



India's peri-urban frontier: rural-urban transformations and food security

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In India, peri-urban areas are too often neglected. Many people live in poverty and face increasing marginalisation and food insecurity. Yet peri-urban agriculture could be a major contributor to poverty alleviation and food security.

This working paper examines rural-urban transformations in India in relation to changes in food production, access, consumption, nutritional quality and safety. To improve health and nutrition, a more holistic, food security-based perspective is needed. Policy and planning must support those fragile communities engaged in peri-urban agriculture while protecting the environmental services on which they depend. It also discusses examples of specific policies and programmes and considers knowledge gaps, governance challenges and mechanisms that might help facilitate pro-poor food security developments on the ground.

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Summary

In India, peri-urban areas are too often neglected. They are fraught with institutional ambiguity, unplanned growth, poor infrastructure and environmental degradation. Many people live in poverty and face increasing marginalisation and food insecurity. Yet peri-urban agriculture could be a major contributor to poverty alleviation and food security.

In this working paper, we examine rural-urban transformations in India in relation to changes in food production, access, consumption, nutritional quality and safety. We demonstrate how efforts to address malnutrition in India are decoupled from urban development initiatives and associated areas of policy and planning. We discuss how a more holistic, food security-based perspective, along with measures to support fragile peri-urban ecosystems and communities engaged with agriculture, could underpin processes to improve the health and nutrition of urban and peri-urban residents.

In Section 1, we review characteristics of rural-urban transformations, focusing on the period since the introduction of the economic liberalisation agenda in the 1990s. During this time, there has been a major decline in public funding and support for agriculture, while cities have been promoted as engines of economic growth. We describe how a first wave of urbanisation in India was characterised by an increase in the population of megacities. This has been followed by a progressive reclassification of peripheral rural areas as their population densifies into 'census towns' as well as the development of new 'statutory towns' with their own municipalities. This process of gradual re-classification from rural villages to census towns unfolds to create an expanding, and often neglected, 'peri-urban' zone. The peri-urban is characterised by a juxtaposition of rural and urban activities and institutions along with institutional ambiguity, unplanned growth and poor infrastructure.

In Section 2, we examine trends in food consumption and nutritional status over this same period, demonstrating that serious concerns over childhood malnutrition in India have remained. The last official National Family Health Survey figures from 2005–6 indicate that approximately half of children under five years of age in India are underweight (low weight for age) and 20 per cent are wasted (low weight for height); albeit with some improvements indicated in the Rapid Survey of Children 2013–2014 (GOI and Unicef, undated). Data on nutritional status is somewhat limited, but suggests that despite claims of 'trickle down', the poorest urban inhabitants may be no better off in terms of nutritional

status than their rural counterparts. In peri-urban areas in particular, there is a high concentration of people living in poverty. Peri-urbanisation tends to be associated with increasing marginalisation, access deficit and environmental degradation, with formal schemes aimed at improving aspects of the environment being often exclusionary in nature, and impacting adversely on the ability to produce safe and nutritious food for urban and peri-urban markets.

In Section 3, we review measures by the government of India, including the Public Distribution System and Midday Meals (MDM) programme for school children, particularly in terms of their success in ensuring access to food and addressing the nutritional requirements of the urban and peri-urban poor. We discuss how such schemes appear to be failing many poor and marginalised groups. In peri-urban situations, which tend to concentrate poverty, many people are unable to access existing formal schemes due to their informal/migrant status.

Finally, in sections 4 and 5 we present our policy recommendations and conclusions focusing on relationships between peri-urban agriculture and multiple dimensions of food security. We discuss the potential for peri-urban areas to support more sustainable food production and ecosystem management, and for peri-urban agriculture to be a major contributor to peri-urban poverty alleviation and to urban food security.

We begin by considering how peri-urban agriculture can and does contribute significantly to food security in and around Indian cities, and the potential to expand on this and to support rural-urban synergies in environmental management through low external input peri-urban food systems. We then discuss environmental, social and political constraints to peri-urban agriculture – reviewing how competing development priorities, uneven power relations and complex governance arrangements are currently undermining the ability to realise its potential.

The limited interventions which have been put in place to support agriculture in the urban fringes often exclude health and poverty alleviation perspectives. There is a lack of alignment in terms of priorities for action. Support

tends towards the economic viability of organic agriculture for urban markets, which has an elite focus. In parallel to this, peri-urban environmental 'greening' initiatives such as city forests neglect agriculture and often compete directly with the environmental resources needed to support agricultural livelihoods.

How can policy and planning integrate appropriate support for peri-urban agriculture while protecting the environmental services on which it depends? In reviewing the possibilities, we discuss examples of specific policies and programmes, considering knowledge gaps, governance challenges, and mechanisms that might help facilitate pro-poor food security developments on the ground.

This working paper is based largely on a literature review and new secondary data analysis from 2016, complemented by discussions with key stakeholders. Section 4 draws on insights from research that we have been carrying out in collaboration with academics, government departments, community groups and non-governmental organisations (NGOs) in India and the UK over the past two decades. Through a series of transdisciplinary projects, we have sought to make visible some key interactions between peri-urban land-use transformations, urban food systems and poverty. We have examined possibilities for turning current destructive feedback loops between urban development trajectories

and the health and livelihoods of urban and peri-urban residents into positive interactions that support food security and wider elements of urban resilience building.

Policy pointers

We recommend the following positive interactions to support food security and build better urban resilience:

- Peri-urban areas are key frontiers for sustainable urbanisation and food security. Urban policy and planning must support these fragile peri-urban ecosystems and their marginalised residents.
- Nutritional data should be collected more frequently. Disaggregation of data should capture peri-urban contexts and analysis relevant to other policy fields such as health, land use and environmental change. This could support policy initiatives to go beyond food distribution to focus on other aspects of food security such as access and food safety.
- Forward-looking policy, planning and research will demand transdisciplinary approaches and sustained engagement with peri-urban communities to establish adaptive environmental governance mechanisms.
- Promising policy entry points include the draft National Land Utilisation Policy and the newly revised Solid Waste Management Rules 2016, among others.

1

Economic liberalisation and rural-urban transformation

1.1 Background

In 1947 after gaining independence, India initiated a development pathway based on industrialisation to achieve economic prosperity. The initial focus was on developing the manufacturing base, with central planning and protectionism. Industries such as iron and steel, oil refineries, cement and fertiliser became major public-sector enterprises in the 1950s, followed by coal mining in the 1970s. The development of small-scale industries was also heavily promoted from the 1970s onwards, on the premise that they would play a vital role in the economic progress of the country, had immense potential for employment generation, would promote decentralised industrial expansion and result in better distribution of wealth. Alongside industrialisation, the agriculture sector also advanced. The net output of agriculture and related activities increased significantly between 1950 and 1980 (Kumar, 2005). In the early 1980s, agriculture contributed 41 per cent of the country's gross domestic product (GDP) against the 22 per cent and 37 per cent contributed by the industry and service sectors respectively. It also employed the majority of the workforce of India (Ghosh and Chandrasekhar, 2006).

During the 1960s and 70s, the growth rate of the Indian economy was stagnant at around 3 per cent, but grew in the 1980s with fiscal stimulus provided by the state in a context of import liberalisation (Chandrasekhar and Ghosh,

2006). However, the underlying fiscal crisis was acute. The fiscal deficit, met by borrowing at home, mounted steadily, and was coupled with increasing international borrowing. The Gulf War and associated oil crisis added to the problem, and in July 1991 the Indian government made a bail-out agreement with the International Monetary Fund (IMF) under its programme of economic 'stabilisation' linked with the World Bank's programme of 'structural adjustment' (Bhaduri and Nayyar, 1996). Reforms were required as part of a bail-out agreement. The agreed reforms were intended to substantially reduce or remove controls on capacity creation, production and prices, and let market forces influence the investment and operational decisions of domestic and foreign economic agents within the domestic tariff area; allow international competition and therefore international relative prices to influence economic decisions; reduce the presence of state agencies in production and trade; and liberalise the financial sector by reducing controls on the banking system (Chandrasekhar and Ghosh, 2006). As a result, the Indian industrial sector underwent significant changes, which removed import restrictions and brought in foreign competition. This led to privatisation of certain public-sector industries and liberalised the foreign direct investment (FDI) policy regime. In 2010, industry contributed approximately 29 per cent to GDP as compared to a declining share from agriculture of 16 per cent (which still employed over 50 per cent of the work force) and 57 per cent from a rapidly growing service sector (Siddiqui, 2014).

1.2 Impacts of liberalisation on the agricultural sector

The high-potential, irrigated, traditional green revolution areas of India have continued to produce large quantities of grain, often resulting in exports, albeit with a significant reduction in the growth rate of overall production in recent years. But the politics of Indian food systems are complex and there are major ongoing difficulties in storage, distribution and with the purchasing power of the poor, such that adequate grain production has done little to address the challenges of undernutrition in the country overall.

There have also been sharp reductions in public planned development expenditure in rural areas, which have impacted the agricultural sector and beyond. From 1985 to 1990, 51,000 crore¹ (510 billion) rupees was spent on rural development, amounting to 4 per cent of net national product (NNP), but by the mid-1990s annual spending on rural development was down to 2.6 per cent of NNP, and it further declined to 1.9 per cent of NNP in 2000–01 (Patnaik, 2006).

Also, as a result of trade liberalisation, 8 million hectares of food-growing land was converted from grain to high-value exportable crops such as cotton and coffee, which are subject to enormous price fluctuations on the global market. There was also a major reduction in planned public expenditure on agricultural subsidies for seeds and fertilisers and power supply for irrigation. Smallholder farmers (who own less than 2ha of land per household and make up the majority of Indian farmers) have been most severely affected by these measures (ibid).

Many small-scale farmers were not able to benefit from selling their produce in a global market due to exposure to steeply falling global primary prices, and reliance on expensive inputs from large private companies, which put them into farm debt and insolvency (ibid). Small-scale farmers have been particularly vulnerable to vertical market integration and coordination, characterised by large retailers or input suppliers controlling technologies, inputs and market access, and international food standards providing additional barriers to market access (Thompson *et al.*, 2007).

In these circumstances, agriculture can become an activity that is no longer profitable. It is these aspects of the current agrarian crisis described above that are often associated with the distressing picture of farmer suicides in India. Nearly 9,000 farmer suicides were recorded in 1998, and the suicide rate has slowly and progressively increased. In 2014, India recorded 12,360 farmer suicides. While the reasons are complex and multiple, 'bankruptcy or indebtedness' was reported to account for 20.6 per cent of them (NCRPB, 2015).

1.3 Economic liberalisation and urban development policies

With the introduction of the neoliberal economic policies and cuts in public expenditure on rural development, cities were viewed as 'engines of growth' which could attract national and global business and investment that could contribute to the larger economic growth of the country (Mitra and Mehta, 2011; Siddiqui, 2014). The realisation of this vision required improvement of the existing infrastructure and also development of new infrastructure. It had already been announced that the public sector lacked funds, which paved the way for the entry of the private sector firmly into the urban development scenario. Accordingly, a major overhaul of the administrative and legislative frameworks of the government was suggested, which resulted in the drafting of an urban reforms mandate. It marked the beginning of a new regime of regulation in the Indian urban sector that cleared the ground for vigorous implementation of state-sponsored neoliberal programmes in 60 cities and towns across the country in subsequent years (ibid).

The first decade of urban reforms unfolded under the aspiration of 'world-class cities'. The idea was to undertake capital- and technology-intensive urban development to attract foreign investment, business and tourism etc (Dupont, 2011). The process of urban restructuring began with multiple interventions, such as the closure of industries and/or relocation from the urban core to the peripheries; demolition and relocations of slums; amendments in master plans for real-estate development for commercial (malls) and residential purposes; and deregulation and privatisation of public utility services etc (Navlakha, 2000; Roy, 2004).

In 2005, the government of India launched its largest post-independence urban development initiative, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). All previous central government funding and urban development schemes – such as the National Slum Development Programme (NSDP), Swarna Jayanti Sahakari Rozgar Yojana, Valmiki-Ambedkar Awas Yojana (for housing the socially marginalised urban poor) and the National Transport Policy – were brought under the mission. The components of JNNURM were: privatisation/commercialisation of basic services such as water supply, sanitation and solid-waste management through public private partnerships (PPPs) with the introduction of user fees; liberalisation of the land and real-estate market through

1. In the Indian numbering system, a crore is equivalent to 10 million.

the repeal of the Urban Land (Ceiling and Regulation) Act² and change in the Rent Control Acts;³ development of a stronger mortgage market alongside 100 per cent FDI in housing and real estate; easier land-use conversion norms; reforms in property tax and reduction in stamp duties; financial and administrative restructuring of municipalities; rationalisation and outsourcing of services provided by the urban local body (ULB); introduction of e-governance; and valorisation of private-sector and private credit-rating agencies over elected civic bodies (*ibid*). The central government planned to invest 1,20,536 crore rupees under the JNNURM during the seven-year period 2005–2012; 65 cities were identified under the Urban Infrastructure and Governance component of the JNNURM programme (MOUD, 2006).

The opening up of 100 per cent FDI in real estate enabled agents to attract international private players to invest in Indian cities in joint ventures with local partners.⁴ It is estimated that the real-estate sector has been growing at the rate of 30 per cent per annum in recent years (Chadchan and Shankar, 2012). Similarly, there has been major growth in other areas of the urban economy such as manufacturing and services. Between 1983–84 and 2009–10, there was a sharp increase in the share of services in the GDP from 40 per cent to 57 per cent and some increase in the share of construction, while the share of industry has remained relatively constant at 20 per cent (MOUD, 2011). As a result of these factors, there has been a significant contribution of the urban economy to the GDP of India (from 62 per cent to 63 per cent in 2009–10) (Faetanini *et al.*, 2011). Overall, the economy grew from 5 per cent per annum in the 1980s to around 10 per cent per annum in 2011 (Siddiqui, 2014). GDP annual growth rate in India averaged 6.08 per cent from 1951 until 2016, reaching an all-time high of 11.4 per cent in the first quarter of 2010 and a record low of -5.2 per cent in the fourth quarter of 1979 (Trading Economics, 2017). In 2015–16, the GDP of India grew at the rate of about 7.56 per cent (*ibid*).

1.4 Patterns of urban growth and peri-urbanisation

Overall, the urban population in India grew from 217 million (27.5 per cent) in 1991 to 377 million (31.16 per cent) in 2011. Of the total numbers of people

living in urban areas, 43 per cent live in cities or urban agglomerations (UAs) with a population of over 1 million which has increased from 35 in 2001 to 53 in 2011. Among the 53 UAs, the three largest UAs or megacities (with a population of more than 10 million) are Greater Mumbai UA (18.4 million), Delhi UA (16.3 million) and Kolkata UA (14.1 million). These are followed by Chennai UA (8.7 million) and Bangalore UA (8.5 million). During the first decade of the economic reforms there was substantial growth in the population of megacities but this has slowed considerably in the period 2001–11 (GOI, 2011a).

The remainder of the 57 per cent of the urban population in India lives in the expanding peripheries of the cities in 'statutory towns' and 'census towns'. Statutory towns are towns with municipalities or corporations, whereas census towns are agglomerations that grow in peripheries of big cities and rural areas and do not have effective urban governance structures or requisite urban infrastructure such as sanitation and roads. The number of statutory and census towns in India increased from 5,161 in 2001 to as many as 7,935 in 2011 with a population of 215 million (*ibid*).

With urbanisation comes an inevitable transformation in the nature and extent of agricultural land use. The processes of land-use transformation have unfolded in a number of ways: land acquisition for industrial, commercial, real-estate and infrastructure development; land acquisition for the creation of special economic zones⁵ (SEZs); and selling of agriculture land by farmers for the construction of houses by individual owners. India ranks 20th among the current top 20 real-estate investment markets globally, with an investment of US\$3.4 billion in 2012 (Sampat, 2015). It is also predicted that India will become the world's third-largest construction market by 2025, adding 11.5 million homes a year. In 2011–12, the shares of real estate and construction together accounted for 19 per cent of the Indian economy, growing from 14.7 per cent in 2000–01. The rising price of land has made real estate a high-return investment. With appreciation of land prices as infrastructure and development projects are announced, some farmers 'give up' land without resistance for immediate returns, as agriculture is less profitable or valuable. In many cases, however, it is agrarian distress caused by the economic reforms which pressures farmers into selling agricultural land (*ibid*). There are also forced evictions, and there have been numerous protests against

2. The Urban Land (Ceiling and Regulation) Act in India was passed in 1976. The objective was 'to provide for the imposition of a ceiling on vacant land in urban agglomerations, for the acquisition of such land in excess of the ceiling limit, to regulate the construction of buildings on such land and for matters connected therewith, with a view to preventing the concentration of urban land in the hands of a few persons and speculation and profiteering therein and with a view to bringing about an equitable distribution of land in urban agglomerations to serve the common good.'

3. The Rent Control Act in India came out in 1947 and since then several states in the country have implemented it with modifications and amendments. The key features of the act include: a) fixation of 'fair' or standard rent; b) providing protection to tenants from indiscriminate eviction; c) defining the duties of the landlord with respect to the maintenance of rented property; d) formalising a leave and license agreement; and e) stating the right of legal heirs of the tenants.

4. A condition of the policy is that FDI investment must be done as a joint venture.

5. SEZ is an especially demarcated area of land, owned and operated by a private company, which is deemed to be foreign territory for the purposes of trade, duties and tariffs. After the passing of the SEZ Act by Parliament in June 2005, the law came into effect in February 2006. SEZs enjoy exemptions from customs duties, income tax, sales tax and service tax. The aim was to establish 500 SEZs in the country. Out of 377 notified SEZs in the country, only 196 are operational. In the National Capital Region alone, 150,000 hectares of land were acquired for establishing SEZs.

forceful acquisition of agricultural land in peri-urban and rural areas (Dutta, 2012; Nayak, 2015).

The distress in agriculture – manifest in low incomes and unemployment caused by the economic reforms – has resulted in some increase in rural to urban migration (Kundu, 1997; Mitra and Murayama, 2008) and in temporary and seasonal migration (Keshri and Bhagat, 2010; Krishna *et al.*, 2014). Alongside diminishing prospects in agriculture there are also other factors such as droughts, difficult working conditions and growing debt, which contribute to rural-urban migration (Krishna *et al.*, 2014). Although official data indicates only a slow upward trend, the migration figures of India seem to suggest that the rural to urban migration increased from 20 per cent in 1991–2001 to 22.2 per cent in 2001–11 (Mahapatro, 2010). The increasing rural to urban migration in recent years is thought to be largely motivated by availability of urban employment in the expanding informal sector. Many will be involved in small-scale industries, the construction industry and agriculture (working as landless peasants). Labour laws are weak, and are often not implemented or enforced, while workers lack minimum wages and are deprived of social security schemes (Himanshu, 2008).

Urbanisation of former villages and the reclassification of rural areas, following the extension of cities' boundaries, have been significant components of urban growth in 2001–11 (Bhagat, 2011). The outward expansion of large cities has meant increasing and more complex interactions with the surrounding rural areas and gradual changes in their land uses and occupations, transforming them into peri-urban areas, where urban and rural activities and or institutions are juxtaposed. They are characterised by dynamic flows of commodities, capital, natural resources, people and pollution and a range of processes leading to the intensification of urban/rural linkages (Marshall *et al.*, 2009; Randhawa and Marshall, 2014; Tacoli, 2006). Original inhabitants are joined in peri-urban areas by those who migrate in from the rural hinterland or out from the urban core. Over the past two decades there has also been a major process of slum demolitions in the megacities such as Delhi, Mumbai and Chennai in order to undertake 'development' projects that represent the vision of world-class cities. Several thousands of urban poor have been either displaced or relocated to the peripheries of the city (Bhan, 2009; Dupont, 2011; Ramanathan, 2005; Roy, 2004).

The majority of the peri-urban population living in slums, unauthorised colonies and villages is bereft of basic services such as water, sanitation or health, resulting in severe public health problems. The example of peri-urban Delhi (Ghaziabad) clearly demonstrates the social fragmentation of services. The middle-class colonies have access to the regular piped water supply and sewerage systems, whereas the traditional villages and informal colonies do not have a water supply or sewer lines. In the absence of any formal provisions of services, people resort to various informal means (coping strategies) to fulfil their needs (Randhawa and Marshall, 2014). Studies documenting the process of urbanisation and its impact on the lives of the people and the water bodies in the peri-urban areas of Gurgaon and Hyderabad in India also show how water security, which was earlier ensured by numerous water bodies in and around cities, has been under threat by land-use changes, land grabbing, and environmentally negligent development focused on growth through unsustainable means (Prakash *et al.*, 2011).

For those peri-urban communities still involved in smallholder farming this often involves reliance on recycled wastewater which is becoming increasingly contaminated, as traditional village ponds which were recharged by rainwater disappear in the development process, and other water sources become less accessible (Amerasinghe *et al.*, 2013; Marshall *et al.*, 2010). At the same time, other agriculture-related ecosystem services⁶ are degraded and access by the poor and marginalised is increasingly restricted (Marshall *et al.*, 2016).

In recent years, peri-urban transitional zones have found some attention at the national level. The 12th Five-Year Plan recommends that Rajeev Gandhi Awas Yojana (or RAY, a social welfare programme to provide housing for the urban poor) should also make provisions for affordable housing for the urban poor in peri-urban areas. It also recommends that provision of affordable housing in peri-urban areas must be accompanied by the provision of basic services as well as functional transport linkages into the city (Planning Commission, 2012). In addition, the Town and Country Planning Office (TCPO) of the Ministry of Urban Development suggests that there is a need for comprehensive and integrated regional planning and development throughout the country so that agricultural land is conserved, forest areas are protected and water resources judiciously managed in the transitional zones (TCPO, 2014). However, despite some formal recognition at this level, peri-urban areas have largely been neglected in policy and practice.

6. Ecosystem services are the 'benefits people obtain from ecosystems' (MEA, 2005). The MEA classifies ecosystem services as supporting services (such as soil formation), provisioning services (such as food grown), regulating services (such as climate regulation) and cultural services (such as recreation). Food produced in the peri-urban context is therefore an ecosystem service, but also dependent on other ecosystem services: for example, a polluted environment will impact on food production.

2

Rural-urban transformation, food consumption and nutrition

There is no apparent association between economic growth since 1990 and improvements in nutritional status of children under five years of age in India (Subramanyam *et al.*, 2011). As per the official figures, India has managed to halve poverty rates from the 1990 levels.⁷ However, over 270 million Indians in 2012 still remained trapped in extreme poverty (UN-ESCAPE, 2015). Despite declines in poverty, as per the 2011 census report, 89 million children in the 0–3 age group were malnourished, with 35.6 million among them underweight (GOI, 2011a). India remains home to one quarter of the world's undernourished population, over a third of the world's underweight children, and nearly a third of the world's food-insecure people (UN-ESCAPE, 2015). The question has also been raised as to why this apparent reduction in poverty was not accompanied by improvements in other indicators of well-being during the same period such as nutritional status (Himanshu, 2008). In this section, we attempt to examine consumption and nutritional data in relation to rural-urban transformations.

2.1 Food consumption and nutritional data-collection processes and problems

Numerous data sets are available that cover aspects of consumption patterns and nutritional status in India, but there is little that is disaggregated below state level or that uses survey approaches that are comparable over time. The limitations in the data collection will inevitably hinder the effective planning and implementation of food security-related programmes and schemes.

The National Sample Survey Organisation (NSSO) provides data on time trends and interstate differences in food consumption patterns and nutritional status in India under the categories of urban⁸ and rural. All areas other than urban areas are called rural. The basic rural unit is a revenue village (GOI, 2011a). The NSSO surveys

7. There is an opinion that poverty appears to have reduced because of the revision in methodology of measuring poverty by the Rangarajan Committee, constituted by the Planning Commission. One of the criticisms of this methodology is that it has missed the opportunity to go beyond expenditure-based poverty rates and examine the possibility of a wider multidimensional view of deprivation, including those associated with environmental change and access to micronutrients. This type of approach would encourage a rethink of the 'absolute view of poverty and would be more appropriate for understanding and addressing the large increase in inequalities in India from the 1990s onwards' (Ray and Sinha, 2014).

8. According to the census of India, constituents of urban areas are urban agglomeration, statutory towns, census towns and outgrowths. An urban agglomeration is a continuous urban spread constituting a town and its adjoining outgrowths, or two or more physically contiguous towns together with or without outgrowths of such towns. Statutory towns are towns with municipalities or corporations, whereas census towns are agglomerations that grow in peripheries of big cities and rural areas, with densification of population that do not have an effective urban governance structure or requisite urban infrastructure. Outgrowth is a viable unit such as a village or part of a village contiguous to a statutory town which possesses urban features in terms of infrastructure and amenities.

Table 1. Description of different income groups (monthly per capita income in rupees)

GROUPS	RURAL				URBAN			
	Lowest income	Middle income	Higher income	Highest income	Lowest income	Middle income	Higher income	Highest income
1993–94	Upper limit 165	Upper limit 235	Upper limit 355	560 and above	Upper limit 230	Upper limit 355	Upper limit 605	1,055 and above
2011–12	Upper limit 845	Upper limit 1,198	Upper limit 1,793	2,886 and above	Upper limit 1,239	Upper limit 2,019	Upper limit 2,771	6,383 and above

Source: NSSO (1996b; 2014b)

provide time-series data of expenditure on food and non-food items and nutritional data for 12 different income groups for residents classified as rural or urban (NSSO, 1996a; 2014a). For the purpose of our analysis, we have aggregated these 12 income groups into four (see Table 1). According to the 2011–12 figures, the percentage distribution of these different income groups is as follows: lowest income (20 per cent), middle income (30 per cent) higher income (30 per cent) and highest income (20 per cent).

The NSSO calculates the intake of nutrients including calories, fat and protein by each household. The quantities of food recorded as consumed by the household are converted into the equivalent amounts of calories, protein and fat on the basis of a nutrition chart based on an Indian Council of Medical Research (ICMR) publication which gives the energy, protein and fat content per unit of different foods in the Indian diet (NSSO, 2014b). The other agencies that carry out diet and nutrition surveys include the National Nutrition Monitoring Bureau (NNMB), National Family Health Survey (NFHS) and District Level Household and Facility Survey (DLHS).

The NNMB carries out a nutrition survey every five years. It collects data from limited states in India and focuses only on rural and tribal populations. The last survey was done on tribal populations in 2009 (NNMB, undated).

The NFHS is a large-scale, multi-round survey conducted in a representative sample of households throughout India. Three rounds of the survey have been conducted since the first survey in 1992–93. It provides state and national information for India on fertility, infant and child mortality, the practice of family-planning, maternal and child health, reproductive health, nutrition, anaemia, and the utilisation and quality of health and family-planning services. The fourth NFHS survey was conducted in 2014–15. In addition to the 29 states, NFHS-4 has also included all six union territories for the first time and will also provide estimates of most indicators at the district level for all 640 districts in the country (IIPS, 2015b). The

results of the first phase of NFHS-4 have been released. It comprises the data of 13 states and 2 union territories out of the total 29 states and six union territories of India (Ministry of Health and Family Welfare, 2016).

The Ministry of Health and Family Welfare (MoHFW) has designated the International Institute for Population Sciences (IIPS), Mumbai as the nodal agency for conducting the District Level Household and Facility Survey (DLHS). The ongoing DLHS is in its third round (following previous rounds in 1998–99 and 2002–04), and if consistent with the second round will include district-level data on nutritional status (IIPS, 2015a). The DLHS is the only agency that has previously collected and reported data at district level. The DLHS mainly focuses on health parameters but in the second round of DLHS in 2002–04 nutritional status was also incorporated, although (for reasons that are not known) it does not cover 38 districts of eight northeastern states of India including Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura, and seven districts of Jammu and Kashmir State (ibid).

These agencies all provide valuable insights, but the data collected by them has significant limitations when seeking to understand changing consumption patterns and nutritional status of different income groups. To date, the NSSO and NFHS data have only provided state- and national-level scenarios. They have not provided the picture of disparities within the state at district or block level. The latest rounds of the NFHS and DLHS are promising, and if regularly repeated with comparable indicators each time, could be immensely helpful in supporting initiatives to target measures to reduce malnutrition. However, on the basis of data currently available, initiatives aimed at targeting malnourished or undernourished women and children are very limited in their ability to effectively target those most in need. Another issue that requires attention is that the food consumption and nutrition data collected by various agencies is purely divided into rural and urban categories, which overlooks the challenges of ever-expanding peri-urban transitional zones.

2.2 Comparing food consumption and nutritional status of the urban and rural poor

According to the NSSO data for 1993–94 and 2011–12 (GOI, undated), the overall trend of expenditure on food consumption in India indicates that a rise in income levels has resulted in reductions in the proportion of overall household expenditure on food. Between 1993–94 and

2011–12, the share of food in total consumer expenditure has fallen from 63.2 per cent to 48.6 per cent in rural areas and from 54.7 per cent to 38.5 per cent in urban areas. However, the income-based analysis indicates that there has been little change in the food consumption patterns of the lower-income groups both in rural and urban areas (see Table 2).

Since 1993–94, the expenditure on food by low-income and middle-income groups has reduced in both rural and urban areas, but these income groups spend around 60 per cent of their earnings on food in rural areas and approximately 55 per cent in urban areas respectively; as

Table 2. Average monthly per capita food expenditure by different income groups, 1993–94 and 2011–12 (%)

INCOME GROUP	LOWEST		MIDDLE		HIGHER		HIGHEST	
	1993–1994	2011–2012	1993–1994	2011–2012	1993–1994	2011–2012	1993–1994	2011–2012
URBAN								
Cereals	29.3	14.2	21.62	9.78	14.75	7.23	6.83	3.36
Gram	0.12	0.14	0.19	0.14	0.21	0.13	0.15	0.7
Cereal substitutes	0.06	0.04	0.08	0.07	0.07	0.06	0.05	0.28
Pulses and products	4.6	3.64	4.14	2.75	3.38	2.16	1.87	1.06
Milk and dairy products	6.4	6.75	9.39	8.36	11.19	8.2	9.14	5.35
Edible oil	5.68	4.77	5.55	3.83	4.94	3.01	3.02	1.47
Eggs, fish and meat	3.4	4.28	3.99	4.73	3.73	4.01	2.71	2.62
Vegetables	7.18	7.97	6.81	6.35	5.86	5.26	4.04	2.74
Fruit (fresh and dry)	1.48	2.01	2.1	3.04	2.61	3.69	3.13	3.56
Sugar	3.42	1.93	3.21	1.54	2.7	1.15	1.47	0.55
Salt and spices	3.45	4.51	2.86	3.73	2.2	2.81	1.26	1.39
Beverages	5.07	7.45	5.88	7.85	7.02	8.23	8.29	10.45
TOTAL % food expenditure	70.2	57.75	65.86	52.2	58.7	46	42	33
RURAL								
Cereals	39	18.11	32.98	14.17	25.75	11	13.61	6.3
Gram	0.11	0.12	0.17	0.14	0.2	0.15	0.21	0.14
Cereal substitutes	0.08	0.02	0.09	0.05	0.1	0.07	0.1	0.07
Pulses and products	4.87	3.87	4.49	3.36	4.04	2.92	2.87	1.94
Milk and dairy products	3.66	4.97	7	7.34	10.2	8.63	11.48	8.42
Edible oil	5.12	4.95	5	4.58	4.75	4.02	3.48	2.61
Eggs, fish and meat	2.44	3.35	3.32	4.78	3.65	5.2	3.17	4.72
Vegetables	7.64	9.5	7.19	8.2	6.53	6.94	4.4	4.56
Fruit (fresh and dry)	0.87	1.21	1.25	2.15	1.71	2.95	2.24	3.5
Sugar	2.76	1.93	3.06	1.89	3.26	1.77	2.82	1.31
Salt and spices	3.58	4.6	3.17	4.23	2.8	4.01	1.9	2.73
Beverages	2.89	7.69	3.63	7.76	4.26	7.79	4.61	8.19
TOTAL % food expenditure	73.02	60.32	71.35	58.64	67.25	55.5	50.9	44.51

Source: NSSO (1996a; 2014a)

Table 3. Average calories, protein and fat intake per capita/day in rural and urban India, 1993–94 and 2011–12

	1993-94		2011-12	
	Rural	Urban	Rural	Urban
Calories (kcal)	2,153	2,071	2,100	2,060
Protein (g)	60.2	57.2	56.5	55.7
Fat (g)	31.4	42.0	41.6	52.5

Source: NSSO (1996b; 2014b)

compared with a national average figure of 49 per cent in rural areas and 39 per cent in urban areas. In other words, 50 per cent of India's population continues to spend more than half of its income on food (NSSO, 1996a; 2014a).

Since 1993–94, expenditure on cereals has declined to almost half across all income groups both in rural and urban areas. Similarly, expenditure on pulses and products has also reduced across all income groups in both rural and urban areas. A detailed analysis of consumption of different kinds of cereals shows that rice and wheat continue to be the core cereals consumed by households. However, there has been a constant decline in traditional staples like jowar, bajra and maize (Gupta, 2012). Stagnant production and a constant rise in the price of pulses are the reasons for decline in the expenditure of pulses by lower-income groups (NCAER, 2014).

Expenditure on milk and milk products has increased in low-income groups both in rural and urban areas, while it has decreased in highest-income groups both in rural and urban contexts. In rural areas, it has increased from 3.66 per cent in 1993–94 to 4.97 in 2011–12 within low-income groups. In urban areas, it has marginally increased from 6.4 per cent to 6.75 per cent during the same period. In highest-income groups, significant increases in income have resulted in a lower proportion of overall income spent on food, with a decrease from 11.48 per cent to 8.42 per cent in rural areas and from 9.14 per cent to 5.35 per cent in urban areas.

In low-income and middle-income groups in rural areas the expenditure on fruits and vegetables from 1993–94 to 2011–12 has increased, while in urban areas it has increased in low-income groups and remained more or less stable within middle-income group. Of course, this increase in expenditure on fruits and vegetable does not necessarily mean that India's low- and middle-income groups have started consuming more fruits and vegetables. The study shows that the majority of Indians continue to consume fruits and vegetables far below the recommended intake. India's diverse climate ensures availability of all varieties of fresh fruits and vegetables. It ranks second in fruit and vegetable production in the world, after China. India is the largest producer of ginger and okra among vegetables and ranks second in the production of potatoes, onions, cauliflowers, brinjal and cabbages etc. Among fruits, the country ranks first in production of bananas (22.04 per cent), papayas (40.74 per cent),

mangoes (including mangosteens and guavas) (32.65 per cent). Despite being the second-largest producer of fruit and vegetables in the world, India is unable to meet the required nutritional needs of its own population because of the inherent perishable nature of the produce/short shelf life of these crops, with as much as 30–35 per cent of fruits and vegetables perishing during harvest, storage, grading, transport, packaging and distribution. Global export of fruits and vegetables is another contributor to shortages within the country (Sachdeva *et al.*, 2013).

According to the NSSO data, the overall trends in the per capita calories, protein and fat intake of the population are often used in assessing the adequacy of food and nutrition (see Table 3). The data on average intake of calories shows declining trends in both rural and urban areas after 1993–94. Similarly, there is a decline in intake of protein. In rural areas, it declined from 60.2g to 56.5g, while in urban areas it declined from 57.2g to 55.7g during the period of 1993–94 to 2011–12. The intake of fat has increased both in rural and urban areas.

The income-wise analysis of intake of calories, protein and fat explains the scenario of change in the nutrition patterns in India (see Table 4).

According to the data there is a marked difference between the calories and protein intake of low-income and high-income groups, with the intake for the poor still far below the prescribed norms. The intake of calories by the lowest-income groups is 1,794kcal, while the highest-income group's intake is 2,844kcal. There has thus been stagnation, if not a decline in the per capita calories and protein intake among the poor rural and urban populations reflecting a very low nutritional intake (NSSO, 2014b).

The data provided by the National Family Health Survey (NFHS-3) indicates that the proportion of underweight children declined marginally from 47 per cent in 1998–99 to 45.9 per cent in 2005–06 although stunting among children declined more markedly. This data is not differentiated by gender. More disturbing, however, is that the percentage of children reported to be wasted in 1998–99 was 15.5 per cent, but this figure increased to 19.1 per cent in 2005–06. While the rate of decline in child malnutrition is expected to be around half the rate of growth of per capita GDP in most developing countries, the situation is not so in India where the rate of decline in malnutrition is much lower than per capita income growth.

Table 4. Calories, protein and fat intakes by different income groups, 1993–94 and 2011–12

INCOME GROUP			CALORIES (KCAL)	PROTEIN (G)	FAT (G)
Rural	Lowest	1993–1994	1,543.7	73.79	43.3
		2011–2012	1,794	47.4	25.73
	Middle	1993–1994	1,955.3	72.4	53.66
		2011–2012	2,083.8	56.1	38.1
	Higher	1993–1994	2,278.3	68.50	63.57
		2011–2012	2,306	62.9	50.0
	Highest	1993–1994	2,886	54.89	82.23
		2011–2012	2,823	78.4	74.3
Urban	Lowest	1993–1994	1,603	44.74	22.2
		2011–2012	1,749	47.3	33
	Middle	1993–1994	1,982.3	54	36.63
		2011–2012	2,033	55.6	49.9
	Higher	1993–1994	2,319.6	63	53.67
		2011–2012	2,291	62.7	63.9
	Highest	1993–1994	2,850	78.1	79.6
		2011–2012	2,844	77.7	87.2

Source: NSSO (1996b; 2014b)

Indicators on anaemia for women and children provided by the NFHS show that more than 50 per cent of women and nearly 80 per cent of children are victims of anaemia. This reflects a very high level of micronutrient deficiencies that has very adverse effects on maternal and child health (Ittyerah, 2013).

The discussion above illustrates that despite claims of 'trickle down' and improvements in some overall trends of food consumption in India, the nutritional status of lower-income groups in urban and rural areas has not improved significantly, with the poorest urban inhabitants no better off than their rural counterparts. There is a need for comparable data sets over time concerning the nutritional status for particular groups and for particular

places; for data to be released to the public domain in a timelier fashion; and for fine-grain analysis of such data. Such analysis would help to determine the associations between development initiatives across various relevant sectors and changes in nutritional status.

Due to the process of restructuring of urban agglomerations and rural to urban migration, a large section of the lower-income groups have become part of the population of peri-urban transitional zones, while food consumption and nutritional data is divided into discrete rural and urban categories. Attention needs to be paid both in terms of collection of data and the implementation of food-security schemes for the populations living in these areas.

3

Government-led schemes to address food insecurity

There have been numerous policies and schemes introduced with the purpose of ensuring 'food security' for the population.⁹ These policies have included public support for the production, marketing, storage and distribution of food with some emphasis on distribution to poor consumers and efforts to improve the nutritional status of children and women.

In this section, we discuss some of these key schemes, particularly in terms of their degree of success in addressing food access and the nutritional needs of the poor in urban and urbanising environments.

3.1 Public Distribution System (PDS)

The evolution of public distribution of grains in India had its origin in the 'rationing' system introduced by the British during World War II. When the war ended, it was decided to abolish the rationing system. However, on attaining independence, India reintroduced it in 1950 (FAO, 2015). The PDS is one of the instruments aimed at improving food security at the household level in India. The PDS ensures availability of essential commodities such as rice, wheat, edible oils and kerosene to consumers through a network of outlets or fair price shops (FPS). These commodities are supplied at below-market prices to consumers. With a network of more than 462,000 fair price shops distributing commodities worth more than 300 billion rupees annually

to about 160 million families, the PDS in India is perhaps the largest distribution network of its kind in the world. The PDS evolved as an important instrument of government policy for management of scarcity and for distribution of food grains at affordable prices. Supplemental in nature, the scheme is not intended to make available the entire requirements of food grains for households (Dev and Sharma, 2010).

The Targeted Public Distribution System (TPDS) was introduced in 1997 and under this scheme special cards were issued to families below the poverty line (known as BPL households) and food grains were distributed at a lower price for these families compared to those above the poverty line (known as APL households). The entire population was divided into three categories: BPL (below poverty line), APL (above poverty line) and AAY (Antyodaya Anna Yojana or destitute). The BPL population are provided with 35kg of food grains per month at a subsidised price. AAY, the destitute households (part of BPL households), are provided a monthly provision of 35kg of food grains at specially subsidised rates (2 rupees per kg for wheat and 3 for rice). About 25 million people (38 per cent of BPL households) have been covered under AAY. Under this scheme, the central government allocates food grains to different states of India based on poverty ratios (*ibid*).

However, a large proportion of the BPL population living in transitional peri-urban and urban areas are bypassed

9. These policies include the Public Distribution System (PDS), Integrated Child Development Services (ICDS) scheme, Midday Meal (MDM) for school children, National Rural Employment Guarantee Act (NREGA) 2005, National Food Security Mission and National Food Security Act 2013.

by government schemes such as the PDS. The reason is that most of them live in informal settlements (unauthorised colonies and slums), which are not necessarily notified by the concerned government department. Only 50 per cent of the poor inhabiting notified informal settlements access PDS and other government schemes and programmes. People from un-notified areas in urban and peri-urban areas have to buy their food from the open market at competitive prices and cannot access subsidised food available through the PDS (Upadhaya and Palanivel, 2011).¹⁰ PDS food-grain purchases constituted only 11 per cent of the total per capita monthly food grains consumption in 2004–05. There was marked regional disparity and, although the impact of PDS on southern and northeastern states is much better, it has had little impact on some of the poorest states such as Bihar, Assam and Uttar Pradesh (Dev and Sharma, 2010).

The PDS has been criticised for a number of major oversights and has been beset with difficulties in implementation. Two major Indian government reviews were carried out on the PDS (GOI, 2002; 2005). These identified four key problems in the present TPDS: high exclusion errors (the issues described above); non-viability of fair price shops (low margins); not fulfilling the price stabilisation objective; and leakages/loss of food grains before reaching the intended beneficiaries because of corruption involved at the various stages of distribution. The leakages vary enormously between states. In Bihar and Punjab, the total leakage exceeded 75 per cent while in Haryana and Uttar Pradesh it was between 50 and 75 per cent. Other problems included low quality of food grains, infrequent supply of food grains, political interference and corruption, and lack of a system of inspection of entitlements (*ibid*). However, in the absence of other measures, the PDS is still critically important in supporting the basic nutritional needs for some of the 270 million people who continue to live below the poverty line.

3.2 Midday Meals (MDM) programme for school children

The MDM programme was taken up as a national programme of nutritional support to children undergoing primary education in 1995. It has twin objectives of improving the nutritional status of primary school children and of increasing enrolment, regular attendance and retention in schools. The food grains are supplied by the central government free of cost to the state governments, while the transport and cooking costs are borne by the state governments. Under this programme, three options are available to the states: providing a hot, cooked meal consisting of 100g of rice/wheat per day per child for 200

school days; distributing pre-cooked ready-to-eat meals; or dispensing 3kg of rice or wheat per child per month for 10 months (Acharya, 2009).

However, there are a number of problems with the implementation of the scheme. The sixth report of the commissioner appointed by the Supreme Court points to inadequate infrastructure for midday meals. Of the 16 states that sent data to the commissioner in this regard, 13 stated that less than 45 per cent of schools have a separate kitchen (Dev and Sharma, 2010). Some states are yet to introduce the MDM scheme. In states such as Bihar and Orissa, where the poverty ratio is very high, poor implementation of nutritional programmes has had a significant impact on food security (Upadhaya and Palanivel, 2011). Presently, the MDM scheme has been integrated with the National Food Security Act discussed in the next section.

3.3 Other schemes to complement the PDS and MDM

Schemes such as the PDS and MDM directly focusing on improving distribution and access to food are complemented by others aimed at addressing poverty through production of food grains, employment opportunities and improving access to healthcare and advice. These include the National Food Security Mission (NFSM 2007), National Rural Employment Guarantee Act (NREGA, 2005) and the Integrated Child Development Services (ICDS) scheme.

The NFSM was launched in 2007. The mission is being continued during the 12th Five-Year Plan (Planning Commission, 2012) with new targets of additional production of food grains of 25 million tons of food grains comprising of 10 million tons of rice, 8 million of wheat, 4 million of pulses and 3 million of coarse cereals by the end of the plan. During this time, the NFSM will have five components: rice, wheat, pulses, coarse cereals and commercial crops (GOI, 2007).

The NREGA is a step towards legal enforcement of the Right to Work (Article 41 of the Indian Constitution), as an aspect of the fundamental right to live with dignity. NREGA was notified in September 2005 with the aim to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household. The primary objective is employment creation. The auxiliary objective is regenerating a natural resource base and creating productive assets. The third, a process objective, is to strengthen grassroots democracy by infusing transparency and accountability in governance. It is the first time that a rights-based approach for

10. There is also an issue with the non-portability of ration cards. Temporary migrants cannot use their ration card while away from wherever their card is registered/issued. The use of ration cards is also time bound. If it is not used during a specified time period, it is cancelled.

BOX 1. CRITIQUE OF THE FOOD SECURITY BILL BY THE RIGHT TO FOOD CAMPAIGN

Prior to the formulation of the act, when it was in the form of the Food Security Bill, the Right to Food Campaign produced a critique in which the following issues were highlighted:

- The bill continues with a Targeted Public Distribution System (TPDS), excluding 33 per cent of the population from accessing the PDS as a right, giving scope to large exclusion errors of the poor in the country as a whole. The improved framework of single pricing in the present bill over the dual pricing under the existing APL-BPL system is undermined by the exclusion of a third of the country.
- While the ICMR norms recommend that an adult requires 14kg of food grains per month and children 7kg, the bill provides for reduced entitlements of 5kg per person per month, thus ensuring only 166g of cereal per person per day, which is barely enough for two rotis a day.
- The bill provides only for cereals with no entitlements to basic food necessities such as pulses and edible oil required to combat malnutrition.
- The bill continues to allow for the entry of private contractors and commercial interests in the supply of food in the ICDS, especially by insisting on specific norms related to Food Safety Acts and micronutrient norms.
- This bill is still ambiguous regarding universal maternal entitlements by continuing with the conditionality in the scheme of the two-child norm, which will penalise children of higher order as well as deny the mother her basic rights.
- The bill does not have a strong grievance redress mechanism. For the bill to be effective there needs to be in place a strong, decentralised and independent grievance redress mechanism that includes *panchayat* or block-level grievance redress officers with powers to impose penalties on erring officials.
- The bill does not provide any agriculture- and/or production-related entitlements for farmers in spite of the fact that more than 60 per cent of the people in this country are dependent on agriculture for their livelihoods. A revived and vibrant agriculture sector forms the backbone of food security.
- The bill allows for the backdoor entry of cash transfers instead of food grains by allowing for a food security allowance when food is not available, and by allowing cash transfers as a part of PDS reforms. There has been major opposition to cash transfers by the women of poor communities, who report misspent funds if cash transfers are made to the male members of the household.
- It has no provisions like old-age pensions for the support of senior citizens, or for feeding through community kitchens or other measures for the homeless, destitute and other sections of society that are most often the victims of starvation.

Adapted from Right to Food Campaign (2012)

employment has been introduced throughout India. This is the largest-ever public employment programme envisaged in human history. One of the most important requisites for this programme is transparency and accountability. Village assemblies or *gram sabhas* conduct social audits of all works taken up within *gram panchayats*.¹¹ Social audits include scrutinising and verifying the authenticity of all records and procedures of the programme and expenditure. Social audits of all works in the *gram panchayat* area is conducted by the *gram sabha* (Dev and Sharma, 2010).

The ICDS scheme was launched in 1975. It is aimed at children of up to six years of age with a special focus on children up to two years, in addition to expectant and nursing mothers. This is carried out through a package of six services: health checks, immunisation, referral services,

supplementary feeding, non-formal pre-school education, and advice on health and nutrition. These services are made available through a wide network of childcare centres popularly known as '*anganwadis*'. In spite of its expansion in the last three decades, the impact on child nutrition and protecting the rights of children is quite limited, due to limited coverage and outreach of services (Ittyerah, 2013).

3.4 National Food Security Act (NFSA)

The NFSA was launched in 2013. It did not replace the earlier schemes but ensured that they became a legal entitlement, such that lack of implementation can be challenged in the court. The NFSA includes the MDM

11. In India, under the *panchayati raj* system, a *gram sabha* is a village assembly that includes all adult residents. *Gram panchayat* is the organisation of elected representatives (called *panchas*) by the members of the village *gram sabha*. It is a self-government organisation. The number of members in a *gram panchayat* depends upon the population of the village.

scheme, ICDS scheme and the PDS. The NFSA also recognises maternity entitlements. The scheme is aimed at providing subsidised food for up to 75 per cent of the rural and 50 per cent of the urban population (GOI, 2013b) and makes provision for the state governments to support children and mothers by providing them with one hot meal a day (ibid).

Both the central government and state/union territories are jointly responsible for its implementation. The central government is responsible for procurement, allocation and transportation of food grains to the designated depots of the Food Corporation of India. The operational responsibilities for lifting and distributing allocated food grains within the states/union territories, identifying eligible below poverty line (BPL) families, issuing ration cards and supervising the distribution of allocated food grains to eligible card holders through the fair price shops are that of the states/union territory governments (ibid). The NFSA also has prescribed roles for local authorities in the implementation of all the schemes under the act, including the Targeted Public Distribution System (TPDS), for ensuring that the subsidised food grains reach the targeted beneficiary. According to the NFSA, every local authority, or any other authority or body as may be authorised by the state government, shall conduct or cause to be conducted periodic social audits on the functioning of fair price shops, TPDS and other welfare schemes, and should publicise its findings and take necessary action, in such manner as may be prescribed by the state government.

While the NFSA is a positive step towards trying to address the problem of food insecurity, the schemes on which it is based have a number of significant shortcomings. One apparent shortfall across all of these schemes is their focus on supply of food grains, with little or no attention to, for example, pulses, edible oils and vegetables required to tackle malnutrition.

It is argued that the Food Security Act neglects production, procurement, and farmers' livelihoods and food rights. The

right to food requires not only equitable, decentralised and sustainable food systems, but also entitlements relating to livelihood security such as the right to work, land reform and social security. It is strongly recommended that social security pensions, special entitlements for vulnerable groups, community kitchens and strong accountability measures among others should also be a part of the food security agenda (Dreze, 2013; see also Box 1).

There has also been much public debate and a series of specific recommendations from others about alternative approaches to address food security. Lowering the cost of production and increasing the livelihood sustainability of small and marginal farmers is thought by many to be an important first step in building food security (Lehman and Chakravarti, 2015). Some argue for lower-input, sustainable agricultural practices to liberate farmers from costly inputs – fertiliser, seed and pesticides for example – and the associated debt trap that is making agriculture unviable for some (Vandana, 2013).

Mainstream food security schemes have inevitably had some successes, but are criticised for a relatively simplistic macro-level framing of the food system, with preferred action plans largely based on the centralised distribution of foodstuffs able to meet basic calorific requirements. These approaches tend to neglect other crucial components of food security such as access, consumption, nutritional quality and food safety.

The collection and fine-grain analysis of comparable data sets concerning the nature and determinants of change in nutritional status (in particular settings and contexts) is vital to understand food system dynamics and entry points for transformational change in terms of food security for the urban and rural poor. This is particularly important in transitional urbanising situations, where there are high concentrations of people living in poverty, many of whom are unable to access existing formal schemes. In the meantime, we urge for additional considerations for informal/migrant residents to provide such access.

4

Transformative policies to bridge the rural-urban divide

In the previous three sections of this paper, we have discussed challenges that India faces in relation to malnutrition, how these relate to rural-urban transformations, and the successes and failures of existing government schemes to improve access to food for the poor in urban and peri-urban contexts.

Current efforts to address malnutrition in India appear to be somewhat decoupled from the pursuit of urban development trajectories and other key areas of policy and planning. In this section, we address one set of possibilities for constructive forms of integration across these agendas, based on greater attention to rural-urban transformations and dynamics in peri-urban contexts. We focus on the potential for peri-urban areas to support more sustainable food production and ecosystem management, and for peri-urban agriculture to be a major contributor to peri-urban poverty alleviation and to urban food security. We suggest that a more holistic, food security-based approach to addressing malnutrition, along with measures to support fragile peri-urban ecosystems and communities engaged with agriculture, could underpin processes to improve the health and nutrition of urban and peri-urban residents.

In presenting this argument, we build on material presented in sections 1–3, but also on insights from major transdisciplinary research projects funded by the UK Department for International Development (DFID), the UK's Natural Environment Research Council (NERC) and the Economic and Social Research Council (ESRC)

over the past two decades.¹² These have sought to make visible some key interactions between peri-urban land-use transformations, urban food systems and poverty and to examine possibilities for turning current destructive feedback loops between urban development trajectories and peri-urban natural resource management into positive synergies.

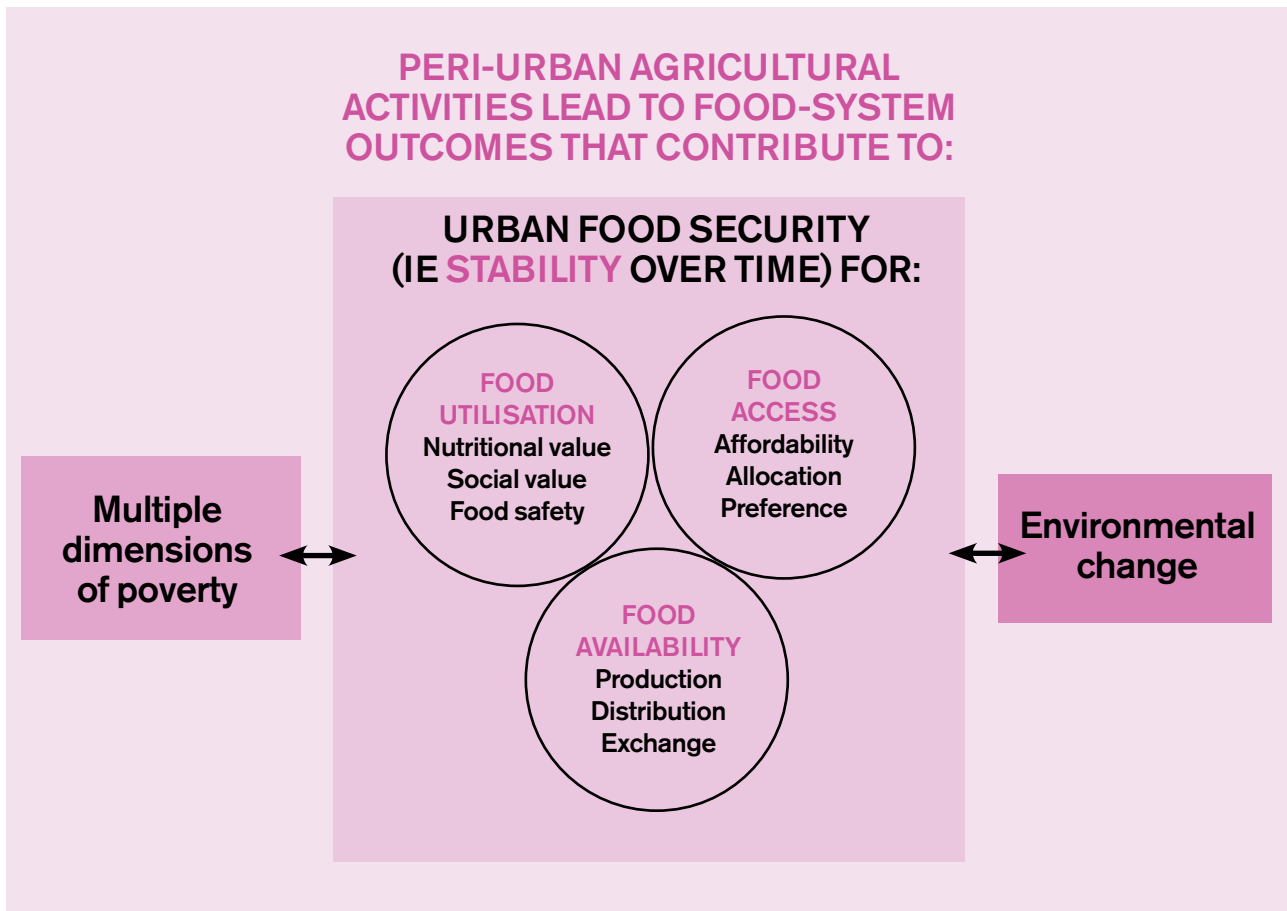
These studies began with assessments of the nature, extent and significance of peri-urban agriculture in India in and around Delhi and Varanasi. They included biophysical studies (in collaboration with colleagues at Banaras Hindu University, Jawaharlal Nehru University (JNU) and the Indian Council of Agricultural Research) into the impacts of environmental change on crop yield and safety, coupled with participatory assessments of implications for agricultural communities, and policy analysis and engagement to consider intervention points. More recent work has sought to understand and influence formal and informal institutions and governance arrangements, and support targeted and integrated interventions to preserve peri-urban ecosystems in support of the health and livelihoods of citizens across the rural-urban continuum.

4.1 Focus on multiple dimensions of food security

It is now widely accepted that food security depends not only on the availability of food, but on entitlements of

12. For a list of projects, see the acknowledgements to this working paper.

Figure 1. The role of peri-urban agriculture in food security



Adapted from: Ingram *et al.* (2010)

particular groups that enable them to have economic and social access to it. As definitions of food security have evolved, the ability of individuals to obtain adequate nutritional value from food has been included, and the associations between poverty and both undernutrition and malnutrition have been more widely explored.

According to the Food and Agriculture Organization of the United Nations (FAO), 'Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (FAO, 2003).

Current 'food security' schemes in India (described in Section 3) are intended to target the poor, but do not appear to engage with the multiple dimensions of food security expressed in the FAO definition. They are largely based on the centrally managed distribution of a limited range of foodstuffs (as discussed in Section 3) with some urban and peri-urban poverty groups, arguably those in most need, unable to access them.

Despite an apparent lack of association between overall improvements in agricultural production and nutrition nationally in India (Acharya, 2009), evidence suggests that urban and peri-urban agriculture/horticulture can

make a major contribution to addressing multiple food insecurities. It can improve access to fresh, affordable and nutritious produce for urban and peri-urban consumers (Bentaya, 2015; Drechsel *et al.*, 2015). It can also underpin the alleviation of multiple dimensions of poverty and/or act as a safety net to keep producers out of poverty (Marshall *et al.*, 2016).

There are multiple interdependencies not only between food security and poverty alleviation, but also environmental change. For an urbanising/peri-urban context we might represent the role of agriculture as contributing to urban food security as in Figure 1.

4.2 How can urban and peri-urban agriculture contribute to food security?

Just as there is a lack of adequate data on nutritional status disaggregated below state level in India (Section 2.1), there is also a dearth of information on the nature, extent and significance of urban and peri-urban agriculture. Such data would be immensely useful to support constructive dialogue among a number of

national and international agencies who are developing interests in its contribution to food security and with other stakeholders (Kenmore, 2014). There is very little published empirical data, and it is challenging to gather information on rapidly changing peri-urban crop distribution from existing secondary sources, or to map them on the basis of readily available satellite imagery and census data.¹³

However, the empirical data that is available does demonstrate that a high proportion of the fresh perishable produce is grown in peri-urban areas adjacent to the urban core. Crops are produced largely by smallholder farmers, and marketed through informal channels (Marshall *et al.*, 1999; te Lintelo *et al.*, 2002). Livestock keeping, particularly dairy herds, supplies an increasing urban demand for milk products (Singh and Rai, 1998).

As part of a wider DFID-funded study (Marshall *et al.*, 1999; Mukherjee, 2001), we examined the significance of agriculture to poor communities in selected case-study villages around Delhi and Varanasi, through an intensive programme of participatory research activities (PRA) involving over 1,000 farmers in 28 villages during 1999–2003. This revealed an in-depth picture of the contribution which agriculture makes, particularly in terms of food provision, employment and income from off-farm sales. Complementary studies included interviews in a wider range of agricultural communities and surveys at major wholesale markets to assess the proportion of products arriving at the market which originated from urban and peri-urban areas.

The study revealed that despite lack of official awareness at the time, peri-urban agriculture was supporting livelihoods (food, income, employment, cooking fuel) and providing a safety net for poor marginal (< 1 ha) and smallholder farmers (1–2 ha) who form a large majority of the total farming population. Of the households surveyed, 70–90 per cent were involved in agriculture, many part-time (earning 25–66 per cent of household income). Food production within the community provided households with direct access to nutritious food which was culturally acceptable; and indirectly, the sale of cash crops facilitated the purchase of other food items such as milk to supplement the diet. Furthermore, villagers cited the importance of agriculture in dissipating the effects of seasonal hunger and poverty, although overall livelihood strategies were diverse. The survey of the origin of produce indicated the very high proportion of perishable produce grown in the districts adjacent to the Delhi and Varanasi municipalities being supplied to the city

from districts immediately adjacent to the urban centres (Marshall *et al.*, 1999, 2003a).

The data from these studies is rather old, but appears to remain relevant in its research approach and key messages today. Limited follow-up work has indicated the continued importance of peri-urban agriculture in the expanded peri-urban zone around Delhi and Varanasi, but a comprehensive follow up is yet to be undertaken. In a few of the original villages examined, agriculture remains the major source of livelihood (such as those specialising in particular crops such as cauliflower) although the pressures of urbanisation have resulted in additional constraints on yield and quality, and increased use of agrochemicals (Bhupal, 2014). In others, a combination of urbanisation pressures and opportunities have resulted in a smaller proportion of households now depending directly on agriculture.

Our ongoing work funded by ESPA¹⁴ (Marshall *et al.*, 2016) is examining the relationships between peri-urban environmental change and poverty amongst peri-urban farming communities in Delhi's National Capital Region and in the peri-urban vicinity of Hyderabad.¹⁵ Field research in Ghaziabad district in 2016 (as part of a community survey and participatory 'mapping' exercise led by Ritu Priya and Ramila Bisht at JNU and Linda Waldman at the Institute of Development Studies) has demonstrated that about a third of households in some wards classified as 'urban' still depend directly on agriculture for their livelihoods. It is particularly important for landless workers, and supplies local markets through a variety of formal and informal marketing channels (*ibid.*)¹⁶

Other recent work has revealed the continued importance of peri-urban agriculture to producers and consumers, for example on the banks of the river Yamuna in Delhi (Follman, 2015), and in peri-urban districts surrounding Delhi (Narain, 2008) and Hyderabad (Hussain and Hanisch, 2014; Anuradha *et al.*, 2015; see also Table 5)

While recognition of the significance of urban and peri-urban agriculture is gradually entering mainstream debate in India (GOI, 2013a; Hussain and Hanisch, 2014; Jacobi *et al.*, 2009), it is rarely a priority in planning decisions, even when some planning activity does occur beyond municipal boundaries in city regions, such as Delhi's National Capital Region. Therefore, where agricultural activities do continue there is almost no formal recognition and access to supporting resources and appropriate advice is scarce, particularly for smallholder farmers working in the informal sector.

13. Current work led by Priyane Amerasinghe, International Water Management Institute (IWMI) and Jorn Scharlemann, University of Sussex is seeking to develop methodologies to address this issue with case studies around six cities in South Asia. See <https://impact.pub/January2017digitaledition/> and <http://waterdata.iwmi.org/applications/espas>

14. Risks and Responses to Urban Futures project. Funded with support from ESPA, which is funded by DFID, ESRC and NERC.

15. The Delhi National Capital Region (NCR) encompasses the National Capital Territory of Delhi, including New Delhi, and designated areas surrounding it in the neighbouring states of Haryana, Uttar Pradesh and Rajasthan.

16. See also <http://steps-centre.org/project/urban-futures> and <http://steps-centre.org/blog/what-does-the-future-hold-for-delhis-urban-farmers>

Table 5. Sources of produce sold at Azadpur Market (%)

VEGETABLE	DELHI NCT	SIX ADJACENT DISTRICTS	OUTSIDE AREAS	NUMBER OF RESPONDENTS
Cauliflower**	58	35	7	54 (a)
	95	5	0	150 (b)
Okra**	17	82	1	54 (a)
Spinach beet/ palak**	57	43	0	54 (a)
	72	22	6	559*
Potato	0	2	98	896*
Aubergine	10	47	43	410*

* Marshall *et al.* (1999)

** Marshall *et al.* (2003b): November 2000 (a) and January 2001 (b)

4.3 How does peri-urban environmental degradation impact on food security?

While creating livelihood opportunities for many, urbanisation can also pose enormous challenges for an increasing number of disenfranchised, poor and marginalised citizens, particularly in transitional peri-urban areas where there is intense competition over land and other resource use, environmental degradation and increasing access deficit (Dupont, 2007; Gururani, 2013; Levien, 2011; Narain, 2009). Despite opportunities presented by growing urban markets, there are distinctive challenges for farming in these contexts. Here we consider how the current lack of attention to urban and peri-urban agriculture, and in particular the ecosystems that support them, is undermining the current and future ability to produce local fresh and nutritious food to supply urban populations, while also impacting adversely on the health and livelihoods of urban and peri-urban citizens.

Peri-urban environmental degradation can impact on food security in multiple ways (see Figure 1), through:

- Reduced **availability of fresh produce** (as a result of loss of suitable land, or access to water for agriculture and declining yields due to soil deterioration and pollution),
- Reduced **access to food** to poorer consumers (due to loss of livelihoods for landless agricultural workers, loss of subsistence agriculture and reduction in quantities of fresh affordable local produce for informal local markets), and

- Adverse effects on the **food utilisation** dimension of food security (eg through air and water pollution affecting food quality and safety).

There are multiple factors contributing to peri-urban environmental degradation. A wider process of neoliberal reordering is associated with:

- Relocation of polluting industries from the core of cities to the transitional zones,
- Flows of urban waste from the city's core to the peripheries in the form of landfill sites and waste-treatment facilities, and
- Illegal extraction of groundwater by industries and disposal of untreated industrial and domestic waste in open spaces, under the ground and in rivers or other water bodies (Marshall *et al.*, 2009; 2010).

The peri-urban zones thus suffer from increased extraction of resources to support the urban core, while also absorbing the cities' waste. Ambiguous jurisdictional boundaries, weak environmental regulations and a lack of pollution-monitoring facilities and human resources in state pollution-control boards result in a failure to address peri-urban environmental degradation (Karpouzoglou and Zimmer, 2012). This directly impacts on the health and livelihoods of peri-urban residents, while also adversely affecting the yield, nutritional quality and safety of food crops produced there (Agrawal *et al.*, 2003; Marshall *et al.*, 2003a; Marshall and Malamud, 2005; Singh *et al.*, 2010).

Health hazards from polluted peri-urban ecosystems also extend to those who might consume the produce grown on peri-urban smallholdings, including those who purchase from urban markets. For example, heavy metals (largely from peri-urban industries) have been found in produce

from peri-urban areas, linked to both aerial contamination and uptake through soil contaminated with industrial wastewater (Marshall *et al.*, 2003a; Marshall and Malamud, 2005; Singh *et al.*, 2010). The levels of highly toxic lead and cadmium in some crops were far in excess of any international permissible limits, presenting a multitude of health threats, including carcinogenic potential (*ibid*). In addition to industrial contaminants, the re-use of domestic wastewater can lead to health problems associated with faecal contamination (Bradford *et al.*, 2003). Specifically, key linkages between environmental pollution and food production are not considered in pollution monitoring and control (Marshall *et al.*, 2003a; Marshall and Malamud, 2005; Singh *et al.*, 2010).

Where attention has been drawn to the safety of food grown in transitional areas, it has tended to focus on agriculture as a cause of environmental pollution and as a source of contaminated produce due to high levels of agrochemical use. This has, for example, prompted a number of campaigns to ban specific pesticides, to more effectively regulate pesticide use and to support alternative agricultural practices (ICAR-NCIPM; PAN, 2016). These are important issues. However, the issue of wider environmental degradation caused by industrial development in peri-urban transitional zones and how this impacts on the yield, quality and safety of agricultural produce is still largely neglected. The Food Safety and Standards Act 2006 is able to focus only on testing of limited contaminants, and largely of contaminants in processed foods, while the safety of fresh produce and non-packaged produce is not routinely covered (GOI, 2006).

At a policy level the focus of health plans and programmes in India continues to be on water-borne disease and other traditional public health concerns. While there is some concern over occupational health and other located pollution hazards, management attempts have tended to disregard surrounding communities that are integrated into and negatively affected by industrial processes. Thus, many environment-health linkages are not well specified in public policy in India, which continues to be organised by sector in principle as well as in implementation. Although considerable disciplinary expertise exists, there is still little cross-disciplinary collaboration between the environment, health, agriculture and development sectors.

While the nature and extent of these challenges will continue to evolve, there are also multiple ways in which the adverse impacts can be ameliorated and safe and nutritious peri-urban food be produced. For example, relatively simple agronomic measures such as applying lime to soils can reduce significantly heavy metal uptake into the edible portion of crop plants while longer-term efforts to address pollution at source are examined. But effective adaptation and integration of agriculture into an increasingly peri-urban India will require formal recognition of the linkages between environmental degradation and food production. A new priority needs to be given to smallholder peri-urban farming.

4.4 Key policy entry points for addressing food security

There are promising policy entry points for facilitating the role of urban and peri-urban agriculture in addressing food security. We argue that the peri-urban interface, and its marginalised inhabitants, need be recognised as a key frontier in addressing the challenges of sustainable urbanisation, with food security being central to this (Marshall *et al.*, 2016). Here, we explore opportunities for interventions relating to peri-urban agriculture that could support moves in this direction. We consider how a more constructive set of engagements with the expanding peri-urban realm could be incorporated into current and emergent policy and planning initiatives.

4.4.1 National Land Utilisation Policy

A current and promising policy entry point is found in the draft National Land Utilisation Policy which is aimed at protecting land that is suitable for agriculture. The objectives of the policy include the 'protection of agricultural lands from land use conversions so as to ensure food security and to meet consumption needs of a growing population and to meet livelihood needs of the dependent population' and the 'preservation of areas of natural environment and its resources that provide ecosystem services' (GOI, 2013a). Peri-urban agriculture is itself dependent on the preservation of peri-urban ecosystems in order to support a range of ecosystem services (Marshall *et al.*, 2016). Protection of those ecosystem services upon which agriculture depends can also have multiple other benefits for supporting urban resilience (de Zeeuw *et al.*, 2011). For example, a study carried out by the Delhi School of Economics in 2013 in the National Capital Region (NCR) sends a clear warning that several areas of Delhi's satellite town could end up under floodwater. This risk is associated with the loss of farmland, forest and shrub since 1995, with more than 36 per cent of the forest and 22 per cent of the shrub areas being transformed into settlements (Bedi, 2014).

Large extents of agricultural land still exist within the municipal boundaries of small- and medium-sized towns due to the relatively slow pace of physical growth. The draft land utilisation policy states that such lands should preferably be retained as such, particularly if the soils are of high quality. Importantly, the policy recommends that land should be divided into land utilisation zones including predominantly rural and agricultural areas; areas under transformation (this includes peri-urban areas); predominantly urban areas; predominantly industrial areas; predominantly ecological areas, landscape conservation and tourism areas; heritage areas; and major hazard-vulnerable areas (GOI, 2013a). There is also an implementation process outlined in the policy, which emphasises the incorporation of

these issues into state-level plans, regional plans and master plans. This suggests the potential to influence approaches to dealing with peri-urban areas which will indeed become an increasing proportion of the overall 'land utilisation'.

While formal processes to protect agricultural land are promising, a major challenge will remain in ensuring that the poor and marginalised benefit, in the context of rising peri-urban land prices and the conflicting priorities of powerful interest groups. Peri-urban areas are fuzzy jurisdictional zones, being neither rural or urban, with decisions regarding land-use change tending to lack coordination between agencies and transparency. In these circumstances the preservation of peri-urban land for agriculture is challenging. Pressures from urban development resulting in voluntary land sales or acquisitions increase the vulnerability of small-scale farmers in particular, many of whom are landless tenant farmers. For those remaining in agriculture, the transfer of responsibilities from village *panchayats* (after urban reclassification) to entirely new urban local bodies leaves agricultural support in the hands of the district authorities whose focus of attention is on rural rather than 'urban' areas. This suggests that areas under transition should have agricultural land clearly identified and demarcated.

Another important feature of land-use policy is the increased prevalence of 'greening' initiatives in peri-urban spaces. Here, areas of peri-urban land are acquired for green recreational spaces such as 'biodiversity parks' or 'city forests'. While preserving certain types of ecosystem services, these initiatives can undermine current or future agricultural uses by competing directly for land and water or other resources such as fodder through the replacement of common property resources with exclusive reserves. It would seem entirely possible to develop government-supported ecosystem management approaches that incorporate food production in peri-urban areas. However, pro-poor and pro-environment initiatives rarely coincide, and many environmental activists are not in support of preserving agriculture. Here, there could be possibilities for influencing policy and planning by building new alliances of actors that link (peri-urban) environmental activism with concerns of the poor, and recognition of the significance of agriculture. This is the focus of ongoing work by JNU colleagues in collaboration with the Sussex STEPS Centre (Priya *et al.*, 2017).

4.4.2 Vegetable Initiative for Urban Clusters (VIUC)

More recently, there has been some formal recognition of the importance of peri-urban vegetable production, led by the increasing demand from urban consumers. This has been demonstrated most notably through the government-led Vegetable Initiative for Urban Clusters (VIUC) (GOI, 2011b). This scheme was launched in

2011–2012 under the Rashtriya Krishi Vikas Yojana (RKVY) or National Agricultural Development Scheme. It was aimed at fulfilling the supply of vegetables in urban clusters from the nearby villages and peri-urban areas, while looking at a number of constraints such as access to markets and food safety concerns. It has been implemented in one city in each of 30 states of India. Components of the scheme include vegetable seedling production, vegetable cultivation, protected cultivation, organic farming, post-harvest management, promotion of farmers' groups, and support for marketing (*ibid*).

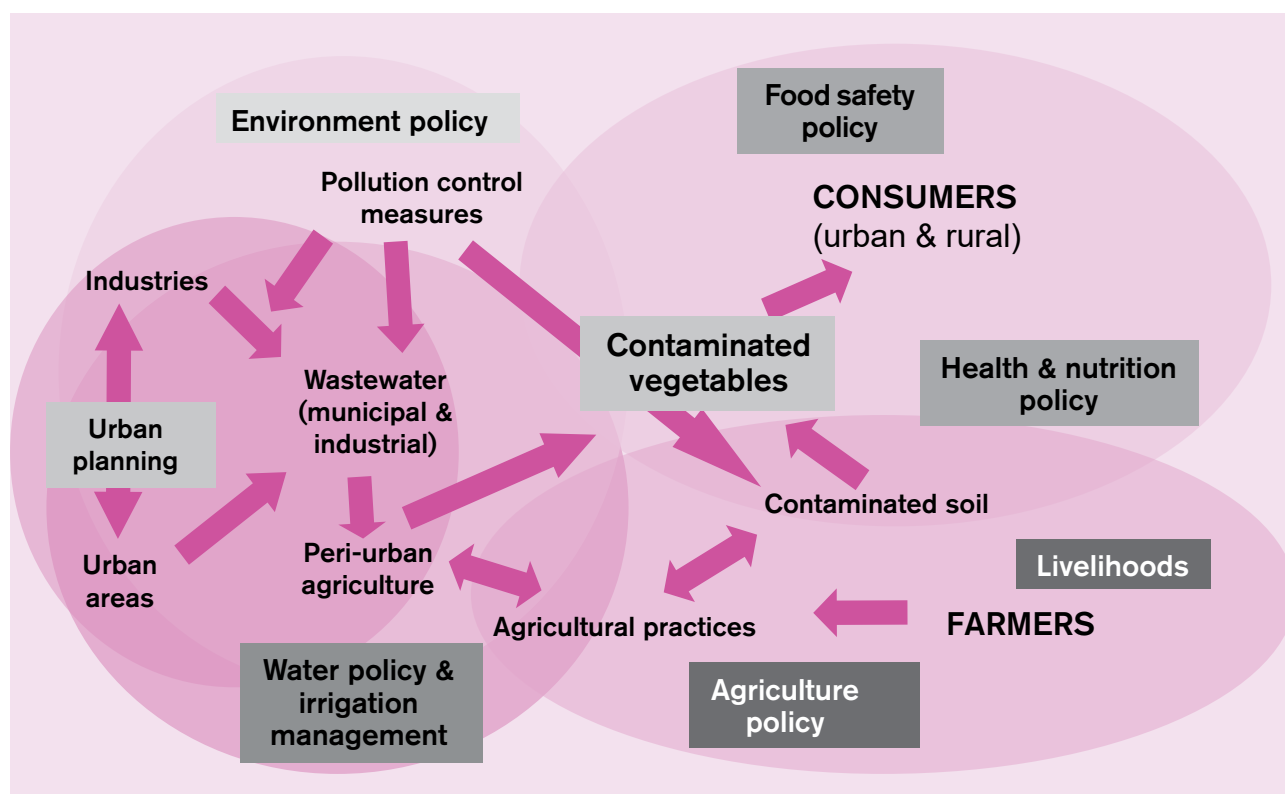
This promising scheme is no longer operational, but if it were to be reinstated and developed, a thorough evaluation of its impacts and a consideration of the potential for it to provide more comprehensive support for multiple dimensions of food security would be helpful. For example, there appears to be potential to develop such schemes in a manner that actively encourages the wider involvement of small-scale producers and other food-system actors in the informal sector. This could provide the basis for much-needed support and advisory mechanisms, and also perhaps an incentive to remain involved in agriculture despite multiple pressures to withdraw. While 'protected cultivation' was the preferred approach in the VIUC to ensure year-round production of 'safer' produce (and accounted for a sizeable proportion of the overall budget for the scheme), there would appear to be much potential to consider the incentivisation of sustainable farming practices through a wider variety of agronomic approaches (which, although mentioned in the VIUC documentation, do not appear to have featured significantly in implementation). For example, there is heavy and widespread use of pesticides in peri-urban agriculture, and considerable potential to develop integrated pest-management programmes (ICAR, 2016) for these priority vegetable-production areas. These schemes have the potential to improve the safety of vegetables while also reducing the cost of production and wider environmental health impacts.

4.4.3 Prime Minister's Irrigation Development Plan (PMKSY)

This new initiative is one of several that suggest the potential to improve synergies in resource use across the rural-urban continuum, while supporting multiple dimensions of food security. Wastewater reuse was not formally recognised as a source of irrigation water in India, despite the dependence upon it by a growing number of farmers in transitional spaces (Marshall and Malamud, 2005) and its relationship to food safety, health and environmental opportunities and threats. Some of the key linkages between the unsupported use of contaminated wastewater in peri-urban vegetable production and related policy fields are illustrated in Figure 2.

PMKSY is an amalgamation of a number of ongoing and previously centralised irrigation-related schemes. PMKSY has recently been approved for implementation across the

Figure 2. Peri-urban vegetable production and related policy fields



Source: Marshall and Malamud (2005)

country with an outlay of 50,000 crore (500 billion) rupees in five years (GOI, 2015). It aims to increase the proportion of agricultural land under irrigation, using a variety of water use, conservation and harvesting techniques. Importantly, it involves collaboration across a range of relevant ministries and departments (including Ministry of Agriculture, Ministry of Water Resources, Ministry of Urban Development, Ministry of Environment and Forests). It is based on the adoption of a decentralised state planning and project execution structure, although at the time of writing the crucial role of local government in implementing this scheme is yet to become apparent.

There is one key objective in the PMKSY that deals with the peri-urban. It states that those involved in the initiative should 'explore the feasibility' of reusing treated municipal wastewater for peri-urban agriculture. Thus, in this emergent scheme there is potential to support the safe and appropriate use of urban wastewater for agricultural production, and through this process to address a number of constraints on food security – through improved access to water resources and improved crop safety. However, implementation such that the benefits are shared across income groups, will require considerable commitment beyond assessing the possibilities to establish new treatment and supply links between municipal water treatment plants and selected agricultural sites. It will certainly require recognition and support for farmers who

are currently relying on the widespread informal use of wastewater (which contains a mixture of industrial and domestic contaminants, some of which are not removed in established treatment processes) and improved understanding of how benefits of such schemes will accrue to poorer consumers and producers. It would also be useful to further examine, and support learning between, apparently successful wastewater reuse initiatives such as the Kolkata example where municipal household and industrial wastewater reuse is used in a polyculture based on aquaculture, with vegetable cultivation and pig rearing as supplementary activities (Cofie and Jackson, 2013).

4.4.4 Composting in Solid Waste Management (SWM) Rules 2016

The reuse of urban solid waste for peri-urban farming provides opportunities to have positive impacts on food security by helping to preserve soil quality and structure, and reducing the costs and environmental impacts of synthetic fertiliser inputs, while contributing to the challenge of addressing solid-waste management. However, policy and institutional constraints associated with these often-informal practices, coupled with competition for land and environmental degradation, have made widespread and safe use of urban waste increasingly challenging. Several authors have argued for the need to develop appropriate policies and programmes

to support waste reuse with the involvement of peri-urban stakeholders (Hofmann, 2013).

Indeed, there are already a number of successful examples from some South Asian cities where this approach is used for urban gardening and horticulture. The Pune Municipal Corporation collaborates with the NGO Waste to Health, which emerged from an early ecological civil society movement and promotes a viable organic waste-recycling technique.¹⁷ The organisation's members have been advertising natural bio-catalysts or 'biosanitiser' developed by the Bhawalkar Ecological Research Institute (BERI) for many years. City residents are motivated to use organic waste and the biosanitiser to cultivate organic fruits and vegetables on their rooftops and terraces (Behmanesh, 2010).

For the first time, there is a major emphasis on composting in the newly revised Solid Waste Management Rules 2016 (GOI, 2016). Previously, there had been no serious policy steer or incentive for composting, and no market for compost as opposed to chemical fertilisers, which were subsidised. Now, alongside centralised composting plants, there is a proposal for decentralised processing of biodegradable waste. The rules state that any resident welfare and market associations, gated communities and institutions occupying more than 5,000m², hotels

and restaurants should process, treat and dispose of biodegradable waste through composting or biomethanation within the premises as far as possible. It has been recommended that local bodies phase out the use of chemical fertilisers in two years and use compost in all parks and gardens maintained by local bodies and wherever possible in other places under their jurisdiction. The Ministry of Agriculture has also been advised that it should propagate the utilisation of compost on farmland; set up laboratories to test the quality of compost produced by local authorities or their authorised agencies; and issue suitable guidelines for maintaining the quality of compost and ratio of use of compost vis-à-vis chemical fertilisers while applying compost to farmland.

With food security as a priority, the challenge will be to establish ways of scaling these activities out or up, linking compost creation with support mechanisms for peri-urban farmers, and ensuring that benefits flow to poorer consumers as well as producers. This also means that schemes such as this, that support more agroecological farming practices, must avoid a sole focus on the creation of high-value organic products which are accessible only to elites.

17. See: www.wastetohealth.com

5

Conclusions and recommendations

We propose that the peri-urban interface – and its marginalised inhabitants – needs to be recognised as a key frontier in addressing the challenges of sustainable urbanisation, with nutritional improvements and wider dimensions of food security being central to this. Our discussion suggests a particular approach to developing transformative policies on food and nutrition that bridge the rural-urban divide in India. Agricultural land use must be fully and effectively incorporated into planning processes, and support for agrifood systems should be progressively integrated with urban environmental management, health, nutrition and poverty alleviation strategies.

We have demonstrated how efforts to address serious malnutrition concerns in India are largely decoupled from urban development initiatives and associated areas of policy and planning. The need to integrate health interventions more closely with overall efforts to tackle malnutrition is already well recognised. We extend this debate in the context of urbanisation, to propose the need for additional transdisciplinary lines of enquiry and intervention points. We suggest that a more holistic, food security-based approach to addressing malnutrition, along with measures to support fragile peri-urban ecosystems and communities engaged with agriculture, could help underpin processes to improve the health and nutrition of urban and peri-urban residents.

In our review of nutritional status and food consumption patterns in India we recognise major concerns over childhood malnutrition in India overall, with the last official National Family Health Survey figures from 2005–6 indicating that approximately half of children under five years of age in India are underweight (low weight for age) and 20 per cent wasted (low weight for height); albeit with some improvements indicated in the Rapid Survey of Children 2013 (GOI and Unicef). Our analysis has focused on the period since the introduction of the economic liberalisation agenda in India, during which cities have been promoted as engines of economic growth. Our analysis of available data on consumption patterns suggests that despite claims of 'trickle down', the

poorest urban inhabitants may be no better off in terms of nutritional status than their rural counterparts. Residents of transitional peri-urban areas, where there is tendency to concentrate poverty, can be particularly vulnerable.

Reviewing data on who consumes what in India, we have highlighted shortfalls in the availability of data, which limits understanding of the nature and extent of challenges to be addressed and also limits the possibilities for targeting support to those in most need. We have also highlighted the need for comparable data sets over time concerning the nutritional status for particular groups and for particular places; the need for data to be released to the public domain in a timelier fashion; and the need for fine-grain analysis of such data. Such analysis would help to determine the associations between development initiatives across various relevant sectors and changes in nutritional status. We argue that this sort of fine-grain analysis and gathering of comparable data sets is particularly important in transitional urbanising situations, where many residents are unable to access existing formal schemes. In the meantime, we urge that additional consideration be given to informal/migrant residents.

We have also reviewed existing measures by the government of India (including the PDS and MDM scheme for school children) to address aspects of food insecurity, and discussed how schemes which are established with the intention of improving the nutritional status of the urban poor appear to be failing many poor and marginalised groups. We have discussed limitations in the framing and specific objectives of existing food security-related programmes, arguing that these stem partly from a lack of understanding of and engagement with key features of rural-urban transformations, a focus on the distribution of food, and a neglect of other crucial components of food security such as access, consumption, nutritional quality and food safety.

We have emphasised the importance of urban and peri-urban agriculture which can make a major contribution in terms of providing access to fresh, affordable and

nutritious produce to urban and peri-urban consumers. It can also underpin the alleviation of multiple dimensions of poverty and/or act as a safety net to keep producers out of poverty, while also supporting urban waste management and maintaining other ecosystem services. Competition for land and water resources, along with industrial pollution, have serious impacts on peri-urban agriculture which also undermines food safety, livelihoods and other environmental benefits. Urban and peri-urban agriculture are rarely priorities in planning decisions in city regions in India. Where agriculture does continue, there is almost no formal recognition, and therefore access to supporting resources and appropriate advice is scarce. We argue that recognition of the significance of peri-urban agriculture, and preservation of the peri-urban ecosystems upon which it depends, is vital not only for peri-urban livelihoods but also for food security (supply, access, quality) for city inhabitants.

There are some existing opportunities to integrate agriculture and urban food security concerns into policy and planning. For example, the draft National Land Utilisation Policy (2013), which explicitly aims to protect land that is required to meet food security, suggests possibilities for more productive peri-urban land use. The new PMKSY irrigation plan, which promotes a more integrated and decentralised approach to irrigation planning, includes some recognition of peri-urban farming through a specific objective to explore the feasibility of using treated municipal wastewater for irrigation. Other recent initiatives such as the Vegetable Initiative for Urban Clusters scheme, which focused on increasing production and access to markets for some peri-urban farmers, could be usefully reinstated and developed. Schemes such as this could have positive impacts on multiple dimensions of food security by actively involving producers and consumers in the informal sector, finding inclusive ways of incentivising sustainable farming practices and examining ways of reducing the impacts of urban industrial pollution on food crops. There are also further possibilities to engage and influence emergent activities concerned with 'resilient' cities and climate change (Sharma *et al.*, 2013; TERI, 2015). But many cities are still looking within their city boundaries, with much work to be done supporting agencies to work together and think beyond such boundaries.

Even where priorities relating to agriculture and ecosystem management are incorporated into planning frameworks, the institutional ambiguity of the peri-urban realm and its unique governance challenges need to be addressed. There is a need to make visible the social and political infrastructure that reinforces food-security concerns in the midst of interventions aimed at addressing them, and map out the enablers as well as barriers. Here the promotion of 'politically smart and locally led' (Booth and Unsworth, 2014) urban development is very pertinent. If addressed appropriately, the unharnessed transformative potential of peri-urban spaces for urban food security and wider sustainability objectives could perhaps be realised.

Rural-urban transformations in India create complex, diverse risk-prone environments for agrifood systems, while also throwing up new opportunities. This is an uncharted development territory in which there are no blueprints for success; it is rife with uncertainty and the need for adaptation. We propose that there is an urgent need to engage with a deeper understanding of rural-urban transformations and their relationship with food insecurity, and to gather and share data, such that new interventions can be targeted to those in most need. This requires better understanding of how processes of urbanisation are actually unfolding – learning from the interventions that have been made, and the exclusions that have resulted. This is part of a wider global need to establish better understandings of the multitude of direct and indirect mechanisms that link urban systems and food systems (Seto and Ramankutty, 2016).

We argue that there is a strong case for looking beyond the traditional technology and growth models (Thompson *et al.*, 2007) with a commitment to supporting emergent agroecological approaches and multiple smaller-scale community innovations (for example in waste and water recycling to support food production) in peri-urban contexts. These offer the potential for flexible, context-specific ways of reconnecting agriculture in transitional environments with sustained and improved nutrition for the poor. In order to achieve this, it is essential to develop mechanisms to enhance the legitimacy of local knowledge from communities of the poor, and establish adaptive forms of peri-urban environmental governance that can respond to the fast-paced and unexpected repercussions of this uncharted development trajectory.

In order to distil lessons for future agrifood system design, forward-looking research agendas need to explore, through transdisciplinary approaches, the complex interactions that occur across scales; that link household food and livelihood systems to consumption patterns and processes of land-use and environmental change. Such activities should involve sustained engagement with peri-urban communities in order to develop experiential embedded knowledge of how and in what ways existing rural-urban transformations unfold and with what impacts on the environment and on the nutritional status, health and livelihoods of diverse residents across the rural-urban divide. This in turn requires attention to how wider political economy drivers meet local policies, politics and governance arrangements – and to shifting power relations, norms, values and cultures.

Insights from such action research activities need to be developed, shared and deliberated using formats that are engaging, forming new alliances to utilise insights in ways that support effective cross-sectoral interaction, and which also support multi-level policy advocacy (te Lintelo *et al.*, 2017) that has been largely missing in nutrition interventions to date.

References

- Acharya, SS (2009) Food security and Indian agriculture: policies, production performance and marketing environment. *Agriculture Economics Research Review* 22: 1–19.
- Agrawal, M *et al.* (2003) Effect of air pollution on peri-urban agriculture: a case study. *Environmental Pollution* 126(3): 323–329.
- Amerasinghe, P *et al.* (2013) Urban wastewater and agricultural reuse challenges in India. International Water Management Institute (IWMI). <https://cgspace.cgiar.org/handle/10568/39932>
- Anuradha, T *et al.* (2015) Urban agriculture in and around greater Hyderabad region. *Journal of Applied Science and Research* 3(4): 24–30. www.scientiaresearchlibrary.com/archive/JASR-2015-3-4-129-24-30.pdf
- Bedi, JS (2014) Urbanisation, development and housing requirement in the National Capital Region (NCR). National Council of Applied Economic Research. <https://ideas.repec.org/p/ess/wpaper/id6083.html>
- Behmanesh, S (2010) Municipal solid waste management as an incentive for city farming in Pune, India. *Urban Agriculture Magazine* 23. www.ruaf.org/municipal-solid-waste-management-incentive-city-farming-pune-india
- Bentaya, MG (2015) Urban agriculture's contribution to urban food security and nutrition. In: de Zeeuw, H and P Drechsel (eds). *Cities and agriculture: developing resilient urban food system* (First edition). Routledge, London and New York: 139–167. www.ruaf.org/publications/cities-and-agriculture-developing-resilient-urban-food-systems
- Bhaduri, A and Nayyar, D (1996) *The intelligent person's guide to liberalisation*. Penguin Books, New Delhi.
- Bhagat, RB (2011) Emerging pattern of urbanisation in India. *Economic and Political Weekly* 46(34): 10–12. <http://tinyurl.com/bhagat-rb-2011>
- Bhan, G (2009) 'This is no longer the city I once knew.' Eviction, the urban poor and the right to the city in millennial Delhi. *Environment and Urbanization* 21(1): 127–142. <http://journals.sagepub.com/doi/abs/10.1177/0956247809103009>
- Bhupal, DS, Agricultural Economics Research Centre, University of Delhi, personal communication, 2014.
- Booth, D and Unsworth, S (2014) Politically smart, locally led development. ODI. www.odi.org/publications/8800-politically-smart-locally-led
- Bradford, A *et al.* (2003) Wastewater irrigation in Hubli–Dharwad, India: implications for health and livelihoods. *Environment and Urbanization* 15(2): 157–170. <http://journals.sagepub.com/doi/abs/10.1177/095624780301500206>
- Chadchan, J and Shankar, R (2012) An analysis of urban growth trends in the post-economic reforms period in India. *International Journal of Sustainable Built Environment* 1(1): 36–49. <http://www.sciencedirect.com/science/article/pii/S2212609012000040>
- Chandrasekhar, CP and Ghosh, J (2006) *The market that failed: a decade of neo-liberal economic reforms in India*. LeftWord, New Delhi.
- Cofie, O and Jackson, L (2013) Thematic paper 1: Innovative experiences with use of organic wastes and wastewater in (peri-) urban agriculture in the global South. SUPURBFOOD, RUAF/IWMI. www.ruaf.org/sites/default/files/SUPURBFOOD%20Waste%20reuse%20FINAL.pdf
- Dev, SM and Sharma, AN (2010) Food security in India: performance, challenges and policies. Oxfam India. <http://tinyurl.com/dev-sharma-2010>
- de Zeeuw, H *et al.* (2011). The role of urban agriculture in building resilient cities in developing countries. *The Journal of Agricultural Science* 149(S1), 153–163.
- Drechsel, P *et al.* (2015) Productive and safe use of urban organic wastes and wastewater in urban food production systems in low-income countries. In: de Zeeuw, H and P Drechsel (eds). *Cities and agriculture: developing resilient urban food system* (First edition). Routledge, London and New York: 162–191. www.ruaf.org/publications/cities-and-agriculture-developing-resilient-urban-food-systems
- Dreze, J (9 July 2013) The food security debate in India. *The New York Times*. <http://tinyurl.com/dreze-j-09-07-2013>
- Dupont, V (2007) Conflicting stakes and governance in the peripheries of large Indian metropolises – an introduction. *Cities* 24(2): 89–94.
- Dupont, V (2011) The dream of Delhi as a global city. *International Journal of Urban and Regional Research* 35(3): 533–54.
- Dutta, V (2012) Land use dynamics and peri-urban growth characteristics: reflections on master plan and urban suitability from a sprawling North Indian City. *Environment and Urbanization Asia*, 3(2): 277–301. <http://doi.org/10.1177/0975425312473226>

- Faetanini, M *et al.* (eds) (2011) Urban policies and the right to the city in India: rights, responsibilities and citizenship. United Nations Educational, Scientific and Cultural Organization and Centre de Sciences Humaines. <http://unesdoc.unesco.org/images/0021/002146/214602e.pdf>
- FAO (2003) Trade reforms and food security: conceptualising the linkages. FAO, Rome. www.fao.org/docrep/005/y4671e/y4671e00.htm
- FAO (2015) Public Distribution System in India-evolution, efficacy and need for reforms. FAO, Rome. www.fao.org/docrep/x0172e/x0172e06.htm
- Follman, A (2015) Urban mega-projects for a 'world class' riverfront. The interplay of informality, flexibility and exceptionality along the Yamuna in Delhi, India. *Habitat International* 45(3): 213–222.
- Ghosh, J and Chandrasekhar, CP (2006) Economic growth and employment generation in India: old problems and new paradoxes. <http://tinyurl.com/Ghosh-Chandrasekhar-2006>
- GOI, Household consumer expenditure: national sample survey, Open Government Data Platform India, <https://data.gov.in/catalog/household-consumer-expenditure-national-sample-survey>
- GOI (2002) Report of the High Level Committee on long-term grain policy, July 2002. Department of Food and Public Distribution, Ministry of Consumer Affairs, Food and Public Distribution, Government of India.
- GOI (2005) Performance evaluation of Targeted Public Distribution System (TPDS). Programme Evaluation Organisation Planning Commission, Government of India. http://planningcommission.nic.in/reports/peoreport/peo/peo_tpds.pdf
- GOI (2006) Food Safety and Standards Act 2006. Ministry of Law and Justice, Government of India.
- GOI (2007) National food security mission. Ministry of Agriculture and Farmers Welfare, Government of India.
- GOI (2011a) Census of India. Office of Registrar and Census Commissioner, Ministry of Home Affairs, Government of India.
- GOI (2011b) Guidelines for the Vegetable Initiative for Urban Clusters. Department of Agriculture, Cooperation and Farmers Welfare, Government of India.
- GOI (2013a) Draft National Land Utilisation Policy. Department of Land Resources, Ministry of Rural Development, Government of India. <http://tinyurl.com/NLUP-India-2013>
- GOI (2013b) National Food Security Act 2013. Department of Food and Public Distribution, Ministry of Consumer Affairs, Food and Public Distribution, Government of India.
- GOI (2015) Operational guidelines of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY). Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India.
- GOI (2016) Solid Waste Management Rules 2016. Ministry of Environment, Forest and Climate Change, Government of India.
- GOI and Unicef (undated) Rapid survey on children (RSOC) 2013–14 national report. Ministry of Women and Child Development, Government of India and Unicef. <http://wcd.nic.in/acts/rapid-survey-children-rsoc-2013-14>
- Gupta, S (14 January 2012) Food expenditure and intake in the NSS 66th Round. *Economic and Political Weekly* 47(2): 23–26. <http://re.indiaenvironmentportal.org.in/files/file/Food%20Expenditure.pdf>
- Gururani, S (2013) Flexible planning: the making of India's 'millennium city,' Gurgaon. In: A Rademacher and K Sivaramakrishnan (eds). *Ecologies of urbanism in India*. Hong Kong University Press: 119–143.
- Himanshu, H (2008) Growth, employment and poverty reduction: post-reform Indian experience. Asia Research Centre, London School of Economics and Political Science, London. <http://eprints.lse.ac.uk/38342>
- Hofmann, P (2013) Wasted waste – disappearing reuse at the peri-urban interface. *Environmental Science and Policy* 31(2006): 13–22.
- Hussain, Z and Hanisch, M (2014) Dynamics of peri-urban agricultural development and farmers' adaptive behaviour in the emerging megacity of Hyderabad, India. *Journal of Environmental Planning and Management* 57(4): 495–515.
- ICAR-NCIPM, National Research Centre for Integrated Pest Management, www.ncipm.org.in/startpageindex.asp
- ICAR (2016) Success stories of integrated pest management in India. ICAR-NCIPM. www.indiaenvironmentportal.org.in/files/file/Success%20stories.pdf
- IIPS (2015a) District-level household and facility survey. Ministry of Health and Family Welfare, Government of India.
- IIPS (2015b) National family health survey. Ministry of Health and Family Welfare, Government of India.
- Ingram, J *et al.* (eds) (2010) Food security and global environmental change. Earthscan, London. www.gecafs.org/publications/Publications/Food_Security_and_Global_Environmental_Change.pdf
- Ittyerah, AC (2013) 'Food security in India: issues and suggestion for effectiveness.' Theme Paper for the 57th Members' Annual Conference, Indian Institute of Public Administration. www.iipa.org.in/upload/Food%20Security%20Theme%20Paper-2013.pdf

- Jacobi, J *et al.* (2009) 'Crop diversity as a livelihood strategy? The case of wastewater irrigated vegetable cultivation along the Musi River in periurban Hyderabad, India'. Conference on International Research on Food Security, Natural Resource Management and Rural Development (Tropentag 2009), 6–8 October 2009, University of Hamburg. www.tropentag.de/2009/abstracts/full/82.pdf
- Karpouzoglou, T and Zimmer, A (2012) Closing the gap between 'expert' and 'lay' knowledge in the governance of waste water: lessons and reflections from New Delhi. *IDS Bulletin* 43(2), 59–68. <https://opendocs.ids.ac.uk/opendocs/handle/123456789/7475>
- Kenmore, P, FAO representative India, personal communication, 2014.
- Keshri, K and Bhagat, R (2010) Temporary and seasonal migration in India. *Genus*.
- Krishna, A *et al.* (2014) Slum types and adaptation strategies: identifying policy-relevant differences in Bangalore. *Environment and Urbanization* 26(2): 568–585. <http://journals.sagepub.com/doi/abs/10.1177/0956247814537958>
- Kumar, D (ed.) (2005) *The Cambridge economic history of India Vol 2 (1975–2003)*. Orient Longman Private Limited, New Delhi.
- Kundu, A (1997) Trends and structure of employment in the 1990s: implication for urban growth. *Economic and Political Weekly* 32(4): 1,399–1,405.
- Lehman, JP and Chakravarti, S (6 March 2015) A faulty food security plan. *The Financial Express*. New Delhi. www.financialexpress.com/archive/a-faulty-food-security-plan/1231524
- Levien, M (2011) Special economic zones and accumulation by dispossession in India. *Journal of Agrarian Change* 11(4): 454–483.
- Mahapatro, SR (2010) 'The changing pattern of internal migration in India: issues and challenges.' European Population Conference, 13–16 June 2012, Stockholm University. <http://epc2012.princeton.edu/abstracts/121017>
- Marshall, F *et al.* (1999) The impacts and policy implication of air pollution on agriculture in urban and peri-urban areas of developing countries: a case study from India. Final Technical Report, R6992, DFID.
- Marshall, F *et al.* (2003a) Heavy metal contamination of vegetables in Delhi. Executive summary of technical report. DFID. <http://tinyurl.com/marshall-et-al-2016-tech-summ>
- Marshall, F *et al.* (2003b) Enhancing food chain integrity: quality assurance mechanisms for air pollution impacts on fruit and vegetable systems. DFID Crop Post Harvest Programme Project R7530 Final Technical Report. <http://tinyurl.com/marshall-f-et-al-2003>
- Marshall, F and Malamud B (2005) Contaminated irrigation water and food safety for the urban and peri-urban poor: appropriate measures for monitoring and control from field research in India. DFID Enkar 8160. <http://tinyurl.com/marshall-malamud-2005>
- Marshall, F *et al.* (2009) On the edge of sustainability: perspective on peri-urban dynamics. STEPS Working Paper 35. STEPS Centre. www.ids.ac.uk/publication/on-the-edge-of-sustainability-perspectives-on-peri-urban-dynamics
- Marshall, F *et al.* (2010) Contesting sustainabilities in the peri-urban interface. STEPS Centre and Sarai. <http://steps-centre.org/publication/contesting-sustainabilities-in-the-peri-urban-interface>
- Marshall, F *et al.* (2016) Risk and responses to urban futures: integrating peri-urban/urban synergies into urban development planning for enhanced ecosystem service benefits, ESPA Project Progress Report.
- MEA (2005) Ecosystems and human well-being: biodiversity synthesis. Millennium Ecosystem Assessment, Washington DC. www.millenniumassessment.org/documents/document.354.aspx.pdf
- Ministry of Health and Family Welfare (2016) National family health survey 2015–16 (NFHS-4): state fact sheets.
- Mitra, A and Mehta, B (2011) Cities as the engine of growth: evidence from India. *Journal of Urban Planning and Development* 137(2): 171–183.
- Mitra, A and Murayama, M (2008) Rural to urban migration: a district level analysis for India. IDE Discussion Paper 137. Institute of Developing Economies. www.ide.go.jp/English/Publish/Download/Dp/pdf/137.pdf
- MOUD (2006) Jawaharlal Nehru urban renewal mission. Government of India.
- MOUD (2011) Report on the Indian infrastructure and services. Government of India.
- Mukherjee, N (2001) Alternative perspectives on livelihoods, agriculture and air pollution: agriculture in urban and peri-urban areas in a developing country. DFID Environment and Research Project R6992.
- Narain, V (2008) Gone land, gone water: crossing fluid boundaries in periurban Gurgaon and Faridabad, India. *SAWAS Journal* 1(2), 143–158. www.sawasjournal.org/files/templates/sawas/images/Vishal%20Narain.pdf
- Narain, V (2009) Growing city, shrinking hinterland: land acquisition, transition and conflict in peri-urban Gurgaon, India. *Environment and Urbanization* 21(2), 501–512. <http://journals.sagepub.com/doi/abs/10.1177/0956247809339660>
- Navlakha, G (2000) Urban pollution: driving workers to desperation. *Economic and Political Weekly* 35(51), 4,469–4,474.

- Nayak, AK (2015) Environmental movement in India. *Journal of Developing Societies* 31(2): 249–280.
- NCAER (2014) India's pulses scenario. National Council of Applied Economic Research.
- NCRPB (2015) Chapter 2A, Farmer suicides in India. <http://ncrb.nic.in/StatPublications/ADSI/ADSI2014/chapter-2A%20farmer%20suicides.pdf>
- NFHS, National family health survey, India, <http://rchiips.org/nfhs/nfhs3.shtml>
- NNMB, Activities carried out so far, National Nutrition Monitoring Bureau, National Institute of Nutrition. <http://nnmbindia.org/activites.html>
- NSSO (1996a) Level and patterns of consumer expenditure 1993–94, NSS 50th round. Ministry of Statistics and Programme Implementation, Government of India. www.ilo.org/surveydata/index.php/catalog/137
- NSSO (1996b) Nutritional intake in India, NSS 50th round, July 1993–June 1994. Ministry of Statistics and Programme Implementation, Government of India. http://mospi.nic.in/sites/default/files/publication_reports/405_final.pdf
- NSSO (2014a) Level and patterns of consumer expenditure 2011–12, NSS 68th round. Ministry of Statistics and Programme Implementation, Government of India. <http://tinyurl.com/nss-2011-2012-68th-round>
- NSSO (2014b) Nutritional intake in India 2011–12, NSS 68th round. Ministry of Statistics and Programme Implementation, Government of India. <http://tinyurl.com/nutrition-11-12-nss-68th-round>
- PAN (2016) Stop highly hazards pesticides. Pesticide Action Network India.
- Patnaik, U (2006) The republic of hunger and other essays. Three Essays Collective, New Delhi.
- Planning Commission (2012) Twelfth five-year plan. Government of India.
- Prakash, A *et al.* (2011) Changing waterscape in the periphery: understanding peri-urban water security in urbanizing India. Oxford University Press. www.idfc.com/pdf/report/2011/Chp-11-Changing-Waterscapes-in-the-Periphery.pdf
- Priya, R *et al.* (2017) Local environmentalism in peri-urban spaces: the politics of emerging alliances in an Indian context. STEPS Working Paper (in press).
- Ramanathan, U (2005) Demolition drive. *Economic and Political Weekly* 40(27), 2,908–2,912.
- Randhawa, P and Marshall, F (2014) Policy transformation and translation in peri-urban Delhi, India. *Environment and Planning C: Government and Policy* 32: 93–107.
- Ray, R and Sinha, K (9 August 2014) Rangarajan Committee report on poverty measurement: another lost opportunity. *Economic and Political Weekly* 49(32), 43–48. www.epw.in/journal/2014/32/insight/rangarajan-committee-report.html
- Right to Food Campaign (2012) National Food Security Bill 2011: summary critique. Right to Food Campaign.
- Roy, D (2004) From home to estate. *Seminar* 533: 68–75.
- Sachdeva, S *et al.* (2013) Increasing consumption of fruit and vegetables: challenges and opportunities. *Indian Journal of Community Medicine* 38(4): 192–197. www.ncbi.nlm.nih.gov/pmc/articles/PMC3831687
- Sampat, P (28 March 2015) Growth for a few, loss for many. *The Hindu*. New Delhi. <http://tinyurl.com/sampat-28-03-2015>
- Seto, KC and Ramankutty, N (2016) Hidden linkages between urbanization and food systems. *Science* 352(6288): 943–945.
- Sharma, D *et al.* (2013) Urban climate resilience: a review of the methodologies adopted under the ACCCRN initiative in Indian cities. IIED, London. <http://pubs.iied.org/10650IIED>
- Siddiqui, K (2014) Growth and crisis in India's political economy from 1991 to 2013. *International Journal of Social and Economic Research* 4(2), 84–99. <http://eprints.hud.ac.uk/21227>
- Singh, A *et al.* (2010) Health risk assessment of heavy metals via dietary intake from the wastewater irrigated site of a dry tropical area of India. *Food and Chemical Toxicology* 48: 611–619.
- Singh, V and Rai, KN (1998) Economics of production and marketing of buffalo milk in Haryana. *Indian Journal of Agricultural Economics* 53(1): 41–52.
- Subramanyam, MA *et al.* (2011) Is economic growth associated with reduction in child undernutrition in India? *PLoS Medicine*, 8(3). <http://doi.org/10.1371/journal.pmed.1000424>
- Tacoli, C (2006) The Earthscan reader in rural-urban linkages. Earthscan, London.
- TCPO (2014) Towards responsive urban and regional planning. Town and Country Planning Organisation, Ministry of Urban Development, Government of India.
- te Lintelo, D *et al.* (2002) Urban food: the role of urban and peri-urban agriculture in India: a case study from Delhi. *Food, Nutrition and Agriculture* 29: 4–13.
- te Lintelo, D *et al.* (2017) What are the challenges and opportunities for multi-level advocacy for nutrition? IDS Policy Brief. <http://tinyurl.com/telintelo-et-al-2017-ids>

TERI (2015) Road map for mainstreaming urban climate resilience in Uttarakhand. www.teriin.org/policybrief/files/urban-climate-resilience-uttarakhand/index.html#p=1

Thompson, J *et al.* (2007) Agri-food system dynamics: pathways to sustainability in an era of uncertainty. STEPS Centre. <http://tinyurl.com/thompson-j-et-al-2007-steps>

Trading Economics (2017) India GDP annual growth rate. www.tradingeconomics.com/india/gdp-growth-annual

UN-ESCAPE (2015) India and the MDGs: towards a sustainable future for all. United Nations, India. www.unescap.org/resources/india-and-mdgs-towards-sustainable-future-all

Upadhaya, RP and Palanivel, C (2011) Challenges in achieving food security in India. *Iranian Journal of Public Health* 40(4): 31–36.

Vandana, S (21 September 2013) India's Food Security Act: myths and reality. *Al Jazeera*. www.aljazeera.com/indepth/opinion/2013/09/201398122228705617.html

Abbreviations and acronyms

AAY	Antyodaya Anna Yojana (subsidised food scheme)
APL	Above poverty line
BPL	Below poverty line
DFID	UK Department for International Development
DLHS	District Level Household and Facility Survey
ESPA	Ecosystem Services for Poverty Alleviation programme
ESRC	Economic and Social Research Council
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign direct investment
FPS	Fair price shops
GDP	Gross domestic product
GOI	Government of India
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
JNU	Jawaharlal Nehru University
MDM	Midday Meals programme for school children
NCR	National Capital Region
NERC	Natural Environment Research Council
NFHS	National Family Health Survey
NFSA	National Food Security Act
NFSM	National Food Security Mission
NGO	Non-governmental organisation
NNMB	National Nutrition Monitoring Bureau
NNP	Net national product
NREGA	National Rural Employment Guarantee Act
NSSO	National Sample Survey Organisation
PDS	Public Distribution System
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana (Prime Minister's Irrigation Development Plan)
SEZs	Special economic zones
STEPS	Social, Technological and Environmental Pathways to Sustainability
TPDS	Targeted Public Distribution System
UAs	Urban agglomerations
VIUC	Vegetable Initiative for Urban Clusters

Related reading

Urbanisation, rural-urban transformations and food systems

This working paper is part of the IFAD-funded project Rural-Urban Transformations and Food Systems: Re-Framing Food Security Narratives and Identifying Policy Options That Foster Sustainable Transitions. Global food security and rural development are often framed in terms of inadequate agricultural production. But urbanisation is driving profound transformations in food systems in rural, peri-urban and urban areas – from food consumption to food processing, transport, markets and all related activities. Local, national, regional and global policies are critical to shaping rural-urban linkages and the political economy of food systems. Policies must support food security and livelihoods of low-income groups in all locations – while fostering sustainable rural-urban transitions.

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In India, peri-urban areas are too often neglected. Many people live in poverty and face increasing marginalisation and food insecurity. Yet peri-urban agriculture could be a major contributor to poverty alleviation and food security.

This working paper examines rural-urban transformations in India in relation to changes in food production, access, consumption, nutritional quality and safety. To improve health and nutrition, a more holistic, food security-based perspective is needed. Policy and planning must support those fragile communities engaged in peri-urban agriculture while protecting the environmental services on which they depend. This working paper discusses examples of specific policies and programmes and considers knowledge gaps, governance challenges and mechanisms that might help facilitate pro-poor food security developments on the ground.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them — from village councils to international conventions.



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