SPATIAL TRENDS IN INDIAN AGRICULTURE 1960s to 2000s

Tata-Cornell Agriculture and Nutrition Initiative (TCi)
June 2015
India’s narrative of the Green Revolution is familiar to agricultural development practitioners. High-yield varieties of wheat and rice introduced in the 1960s, along with access to modern inputs such as fertilizer and irrigation, doubled cereal production (Hazell 2009). A country that was plagued by famine in the first half of the 1900s became self-sufficient in calorie production by the end of the century.

Yet India remains one of the most malnourished nations in the world (World Bank 2013). Rates of childhood malnutrition are double those in Sub-Saharan Africa and nearly five times those in China. Sixty million children are underweight, nearly half of whom live in just four of India’s 27 states. The growth in production has had uneven impacts across the country, and many communities still go hungry or malnourished today.

Using almost half a century of data on area and production of major crops at the district level from ICRISAT’s VDSA database (http://vdsa.icrisat.ac.in), the Tata-Cornell Agriculture and Nutrition Initiative (TCi) has mapped this evolution in farming. A three-year average of data from 1967-1969 shows the status of agriculture in the late 1960s, which is then juxtaposed against an average of data from 2007-2009 (late 2000s). Comparing the landscape across time illuminates patterns of how and where agriculture has changed in India, perhaps enabling more targeted interventions to address the shortcomings of the last fifty years.

Statistics can highlight need—the number of people in poverty, a percentage of households suffering from malnutrition, the tonnage of rice lost to drought—but their spatial distribution can be far more illuminating. Mapping this data indicates where need is greatest, which regions suffer more relative to others, and exceptions that buck the trend of their neighbors. Insights into the spatial patterns of food production can inspire research and advocacy for more targeted interventions for malnutrition in the parts of India that need them most.

References

© 2015 Tata-Cornell Agriculture and Nutrition Initiative (TCi)
Changing dominant cropping patterns

Cropping patterns have changed significantly over the last half-century in India. The rural landscape in the mid-1900s was mostly subsistence agriculture, where farmers cultivated coarse cereals, rice, and pulses with limited inputs.

Forty years later, the country is more of a patchwork of cash and high-value crops. Oilseeds—including soybean, peanut, sesame, sunflower, and mustard—have expanded northwards, making India one of the world’s largest producers of vegetable oils.
Although different regions grew different cereal crops (rice, coarse cereals, wheat, maize), the proportion of area under cereals was high and relatively even across the country in the late 1960s.

Intensive investment in rice and wheat during the Green Revolution focused production of these crops in areas endowed with a certain resources and infrastructure, primarily across the plains of northern India. By the late 2000s cereal production was clearly concentrated in the north, but continued to be a focus for much of the rest of the country.
As northern India focused on intensive rice-wheat cultivation, its overall cropping diversity declined (shown here as shift from green to brown as the diversity index moves towards zero).

The rest of India, however, has tended to show an increase in cropping diversity. Oilseeds, sugarcane, fruits, and vegetables grown across central and southern India diversify the practices of traditional cereal and pulse cultivation.
Again, looking at changes in nutritious crops, northern India’s shifting cultivation patterns are evident in the decline of pulses in the region. Pulses, though, seemed to have moved southward, as country-wide area under pulses has remained about constant—decreasing just 650,000 hectares, or 3%, from the 1960s to the 2000s.

Rising incomes and changing diets in India over the last few decades have increased demand for fresh produce, dairy, and meat (Pingali 2007). Consequently, production of fruits and vegetables has expanded (though slowly) in southern and eastern regions.
Likewise, there has been a striking increase in the number of milk-producing animals (cows and buffalo) relative to their male counterparts (shown here in purple).

Milk and vegetables are important sources of micronutrients, key to addressing iron and vitamin deficiencies that plague most of India’s poor. Yet the late 2000s show a clear disparity: the impoverished and malnourished districts of central and eastern India remain almost unchanged after forty years.
Cereals & Pulses

Changes in Area, Production and Yield
Cereals

Total area under cereals:
Late 1960s: 91,447,000 hectares
Late 2000s: 97,358,000 hectares

*includes coarse cereals, maize, rice, & wheat

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Cereals Production

Late 1960s

Total production of cereals: 77,197,000 tons

Late 2000s

Total production of cereals: 210,862,000 tons

*includes coarse cereals, maize, rice, & wheat

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Cereals Yield

Late 1960s

Average yield of cereals: 0.89 tons/hectare

Late 2000s

Average yield of cereals: 2.1 tons/hectare

*includes coarse cereals, maize, rice, & wheat

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Coarse Cereals

Late 1960s
Total area under coarse cereals: 35,403,000 hectares

Late 2000s
Total area under coarse cereals: 18,959,000 hectares

Data Source: Govt of India, Agricultural Statistics (from ICRIAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries

*includes millets & barley
Coarse Cereals Production

Late 1960s

Total production of coarse cereals: 18,749,000 tons

Late 2000s

Total production of coarse cereals: 19,055,000 tons

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)

Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009

White fill indicates no data available; 1970 district boundaries

*includes millets & barley
Coarse Cereals

Yield

Late 1960s
Average yield of coarse cereals: 0.66 tons/hectare

Late 2000s
Average yield of coarse cereals: 1.2 tons/hectare

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries

*includes millets & barley
Maize Area

Late 1960s
Total area under maize: 5,406,000 hectares

Late 2000s
Total area under maize: 7,455,000 hectares

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Maize Production

Late 1960s
Total production of maize: 5,440,000 tons

Late 2000s
Total production of maize: 17,376,000 tons

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Rice Area

Late 1960s

Total area under rice: 35,339,000 hectares

Late 2000s

Total area under rice: 42,816,000 hectares

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Rice Production

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Rice Yield

Late 1960s
Average yield of rice: 0.94 tons/hectare

Late 2000s
Average yield of rice: 2.0 tons/hectare

Data Source: Govt of India, Agricultural Statistics (from ICRISAT's YDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Wheat Production

Late 1960s
Total production of wheat:
17,710,000 tons

Late 2000s
Total production of wheat:
80,894,000 tons

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Wheat Yield

Late 1960s

Average yield of wheat:
0.92 tons/hectare

Late 2000s

Average yield of wheat:
2.1 tons/hectare

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries
Pulses

Late 1960s

Total area under pulses: 23,804,000 hectares

Late 2000s

Total area under pulses: 23,154,000 hectares

Data Source: Govt of India, Agricultural Statistics (from ICRISAT's VDSA database)

Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009

White fill indicates no data available; 1970 district boundaries
Pulses

Average yield of pulses:
- 0.25 tons/hectare (Late 1960s)
- 0.34 tons/hectare (Late 2000s)

Data Source: Govt of India, Agricultural Statistics (from ICRISAT’s VDSA database)
Late 1960s is an average of 1967-1969; Late 2000s is an average of 2007-2009
White fill indicates no data available; 1970 district boundaries