivasi communities. Another important observation from these findings is that this lived experience and knowledge which is an integral part of the lives and livelihoods of these communities equips them with the ability to adapt to ecological and economic uncertainties: affording them a socio-ecological resilience particularly in the context of climate change. Critical for this diverse food system is the geography, ecology and the social interrelationships that forms its foundation.

The main concerns that emerged from the participatory collective exploration and consultations are around the appropriation of (i) the resource base on which is built the traditional food systems in all the communities - the source of this diversity and (ii) the knowledge base, genetic diversity (seeds and breeds) and practice, and (iii) the challenges which are also opportunities to strengthen, restore and transit to the erstwhile food production systems.

Land, water and forest rights of the communities in all these villages are seriously under threat. In many villages, incomplete land reforms to correct the skewed distribution of land remains an unfinished agenda. The vulnerabilities posed by near landlessness, have only been further heightened by severe threats to the commons (e.g., the forests, grazing lands, water sources) - the resource base for the nutritionally diverse traditional diets, which are being steadily enclosed and people excluded: mining, sanctuaries, highways, expansion of urban areas, real estate, industries, are some of the most common forces that are encroaching upon peoples resources and displacing them from the same. In an increasingly uncertain changing climate, privatisation and destruction of these commons will only serve to deepen the malnutrition crisis. Across the regions, communities articulate how difficult it is for them to continue to hold on to their traditional cropping practices and food systems, in the face of government policies that increasingly make it completely financially unviable for communities to cultivate according to their traditional and very ecologically appropriate and nutritionally rich cropping systems.

The monopoly of food and agriculture markets by a few agri-businesses, are further compromising the autonomous decision-making capacities of small and marginal farmers vis-a- vis what they grow on their fields, and pushing them into debt-based commodity production of monocrops. What is grown is then sold, and in turn they are forced to buy food, rather than cultivate food to eat first, and then sell the surplus.

The technology-centric approach to food systems and health, appropriation of knowledge in the form of seeds and germplasm, and the complete alienation of people from their knowledge is severing the animal – environment – farmer connection, as well eroding the genetic diversity. The more recent 'safronisation' of the food agenda e.g., criminalising the consumption of beef, is threatening people's sovereignty over their food systems and culture. The threat from such an approach to the inherent resilience of these socio-ecological systems deepens the risks posed by climate change in these communities.

6.0 Conclusion and Recommendations

This community enquiry into their traditional food systems and the desk review of the country's food and agricultural policies and its larger economic agenda, draws the following conclusions on the potential of diversified traditional diets to contribute to a health diet:

(i) nutritionally diverse and rich food systems are present in each of the communities in the study area. These continue to be strongly embedded in the local ecological and cultural context. Nutritional analyses of these diets shows that the foods can meet and counter malnutrition including micro-nutrient malnutrition such as VAD. An important aspect of these diets is that they do this in a holistic and comprehensive manner;

ii) communities are a rich repository of knowledge around resilient food systems (production, storage, nutritional and medicinal properties) built on lived experience. This is of significance particularly in the context of challenges to food production and nutrition from climate change;

(iii) although terms such as 'dietary diversification', 'food-based strategies' are increasingly becoming part of the malnutrition vocabulary being used by FAO, Governments and industry, the push towards biofortification (with a strong focus on genetic engineering) as part of the overall strategy continues (FAO, 2011). Emerging from the community enquiry in the present study is an emphatic rejection of the

introduction of fortified foods in their diets and other similar technical fixes. A strong need is articulated for policies, programmes and systems that will nurture these holistic socio-ecological systems of food and agriculture;

(iv) structural inequalities due to unresolved and undermined land ownership issues in India and the embedded inequalities of caste, class, gender and geography have prevented access to resources (land, water, forests and the commons in general) that have led to serious malnutrition, chronic hunger and starvation. This is compounded by an erosion of cultural and genetic diversity (in seeds, breeds, ways of production, accessing, preparing, sharing and consuming food). This fallout of the larger economic agenda which has privileged industrial agriculture and agri-business has severely compromised the resource base of the traditional food systems. To nurture the traditional diets and food systems described through this study, public investment and Government support to these marginalised communities is critical. The support required is to transform their largely chemical-based system of monocrop commodity production, to cultivating traditional foods without chemicals. This will automatically also bring in the natural wild and uncultivated greens and vegetables back onto the fields;

(v) consumption patterns are being dictated by the 'supermarket revolution' and a food retail business that is increasingly being dominated by multinational agribusiness corporations – both international and domestic. This has contributed significantly to obesity-related malnutrition. Even while the State continues its increasingly aggressive push towards further integration into the international market and corporatisation of the agricultural system further compromising people's health, hope is visible in the form of the practice and existence of traditional diets and food systems as seen during this study. Many of these communities are resisting the takeover of their food systems and cultures and working at shedding the spectre of deprivation and malnutrition.

The importance of empowering communities to nurture their food systems has been recognised by a few voices in the international arena such as Olivier de Schutter, former UN Special Rapporteur on the Right to Food who are calling for “clear exit strategy to empower communities to feed themselves”. Another prominent voice is that of Fabio da Silva Gomes, Officer of the National Cancer Institute of Brazil, Ministry of Health, External Affairs Secretary of the World Public Health Nutrition Organisation. A section of a commentary by him, which must be paid heed to by Indian policy makers, is presented here (Welthungerhilfe & Terre de hommes, 2014): “All forms of malnutrition are expressions of food systems' failures. Adopting artificial and simplistic measures to fix one of these expressions might result in the perpetuation and production of old and new problems. Policies of adding nutrients to foods, culinary ingredients or ultraprocesed products are biologically and socio-politically artificial ways to mend the failure of a food system. When a country decides to adopt them, it means that they are endorsing that its food system and biodiversity have collapsed and are no longer able to solve the expressions of malnutrition resulting from this failure. By taking that premise as truly fatal and irreversible, countries may simply drive all their efforts to artificial measures.”

The study has clearly identified how the economic trajectory and the development model adopted by the State has completely blocked and undermined the abilities of communities to practice their diverse traditional food systems and diets. This coupled with the shrinking outreach and produce content of the public food distribution system, MDM and ICDS are primary reasons why malnutrition, particularly micronutrient related malnutrition continue to be an intractable problem in India. Agriculture policies are merely serving to force farmers into keeping diversity off their farms and fields, whereas both from a climate change standpoint, as also nutrition point of view, diversity is critical.

In the final analysis, communities of landless, marginal farmers, adivasis, dalits and agro-pastoralists conclude based on this enquiry, which has been validated by scientists, that traditional diets derived from traditional food systems provide all the nutrients and micro-nutrients required to lead a healthy life. This holds particularly true for vulnerable groups within the communities : children below 5, women and the elderly and sick. Therefore, the communities do not see any necessity for the state to support programs which introduce new technological remedies to address micro-nutrients via food (such as genetically engineered rice - golden rice), as a solution.

Instead, the communities strongly assert and offer a counter proposal: the State must pro-actively support with public funds, programs that enable farmers to transition from chemical based farming, to revive their diverse traditional food systems which will locally enrich the potential to contribute to nutritionally complete dietary patterns. Communities will be able to nurture the associated transgenerational knowledge transfer, in theory and practice, and gradually shift and begin to assimilate these foods into routine diets Self-governance by local communities who know these areas intimately – cycles, access, availability, scarcity/abundance etc. - is critical to sustain these diets and systems rather than State rules and top-down Government regulations

REFERENCES

- Agarwal, B. 1992. The Gender and Environment Debate: Lessons from India. *Feminist Studies*. Vol. 18, No. 1 (Spring, 1992), pp. 119-158. Published by: Feminist Studies, Inc. DOI: 10.2307/317821. Stable URL: <http://www.jstor.org/stable/3178217>
- Balagopal, K. 1988. Agrarian Revolution, Not Wage Increases. *Economic and Political Weekly*. September 10, 1988.
- Basole, Amit and Basu, Deepankar, "Relations of Production and Modes of Surplus Extraction in India" (2010). Economics Department Working Paper Series. 109.
Retrieved from https://scholarworks.umass.edu/econ_workingpaper/109
- Barnagarwala. T. 2017. Nod to ready-to-use food to tackle malnutrition, June 4, 2017. *Indian Express*.
<http://indianexpress.com/article/cities/mumbai/maharashtra-nod-to-ready-to-use-food-to-tackle-malnutrition-4687804/>
- Berti, C., Faber, M., Smuts, C.M. 2014. Prevention and control of micronutrient deficiencies in developing countries: current perspectives. *Nutrition and Dietary Supplements*. May 29, 2014. Downloaded from <https://www.dovepress.com/> by 43.249.184.109 on 06-Jul-2017
- Bhattacharya. R, Ghosh, B.N., Mishra, P.K., Mandal, B., Rao, C.S., Sarkar, D., Das. K., Anil. K.S., Manickam, L., Hati. K.M., Franzluebbbers. A.J. 2015. Soil Degradation in India: Challenges and Potential Solutions. *Sustainability Review*. No. 7, 3528-3570; doi:10.3390/su7043528
- Boga. D. 2015. Why malnutrition is growing in rising, urban India. *Business Standard*, June 3, 2015 http://www.business-standard.com/article/specials/why-malnutrition-is-growing-in-rising-urban-india-115060300308_1.html.
- Compendium – Final Report, Zero Hunger Challenge Working Groups,
- CPS 2011. Indian Agriculture before Modernisation. <http://cpsindia.org/index.php/art/114-science-sustainability-and-indian-national-resurgence/d-science-and-technology-under-the-british-rule/158-d1-indian-agriculture-before-modernisation> (Accessed on July 15th, 2017)
- Cullather, N. 2010. *The Hungry World. America's Cold War Battle Against Poverty in Asia*. Harvard Univ Press. Cambridge, Massachusetts. 2010.
- Cullet P, Gupta J. 2009. India: Evolution of Water Law and Policy. IELRC. <http://www.ielrc.org/content/a0901.pdf> (Downloaded on July 15th, 2017)
- Dixon, J. 2009. From the imperial to the empty calorie: how nutrition relations underpin food regime transitions. *Agric Hum Values* (2009) 26:321–333.
- FAO. 1995. FAO Consultation on Food Fortification: technology and Quality Control. FAO, Rome. Downloaded from <http://www.fao.org/docrep/W2840E/w2840e0b.htm> 01-Aug-2017.
- FAO. 2001. Human Vitamin and Mineral Requirements. Report of the FAO/WHO Expert Consultation on human, vitamin and mineral requirements. FAO, Rome. Downloaded from <http://www.fao.org/3/a-y2809e.pdf> on 07-Jul-2017
- FAO. 2011. Addressing Micronutrient Malnutrition to Achieve Nutrition Security by P. Shetty. In: *Combating micronutrient deficiencies: Food-based Approaches*. edited by Brian Thompson and Leslie Amoroso. Pub CAB International and FAO. 2011.
- FAO, IFAD, UNICEF, WFP and WHO. 2017. *The State of Food Security and Nutrition in the World 2017. Building resilience for peace and food security*. Rome, FAO. <http://www.fao.org/3/a-l7695e.pdf>
- Finkelstein. J.L., Haas. J.D., Mehta. S. 2017. Iron-biofortified staple food crops for improving iron status: a review of the current evidence. *Current Opinion in Biotechnology*. Vol. 44, p. 138-145. April 2017. Accessed on 7-Jul-2017 from <http://www.sciencedirect.com/science/article/pii/S095816691730006X>
- FSSAI. 2017. *Journey of Food Fortification – Fighting Malnutrition Improving Lives*. Fortified – Sampoorana Poshan Swasth Jeevan. FSSAI, New Delhi.

- FSA, 2017. The Milk Crisis in India: The Story Behind the Numbers. Researched and compiled by The Dairy Working Group, Food Sovereignty Alliance - India: Adi Narayana N., Apparao.S, Charanya R., Murugamma V., Radha Gopalan, Sagari R Ramdas, Srikrupa R., Yadgiri G. and Yellaiah Ch.
- Fuller, D.Q. 2006. Agricultural origins and frontiers in South Asia: a working synthesis. *Journal of World Prehistory*, 20 (1). pp. 1-86
- Ghosh, J. 2005. Background Paper for HDR 2005. Trade liberalization in agriculture: An examination of impact and policy strategies with special reference to India. Human Development Report 2005, UNDP. Date retrieved, August, 2017 from http://hdr.undp.org/sites/default/files/hdr2005_ghosh_jayati_12.pdf
- Government of India. 2016. Ministry of Agriculture and Farmers Welfare. State of Indian Agriculture 2015-16, May 2016. http://www.indiaenvironmentportal.org.in/files/file/State_of_Indian_Agriculture,2015-16.pdf
- Gupta. A. 2013. The Nutrition Challenge: Can evidence and conflict of interests go hand in hand?. July 17, 2013. One World South Asia. Accessed on 6-Jul-2017 from <http://southasia.oneworld.net/peoplespeak/the-nutrition-challenge-can-evidence-and-conflict-of-interests-go-hand-in-hand#.WZfnOq2B1mA>
- History of Agriculture, Wikipedia. Accessed on July 14th 2017.
- IAASTD, 2009. Agriculture at a Crossroads. Global Report. Island Press, Washington DC.
- IFPRI, 2016. International Food Policy Research Institute. 2016. Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030. Washington, DC (<https://data.unicef.org/wp-content/uploads/2016/06/130565-1.pdf>)
- IISS, 2013. Indian Institute of Soil Science, Vision 2050, Bhopal India. June 2013. <http://iiss.nic.in/vision/vision2050.pdf>
- Indian National Science Academy. 2011. INSA. 2011. Micronutrient Security for India – Priorities for Research and Action. Published by INSA, New Delhi
- John, J and Bansari, N. 2009: Chronic Hunger in India: A Study of Nine Villages in Eight States. New Delhi, India: The Information and Feature Trust
- Kataki, P. K. 2002. Shifts in Cropping System and Its Effect on Human Nutrition: Case Study from India. *J of Crop Production*, 2008.
- Kataki, P. K. 2008. Shifts in Cropping System and Its Effect on Human Nutrition: Case Study from India. *J of Crop Production*, 2008.
- Kimura Aya Hirata. 2013. Hidden hunger : Gender and the Politics of Smarter Foods. Cornell University, Ithaca, New York.
- Levinson, F.J. Balarajan, Y. Marini A. 2013. Published by UNICEF. United Nations 2013.
- National Sample Survey Office (2014), National Sample Survey (70th Round. KI (70/18.1) Key indicators of Land and Livestock Holding in India. http://mospi.nic.in/sites/default/files/publication_reports/KI_70_18.1_19dec14.pdf.
- Nayyar. D. 2017. Economic Liberalisation. Then and Now. *Economic and Political Weekly*. Vol LII, No. 2.
- National Sample Survey Office (2003), National Sample Survey (59th Round Report No. 493) Livestock Ownership Across Operational Land Holding Classes in India 2002-03, <http://mail.mospi.gov.in/index.php/catalog/136>.
- National Sample Survey Office (1992) , National Sample Survey (48th Round, Report No 408) Livestock and Agricultural implements in Household operational holdings, 1991-92; National Sample Survey Office (1992) Land and Livestock Holdings Survey: Operational Land Holdings in India, 1991-92—Salient Features (Report 2), 48th Round, <http://catalog.ihnsn.org/index.php/catalog/2762>.
- NFHS 2016, http://www.jmnn.org/temp/JMedNutrNutraceut1137-2363642_063356.pdf
- NIN, 2011. Nutrient requirements and recommended dietary allowances for Indians – National Institute of Nutrition <http://ninindia.org/DietaryGuidelinesforNINwebsite.pdf>

- Patel. R. 2013. The Long Green Revolution, *The Journal of Peasant Studies*, 40:1, 1-63, DOI: 10.1080/03066150.2012.719224. Date retrieved, August 2017.
- Pattanaik. S. Commercialization of Shrimp Trade, Environment and Rural Poverty: A Socio-Ecological Exploration in Coastal Orissa. Centre for Interdisciplinary Studies in Environment and Development, Institute for Social and Economic Change. Bengaluru, 2006.
- Patnaik, U. 2001. Falling Per Capita Availability of Foodgrains for Human Consumption in the Reform Period in India. *Akhbar*, No. 2, October 2001. <http://www.indowindow.com/akhbar/article.php?article=44&category=3&issue=12;>
- Patnaik, U. 2004. The Republic of Hunger. Public Lecture Organised by SAHMAT, April 10, 2004. <http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=2FD0728AEF206A8D9BFE70B80148DB06?doi=10.1.1.559.6602&rep=rep1&type=pdf>
- Perkins. J.H. 1997. *Geopolitics and the Green Revolution: Wheat, Genes and the Cold War*. New York and Oxford. Oxford University Press, USA, 1997
- Pingali, P. 2012. Green Revolution: Impacts, Limits and the Path Ahead. *PNAS*, Vol. 109, No. 31. Date retrieved, August 2017 from: <http://www.pnas.org/content/109/31/12302.full#xref-ref-25-1>
- Pingali, P. 2017. The bumpy road from food to nutrition security - Slow evolution of India's food policy. *Global Food Security* (2017). Date of retrieval, November 2017. <http://dx.doi.org/10.1016/j.gfs.2017.05.002>
- Pursell, Garry and Gulati, Ashok (1993), "Liberalizing Indian Agriculture: An Agenda For Reform", World Bank, Report No. WPS 11721993, Washington. Date retrieved, July 2017. <http://documents.worldbank.org/curated/en/518381468756558998/pdf/multi0page.pdf>
- Ramachandran, V.K., Rawal, V. 2009. The Impact of Liberalization and Globalization on India's Agrarian Economy. *Global Labour Journal*, [S.I.], v. 1, n. 1, December. 2009. <https://mulpress.mcmaster.ca/globallabour/article/view/1065> (Date Accessed Jan 5, 2018)
- Ramakumar R. 2009. Indian Agriculture Under Economic Reforms: A Preliminary Review. Date retrieved August 2017. Available at: <http://www.networkideas.org/ideasact/jan09/PDF/Ramakumar.pdf>
- Ramdas, S.R. 2017. A Landscape Analysis of the Agrarian and Food Crises in India: towards evolving a Strategic Plan of support to build Democratic, Ecologically and Socially just Food and Agriculture Systems. American Jewish World Service (AJWS).
- Raykar N., Majumder M., Laxminarayan R., Menon P. 2015, *Indian Health Report: Nutrition 2015*. New Delhi, India. Public Health Foundation of India.
- Reardon T., Minten, B. 2011. The Quiet Revolution in India's Food Supply Chains. IFPRI Discussion Paper 01115 September 2011. Date of retrieval, August 2017. <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/124942/filename/124943.pdf>
- Reardon, T., Timmer, C. P., Minten, B. 2012. Supermarket revolution in Asia and emerging development strategies to include small farmers. *Proceedings of the National Academy of Sciences* Jul 2012, 109 (31) 12332-12337; DOI:10.1073/pnas.1003160108. Date of retrieval, July 2017.
- Sahay. G.R. 2010. G. R. Globalisation, Liberalisation and Agrarian Distress: A Study of suicides among farmers in India. *Global Labour University Conf. Berlin*. http://www.global-labour-university.org/fileadmin/GLU_conference_2010/papers/51._Globalisation__Liberalisationand_Agrarian_Distress.pdf
- Sarkar. S. 2014. Children bear the brunt of caste abuses in rural MP *Hindustan Times*. December 05, 2014. <https://web.archive.org/web/20141213194934/http://www.hindustantimes.com/india-news/bhopal/kids-bear-brunt-of-macabre-caste-abuses-in-rural-mp/article1-1293731.aspx>
- Satyavathi, C.T., Bharadwaj, Ch., Brahmanand, P.S. 2010. Role of Farm Women in Agriculture: Lessons Learned. *Gender, Technology and Development*. Vol 14, Issue 3, pp. 441 – 449, 2010. Date of retrieval, August 2017. <https://doi.org/10.1177/097185241001400308>

- Sen. A. 1983. Poverty and Famines: An Essay on Entitlement and Deprivation. Oxford Clarendon Press. 1981.
- Shiva, V. The Violence of the Green Revolution: Third World Agriculture, Ecology and Politics. October 1991, Pub by Zed Books, London
- Singh. R.B. 2000. Environmental consequences of agricultural development: a case study from the Green Revolution state of Haryana, India. Agriculture Ecosystems and Environment. 82 (2000) 97–103
- Sukla, A. Marathe, S. 2017. The Malnutrition Market – Let them Eat Paste. Economic and Political Weekly. Vo. LII. Nos 25 and 26.
- The Hindu. July 23, 2016. Bali. V. We Need a Nutrition Mission. <http://www.thehindu.com/opinion/lead/We-need-a-Nutrition-Mission/article14503108.ece>
- Vasavi, A.R. 2016. The bitter reality behind the pro-farmer budget. Livemint, March 02, 2016.
- Welch R. M., Graham, R.D. 2000. A new paradigm for world agriculture: productive, sustainable, nutritious, healthful food systems. Food and Nutrition Bulletin. Vol 21, No.4. United Nations University.
- Welthungerhilfe and Terre de hommes. 2014. Food fortification: A “techno-fix” or a sustainable solution to fight hidden hunger? Bonn, Germany.
- WHO. 2017. Biofortification of Staple Crops. <http://www.who.int/elena/titles/biofortification/en/> Balasubramanian. D. 2016. Biofortification: Micronutrient-built-in-grains. The Hindu. August 14, 2016 <http://www.thehindu.com/sci-tech/science/Biofortification-Micronutrient-built-in-grains/article14572744.ece>
- World Bank, 2012. Kapoor Mehta, Soumya; Das, Maitreyi B. 2012. Issue brief : poverty and social exclusion in India - adivasis. Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/390061491903376547/Issue-brief-poverty-and-social-exclusion-in-India-adivasis>(Downloaded on July 27, 2017)
- Working Group for Children Under Six. 2009. Should India use Commercially Produced Ready to Use Therapeutic Foods (RUTF) for Severe Acute Malnutrition (SAM). Social Medicine. Vol. 4, No. 1. March 2009.
- WRI, 2015. 3 Maps Explain India's Growing Water Risks. World Resource Institute. <http://www.wri.org/blog/2015/02/3-maps-explain-india's-growing-water-risks>

Annexure 1 – Nutritional Analyses of the Traditional Diet of Communities

Annexures are available on request please contact :
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Exploring the Potential of Diversified Traditional Food Systems to Contribute to a Healthy Diet



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