सत्यमेव जयते
Government of Rajasthan

WFP
World Food Programme

Rajasthan Food and Nutrition Security Analysis, 2023

Department of Planning,
Government of Rajasthan &
The World Food Programme

सत्यमेव जयते
Government of Rajasthan

WFP
World Food Programme

Rajasthan Food and Nutrition Security Analysis, 2023

Disclaimer: This report presents an analysis encompassing 33 districts and 7 administrative divisions of the state of Rajasthan, prior to its division into 50 districts and 10 administrative division. This report is a snapshot in time, and its limitations are explicitly tied to the data and geographic boundaries that were in effect until July 2023. The boundaries and names shown, and the designations used on these maps do not imply official endorsement or acceptance by the United Nations. The shape files of all the maps used in this report were sourced from the public domain.

Designed and printed by Nikhil Offset.

Project Management Team

State Government of Rajasthan

Mr. B.L. Bairwa, Director and Joint Secretary, DES

Mr. Narain Lal Paliwal, OSD, Planning Department

Mr. Ashok Kumar Jain, Joint Director, Centre for SDGs Implementation, DES

Dr. Anant Jain, Assistant Director, Planning Department

Dr. Praveen Kumar, Statistical Officer, Centre for SDGs Implementation, DES

Mr. Devendra Kumar Bairwa, Assistant Statistical Officer, Centre for SDGs Implementation, DES

World Food Programme

Dr. Abhay Kumar, Head, Evidence and Results Unit, WFP, India

Dr. Ayushi Jain, Senior Programme Associate, M&E and Research, WFP, India

Dr. Chaitali Pal, Senior Programme Associate, Vulnerability Analysis and Monitoring, WFP, India

Technical Advisory Group (TAG)

Representatives from the following Departments and institutions

Agriculture, GoR
Integrated Child Development Services, GoR
Tribal Area Development, GoR
Food and Civil Supplies, GoR
Medical, Health and Family Welfare, GoR
Social Justice and Empowerment, GoR
Education, GoR
SWACH Udaipur, GoR
Directorate of Evaluation Organisation, GoR
Maharana Pratap University of Agriculture & Technology, Udaipur
Planning Department, GoR
Directorate of Economics and Statistics, GoR

सत्यमेव जयते

Shri Ashok Gehlot
Chief Minister, Rajasthan

MESSAGE

I am glad to know that the Planning Department, Government of Rajasthan and the United Nations World Food Programme have jointly brought out the **'Rajasthan Food and Nutrition Security Analysis Report - 2023.'**

The Government of Rajasthan is committed towards achievement of all Sustainable Development Goals (SDG) by 2030. Working towards this objective, Rajasthan is one of the foremost states showing tremendous growth in achievement of SDGs. There are numerous schemes targeting SDG-2 dedicated towards hunger eradication, nutrition security, notably one among them being the **Indira Rasoi Yojana** with the objective - "**Koi Bhi Bhooka Na Soye**". Rajasthan is surging ahead to provide respect to all its citizens on all fronts.

This report presents an integrative analysis of food and nutrition security for Rajasthan and its districts. The report informs us about the challenges of sustainable food systems in Rajasthan for which we are committed to work on.

I am confident that the findings and recommendations of this report would help in taking necessary actions by all relevant departments and stakeholders for achieving SDG-2 in the state.

I would like to appreciate the efforts and contributions of all those who have contributed to this report.

(Ashok Gehlot)

सत्यमेव जयते
Government of Rajasthan

Smt. Mamta Bhupesh

Minister, Minister - Women & Child Welfare, Child Rights, Planning, Rajasthan

MESSAGE

It is a matter of great pleasure to know that the Rajasthan Food and Nutrition Security Analysis Report - 2023' is being brought out as a joint collaboration by the Planning Department, Government of Rajasthan and the United Nations World Food Programme.

Government of Rajasthan has taken many initiatives like Indira Gandhi Matritava Poshan Yojana , Mukhya Mantri Bal Gopal Yojana, etc. to ensure 'Suposhit Rajasthan'.

The report identifies the evidence gap in the areas of food and nutrition security. It provides district level evidence on the important parameters of food and nutrition security across its four broad dimensions. The report also brings out disaggregated evidence for the vulnerable groups of Rajasthan such as women, children, scheduled tribes, casual wage workers and others.

I am sure that the findings and recommendations of this report would be highly instrumental to policy makers, planners, researchers, academicians, and nutritionists in augmenting their efforts to achieve SDG-2 in the State.

I compliment the entire team of Planning Department, Directorate of Economics and Statistics and the World Food Programme for this notable work.

(Mamta Bhupesh)

सत्यमेव जयते
Government of Rajasthan

Shri Govind Ram Meghwal

Minister, Statistics Department,
Rajasthan

MESSAGE

I am elated to hear that the report of Rajasthan Food and Nutrition Security Analysis – 2023, is being published. This report is product of collaboration amongst the Planning Department, Government of Rajasthan, Directorate of Economics and Statistics, Government of Rajasthan and the United Nations World Food Programme.

The government of Rajasthan is making numerous initiatives to improve SDG-2 achievement by concentrating on achieving its targets. This report provides a comprehensive view of Rajasthan's food and nutrition security (FNS) scenario, along with evidence gaps.

I hope that this report will be extremely useful to policymakers, planners, researchers and academicians to derive better solutions for achieving SDG2 targets before 2030.

I would like to recognize the efforts of the team of Planning Department, Directorate of Economics and Statistics and the World Food Programme for this report.

(Govind Ram Meghwal)

सत्यमेव जयते
Government of Rajasthan

Smt. Usha Sharma
Chief Secretary, Rajasthan

MESSAGE

I am glad to know that the Planning Department, Government of Rajasthan and the United Nations World Food Programme (UNWFP) are bringing out the 'Rajasthan Food and Nutrition Security Analysis Report - 2023.' This report would serve as a baseline for monitoring the SDG-2 in the State.

Amongst the 17 SDGs, 'SDG-2: Zero Hunger' is concerned with the food and nutrition security for the population. Attainment of targets under SDG-2 is a pre-requisite for progress in other SDGs. This report shows the rapid improvement of the state on SDG- 2 indicators, which represents the effectiveness of policies of Government of Rajasthan.

This report also examines four dimensions of Food and Nutrition Security (Food Availability, Food Accessibility, Food Utilization and Food Stability) upto district level. The detailed analysis, findings and recommendations of this report will be very useful for the policy makers to achieve SDG-2 in the State.

I would like to express my sincere thanks to all the departments in Government of Rajasthan that have contributed in the development of this report. I am especially appreciative of the efforts of the Planning Department and the Directorate of Economics and Statistics (DES) for providing the data, information and necessary guidance in the development of this report. Finally, I would like to thank the team at UNWFP for their efforts in bringing out this report.

(Usha Sharma)

सत्यमेव जयते
Government of Rajasthan

Mr. Bhawani Singh Detha, IAS

Principal Secretary (Planning Department),
Rajasthan

MESSAGE

I am indeed very happy to bring out the Rajasthan Food and Nutrition Security Analysis Report-2023, which is based upon the global framework and definition of food and nutrition security.

This report analyses all the four dimensions of Food Security i.e., Food Availability, Food Accessibility, Food Utilization and Food Stability. District level food and nutrition security index has also been constructed for the food security pillars which depicts in-depth and district level analysis of food and nutrition security in the State.

This report particularly focuses on production and consumption of Food Grains and their sustainability, nutritional intake of Energy, Protein, Fat and nutritional outcomes with focus on anaemia, stunting, wasting and underweight in women and children. It highlights the Food and Nutrition Security (FNS) indicators that have recorded remarkable progress and points out those indicators and districts which require improvement.

It provides pragmatic recommendations to accomplish the goals and targets of SDG-2 in Rajasthan. I believe that the generated evidence, findings and recommendations of this report will help all the stakeholders in effectively addressing the challenges of food and nutrition security in the State.

This report is a collective effort of Planning Department, Directorate of Economics and Statistics and the United Nations World Food Programme team. I am thankful to the members of the Technical Advisory Group (TAG) from various departments in Government of Rajasthan who have contributed through their data and inputs to make this report relevant and useful. I am confident that this report will help in steering the path and direction of achieving SDG- 2 in the state.

(Bhawani Singh Detha)

Ms. Elisabeth Faure

Representative and Country Director
WFP India

MESSAGE

I am delighted to see the Rajasthan Food and Nutrition Security Analysis Report, 2023 come to fruition through a collaboration between the United Nations World Food Programme (WFP) and the Planning Department, Government of Rajasthan.

WFP in India has been supporting the national and state governments in monitoring progress on Sustainable Development Goal 2 (SDG-2). In 2019, WFP and the Ministry of Statistics and Programme Implementation, Government of India, brought out National Food and Nutrition Security Analysis Report. We also worked with the Government of Odisha to develop the State of Food and Nutrition Security Report.

Using government statistics, the report analyses four dimensions of Food and Nutrition Security, which are availability, accessibility, absorption, and stability. The report maps food insecure people, their location, characteristics, and the underlying causes of food insecurity in districts of Rajasthan. Through the production and consumption data, the report for the first time looks at disaggregated district-level information on energy, protein, and fat consumption. The nutritional outcome of women and children such as anaemia, stunting, wasting and underweight have also been analysed at disaggregated levels. The report presents recommendations for strengthening progress towards SDG-2 targets. I am confident that this report will further help the state government to augment these efforts.

I would like to express my heartfelt gratitude to the Planning Department, the Government of Rajasthan and the Directorate of Economics and Statistics for their tremendous support and efforts to our team to bring out this report.

I would also like to thank all the members of the Technical Advisory Group from various departments for their inputs which have helped in further refining the findings and recommendations of this report.

I am confident that the report would be welcomed by policymakers, development partners, academicians, and researchers to better formulate food and nutrition security policies.

(Elisabeth Faure)

Acknowledgements

The "Rajasthan Food and Nutrition Security Analysis Report, 2023" provides a mechanism to monitor the performance of Rajasthan on various targets and indicators of SDG. This report analyses Food and Nutrition Security through framework of its four pillars- Food Availability, Food Accessibility, Food Utilization and Food Stability. Proceeding through extensive analysis of these four pillars and their indicators, the overall progress for overall Rajasthan and at its district – level is examined. Ranking of districts for these four pillars and overall food security highlights the relative progress of districts in Rajasthan for each dimension. The report finally provides recommendations for improvement in overall food security for Rajasthan and specifically by its four pillars.

The report would not have been possible without the vision and guidance of Mr. Bhawani Singh Detha, IAS, Principal Secretary, Planning Department, Government of Rajasthan. We would also like to express our deep gratitude to WFP Country Director Mr. Bishow Parajuli and Ms. Elisabeth Faure for their incessant support and strategic guidance to the development of this report.

The inputs and motivation of Mr. Sushil Kumar Kulhari, Joint Secretary, Planning Department were immensely helpful in the development of this report. We would also like to thank the former and present Directors of Directorate of Economics and Statistics (DES), Mr. Om Prakash Bairwa and Mr. Bhanwar Lal Bairwa respectively for providing their guidance and necessary support in the development of the report.

Our utmost gratitude to Mr. Vinesh Singhvi (former OSD, Planning department) and Mr. Naraian Paliwal, OSD, Planning Department for their untiring support, guidance and necessary feedback. They provided critical guidance to the framework of the analysis, overall preparation of the report, and coordinated with other departments under the Government of Rajasthan to ensure their full cooperation and active feedback in enriching the analysis and recommendations outlined in the report. The contribution of Dr. Anant Jain through his inquisitive and valuable comments, suggestions and support were very instrumental. We would also like to thank Ms. Seema Chamoli, Ms. Priyanka Nehra and YIP Smita Sharma for their valuable feedback and comments during the finalization of the report.

We would like to sincerely thank the Technical Advisory Group (TAG) and their representatives, spreading across various departments of Government of Rajasthan They provided the able guidance at various milestones during the preparation of the report. Their inputs have been extremely useful in contextualising the findings and recommendations.

Our special thanks to the entire SDG team led by Mr. Ashok Jain (Joint Director, DES), Dr. Praveen Kumar, Mr. Devendra Kumar Bairwa, Ms. Sunita Sharma and Mr. Ashok Gehlot who provided their relentless support during the preparation of this report. They ensured the timely availability of the most updated dataset for this report. We would like to remember the contribution made by Mr. R. K. Pandey (former Director) and Mr. Rajendra Prasad Chulet (former Deputy Director) who initially led the conceptualisation of this report.

The DES-WFP team is also grateful to WFP colleagues for their inputs and contributions at various stages during the preparation of this report. In particular, we would like to thank Mr. Eric Kenefick, Ms. Almudena Serrano, Ms. Susana Moreno, Ms. Pradnya Paithankar, Dr. Aradhana Srivastava for their review and inputs on the draft report. A special thanks to Mr. Vijay Avinandan, Ms. Divya Lad, Mr. Sumit Kumar, Ms. Amrita Anand for their contribution of various forms during the data analysis and report writing. We thank our Communications team - Mr. Parvinder Singh and Ms. Shyamalima Kalita for their inputs and support in proof reading and designing of report.

Our sincere gratitude to everyone who directly and indirectly contributed to this report with a humble anticipation for continuation of this analysis and its use in the state for better decision making towards Zero Hunger and eradication of malnutrition in Rajasthan, with the focus on leaving no one behind.

DES-WFP Team

Contents

	Executive Summary	xxix
1.	Introduction	1
2.	Profile of Rajasthan	9
3.	Food Availability	19
4.	Food Accessibility	47
5.	Food Utilization	73
6.	Food Stability	111
7.	Rajasthan Food and Nutrition Security Index	131
8.	Conclusion and Recommendations	145
	Annexures	162

List of Tables

Table 1: Agro-climatic zones of Rajasthan - Major crops grown, districts covered, soil types 14

Table 2: Classifications used in the Composite Index of Anthropometric Failure (CIAF) 102

Table 3: Table 3: Distribution of children in Rajasthan based on CIAF classification as per their socio-economic characteristics, in percentage. 105

Table 4: Indicators Matrix selected for Food and Nutrition Security Index. 134

Table 5: Ten priority districts in Rajasthan based on Food and Nutrition Security Index (FNSI) 143

List of Figures

Figure1: Core Indicators used for analysis under the Food Security Pillars 06

Figure 2: Rajasthan with district boundaries, representing distribution of administrative zones and social groups. 11

Figure 3: Rajasthan Land Use Statistics, 2019-20, in percentage. 15

Figure 4: Contribution of Districts in percentage to Gross State Domestic Product (GSDP) at constant prices (base year: 2011-12) in Rajasthan, 2019-20 (Provisional Estimates), in percentage. 16

Figure 5: Sectoral Contribution in GDVA at constant prices (base year: 2011-12) by districts in Rajasthan (2019-20, Provisional Estimate), in percentage. 17

Figure 6: Trends of annual food grain production in Rajasthan and India (in Million Metric Tonnes) 21

Figure 7: Trends in production of cereals and pulses in Rajasthan during 2006-07 to 2018-19 (in Million Metric Tonnes) 22

Figure 8: Trends in production of cereals and pulses in Rabi and Kharif seasons in Rajasthan during 2006-07 to 2018-19 (in Million Metric Tonnes) 22

Figure 9:Trends in production of major cereals in Rabi and Kharif seasons in Rajasthan during 2006-07 to 2018-19 (in Million Metric Tonnes) 23

Figure 10: Trends in production of major pulses in Rabi and Kharif seasons in Rajasthan during 2006-07 to 2018-19 (in '00 thousand Metric Tonnes) 24

Figure 11: Trends of total food grains production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes) 25

Figure 12: Trends of total cereals production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes) 26

Figure 13: Trends of total pulses production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes) 27

Figure 14: Trends of wheat production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes) 28

Figure 15: Trends of bajra (pearl millets) production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes) 29

Figure 16: Trends of gram production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in Thousand Metric Tonnes) 31

Figure 17: Trends of moong production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in '00s Metric Tonnes) 32

Figure 18: Trends of productivity of cereals, pulses, and total food grains in Rajasthan from 2006-07 to 2018-19 (in Kg per hectare) 33

Figure 19: Trends of productivity of major food grains in Rajasthan from 2006-07 to 2018-19 (in Kg per hectare) 34

Figure 20: Trends of food grain productivity across districts in Rajasthan between 2016-17 to 2018-19 (in Kg per hectare), 3-years average 34

Figure 21: Irrigation Extent versus food grain productivity across districts in Rajasthan between 2016-17 to 2018-19, 3-years average 35

Figure 22: Clusters of districts with respect to Irrigation Extent versus food grain productivity across districts in Rajasthan between 2016-17 to 2018-19, 3-years average 36

Figure 23: Trends of cropping intensity and fertiliser consumption across districts in Rajasthan between 2016-17 to 2018-19 (in Kg per hectare), 3-years average 37

Figure 24: Food crops composition by total food grain area in Rajasthan (3-year average: 2006-2009 and 2016-2019, in %) 38

Figure 25:Trends of Consumption Requirement and Production of Cereals in Rajasthan, 2006-2019 39

Figure 26: Trends of Consumption Requirement and Production of Pulses in Rajasthan, 2006-2019 39

Figure 27: Trends in Livestock production (Milk, Eggs, and Meat) in Rajasthan, 2011-12 to 2018-19. 40

Figure 28: Milk Production across districts in Rajasthan, three years average, 2016-17 to 2018-19 (million metric tonnes) 41

Figure 29: Egg Production across districts in Rajasthan, three years average, 2016-17 to 2018-19 (in millions) 41

Figure 30: Meat Production across districts in Rajasthan, three years average, 2016-17 to 2018-19 (in thousand metric tonnes) 42

Figure 31: Utilisation of Storage Capacities across Districts as of March 2022 (in thousand metric tonnes) 43

Figure 32: Share of food in Total expenditure in Rajasthan and India, 1999-00 to 2011-12, in percentage. 49

Figure 33: Share of food expenditure to total expenditure in a) rural and b) urban Rajasthan, 2011-12, in percentage. 50

Figure 34: Percentage of Food expenditure to total expenditure (total MPCE levels) in across rural, urban, and total Rajasthan, 2011-12, in percentage. 51

Figure 35: Trends of Consumer Price Indices (CPI) in Rajasthan, 2018 to 2021 (Base year 2012=100) 52

Figure 36: Trends of Per Capita Per Day Energy (KCal), Protein (in grams) and Fat (in grams) Intake in Rural and Urban Areas of Rajasthan and India and among the poorest 25 percent, 1999-2000 to 2011-2012. 54

Figure 37: Per Capita Per Day Energy (in Kcal), Protein (in grams) and Fat intake (in grams) in Rural and Urban Rajasthan by Background Characteristics, 2011-12. 55

Figure 38: Per Capita Per Day Calorie (in Kcal) by districts in Rural and Urban Rajasthan, 2011-12 58

Figure 39: Per Capita Per Day Protein Intake (in grams) by districts in Rural and Urban Rajasthan, 2011-12. 59

Figure 40: Per Capita Per Day Fat Intake (in grams) by districts in Rural and Urban Rajasthan, 2011-12. 60

Figure 41: Changes in sources of energy intake in rural and urban Rajasthan, 2004-05 to 2011-12. 61

Figure 42: Changes in sources of Protein Intake in rural and urban Rajasthan, 2004-05 to 2011-12, in percentage. 62

Figure 43: Frequency of consumption of major foods among women and men in Rajasthan, 2019-21, in percentage. 62

Figure 44: Workforce Participation Rate across districts in Rajasthan, 2011, in percentage. 63

Figure 45: Proportion of Agriculture Labours across districts in Rajasthan, 2011, in percentage. 64

Figure 46: Proportion of Male and Female Agriculture Labourers across districts in Rajasthan, 2011, in percentage. 65

Figure 47: Average Daily Agriculture Wage Rates for Male and Female Workers across districts in Rajasthan, 2019-20, in INR. 66

Figure 48: Village connectivity in Rajasthan with respect to population size until March 2022, in percentage. 67

Figure 49: Proportion of Unconnected Villages across districts in Rajasthan until March 2022, in percentage. 68

Figure 50: Malnutrition among Under five children in selected States of India including Rajasthan, NFHS-5 (2019-21), in percentage. 77

Figure 51: Change in prevalence of undernutrition in children below the age of five in Rajasthan from 2005-06 to 2019-21, in percentage (NFHS-V). 78

Figure 52: Prevalence of malnutrition in under five children with respect to place of residence and gender in Rajasthan, NFHS-5 (2019-21), in percentage. 78

Figure 53: Prevalence of undernutrition in under five children with respect to age in Rajasthan, NFHS-5 (2019-21), in percentage. 79

Figure 54: Prevalence of malnutrition in under five children with respect to social groups in Rajasthan, NFHS-5 (2019-21), in percentage. 79

Figure 55: Effect of mother's nutritional status on child nutrition outcomes, NFHS-5 (2019-21), in percentage. 80

Figure 56: Prevalence of children who are stunted below the age of five years across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 80

Figure 57: Prevalence of children who are wasted and severely wasted below the age of five years across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 81

Figure 58: Shift in prevalence of severe wasting in children below 5 years from NFHS-4 (2015-16) to NFHS-5 (2019-21) across districts in Rajasthan, in percentage. 82

Figure 59: Prevalence of children who are underweight below the age of five years across districts in Rajasthan, NFHS-5 2019-21, in percentage. 83

Figure 60: Change in Nutrition Status among Adults (15-49 years) in Rajasthan and India between 2015-16 and 2019-21, in percentage (NFHS). 84

Figure 61: Nutrition status of adults (15-49 years) with respect to age in Rajasthan, NFHS-5 (2019-21), in percentage. 85

Figure 62: Nutrition status of adults (15-49 years) with respect to social groups in Rajasthan, NFHS-5 (2019-21), in percentage. 85

Figure 63: Prevalence of thinness (BMI<18.5 kg/m2) in women between 15-49 years of age across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 86

Figure 64: Change in anaemia prevalence across various age groups in Rajasthan between NFHS-4 (2015-16) and NFHS-5 (2019-21), in percentage. 87

Figure 65: Prevalence of anaemia in children aged 6-59 months with respect to social groups in Rajasthan, NFHS-5 (2019-21), in percentage. 87

Figure 66: Anaemia status in adults with respect to various sub-groups in Rajasthan, NFHS-5 (2019-21), in percentage. 88

Figure 67: Prevalence of anaemia in children between 6-59 months of age across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 89

Figure 68: Shift in prevalence of anaemia in children between 6-59 months from NFHS-4 (2015-16) to NFHS-5 (2019-21) across districts in Rajasthan, in percentage. 90

Figure 69: Prevalence of anaemia in women between 15-49 years of age across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 91

Figure 70: Shift in prevalence of anaemia in women

between 15-49 years of age from NFHS-4 (2015-16) to NFHS-5 (2019-21) across districts in Rajasthan, in percentage. 92

Figure 71: Performance of Rajasthan on indicators related to IYCF and antenatal care in Rajasthan between NFHS-4 (2015-16) and NFHS-5 (2019-21) (in percentage). 93

Figure 72: Proportion of children under the age of three years who were breastfed within one hour of birth across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 94

Figure 73: Proportion of children aged 6- 23 months receiving adequate diet across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 95

Figure 74: Proportion of children aged 9-35 months who received Vitamin A dose in six months prior to NFHS-5 survey across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 96

Figure 75: Proportion of households using iodized salt across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 96

Figure 76: Micronutrient Intake among Children in Rajasthan, NFHS-5 (2019-21), in percentage. 97

Figure 77: Consumption of iron folic acid tablets for 100 days or more by mothers when they were pregnant across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 98

Figure 78: At least 4 Antenatal care visits made by mothers when they were pregnant across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 98

Figure 79: Proportion of households with access to safe drinking water source and improved sanitation facility in Rajasthan, NFHS-5 (2019-21), in percentage.99

Figure 80: Proportion of households using an improved sanitation facility across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 100

Figure 81: Proportion of households using an improved drinking water source across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 101

Figure 82: Proportion of households with any member covered under a health insurance/financing scheme across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 101

Figure 83: Anthropometric Failure in children below the age of five in Rajasthan between 2015 and 2021, in percentage. 103

Figure 84: Annual Rainfall (in millimetres) and Change (in percentage) from normal rainfall between 2006-07 and 2021-22. 113

Figure 85: Average Annual Rainfall between 2008-11 and 2016-19, three years average, in millimetres. 114

Figure 86: Stage of Ground Water Extraction in 2017 and 2022, in percentage. 115

Figure 87: Districts (in numbers) and population (in millions) affected in Rajasthan due to extent of scarcity from 2004-05 to 2021-22. 116

Figure 88: Frequency of droughts and floods across districts during Kharif Season in Rajasthan from 2017-18 to 2022-23, in numbers). 117

Figure 89: Most common infectious diseases affecting population (in millions) in Rajasthan from 2016 to 2019 (MoHFW). 118

Figure 90: Prevalence of diarrhoea in children below five years two weeks preceding the NFHS-5 survey across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 119

Figure 91: Prevalence of symptoms of acute respiratory infection in children below five years two weeks preceding the NFHS-5 survey across districts in Rajasthan, NFHS-5 (2019-21), in percentage. 120

Figure 92: Proportion of Women who are literate in Rajasthan, 2019-21, in percentage (NFHS-V). 121

Figure 93: Unemployment Rate in Rajasthan and India for population 15-59 years of age according to usual status between 2017-18 and 2020-21, in percentage. 122

Figure 94: Unemployment Rate in rural and urban Rajasthan according to usual status between 2017-18 and 2020-21 for population 15-59 years of age, in percentage. 123

Figure 95: Proportion of Migrant workers in Rajasthan, 2011, in percentage (Census 2011) 124

Figure 96: Age Dependency Ratio in Rajasthan, 2011, in percentage (Census 2011). 125

Figure 97: Performance of Rajasthan's districts in Food Availability Index (FAI). 136

Figure 98: Performance of Rajasthan's districts in Food Accessibility Index (FAcI). 137

Figure 99: Performance of Rajasthan's districts in Food Utilization Index (FUI). 137

Figure 100: Performance of Rajasthan's districts in Food Stability Index (FSI). 139

Figure101: Performance of Rajasthan's districts in Food and Nutrition Security Index (FNSI). 140

Figure 102: Box plot of FNS Indices. 141

Figure103: Common districts among bottom ten and top ten in both Food and Nutrition Security Index (FNSI) and NITI Aayog's Multidimensional Poverty Index (MPI) 2021. 142

Figure 104: Scatter Plot depicting correlation between NITI Aayog's Multidimensional Poverty Index and Rajasthan's Food and Nutrition Security Index. 142

Acronyms

AMMA	Acute Malnutrition Management and Action
ANC	Antenatal Check-up
ANM	Auxiliary Nurse and Midwife
ARI	Acute Respiratory infection
AWC	Anganwadi Centre
BMI	Body Mass Index
BPL	Below Poverty Line
CHC	Community Healthcare Centre
CIAF	Composite Indicator for Anthropometric Failure
CMDPS	Chief Minister's State Disability Pension Scheme
CPI	Consumer Price Indices
DALY	Disability Adjusted Life Years
EAG	Empowered Action Group
FAcI	Food Accessibility Index
FAvI	Food Availability Index
FNSI	Food and Nutrition Security Index
FSI	Food Stability Index
FNS	Food and Nutrition Security
FNSI	Food and Nutrition Security Index
FUI	Food Utilization Index
GDP	Gross Domestic Product
GoR	Government of Rajasthan
GSDP	Gross State Domestic Product
GSVA	Gross State Value Added
ICDS	Integrated Child Development Services
IDSP	Integrated Disease Surveillance Programme
IGMPY	Indira Gandhi Matritva Poshan Yojana
IGNDPS	Indira Gandhi National Disability Pension Scheme
IMR	Infant Mortality Rate
INR	Indian National Rupee
IOC	Indian Oil Corporation
IYCF	Infant and Young Child Feeding
MAM	Moderate Acute Malnutrition
MCHN	Maternal Health Child Health and Nutrition
MDM	Mid-Day Meal
MDPI	Multi Dimensional Poverty Index
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MJSA	Mukhyamantri Jal Swavlamban Abhiyaan
MMR	Maternal Mortality Ratio
MMT	Million Metric Tonnes
MOSPI	Ministry of Statistics and Program Implementation
MPCE	Monthly Per Capita Expenditure
MPI	Multi-Dimensional Poverty Index
MSP	Minimum Support Prices
MSS	Market Stabilization Scheme
NDRF	National Disaster Response Force
NFHS	National Family Health Survey
NFSA	National Food Security Act
NFSM	National Food Security Mission
NHM	National Health Mission
NHM	National Horticulture Mission
NMAET	National Mission on Agriculture Extension and Technology
NMR	Neonatal Mortality Rate
NMSA	National Mission for Sustainable Agriculture
NRLM	National Rural Livelihood Mission
NSSO	National Sample Survey Office
OBC	Other Backward Class
PHC	Primary Healthcare Centre
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMGKY	Pradhan Mantri Garib Kalyan Yojana
PMGSY	Pradhan Mantri Gram Sadak Yojana
PMMVY	Pradhan Mantri Matru Vandana Yojana
PM-POSHAN	Pradhan Mantri Poshan Shakti Nirman
RGJSY	Rajiv Gandhi Jal Sanchay Yojana
RKVY	Rashtriya Krishi Vikas Yojana
SAM	Severe Acute Malnutrition
SBCC	Social Behaviour Change Communication
SC	Scheduled Caste
SD	Standard Deviation
SDG	Sustainable Development Goals
SDRF	State Disaster Response Force
ST	Scheduled Tribe
TAG	Technical Advisory Group
THR	Take Home Ration
TPDS	Targeted Public Distribution System
TPDS	Targeted Public Distribution System
U5MR	Under-Five Mortality Rate
USD	United States Dollar
UT	Union Territory
WFP	World Food Programme
WHO	World Health Organization

Photo Credit

Cover Photo: ©WFP/Mohammad Khalil Khan
Photo page ii: ©WFP/Dr. Praveen Kumar
Photo page vii: ©WFP India
Photo page ix: ©WFP India
Photo page xi: ©WFP India
Photo page xiii: ©WFP India
Photo page xv: ©WFP India
Photo page xvii: ©WFP India
Photo page xxi: ©WFP India
Photo page xxviii: ©WFP/Mohammad Khalil Khan
Photo page xxix: ©WFP/Mohammad Khalil Khan
Photo page xxx: ©WFP/Mohammad Khalil Khan
Photo page xxxi: ©WFP/Mohammad Khalil Khan
Photo page xxxii: ©WFP/Mohammad Khalil Khan
Photo page xxxiii: ©WFP/Mohammad Khalil Khan
Photo page xxxiv: ©WFP/Mohammad Khalil Khan
Photo page xxxv: ©WFP/Mohammad Khalil Khan
Photo page xxxvi: ©WFP/Mohammad Khalil Khan
Photo page xxxvii: ©WFP/Mohammad Khalil Khan
Photo page xxxviii: ©WFP/Dr. Praveen Kumar
Photo page xxxix: ©WFP/Mohammad Khalil Khan
Photo page xl: ©WFP/Mohammad Khalil Khan
Photo page xli: ©WFP/Mohammad Khalil Khan
Photo page 1: ©WFP/Mohammad Khalil Khan
Photo page 2: ©WFP/Dr. Chaitali Pal
Photo page 4: ©WFP/Mohammad Khalil Khan
Photo page 5: ©WFP/Mohammad Khalil Khan
Photo page 7: ©WFP/Mohammad Khalil Khan
Photo page 8: ©WFP/Mohammad Khalil Khan
Photo page 9: ©WFP/Mohammad Khalil Khan
Photo page 10: ©WFP/Mohammad Khalil Khan
Photo page 18: ©WFP/Mohammad Khalil Khan
Photo page 19: ©WFP/Mohammad Khalil Khan
Photo page 20: ©WFP/Mohammad Khalil Khan
Photo page 21: ©WFP/Mohammad Khalil Khan
Photo page 30: ©WFP/Mohammad Khalil Khan
Photo page 40: ©WFP/Mohammad Khalil Khan
Photo page 41: ©WFP/Mohammad Khalil Khan
Photo page 41: ©WFP India
Photo page 45: ©WFP/Mohammad Khalil Khan
Photo page 46: ©WFP/Mohammad Khalil Khan
Photo page 47: ©WFP/Mohammad Khalil Khan
Photo page 48: ©WFP/Mohammad Khalil Khan
Photo page 56: ©WFP/Mohammad Khalil Khan
Photo page 61: ©WFP/Mohammad Khalil Khan
Photo page 63: ©WFP/Mohammad Khalil Khan
Photo page 65: ©WFP/Dr. Praveen Kumar
Photo page 66: ©WFP/Mohammad Khalil Khan
Photo page 69: ©WFP/Mohammad Khalil Khan
Photo page 71: ©WFP/Mohammad Khalil Khan
Photo page 72: ©WFP/Mohammad Khalil Khan
Photo page 73: ©WFP/Mohammad Khalil Khan
Photo page 74: ©WFP/Mohammad Khalil Khan
Photo page 76: ©WFP/Mohammad Khalil Khan
Photo page 79: ©WFP/Mohammad Khalil Khan
Photo page 84: ©WFP/Mohammad Khalil Khan
Photo page 88: ©WFP/Mohammad Khalil Khan
Photo page 89: ©WFP/Mohammad Khalil Khan
Photo page 91: ©WFP/Mohammad Khalil Khan
Photo page 94: ©WFP/Mohammad Khalil Khan
Photo page 95: ©WFP/Mohammad Khalil Khan
Photo page 97: ©WFP/Mohammad Khalil Khan
Photo page 103: ©WFP/Mohammad Khalil Khan
Photo page 106: ©WFP/Dr. Praveen Kumar
Photo page 107: ©WFP/Mohammad Khalil Khan
Photo page 108: ©WFP/Mohammad Khalil Khan
Photo page 109: ©WFP/Mohammad Khalil Khan
Photo page 110: ©WFP/Mohammad Khalil Khan
Photo page 111: ©WFP/Mohammad Khalil Khan
Photo page 112: ©WFP/Mohammad Khalil Khan
Photo page 118: ©WFP/Mohammad Khalil Khan
Photo page 119: ©WFP/Mohammad Khalil Khan
Photo page 121: ©WFP/Mohammad Khalil Khan
Photo page 124: ©WFP/Dr. Chaitali Pal
Photo page 125: ©WFP/Mohammad Khalil Khan
Photo page 126: ©WFP/Dr. Chaitali Pal
Photo page 127: ©WFP/Mohammad Khalil Khan
Photo page 128: ©WFP/Mohammad Khalil Khan
Photo page 129: ©WFP India
Photo page 130: ©WFP/Mohammad Khalil Khan
Photo page 131: ©WFP/Mohammad Khalil Khan
Photo page 132: ©WFP/Dr. Anant Jain
Photo page 133: ©WFP/Mohammad Khalil Khan
Photo page 136: ©WFP/Mohammad Khalil Khan
Photo page 138: ©WFP/Mohammad Khalil Khan
Photo page 141: ©WFP/Mohammad Khalil Khan
Photo page 144: ©WFP/Mohammad Khalil Khan
Photo page 145: ©WFP/Mohammad Khalil Khan
Photo page 146: ©WFP/Mohammad Khalil Khan
Photo page 147: ©WFP/Mohammad Khalil Khan
Photo page 148: ©WFP/Mohammad Khalil Khan
Photo page 149: ©WFP/Mohammad Khalil Khan
Photo page 150: ©WFP/Mohammad Khalil Khan
Photo page 151: ©WFP/Mohammad Khalil Khan
Photo page 152: ©WFP/Mohammad Khalil Khan
Photo page 153: ©WFP/Mohammad Khalil Khan
Photo page 157: ©WFP/Mohammad Khalil Khan
Photo page 158: ©WFP India
Photo page 161: ©WFP India

Executive Summary

Context

Persistent malnutrition and extreme hunger trap people in a cycle of poverty through decreased productivity, increased vulnerability to illnesses, and limited opportunities to improve one's income and standard of living. Reducing and ending hunger would have a positive impact on the economy, health, education, equality, and social development.

The Rajasthan Government's commitment towards food and nutrition security has resulted in significant improvements. Despite these gains, the prevalence of stunting, wasting, and underweight among children remains unacceptably high. Prevalence of Anaemia is a pressing concern affecting all age groups, with Rajasthan ranking among the bottom six states in terms of prevalence among children under the age of five. Factors such as gender inequality impact food and nutrition security challenges besides differential access to food, nutrition, and health services within households leading to disparities in outcomes.

Purpose

The objective of this report is to analyse patterns of food insecurity and malnutrition in Rajasthan, identify the most affected areas and population groups, and the underlying factors contributing to their vulnerability aiming to achieve Sustainable Development Goal 2 - Zero Hunger (SDG-2) in the state.

Concepts and Measurements

Following the 1996 definitions adopted at the World Food Summit-Rome by United Nations Member States, four pillars to measure food security were established, and these were - food availability, food accessibility, food utilisation and food stability. The report analyses the food and nutrition security in Rajasthan in respect of above four dimensions.

Based on the review of existing global frameworks for food and nutrition security analysis as well as WFP's experiences and learning while undertaking food security analysis in India and its states, a comprehensive suite of 102 indicators was identified and grouped each into four food security dimensions, that may either have a direct or indirect influence on food and nutrition security of the population in Rajasthan. These indicators were finalised in consultation with the Directorate of Economics and Statistics, Government of Rajasthan.The data for these indicators were collated from various secondary data sources such as the Census 2011 and its population projection of 2019, different rounds of National Family Health Surveys (NFHS), Household Consumption Expenditure Survey of the National Sample Survey Office (NSSO), Periodic Labour Force Survey and various administrative data. The data was analysed pertaining to each indicator and presented in thematic charts and maps.

Further, a composite Food and Nutrition Security Index (FNSI) has been computed to rank districts to identify food-secure and insecure pockets of Rajasthan. The analysis brings out clear perspectives on where the problem is and what interventions are required. The report also maps various scheme and programmes of state and central government that caters to food and nutrition security. The report serves as a true guide to develop a roadmap towards ***'Suposhit Rajasthan'*** and take the initiative forward through continued updated analysis and evidence.

Rajasthan has seen a consistent rise in food grain production.

Key Findings

1. Food Availability in Rajasthan

- **Growing Food Grain Production:** India's national production increased from 198 to 316 million metric tonnes, and Rajasthan's has nearly doubled from 12 to 21 million metric tonnes between 2004-05 and 2021-22. Rajasthan ranks fourth among Indian states in food grain production, contributing 21.05 million metric tonnes, with its share of total food grain production in India growing from 6.1 percent to 6.7 percent during this period. While overall food grain production improved in many districts of Rajasthan from 2008-11 to 2016-19, the western region, influenced by the arid agroclimatic conditions of the Thar desert, experienced exceptions. Alwar, Ganganagar, Jaipur and Hanumangarh consistently have the highest share

of total food grain production in Rajasthan, whereas Sirohi, Jasialmer, Barmer and Dungarpur have the lowest share. Cereal production in Rajasthan increased by 44 percent, and pulse production grew 2.5 times from 1.5 to 3.8 million metric tonnes between 2006-07 and 2018-19. Efforts to boost pulse production have improved the pulse-to-cereal production ratio since 2016-17. High cereal production districts include Alwar, Jaipur, Hanumangarh, and Ganganagar, while Nagaur and Bikaner excel in pulse production. Rajsamand's cereal production doubled, and Baran witnessed an impressive eighteen-fold increase in pulse production. Conversely, Jaisalmer experienced a 50 percent reduction in cereal production, and Bharatpur, Barmer, and Dholpur observed a decline in pulse production from 2016-19 compared to 2008-11.

- **Major Cereals and Pulses and their Production trends:** Wheat is the primary cereal followed by Pearl Millet (Bajra) and maize. Wheat production increased significantly from 7.8 to 12 million metric tonnes between 2006-07 and 2018-19, with dominant production in Hanumangarh, Ganganagar, Alwar, and Bharatpur. Rice production also grew steadily from 0.2 to 0.5 million metric tonnes during the same period. Production of other cereals other than wheat and rice also increased. Rajasthan is India's leading producer of pearl millet, with Bajra concentrated in the central part of the state. While 22 districts saw a decline in average Bajra production from 2011 to 2019, Hanumangarh, Dungarpur, and Baran experienced the highest reductions (in percentage). In terms of pulses, gram had the highest production in 2018-19, followed by Moong. Between 2006-07 and 2018-19, gram production nearly doubled, and moong production increased nearly fivefold, mainly concentrated in the central-northern region. Notably, eleven districts have more than doubled their moong production in 2016-19 compared to 2008-11, with Bikaner showing the highest improvement. Nagaur, Jodhpur, Pali, Ajmer and Jaipur remained consistent top producers of moong throughout both periods- 2008-11 and 2016-19.
- **Crop Cultivation and Composition:** The availability of food grains in Rajasthan depends on factors like crop cultivation area, agroclimatic conditions such as rainfall, government policies, and crop demand. Changes in crop cultivation between 2006-09 and 2016-2019 were observed. Bajra (pearl millets) cultivation area decreased significantly by 10 percent (from 38 percent to 28 percent), while Moong (green gram) increased by 8 percent (from 7 percent to 15 percent). Urad and wheat production areas also increased by 3.6 percent and 1.9 percent respectively. Maize, Jowar, Barley, Arhar, Moth, and Chaula cultivation areas slightly declined, while rice cultivation among cereals and gram and masoor cultivation among pulses saw marginal increases. The drop in Bajra production can be attributed to two factors - inadequate Minimum Support Price and the shift towards pulses production due to their shorter cultivation time and higher economic returns.

- **Livestock Production:** Rajasthan is the largest contributor in milk production across India (15.05 % of total milk roduction). From 13.5 million metric tonnes in 2011-12 to 33.27 million metric tonnes in 2022, the state's milk output has increased by a net 146.44 percent. Jaipur boasts the highest average milk production among districts at 1.88 million metric tonnes, while Dungarpur records the lowest at 0.2 million metric tonnes between 2016-17 and 2018-19. Unlike other states, Rajasthan's population doesn't heavily depend on egg and meat production for consumption, resulting in relatively lower overall production. However, between 2011-12 and 2018-19, both egg and meat production in the state nearly doubled. Egg production increased from 797 million to 1662 million, while meat production rose from 104 thousand metric tonnes to 181 metric tonnes.

2. Status of Access to Food in Rajasthan

- **Food expenditure in Rajasthan - a closer look at household consumption:** Rajasthan's food expenditure aligns with the national average as per NSS Household Consumption Expenditure surveys. In 2011-12, in rural areas, food accounted for 48.1 percent of expenditure, slightly below the national rural average of 48.6 percent, while in urban areas, it was 39.8 percent compared to the national urban average of 38.5 percent. Rural populations, including those in Rajasthan, tend to allocate a higher proportion of their income to food compared to urban populations. Despite economic vulnerability, the bottom 25 percent income group in rural Rajasthan fared better than their counterparts in most other states, except for Goa. Interestingly, Rajasthan is one of the three states in India where urban populations in the bottom 25 percent spent slightly more on food than their rural counterparts, alongside Kerala and Jammu & Kashmir.
- **Food Expense Disparities across Districts in Rajasthan:** In 70 percent of Rajasthan's districts, food expenditure accounts for half or more of total expenses. Jhalawar has the highest proportion of food expenses, while Jaipur has the lowest among all districts. Inequality between rural and urban areas is prominent. In rural areas, food expenses range from 45.9 percent to 57.8 percent of total expenses, with 80 percent of districts spending half or more on food. In urban areas, the share of expenses ranges from 40.4 percent to 53.8 percent, with over 60 percent of districts spending less than half on food. Interestingly, the disparity is higher among urban counterparts compared to rural ones, as rural areas show a more consistent spending pattern. Rural districts like Bikaner (57.8 percent) and Jhalawar (57.6 percent) have the highest share of food expenses, while Udaipur (45.9 percent) has the lowest. In urban Rajasthan, Churu and Sawai Madhopur have the highest share (53.8 percent), while Kota (40.4 percent) has the lowest. Even within districts, the pattern of food expenditure share varies significantly. Except for Nagaur, Churu, and Hanumangarh, rural counterparts in most districts have a higher share of food expenses compared to urban ones.
- **Impact of Food Price Inflation on Access to Food in Rajasthan:** Food price inflation directly affects food access, especially for vulnerable households already spending a large portion of their income on food.

> Food price inflation directly affects food access, especially for vulnerable households already spending a large portion of their income on food.

Rajasthan has seen increase in food inflation since 2012, aligning with general inflation trends. During the COVID-19 pandemic, food inflation exceeded general inflation, peaking from November 2019 to January 2020. Food and beverage inflation from March 2021 to December 2021 rose by 6.8 percent. Consumer Price Index (CPI) for cereals and cereal products rose nearly 19 percent from January 2018 to February 2020 but decreased by up to 7.7 percent from August 2020 to March 2021 due to strategic measures implemented during the pandemic. The CPI for key protein and fat sources like pulses, milk, and oil has consistently increased over the years, with the highest inflation observed in oil and oil products. Except for cereals and cereal products, where urban prices slightly exceeded rural prices after August 2020, prices of all other food commodities, including pulses, oils, milk, and their products, are significantly higher in rural areas compared to urban counterparts in Rajasthan.

- **Nutritional Intake in Rajasthan:** Nutritional intake in Rajasthan surpasses national averages and recommended norms for energy, protein, and fat. However, energy and protein intake has declined between 1999-2000 and 2011-12, while fat intake remains double the recommended norms. The bottom 25 percent of the population based on monthly per capita expenditure (MPCE) in Rajasthan has below-recommended energy intake, but protein and fat consumption slightly exceed the norms. Dietary disparities exist between social groups, with individuals in the bottom 20 percent consuming a thousand calories than those in the top 20 percent. Scheduled tribes or castes, people in the southern agroclimatic zone, and casual laborers face higher levels of energy, protein, and fat deprivation. District-level disparities reveal variations in per capita daily energy, protein, and fat intake, both between rural and urban populations and across districts.

  Changing food preferences in Rajasthan show a decrease in the proportion of calorie intake from cereals, while oils, oil products, and miscellaneous sources have increased. Animal protein consumption remains low, reflecting a prevalence of vegetarianism, while plant-based protein from pulses remains unchanged. Despite meeting recommended daily protein intake, concerns arise about the quality of protein consumed due to the lack of essential dietary amino acids. These findings emphasize the need for targeted measures to address the nutritional requirements of vulnerable populations in Rajasthan.

- **Factors shaping food accessibility in Rajasthan:** Enhancing food accessibility in Rajasthan depends on various factors such as occupational structure, agricultural earnings, and access to well-maintained

roads. The state has a work participation rate of 43.6 percent, slightly higher than the national average of 39.8 percent, with around 16.5 percent of employed individuals working as agricultural laborers. Female agricultural laborers make up twice the proportion of males. Districts in the southern and south-eastern regions have the highest proportion of agricultural laborers, while some districts like Churu, Sikar, Jhunjhunu, and Jaipur have the lowest. Although the average daily wage rates for male and female field laborers in Rajasthan have increased over time and are higher than the national average, they still lag behind states like Kerala, Haryana, Punjab, and Uttarakhand. Moreover, there are significant wage disparities between male and female laborers across districts. For vulnerable households in remote areas, access to paved roads and improved rural connectivity are crucial for consistent physical access to food. However, Rajasthan's road density is considerably lower than the national average, and over half of the villages with a population of under 250 lack proper connectivity, posing significant challenges for residents in accessing essential services in smaller and sparsely populated areas.

3. Status of Food Utilisation in Rajasthan

- **Rajasthan's progress in child undernutrition and mortality:** Between 2015-16 and 2019-21, the state has made significant strides in reducing child undernutrition and mortality, particularly among the Empowered Action Group (EAG) states. Mortality rates have improved, with Rajasthan moving up in Neonatal Mortality Rate (NMR), Infant Mortality Rate (IMR), and Under-5 Mortality Rate (U5MR) rankings. The state has also shown improvements in addressing stunting, wasting, and underweight categories, with significant reductions in prevalence. Notably, Rajasthan experienced the highest decline in stunting prevalence and the second-highest reduction in underweight children among all Indian states. These positive trends indicate notable progress in child health and nutrition in the state.
- **Disparities in child undernutrition across Rajasthan:** Rural regions have higher rates of stunting and underweight among children under five, while urban areas show slightly higher rates of wasting and overweight/obesity. Male children are slightly more affected by stunting, wasting, and underweight than females. The prevalence of stunting and underweight increases significantly after six to eight months. The children under age five of Scheduled Tribe population experiences the highest rates of child undernutrition, with 35.9 percent stunting, 18.6 percent wasting, and 32 percent underweight. Maternal nutritional status also plays a role, as mothers with low BMI (<18.5) have higher rates of child stunting, wasting, and underweight. District-level analysis reveals significant variations in undernutrition across Rajasthan. Baran district carries the highest burden, while Jhunjhunu district has the lowest. Stunting has reduced in most districts, except for Tonk, Barmer, Dausa, and Baran. Jhalawar has the highest burden of severely acute malnourished children, while Udaipur has the lowest. Disparities in underweight prevalence are evident, with Sikar performing the best and Baran performing the worst. Over the past 15 years, there has been increasing concern about overweight/obese children under five, with Jhunjhunu reporting the highest prevalence and Pali the lowest.
- **Rajasthan's progress in addressing adult undernutrition:** Rajasthan achieved the second-highest reduction in adults with below-normal BMI among states and union territories. Between NFHS-4 and NFHS-5 surveys, low BMI proportion decreased

by 7.4 percent for women and 8.7 percent for men. The state is among five witnessing a decline in overweight women (14.1 percent to 12.9 percent), but obese men increased (13.2 percent to 15 percent). Overweight/obese women prevalence in Rajasthan is nearly 50 percent lower than the national average (24 percent). Age and social groups influence nutrition outcomes. Low BMI prevalence decreases with age, while overweight/obesity increases. Among adolescents, 40.1 percent girls and 34.7 percent boys have low BMI. 23.7 percent women and 26 percent men aged 40-49 are obese/overweight. Scheduled tribes have the highest proportion of women with low BMI (24.8 percent), followed by scheduled castes (22.8 percent). Eastern Rajasthan districts have higher low BMI rates. All districts, except Jhunjhunu, show reduced low BMI in women, with Udaipur demonstrating the most significant reduction, and Alwar the least. Ajmer has the lowest prevalence, while Bundi has the highest.

- **Anaemia prevalence in Rajasthan:** Rajasthan ranks sixth from the bottom for anaemia prevalence among children aged 6 to 59 months. The prevalence of anaemia has increased in all age groups between 2015-16 and 2019-21, moving the state's rank from 25th to 31st. Women aged 15-49 years experienced an increase from 46.8 percent to 54.4 percent, and adolescent girls saw a rise of 10.3 percentage points from 49.1 percent to 59.4 percent. Adolescent boys (15-19 years) and men (15-49 years) also saw an increase in anaemia burden. Rural areas have a higher proportion of anaemic children. Children belonging to scheduled tribes have the highest prevalence at 77 percent. Maternal anaemia significantly impacts child anaemia, with most anaemic children having mothers who are also anaemic. The district-level prevalence of child anaemia ranges from 58.6 percent to 84.3 percent, with Jaisalmer having the lowest and Rajsamand having the highest. Dungarpur has the highest proportion of anaemic adolescent girls and women.
- **Progress in Infant and Young Child Feeding (IYCF) indicators, micronutrient intake and immunization coverage:** Rates of early initiation of breastfeeding, exclusive breastfeeding for children under six months, timely introduction of complementary feeding, and adequate diet for breastfeeding children aged 6-23 months have all improved. However, further improvements are needed, and the state government should enhance its

implementation plan. Most districts have witnessed an increase in the proportion of children receiving an adequate diet during the complementary feeding age (6-23 months), with Jodhpur having the highest proportion at 12.5 percent, and Sirohi, Dungarpur, and Jalore having the lowest. Despite government efforts and improvement over the years, around 35 percent of children still lacked Vitamin A doses. Only a small percentage of children under the age of five years consumed iron-rich foods or received iron supplements, and usage of micronutrient powder and deworming tablets was also low. On a positive note, the proportion of fully immunized children aged 12 to 23 months has significantly increased in most districts, with Barmer showing the highest coverage and Alwar and Sawai Madhopur the least. In terms of micronutrient intake among women in Rajasthan, there has been a near doubling of the consumption of 100+ iron and folic acid (IFA) tablets by pregnant women from 17.3 percent in NFHS-4 to 33.9 percent in NFHS-5. Most districts in Rajasthan have shown an increase in the consumption of IFA tablets for 100 days or more during pregnancy, with varying degrees of improvement. Rajsamand exhibited the highest improvement, while Karauli showed the least. Ganganagar district had the highest consumption of IFA tablets, whereas Bharatpur district had the lowest.

- **Access to safe drinking water, sanitation facilities and health coverage:** Between 2015-16 and 2019-21, the proportion of households with improved drinking water sources increased from 93.7 percent to 96.5 percent, with urban areas showing higher access (99.1 percent) compared to rural areas (95.6 percent). Access to improved sanitation facilities also improved significantly, with 71.1 percent of households having them in 2019-21, compared to 46.1 percent in 2015-16. Urban areas (87.2 percent) outperformed rural areas by 21.1 percent. Barmer experienced a four-fold increase in households with improved sanitation facilities, while Hanumangarh (83.8 percent) and Barmer (83.6 percent) had the highest proportions, and Banswara the lowest (40.8 percent). Health insurance coverage in Rajasthan increased dramatically, up to five fold across all districts between NFHS-4 (2015-16) and NFHS-5 (2019-21), largely due to the successful implementation of the **'Mukhya Mantri Chiranjeevi Swasthya Bima Yojana'** launched in 2021. Barmer had the highest proportion of households with health coverage, rising from 8.9 percent to 97.8 percent, while Sawai Madhopur had the lowest at 80.5 percent.
- **Anthropometric failures and burden of undernutrition:** Half of children under five experience one or more anthropometric failures, according to NFHS-5 (2019-21). Baran and Karauli have the highest proportions of children with at least one failure, while Sikar and Jaipur have the lowest. The triple and double burdens of undernutrition have significantly decreased between NFHS-4 and NFHS-5. The prevalence of children suffering from stunting, wasting, and underweight simultaneously has reduced by almost 50 percent. Most districts have seen a reduction in the triple burden, with Karauli, Dausa, Jhalawar, Baran, and Banswara having the highest proportions, and Sikar the lowest. Household wealth significantly impacts undernutrition risk. Children from the poorest households face higher chances of undernutrition but lower odds of overweight/obesity compared to the wealthiest. Scheduled tribes have

the highest prevalence of undernutrition, followed by scheduled castes and other backward castes. Rural areas have a higher risk of undernutrition, and male children have a higher risk of both double and triple undernutrition. Geographic location also plays a role, with Kota and Bharatpur divisions having the highest proportion of children with undernutrition, and Jaipur and Jodhpur divisions having the lowest.

4. Status of Food Stability in Rajasthan

- **Rainfall Variability in Rajasthan:** Rajasthan, known for its arid climate, receives less rainfall compared to the rest of the country, with an average annual rainfall of 549 mm. The state has seen varying levels of rainfall over the years, with the highest recorded in 2013-14 at 137.6 percent above normal and the lowest in 2009-10 at 23 percent below normal. Since 2013-14, Rajasthan has experienced higher peak rainfall every two years, resulting in a decadal average annual rainfall of 31.5 percent above normal.
- **Distinct Rainfall Patterns across districts in Rajasthan:** District analysis reveals two distinct clusters in Rajasthan based on rainfall patterns. The eastern to south-eastern periphery receives higher rainfall, while the northern to southwestern belt experiences lower rainfall. Although the clusters remained similar between 2008-11 and 2016-19, there were exceptions. The districts in the extreme south and southeast received more rainfall in the earlier period, while the northern and western belt experienced even less rainfall in the later period. This divergence led to increased food grain production in districts with higher rainfall and thriving millet and pulse production in areas with lower rainfall.
- **Overexploitation of Ground Water**: Rajasthan heavily relies on rainfall for groundwater recharge, but the state is facing overexploitation. The 2022 assessment shows that groundwater extraction levels in Rajasthan have reached 151.07 percent, an 8 percent increase from 2017. Except for a few districts, the entire state is extracting groundwater beyond its replenishable quantity, with some districts exceeding 200 percent. This trend negatively impacts food production as 85 percent of the extracted water is used for irrigation.
- **Vulnerability to Natural Disasters:** Rajasthan is prone to natural disasters such as droughts, hailstorms, floods, and locust attacks. Droughts during the Kharif season have affected around 4.2 million people on average between 2017 and 2023, causing significant crop losses. Western districts like Barmer, Jaisalmer, Bikaner, Jodhpur, and Pali have been severely impacted. Floods have also become more common, particularly in eastern and south-eastern districts, affecting millions of people and causing substantial crop damage. Hailstorms are frequent, and the state has witnessed locust attacks, which have resulted in significant economic losses.
- **Common Diseases:** Between 2016 and 2019, acute respiratory infections and influenza-like illnesses were prevalent in Rajasthan, affecting an average of 8.5 million people annually. Other common diseases included fever, diarrheal disorders, and malaria, according to the Integrated Disease Surveillance Programme (IDSP).
- **Multidimensional Poverty- Rural-Urban Disparities:** Approximately one in three people in Rajasthan are multidimensionally poor, with rural areas experiencing three times higher poverty rates compared to urban areas. Rajasthan ranks among

the ten states/UTs in India with the highest poverty headcount ratio, according to the NITI Aayog's Multi-Dimensional Poverty Index for 2021.

- **Gender Gap in Literacy:** Based on NFHS-5 (2019-21) data, at 64.7 percent, Rajasthan stands next to Bihar and Jharkhand, the poorest performing states in terms of female literacy. There is a significant gender gap in literacy, with women falling behind men by 24.2 percentage points. Rural areas have a lower female literacy rate compared to urban areas, while the gap in male literacy rates between rural and urban areas is smaller.
- **Unemployment Trends:** Unemployment rates in Rajasthan have shown a steady decline since 2018-19, but the state's unemployment rate in 2020-21 remained slightly higher than the national average. Urban areas have higher unemployment rates compared to rural areas, and female unemployment is more prevalent in urban areas.

Status of Districts in the Food and Nutrition Security Index

A comprehensive set of indicators was utilized to construct Food and Nutrition Security indices, encompassing elements such as food availability, accessibility, utilization, and stability. These indices play a vital role in evaluating the state of food and nutrition security in districts throughout Rajasthan and identifying vulnerable areas that require special attention to achieve 'zero hunger' in the state.

- **Food Availability Index (FAvI):** Rajasthan is categorized as 'moderately insecure' concerning food availability, with approximately two-thirds of the districts falling within the range of moderate to extremely insecure. Specifically, Barmer, Dungarpur, and Churu are classified as extremely insecure, while only six districts, including Ganganagar, Hanumangarh, Baran, Chittorgarh, Bundi, and Alwar, are considered secure.
- **Food Accessibility Index (FAcI):** The food accessibility index reveals a troubling situation in Rajasthan, as the state is labeled as 'severely insecure.' Except for Jaipur, which is deemed secure, the remaining districts are categorized as moderately to extremely food insecure. Notably, Jaisalmer in the west and Baran, Jhalawar, Banswara, Pratapgarh, Kota, and Chittorgarh in the southeastern region form a contiguous cluster and fall under the extremely insecure category.
- **Food Utilisation Index (FUI):** Rajasthan falls into the 'moderately insecure' category in terms of food utilization. Out of all the districts, nine are classified as secure or moderately secure, with Barmer being the highest performer and Pratapgarh ranking the lowest. Eastern districts exhibit lower performance compared to the more successful western districts. Although districts fare relatively better in food utilization compared to availability and accessibility, there is a significant two-fold difference in scores between the highest and lowest performing districts, indicating substantial variations in food utilization across the region.
- **Food Stability Index (FSI):** The food stability index classifies Rajasthan as 'moderately secure,' with Jhunjhunu and Sikar ranking the highest, while Jaisalmer and Pratapgarh rank the lowest. Around 40 percent of the districts are considered secure or moderately secure, forming a cluster in the central to north-eastern part of Rajasthan. Extremely insecure districts include Jaisalmer and Pratapgarh, while Banswara, Jhalawar, Baran, Dungarpur, and Bundi are categorized as severely insecure. The insecure districts form a cluster spanning from the western to the south-eastern side of Rajasthan, excluding Sri G anganagar in the northern region.

Overall **Food and Nutrition Security Index (FNSI),** Rajasthan is categorized as *'moderately secure'* overall. Among all the districts, 15 are considered secure or moderately secure, with Hanumangarh ranked at the top. However, Jaisalmer and Banswara are identified as extremely insecure and demand urgent attention. The ten bottom districts, designated as 'priority districts,' are mostly concentrated between the western and south-eastern peripheries, except Churu in the north-eastern part, forming a nearly continuous cluster.

Policy Recommendations

1. Improving Food Availability in Rajasthan

Augment Irrigation

- Implement additional water availability methods like drainage line treatment, soil and moisture conservation, rainwater nursery raising, afforestation, and pasture development to increase agricultural water resources.
- Store and recycle run-off water during short drought periods to ensure crop survival.

Improve Agriculture Inputs

- Use high-yielding and drought/disease-resistant varieties of seeds to enhance crop productivity.
- Implement Integrated Farming Systems (IFS) to maximize yields of various crops, including millets and pulses.
- Invest in research and development of high-yielding millet varieties and improve shelf life of millet produce with the support of state agriculture universities, positioning Rajasthan as a leader in promoting millets.

Diversify the Production

- Incentivize the production of pulses, millets, dairy, poultry, animal husbandry, and horticulture to address the agriculture-nutrition disconnect.
- Encourage diversification of farm activities, such as animal husbandry and poultry rearing, to mitigate farming households' shocks and stresses.

2. Improving Food Accessibility in Rajasthan

Strengthen Food Safety Nets to Leave No One Behind

- Enhance existing food safety net programs like Targeted Public Distribution System (TPDS), PM-POSHAN and Integrated Child Development Scheme (ICDS) to include vulnerable populations. Extend state food security schemes to cover excluded vulnerable groups, improving overall food and nutrition security.
- Distribute pulses through TPDS, MDM, and ICDS to enhance protein intake among vulnerable populations.

Manage Food Inflation

- Facilitate timely distribution of pulses, grains, and

edible oil through TPDS to address food inflation and rising prices.

- Strengthen a market information system to accurately estimate price spikes in major food commodities. Leverage Central government support on price stabilization funds and schemes to benefit the population.
- Promote livelihood programs and generate employment opportunities, especially in rural areas

Investing in Physical Infrastructure

- Improve physical infrastructure, including roads, modern warehouses, and cold storage, to ensure last-mile physical access to food.

3. Improving Food Utilization in Rajasthan

Fortify the Food Safety Nets

- Fortify dry ration distributed through TPDS, PM-POSHAN and ICDS and hot cooked meals also distributed with iron and essential vitamins. Rice and other grains fortification could be a positive step.
- Ensure successful implementation of micro-nutrient supplementation programs and routine deworming of children and pregnant women.

Generate Mass Awareness

- Launch social behavior change communication campaigns to raise awareness about nutrition-specific and nutrition-sensitive initiatives and promote their adoption.
- Create awareness about diversifying consumption of locally available iron-rich foods like millets, pulses, and green leafy vegetables.

Strengthen the IYCF Programme Implementation

- Focus on the 6-24 months age group, which is critical for preventing growth faltering.
- Strengthen the implementation of IYCF programs, especially in vulnerable populations and areas.
- Improve the Take Home Ration (THR) with desired nutrients and launch campaigns to promote its uptake

Target and treat SAM and MAM Children

- Ensure targeted identification and free treatment of severely and moderately acute malnourished (SAM and MAM) children.
- Provide increased THR quantity, ready-to-eat snacks, enriched THR with additional protein and fat such as milk and eggs for all MAM/SAM children, promoting their consumption through awareness campaigns.

4. Improving Food Stability in Rajasthan

Conserve and preserve rainfall water

- Implement water preservation techniques like check dams, watersheds, and other methods to conserve rainfall water. Encourage the use of modern techniques like check dams and watersheds for groundwater recharge, particularly in vulnerable districts.
- Promote crops that require less groundwater for irrigation, such as millets and pulses.

Invest in early warning systems

- Invest in early warning systems to predict droughts, famine, and floods, enabling timely disaster management responses.
- Strengthen social protection systems to mitigate the effects of these crises.
- Update state disaster response policies to include food and nutrition security responses during emergencies.

Augment local healthcare systems and female education

- Strengthen local healthcare systems, such as primary healthcare centres (PHCs) and community health centres (CHCs), to address the healthcare needs of the vulnerable population and area.
- Mitigate morbidities related to acute respiratory infections (ARI), influenza, malaria, and diarrheal disorders.
- Focus on achieving universal female literacy and promoting gender parity in employment opportunities. Invest in education to ensure a minimum of 10 years of schooling for all women in the state.

5. Improving FNS invulnerable Geographies

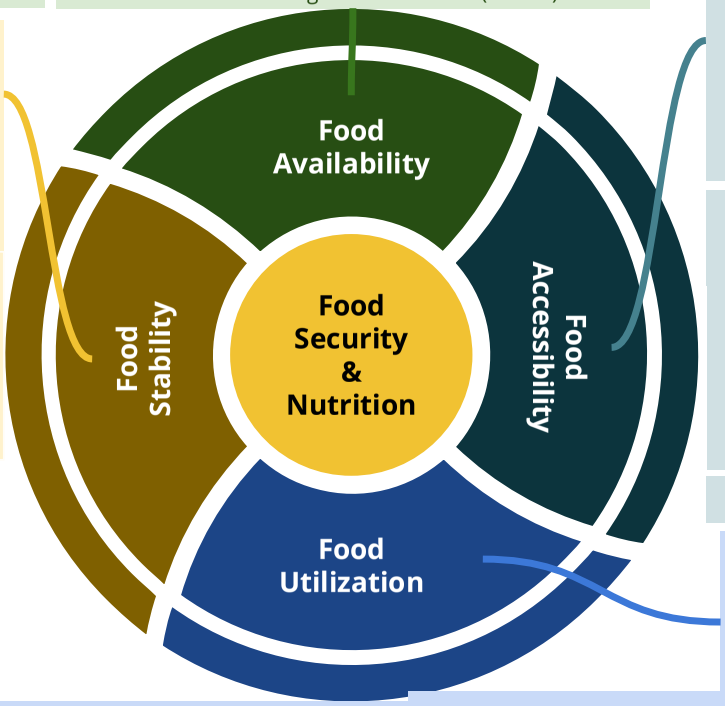
Focused attention on Vulnerable FNS Region of the State

- The state government should make special provisions

> **Identify and extend food security programme to the excluded vulnerable population groups**

on diversifying the food basket and launching the SBCC campaign through the food safety net, specifically in the identified priority districts.

Major schemes for strengthening food and nutrition security in Rajasthan



Yield & productivity (#9)
- Mukhyamantri Beej Swavalamban Yojana **(S)**
- Rajasthan Tarbandi Yojana **(S)**
- Zero Budget Natural Farming
- National Food Security Mission
- National Mission on Agriculture Extension & Technology
- Rashtriya Krishi Vikas Yojana
- National Mission for Sustainable Agriculture
- National Horticulture Mission
- Soil Health Card Scheme

Insurance (#3)
- Rajasthan Mukhya Mantri Kamdhenu Pashu Bima Yojana **(S)**
- Rajiv Gandhi Krishak Sathi Sahayata Yojana **(S)**
- Pradhan Mantri Fasal Bima Yojana

Marketing (#4)
- Rajasthan Agro-Processing, Agri-Business and Agri-Export Promotion Scheme **(S)**
- Krishak Uphaar Yojana **(S)**
- Kisan Kaleva Yojana **(S)**
- electronic National Agriculture Market (e NAM)

Irrigation & power (#5)
- Rajiv Gandhi Jal Sanchay Yojana **(S)**
- Mukhya Mantri Kisan Mitra Urja Yojana **(S)**
- PM-KUSUM
- Pradhan Mantri Krishi Sinchai Yojana
- Atal Bhujal Scheme

Food distribution (#5)
- Indira Rasoi Yojana **(S)**
- Ek Rupay Kilo Gehu Yojana **(S)**
- Targeted Public Distribution System
- Annapurna Food Packet Yojana
- Mid Day Meal

Disaster relief (#2)
- State Disaster Response Fund **(S)**
- National Disaster Response Fund

Insurance (#4)
- Rajasthan Mukhya Mantri Kamdhenu Pashu Bima Yojana **(S)**
- Rajasthan Pashudhan Nishulk Arogya Yojana **(S)**
- Mukhya Mantri Chiranjeevi Swasthya Beema Yojana **(S)**
- Pradhan Mantri Fasal Bima Yojana

Social welfare (#5)
- Chief Minister Specially Abled Samman Pension Scheme **(S)**
- Chief Minister Old Age Samman Pension Scheme **(S)**
- Chief minister Ekal Nari Samman pension Yojana **(S)**
- Palanhar Scheme **(S)**
- Indira Gandhi Disability Pension Scheme

Employment (#3)
- Mahatma Gandhi National Rural Employment Guarantee Scheme
- Indira Gandhi Urban Employment Guarantee Scheme **(S)**
- Indira Gandhi Shahri Credit Card Yojana

Food distribution (#9)
- Indira Rasoi Yojana **(S)**
- Shudh ke Liye Yudh **(S)**
- Mukhya Mantri Bal Gopal Yojana **(S)**
- Targeted Public Distribution System
- Integrated Child Development Scheme
- Mid-Day Meal Scheme
- PM POSHAN
- Supplementary Nutrition Programme
- Annapurana Food Packet Yojana

Conditional cash transfers (#2)
- Indira Gandhi Matritva Poshan Yojana **(S)**
- Pradhan Mantri Matru Vandana Yojana

Livelihood (#4)
- Indira Gandhi Shahri Rozgar Guarantee Yojana **(S)**
- Indira Gandhi Shahri Credit Card Yojana **(S)**
- Mahatma Gandhi National Rural Employment Guarantee Scheme
- National Rural Livelihood Mission

Connectivity (#1)
- Pradhan Mantri Gram Sadak Yojana

Public Health (#8)
- Mukhya Mantri Chiranjeevi Swasthya Bima Yojana **(S)**
- Mukhya Mantri Nishulk Nirogi Rajasthan **(S)**
- Mukhya Mantri Nishulk Dava Yojana **(S)**
- Mukhya Mantri Nishulk Jaanch Yojana **(S)**
- Rajasthan Government Health Scheme**(S)**
- Nirogi Rajasthan Abhiyan **(S)**
- Janta Clinics **(S)**
- Ayushman Bharat (Health & Wellness Center)

Nutritional Well-being (#5)
- Mukhya Mantri Bal Gopal Yojana **(S)**
- Integrated Child Development Scheme
- PM POSHAN
- Targeted Public Distribution System
- Mid-Day Meal Scheme

Water & Sanitation (#4)
- Rajiv Gandhi Jal Sanchay Yojana **(S)**
- Swachh Bharat Mission Gramin & Swachh Bharat Mission Urban
- Jal Jeevan Mission

Note: (S) represents the state schemes launched and implemented by Government of Rajasthan

1. Introduction

1. Introduction

1.1. Context

Amidst the peak COVID crisis, on 20th August 2020, Government of Rajasthan launched **Indira Rasoi Yojana**. The intent of the scheme was ***'Koi Bhi Bhukha Nahi Soye'*** meaning thereby no one should sleep hungry. It made provisions for the poor and the destitute to access the hot cooked meal at a highly subsidised price so that they should not face the crisis of hunger. Even prior to COVID onset, from 1st March 2019, the state government provided the wheat at rupee one per kilogram to Priority Households (PHH), benefiting its 174 million population, as a top-up subsidy against the provision made by central government that was already providing wheat to the NFSA beneficiary at rupees two per kilogram. In continuation of their efforts to support the poorest of the poor of the state to remain hunger free, the state government in 2023-24 budget has announced the provision of **free Annapurna food packets** along with regular NFSA entitlements to 10 million families in the state. Furthermore, the state government provides free universal healthcare through the **Mukhya Mantri Cheeranjeevi Swasthya Beema Yojana**. In 2023-24, the insurance cover has been increased from 12.5 thousand USD (INR 1 million) to 31.3 thousand USD (INR 2.5 million). These initiatives among other reflect deep commitment of the state Government of Rajasthan to address food and nutrition security (FNS) issues in the state.

State's commitment on the FNS issues is not unwarranted. Extreme hunger and malnutrition continue to hinder sustainable development and place individuals in a difficult-to-escape trap. Hunger and malnutrition result in less productive people who are more prone to illness and often unable to increase their income and enhance their standard of living. Extreme hunger and malnutrition remains a barrier to sustainable development and creates a trap from which people cannot easily escape. A world with zero hunger can positively impact our economies, health, education, equality and social development. It's a key piece of building a better future for everyone[1]. It stands to reason that one of the main Sustainable Development Goals is to end hunger and all forms of malnutrition (SDG 2). The other sustainable development goals, such education, health, and gender equality, will not be accomplished if hunger restricts human

1 https://www.un.org/sustainabledevelopment/wp-content/uploads/2018/09/Goal-2.pdf

progress. 'Zero Hunger' has been identified as one of the key Sustainable Development Goals (SDG 2). With hunger limiting human development, we will not be able to achieve the other sustainable development goals such as education, health, and gender equality.[2]

In Rajasthan, with the commitment of the state government, the status of food and nutrition security has shown significant improvement over time. The state has recorded the largest decline in child stunting among the Indian states and union territories of about 7.3 percentage points between 2015-16 and 2019-21. The prevalence of underweight children has decreased by 9.1 percentage points, from 36.7% in 2015–16 to 27.6% in 2019–20. Rajasthan has also been effective in lowering the prevalence of childhood wasting by 6.2 percentage points, from 23% in NFHS-4 to 16.8% in NFHS-5.

Despite notable improvements, the levels of stunting, wasting and underweight among children are still at unacceptable levels. The prevalence of severe wasting among children barely decreased by one percentage point between the NFHS-4 and NFHS-5 rounds, from 8.6% to 7.6%, which is equivalent to the national average (7.7%) of severely acute malnourished (SAM) children in India. Anaemia is another enigma that needs serious exploration in the state. Rajasthan is one of the bottom-six states/UTs in India with regards to the prevalence of anaemia in under five children. According to NFHS-5 statistics, the prevalence of child anaemia increased by 11.2 percentage points between NFHS-4 and NFHS-5, going up from 60.3% in 2015-16 to 71.5% in 2019-21. Similarly, anaemia prevalence among women aged 15 to 49 increased from 46.8% to 54.4% and that of adolescent girls shot up from 49.1% to 59.4% during the two NFHS periods. Rajasthan FNS challenges gets further exacerbated by the socio-economic factors such as prevalence of gender inequality in the state which leads to differing access to food, nutrition, and health services within household, leading to gender-based differentiation in FNS outcomes.

As a result of these persistent challenges in food and nutrition security, the state falls behind in becoming one of the top-performing states. It is evident that the state is not on track to achieve the 2025 Global Nutrition Targets, which includes reducing stunting among children under the age of five, reducing anaemia in women of reproductive age, reducing the incidence of low birth weight and childhood obesity, and increasing the rate of exclusive breastfeeding during the first six months of life[3]. The SDG India Index 2020-21 showed that the state's performance on SDG 2 has been that of 'performer' and is still far from being the 'achiever'[4].

1.2. Need for Food and Nutrition Security Analysis in Rajasthan

Under the federal set up, the Indian States and Union Territories (UTs) are endowed with power and functions by the Constitution of India to implement policies and programmes to meet the aspirations of people through efficient use of resources. Decentralized administrative planning at state and district level, however, demands the availability of disaggregated data and evidence at state, district and block level for effective policy planning and monitoring. The multidimensional aspects of food and nutrition security issues also require disaggregated data and evidence. It helps in providing indispensable information for identifying the most vulnerable population groups, the regions, and their causes of vulnerability. Such disaggregated data and evidence support the policy makers and administrative decisionmakers to take effective and efficient actions for achieving the FNS goals and targets in the state.

WFP being the world's largest humanitarian organization is committed to support the host government in achieving their FNS goals and targets of SDG 2 by 2030. It believes in the core principles of inclusive growth, leaving no one behind, and reaching the furthest first, to ensure sustainable development. WFP has a strong partnership with the Government of India for over 50 years in its transformation in the food security & nutrition sectors & leaving no one behind. In collaboration with national and state governments, WFP has supported generation, dissemination and use of disaggregated data and evidence on food and nutrition security issues by bringing out various food security atlases and reports from the past two and half decades. The objectives of these reports have been to analyse regional patterns of food insecurity and malnutrition, identify the most food insecure locations and population groups and the underlying factors thereof. Towards this objective, at the national level, WFP, in collaboration with the M. S.

2 Ibid.

3 https://www.who.int/publications/i/item/WHO-NMH-NHD-14.2

4 https://sdgindiaindex.niti.gov.in/#/state-compare?goal=2&area=IND008&timePeriod=2020

Swaminathan Research Foundation (MSSRF), published two editions each of 'Food Insecurity Atlas of Rural India'– 2001 and 2008 and the 'Food Insecurity Atlas of Urban India' – 2002 and 2009 and one edition of the "Atlas of the Sustainability of Food Security in India – 2004". During 2007-11, WFP prepared food security atlases of eight states, viz. Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, and Uttar Pradesh. In these atlases, districts were the units of analyses. The Atlases brought out new challenges while also raising the standard for understanding the extent of food security across states. The necessity of good data and disaggregated analysis at the sub-state level was made very clear.

In 2009, WFP together with Government of Rajasthan have brought out 'The Food Security Atlas of Rural Rajasthan'. The analysis helped in identifying the regions such as sub-humid southern plains and western arid plain as most food insecure and accorded priority to districts and suggested policy interventions for improving food security among food insecure regions and vulnerable groups. The analysis also attempted to develop a Food Security Index (FSI) reflecting three dimensions- food availability, accessibility, and absorption, based on which districts were ranked.

Significant progress has taken place since the launch of the food security atlas of rural Rajasthan in 2009. All nations across globe have now committed themselves for the 2030 sustainable development agenda which has a renewed focus to achieve zero hunger. Government of Rajasthan also has now enhanced vision and commitment to achieve food security and remove all forms of malnutrition in the state. To support these vision and efforts, there is a need to comprehensively analyse newer and robust data and evidence of the food and nutrition sector of Rajasthan. Such disaggregated analysis will not only be undertaken to look at the geographical pattern at district level but also by various social and vulnerable groups to respond to the principles of reaching the most vulnerable and leaving no one behind. The evidence will support the state and the local government to make evidence-based policies and programmatic actions to make *'Suposhit Rajasthan'.*

WFP and the Government of Rajasthan signed a partnership agreement in October 2020 for supporting the government's efforts towards achievement of their targets under Sustainable Development Goal 2 by providing technical assistance and transfer and exchange of knowledge, skills, and expertise to concretely strengthen the existing systems. This report is undertaken through this partnership.

1.3. Food and Nutrition Security Analysis: Concept and Approach

Over the past five decades, the concept of food security has evolved and has undergone paradigm shifts at three levels – "(a) from the global and the national to the household and the individual level, (b) from a food first perspective to a livelihood perspective, and (c) from objective indicators to subjective perception"[5]. The most widely accepted definition of food security dates to 1996, when the World Food Summit at Rome agreed on a holistic and multidimensional concept[6]. It defined it as *"Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food, which meets their dietary needs and food preferences for an active and healthy life."* Later, during the 2009 Declaration of the World Summit[7], the nutritional

5 Maxwell, S. (1996). Food security: A post-modern perspective. Food Policy, 21(2), 155–170. https://doi.org/10.1016/0306-9192(95)00074-7.

6 FAO. (1996). The Rome declaration on world food security. Population and Development Review. https://doi.org/10.2307/2137827.

7 FAO (2009). Declaration of the World Summit on food security. World Food Summit.

dimension was emphasised as integral to the concept of food security. Moreover, four distinct pillars to measure food security were established, and these were - food availability, food accessibility, food utilization and food stability.

Food availability refers to the food that is physically available in the given area, through all forms of domestic production, commercial imports, reserves, and food aid. Self-sufficiency in production of food grains is often advocated as a first step towards attaining food security for any country. Over the years, India has successfully transitioned from a food deficient to a self-sufficient nation. However, assessing the quantity, quality, and variety of food that is accessible for human consumption in addition to the production of food grains is also very crucial.

Food accessibility refers to the ability of household to acquire food regularly through one or a combination of home production and stocks, purchases, barter, gifts, borrowing, and food aid. The ability to access food rests on two pillars: economic and physical access. Economic access is determined by disposable income that influences people's purchasing power, food prices, and the provision of and access to social support such as food safety net programmes to cater to the needs of vulnerable population. Improvements in economic access to food can be reflected by reduction in poverty rates, reduced share of expenditure of food to total household expenditure and diverse food basket for consumption. Physical access is determined by the availability and quality of infrastructure, including ports, roads, railways, communication and food storage facilities and other installations that facilitate the functioning of markets. It is also strongly influenced by the levels of education, health status, prevailing social and gender-based inequities of individuals/households.

Food utilization refers to household's use of the food to which they have access and individual's ability to absorb and mobilize nutrients (i.e., the efficiency of food conversion by the body). Disease/ill-health prevalence is negatively correlated with 'nutrient utilization' and this leads to vicious cycle between health and food and nutrition status in individuals. Food utilisation can be captured by two distinct dimensions – anthropometric outcomes in children under the age of five and second by studying various determinants or input indicators that reflect food quality and preparations, health, and hygiene conditions, determining how effectively available food can be utilized. Access to clean water and sanitation is crucial to preparation of clean, healthy food and maintaining a healthy body. It is therefore realized that improved food access and availability is not always accompanied by better food utilization. Outcome indicators of food utilization convey the impact of inadequate food intake and poor health. Wasting, for instance, is the result of short-term inadequacy of food intake, an illness, or an infection, whereas stunting is often caused by prolonged inadequacy of food intake or repeated episodes of infections and illnesses. Good health is a prerequisite for the human body to absorb nutrients effectively, and hygienic food helps maintain a healthy body.

Food stability, at macro level, relates to the capacity to cope with various economic and social shocks, including resilience to natural hazards. If the dimensions of food availability, access and utilization are sufficiently met, stability is the condition in which the whole system is stable, thus ensuring that households are always food secure. Stability issues can refer to short-term instability (which can lead to acute food insecurity) or medium to long-term instability (which can lead to chronic food insecurity). Food stability indicators include a set of parameters that can detect sudden onset shocks and measure the extent and exposure to short term, medium term, and long-term risks. Indicators such as extent of

exposure to climatic shocks such as droughts and floods, area under irrigation, domestic food price volatility, fluctuations in domestic food supply, political instability and conflicts, price hikes often manifest food instability and crises. The resilience capacities depend on short term policies (social protection policies and food aid) and long-term policies (economic growth and public policies impacting their health status, education, and household's resources).

1.4. Measurement of Food and Nutrition Security

Based on the review of existing global frameworks for food security analysis as well as WFP's past experiences and lessons learnt while undertaking food security analysis in India and states, a comprehensive suite of 102 indicators were identified and grouped each into the four food security dimensions- availability, access, utilization, and stability, that may either have direct or indirect influence on food and nutrition security of the population in Rajasthan. Indicators are further classified as core (having direct impact) or underlying (having indirect impact). These indicators were vetted and finalised in consultation with Directorate of Economics and Statistics, Government of Rajasthan.

The data for these indicators was collated from various secondary sources such as Census 2011 and its population projection of 2019, different rounds of National Family Health Surveys — NFHS 3 (2005-06), NFHS 4 (2015-16) and NFHS 5 (2019-21); three rounds of Consumer Expenditure Survey (CES) of National Sample Survey Office (NSSO) — 55th round (1999-2000), 61st round (2004-2005) and 68th round (2011-12); various rounds of Periodic Labour Force Survey (2017-18 to 2020-21) various administrative data collected from different government departments with the support of Directorate of Economics and Statistics, Government of Rajasthan. The district level data on nutritional intakes have been estimated using the latest NSSO data on consumer expenditure (2011-12) by pooling the central and state samples. The data was analysed pertaining to each indicator and presented in thematic charts and maps. Based on these four dimensions of food and nutrition security, a composite Food and Nutrition Security Index (FNSI) has been computed to rank districts to identify food secure and insecure pockets of Rajasthan. The analysis brings out clear perspectives on where the problem is and what interventions are required. The report serves as a true guide to develop a roadmap towards '*Suposhit Rajasthan*' and take the initiative forward through continued updated analysis and evidence.

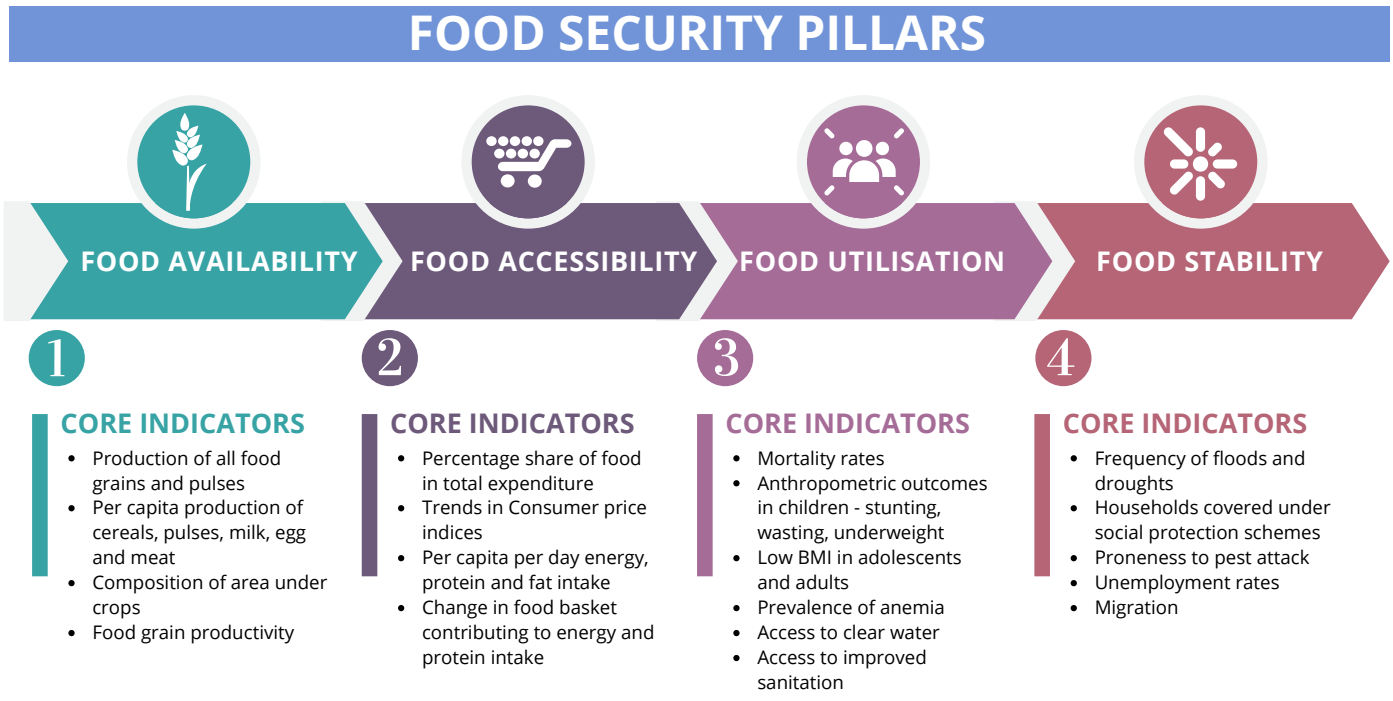


Figure 1: Core Indicators used for analysis under the Food Security Pillars.

This report can also be used as a baseline report to monitor the progress made by Rajasthan on SDG 2. The results of the analysis will facilitate evidence-based targeting of the strategies and allocation of resources to enable timely corrective actions for achieving the targets of SDG-2. The report also highlights various information and data gaps to measure food and nutrition security up to district level.

1.5. Structure of the Report

This report comprises of eight chapters, including the '***Introduction'***, that forms 'Chapter 1'. '***Brief profile of Rajasthan'*** including the state's geographical profile, agro-climatic conditions and its socio-economic characteristics is presented in Chapter 2. Chapter 3 examines the factors related with ***'Food Availability'*** in Rajasthan such as the production and consumption requirements of major crops and livestock, productivity of food grains and the storage facilities. Chapter 4 assesses the economic, social, and physical factors influencing the ***'Food Accessibility'*** situation in Rajasthan. Chapter 5 presents an overview of nutritional outcomes in children and adults in Rajasthan and examines the core and underlying factors that influence the ***'Food Utilisation'*** in Rajasthan. Chapter 6 explores the natural, climatic, and socio-economic factors impacting ***'Food Stability'*** in Rajasthan. Chapter 7 presents the scores and ranking of districts based on ***'Food and Nutrition Security Indices'*** using a suite of indicators influencing availability, accessibility, utilisation, and stability of food in Rajasthan. Chapter eight summarises the overall findings and highlights the gaps thereof and provides recommendations to address the gaps to improve the food and nutrition security situation in Rajasthan and accelerate the path for achieving zero hunger.

> **"The report can serve as a baseline report to monitor the progress of Rajasthan on SDG-2. It will facilitate evidence-based targeting of the strategies and allocation of resources to achieve SDG-2 in the State."**

2. Profile of Rajasthan

2. Profile of Rajasthan

This chapter provides a brief profile of Rajasthan for contextualising the food and nutrition security status of the state. It presents a snapshot of state's geographical profile, agro-climatic conditions, and its socio-economic characteristics.

2.1. Location

Rajasthan is India's largest state by area. It is in the north-western part of India, covering 342 thousand square kilometres, accounting for around 10.4 percent of the country's total geographical area[8]. The state is spread within the geocodes of 23°30' & 30°12' north latitude and 69°30' & 78°17' east longitude. Rajasthan geographical features include the Great Plains (Indian Desert) and Central Highlands, two of India's main physiographic regions. The 550-kilometer-long Aravalli Mountain range in Rajasthan, which stretches diagonally from southwest to north-east and up to Delhi, divides the state into two distinct regions: the western desert region and the eastern semi-arid zone. Surrounded by the states of Punjab, Haryana, and Uttar Pradesh in its north-east, Madhya Pradesh in the south-east and Gujarat in the south-west, Rajasthan also shares an international border with Pakistan in its west.

2.2. Administrative Setup

Present administrative structure of the state comprises 50 districts, 10 divisions, 10 Municipal Corporations, 36 Municipal Councils, 194 Municipal Boards, 323 sub-divisions, 338 Tehsils, and 11,266 Gram Panchayats. It is important to note that the analysis presented in the report is based on information and data available up to 2021-22 when the state comprised of 33 districts and 7 divisions as shown in Figure 2.

8 Figures as per Census of India, 2011

2.3. Demography

As per Census 2011, Rajasthan has one of the lowest populations densities in India with a total population of 6.85 crore which is projected to have increased up to 7.92 crore in 2021[9]. Three-fourth of the population lives in the rural areas (75.1percent) and rest one-fourth in the urban area. As per the recent NFHS-5 survey, the overall sex ratio in the state stands at 1009 females per 1,000 males, slightly below the national average of 1020 females per 1,000 males. The sex ratio of the population below five years of age is lower at 891 females per 1,000 males, much below the national average of 929 females per 1,000 males. The Scheduled Castes constitute 17.8 percent and Scheduled Tribes constitute 13.5 percent, together accounting roughly to one-third of the total population in Rajasthan.

As per the recent NFHS-5 round[10], women literacy in Rajasthan stands at 64.7 percent, about 24 percentage points lower than men literacy (88.9 percent). The neonatal mortality rate (NMR), infant mortality rate (IMR) and under-five mortality rate (U5MR) stands at 20.2, 30.3 and 37.6 per 1,000 live births respectively, slightly lower than the national average. However, the maternal mortality ratio (MMR) is still very high (141 per 100,000 live births) compared to the national MMR (103 per 100,000 live births).[11]

9 Population Projections for India and States, 2011 – 2036: Report of the Technical Group on Population Projections, National Commission on Population, Ministry of Health & Family Welfare

10 National Family Health Survey-5, 2019-21

11 Sample Registration System (SRS)-Special Bulletin on Maternal Mortality in India 2017-19

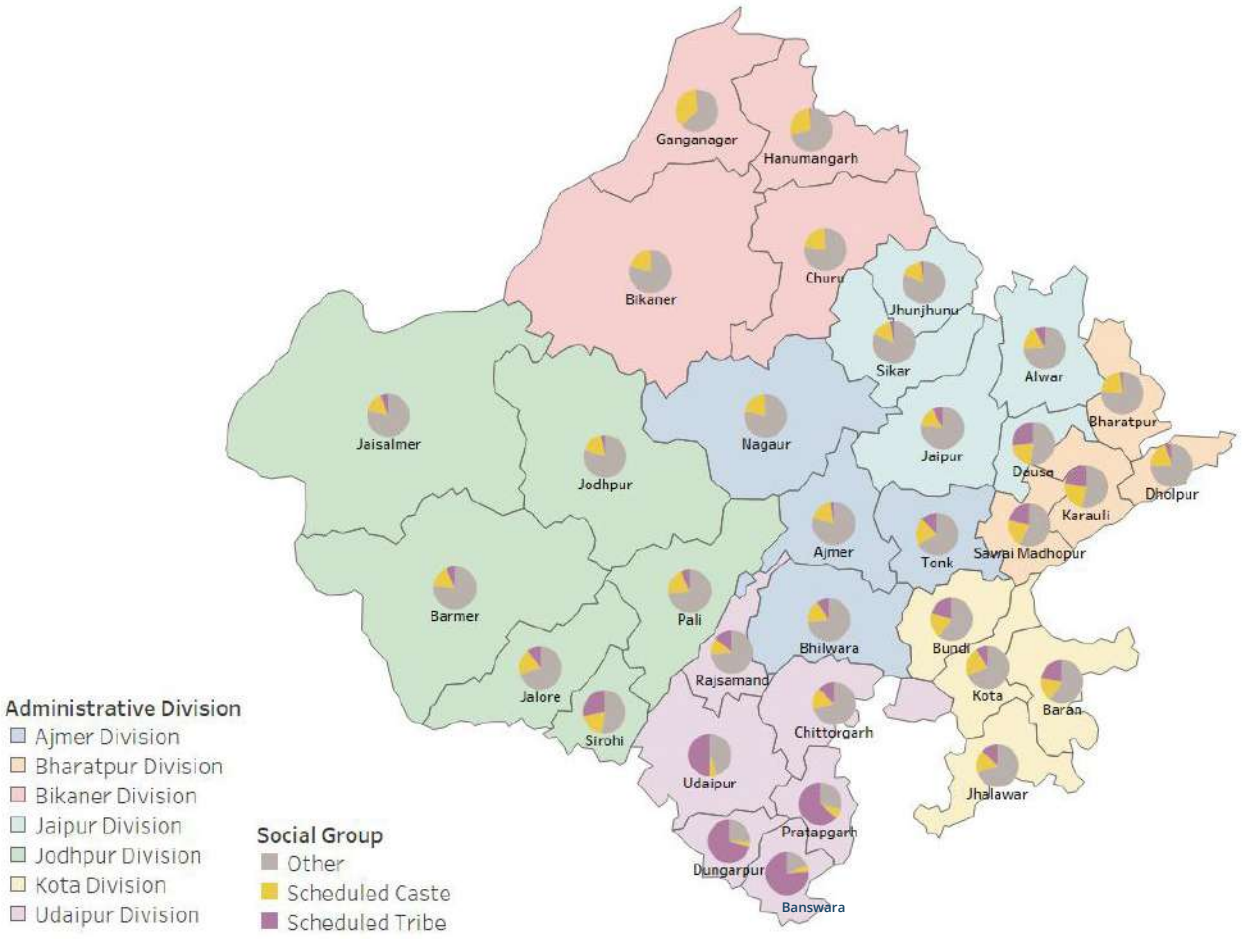


Figure 2: Rajasthan with district boundaries, representing distribution of administrative zones and social groups.

2.4. Physical Characteristics

Physiologically, the state can be divided into 4 major regions[12]:

- the ***Thar Desert*** constituted by the barren hills and rocky and sandy plains,
- the ***Aravalli Hills*** running south–west starting from Gujarat to north–east ending in Delhi,
- the ***Eastern Plains*** composed of rich alluvial soils, and
- the ***South-Eastern Plateau***.

Even though Rajasthan accounts for around 10 percent of India's land area, it only has about 1 percent of the country's water resources. This is because 60 percent of its land area is desert. Around 30 percent of the state is covered in wastelands, and the forest cover is only 8 percent. Except for the Mahi and Chambal, all rivers in Rajasthan are rainfed, and the amount of water flowing through them is solely dependent on the amount of rainfall during the monsoon season. There are 14 rainfed river valley catchments spread across the entire state, with the Chambal catchment having the most run-off followed by the Mahi, Banas, and Luni rivers. The state faces water scarcity and irregular rainfalls, leading to impediments for food production.

In the western part of the state, the annual groundwater recharge is considerably lower mainly due to very little and erratic rainfall, shortage of surface water sources, and high evapotranspiration. The depth of the water varies greatly throughout the state, from 10 to 40 metres in the eastern part to 30 to 80 metres in the western region, respectively. Out of the 302 assessment units in the state spanning across different districts, about 219 units are classified as "over exploited" with stage of ground water extraction above 100 percent, 22 units classsified under "critical," 20 units as "semi-critical" and only 38 units fall under as "Safe" category where the stage of Ground water extraction is less than 70 percent. Moreover, three assessment units, have been categorized as 'Saline' as major part of the ground water in phreatic aquifers is brackish or saline.

2.5. Climate

Rajasthan experiences three distinct seasons: the Hot-Weather Season (from March to the end of June), the Monsoon Season (from the end of June to September), and the Cold-Weather Season (from October to February). These seasons are characterized by variations in temperature and rainfall throughout the year.[13]

The Hot-Weather Season begins in March and continues through April to June. May sees an increase in the diurnal temperature range, making the days even hotter. By

12 Economic Review 2021-22, Department of Economics and Statistics, Government of Rajasthan

13 Dynamic Ground Water Resources of Rajasthan-As on 31.03.2022

June, the mean maximum temperature can soar as high as 48°C. Conversely, January is the coldest month, with normal minimum temperatures ranging from 2°C in the north to 7.8°C in the southwestern part of western Rajasthan. In eastern Rajasthan, near the Aravalli hill ranges, normal minimum temperatures in January range from 7°C to 8°C, increasing further east to more than 10°C in districts like Kota and Bundi.

Rajasthan receives an average annual rainfall of about 58 cm, although there is significant spatial variation between the eastern and western regions of the state. The majority of this rainfall occurs during the Southwest Monsoon season, spanning from June to September. In fact, more than 75 percent of the annual rainfall is concentrated within these four rainy months, resulting in substantial temporal variations.

2.6. Agro-Climatic Zones

The state of Rajasthan is divided into ten Agro-Climatic Zones.[14,15] The *Irrigated north-western plain* consisting of medium to fine textured soils that support growth of a variety of crops and have higher productivity, is irrigated by the Indira Gandhi Canal, Bhakra, and Ganga canal. Popularly known as the 'granary' of Rajasthan – kharif crops of cotton, sugarcane, guar, pulses are grown and amongst Rabi crops grown are wheat, mustard, gram. The *arid western plain* experiences erratic rainfall. While rainfed agriculture is practised with groundwater and tube well water majorly used for irrigation ((pears, kharif pulses, guar), the economy is mainly based on livestock production. *Hyper Arid Partial irrigated zone* has desert soil along with sand dunes and aeolian soil. Groundwater is deep, brackish, and natural vegetation is seasonal. Rainfed agriculture is practiced for bajra (pearl millets), guar, and with canal irrigation, cotton, maize, groundnut is grown. The *transitional plain of inland drainage* spreading from Churu to Nagaur and Sikar uses a mix of rainfed farming with livestock rearing. This has sand dunes and inter-dunal sandy plains, with poorly developed drainage. Bajra (pearl millets), sesasum, kharif pulses are major crops grown in rainy season. The Alluvial plain of Luni Basin has mostly saline water, rainfed cash crop cultivation is carried usually with help of tube-wells. The

> **Even though Rajasthan accounts for 10 percent of India's land area, it only has about 1 percent of the country's water resources and 60 percent of its land area is desert.**

semi-arid eastern plain covering Jaipur, Tonk, Ajmer and Dausa districts are drained by river Banas, its tributaries and receive average annual rainfall. This has better productivity amongst other regions lying in the rain shadow zone of the Aravalli range. The *flood prone eastern plain* extending over Alwar, Bharatpur and Dholpur is drained by River Yamuna and its tributaries, having annual replenished rich alluvial soils, where both kharif and rabi crops are cultivated. The *sub humid southern plains* and Aravalli region cover the southern districts of Udaipur, Rajsamand, Bhilwara and Chittorgarh. The physiography consisting of low Aravalli hills interspersed with plateaus, dissected by streams has adequate natural vegetation. Maize is the major Kharif crop apart from rice which is grown in irrigated areas. Main rabi crops are wheat, gram, and oilseeds. The *humid southern plain* includes Dungarpur, Banswara and Pratapgarh which usually includes low-lying Aravalli hills covered with dense trees, shrubs, and grasses. This is predominantly a tribal area and has adequate natural vegetation. Major cash crops - cotton, sugarcane, and food crops - maize, sorghum, rice is grown here. The *humid southeastern plains* (Hadauti plateau) have hill pediments and alluvial plains drained by rivers Chambal, Parbati, Kali Sindh and their tributaries. Alluvium deposited by these rivers are fertile and this land is productive.[16] Cotton, sugarcane and opium are cultivated in black soil in this region. Other crops include rice and sorghum during kharif and barley, gram, and mustard during rabi. A detailed profile of the 10 agroclimatic zones, along with average rainfall and major crops grown is provided in the table 1.

14 https://agriculture.rajasthan.gov.in/agriculture/#/jankalyan-category-and-entry-type/5/72/382

15 http://www.water.rajasthan.gov.in/content/dam/water/state-water-resources-planning-department/tahaldata/Finalpercent20Reportpercent204.4/Vol.1-Mainpercent20Report/Reportpercent204.4percent20IN-24740-R13-075.pdf

16 https://agriculture.rajasthan.gov.in/content/agriculture/en/Agriculture-Department-dep/Departmental-Introduction/Agro-Climatic-Zones.html

Table 1: Agro-climatic zones of Rajasthan - Major crops grown, districts covered, soil types

Area	Total Area (million ha)	District Covered	Average Rainfall (mm)	Major Crops	
				Kharif	Rabi
Arid Western Plain (I-A)	4.74	Barmer and parts of Jodhpur	200-370	Bajra Moth Sesame	Wheat Mustard Cumin
Irrigated Northwestern plain (I-B)	2.1	Sriganganagar and Hanumangarh	100-350	Cotton Guar	Wheat Mustard Gram
Hyper arid partial irrigated Western Plain (I-C)	7.7	Bikaner, Jaisalmer and Churu	100-350	Bajra Moth Guar	Wheat Mustard Gram
Transitional plain of Inland drainage (II-A)	3.69	Nagaur, Sikar, Jhunjhunu, and Part of Churu	300-500	Bajra Guar Pulses	Mustard Gram
Transitional plain of Luni basin (II-B)	3	Jalore, Pali, Sirohi and Part of Jodhpur	300-500	Bajra Guar sesame	Wheat Mustard
Semi-arid eastern plains (III-A)	2.96	Jaipur, Ajmer, Dausa and Tonk	500-700	Bajra Guar Jowar	Wheat Mustard Gram
Flood prone Eastern plain (III B)	2.77	Alwar, Dholpur, Bharatpur, Karauli and Sawai Madhopur	500-700	Bajra Guar Groundnut	Wheat Barley Mustard Gram
Sub-humid Southern plains (IV-A)	3.36	Bhilwara, Rajasamand, Udaipur, Chittorgarh and Parts of Sirohi	500-900	Maize Pulses Jowar	Wheat Gram
Humid Southern plains (IV-B)	1.72	Dungarpur, Banswara, Pratapgarh, Parts of Chittorgarh and Udaipur	500-1100	Maize Paddy Jowar Blackgram (Urad)	Wheat Gram
Humid southeastern plain (V)	2.7	Kota, Jhalawar, Bundi, Baran and Parts of Sawai Madhopur	650-1000	Jowar Soyabean	Wheat Mustard

Source: https://agriculture.rajasthan.gov.in/content/agriculture/en/Agriculture-Department-dep/Departmental-Introduction/Agro-Climatic-Zones.html

2.7. Land Use Classification and Farming Structure

More than half (52.6 percent) of the state's total area (34.3 million hectares) was net sown area in 2019-20. Details of the state's land use under various aspects is depicted in the figure 3 below.

Source: Directorate of Economics and Statistics, Government of Rajasthan

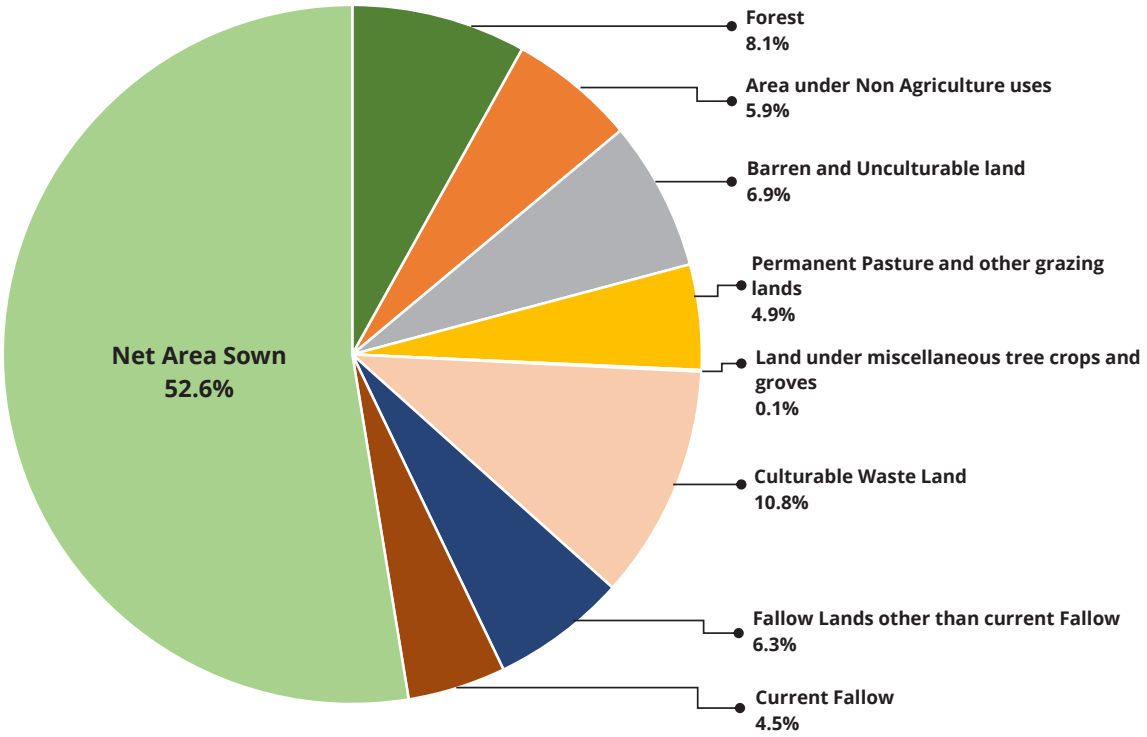


Figure 3: Rajasthan Land Use Statistics, 2019-20, in percentage.

2.8. Soil

The nutrient carrying capacity of soils in Rajasthan varies not only within the district but also village to village and even farm to farm. The complex and extremely variable soils of Rajasthan reflect a wide range of various parent materials and physiographic geographical features. While the soils in the eastern regions are heavy and clayey in texture, the soils in the western region are light and coarse in texture. Aridisols, Alfisols, Entisols, Inceptisols, and Vertisols are the five distinct orders into which the state's soils have been classified.[17]

A report[18] by NITI Aayog states that soils in Rajasthan have low microbial activities and poor soil organic carbon due to which more than 75 percent soils of the state are not in good health. It further highlights that the soil in the state was quite commonly found to be deficient in key minerals such as nitrogen, phosphorous, sulphur, zinc, and iron. The soil types in Rajasthan were categorized into 14 different classifications, corresponding to the types found across various districts. According to the report, the districts with the least fertile desert soil include Sri Ganganagar, Churu, Jhunjhunu, Bikaner, Jaisalmer, Nagaur, Barmer, a portion of Jodhpur, and Sikar. As a result, the productivity of these districts in terms of crop yield is significantly lower compared to other districts in the state.[19]

2.9. State Economy

Rajasthan contributes around 5.15 percent to the Indian economy, with its Gross State Domestic Product (GSDP) for 2021-22 expected to reach 149.5 billion USD (INR 11.96 trillion). This GSDP at current prices was up about 18 percent from 126.6 billion USD (INR 10.128 trillion) in the year 2020-21. This growth rate is slightly higher than the national Gross Domestic Product (GDP) growth rate of 17.6 percent in the comparable period at the current prices. The per capita income in the state is USD 1,690 (INR 1,35,200), up by 16.6 percent in 2021-22 compared to last financial year.

2.10. State Share in GSDP

The contribution of agriculture & allied activities in Rajasthan is estimated to increase to 30.23 percent in

17 NRMC (2018): Doubling Farmers' Income: Issues and Strategies for Rajasthan

18 https://www.niti.gov.in/writereaddata/files/Rajasthan-reports.pdf

19 ibid

the year 2021-22 from 28.56 percent in 2011-12, and the share of service sector to increase to 45.10 percent in the year 2021-22 from 38.75 percent in 2011-12. Whereas the share of industry sector is expected to decrease to 24.67 percent in 2021-22 from 32.69 percent at current (2011-12) prices.

Agriculture and allied sectors are a backbone of Rajasthan's economy, contributing around 30.23 percent to its Gross State Value Added (GSVA) in 2021-22. A large section of the state's population is dependent on agriculture as a source of livelihood. Within the ambit of agriculture and allied activities, crop and fisheries sectors saw a decline of 1.99 percent and 0.12 percent respectively in 2021-22, livestock and forestry & logging have emerged as growing sectors at around 13 percent per annum each.

2.11. Economic Growth at District Level

Based on the 2019-20 provisional estimates at constant prices (base year 2011-12), eight districts of Rajasthan—Jaipur, Alwar, Barmer, Jodhpur, Bhilwara, Ajmer, Udaipur, and Sri Ganganagar—combinedly generated about half of the state's total Gross State District Product (GSDP). The greatest shareholder in the state's gross domestic product (GSDP), Jaipur, alone contributed equivalent to bottom 10 districts in Rajasthan—Pratapgarh, Dungarpur, Jaisalmer, Dhaulpur, Karauli, Sirohi, Bundi, Sawai Madhopur, Banswara and Dausa. The sectoral contribution to Gross Domestic District Product varies across districts in Rajasthan. For instance, among the top three districts – Jaipur, Alwar and Barmer - that generate one-fourth of state GSDP, the contribution of service sector is highest in Jaipur whereas the contribution of industry sector is highest in the GDDP of Barmer and Alwar respectively (figure 4 and 5)

2.12. Main Livelihood Activities and Income Sources

Based on the periodic labour force survey 2020-21, of those who are employed in Rajasthan, 68.7 percent and 41.3 percent are self-employed (agriculture/non-agriculture) in rural and urban areas respectively. The proportion of households with individuals who are regular wage or salaried in urban areas (37.5 percent) is thrice to the proportion of regular wage /salaried households in rural areas (11.4 percent). 12.8 percent

Source: Estimates of District Domestic Product of Rajasthan 2011-12 to 2020-21 (AE), Rajasthan

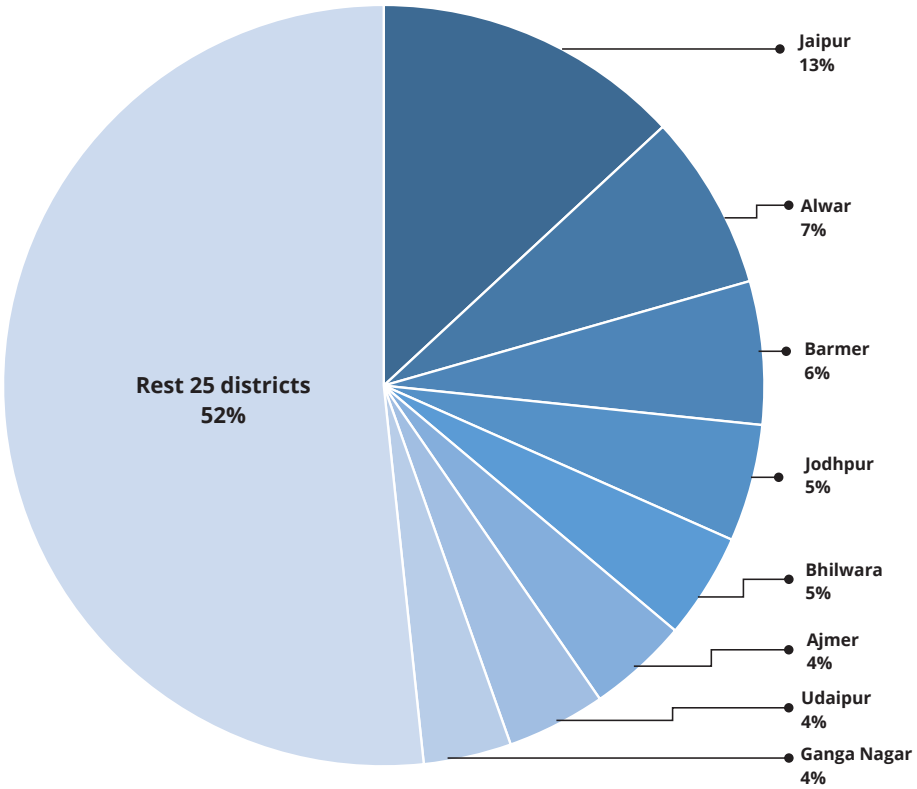


Figure 4: Contribution of Districts in percentage to Gross State Domestic Product (GSDP) at constant prices (base year: 2011-12) in Rajasthan, 2019-20 (Provisional Estimates), in percentage.

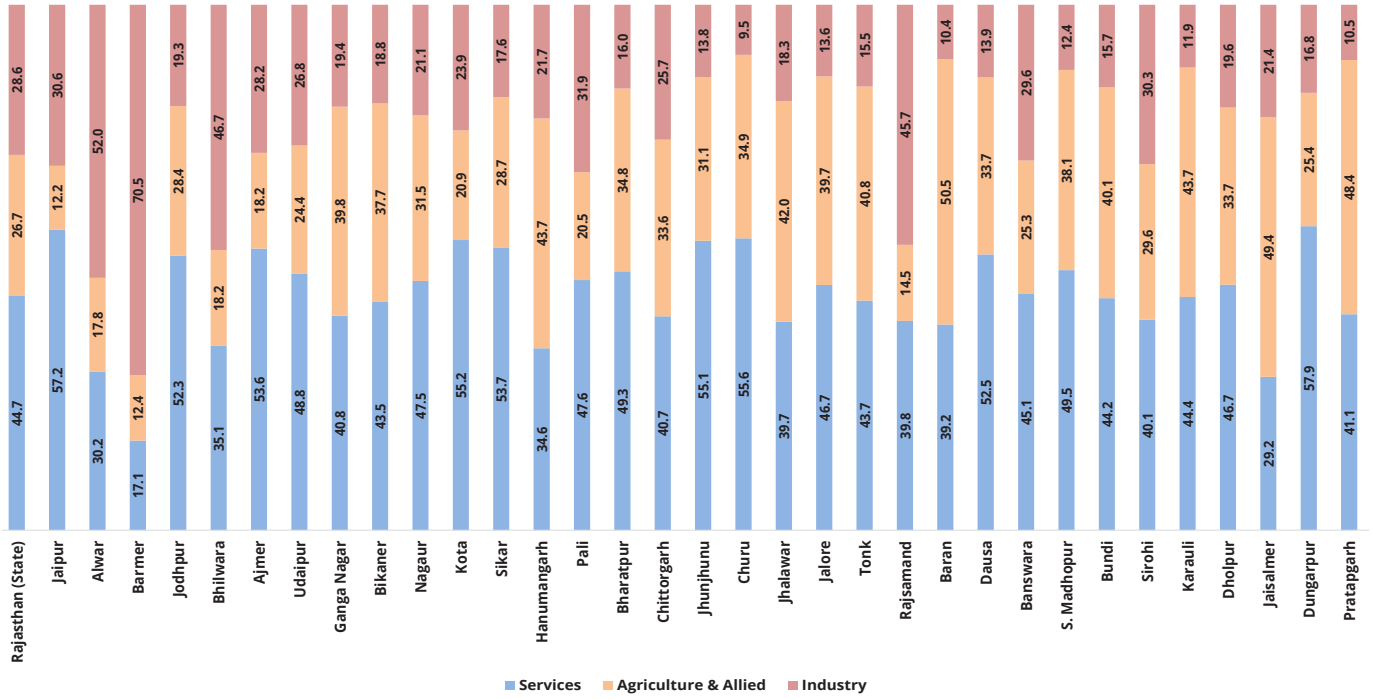


Figure 5: Sectoral Contribution in GDVA at constant prices (base year: 2011-12) by districts in Rajasthan (2019-20, Provisional Estimate), in percentage.

households in rural areas and 9.7 percent households in urban areas belong to individuals employed as casual labour. Those employed in the other category are 7.1 percent in rural areas and 11.5 percent in urban areas.

2.13. Availability of Food, Markets, and Connectivity

Rajasthan's total food grain production, which had been increasing from 2017–18 to 2020–21, decreased by 16.31 percent in 2021–22 to an estimated 22.5 million metric tonnes (MMT) from 26.9 MMT the year before. In 2020–21, the state's cereal and cotton productivity more than doubled compared to the average productivity from 1997–98 to 2001–02. Even the production of pulses and oilseeds surged during the same time frame, by 46.6 percent and 77.7 percent respectively. In 2019, the state unveiled its most important agricultural marketing strategy, which emphasises value addition, skill development, and farmer participation among other objectives. Rajasthan has also been engaging in construction projects to guarantee road connection for smaller villages[20].

2.14. Risks and Natural Disasters

Low rainfall coupled with erratic behaviour of the monsoon in the state makes Rajasthan the most vulnerable to drought, which could severely impact food production and the overall economy. As per the state's Disaster Management Plan (2014), parts of the Alwar, Barmer and Jalore districts fall under the high damage risk zones, even as a large majority of the state falls under the low damage risk zone. The plan also highlights that even though most parts of Rajasthan receive scanty rainfall, the state has a history of flash floods and inundations, mostly along the basins of rivers such as Luni and Chambal. Rajasthan had an amount of 569.9 million USD (INR 45.59 billion) for the State Disaster Relief Fund (SDRF) available for the year 2021-22. Of this, 177.4 million USD (INR 14.19 billion) was utilized up to December 2021, more than half of which was spent on COVID-19 related measures.[21]

20 Smaller villages, defined as per Census 2011.

21 Economic Review 2021-22, Department of Economics and Statistics, Government of Rajasthan.

3. Food Availability

3. Food Availability

3.1. Background

Availability refers to the physical existence of food in desired quantities. At the national level, food availability is a combination of domestic food production, commercial food imports and exports, food aid and domestic food stocks. At the household level, food availability depends on own production, food bought from the local markets or received through the food safety net programmes. The physical availability of food depends on the levels of agricultural production and livestock production which in turn is crucially determined by the type of agro-climatic region, prevailing climatic conditions, irrigation capacity, fertilizer consumption, percentage of arable land available for cultivation and prevailing government schemes supporting agricultural growth and government subsidies in the region.

This chapter provides an overview of the food availability in Rajasthan in terms of the trends and patterns in the production and consumption requirements of major crops in the state, per capita production of food grains and livestock, composition of crops by area under production and crop yield. The chapter also reflects upon factors affecting agricultural production and utilization of storage facilities in Rajasthan.

3.2. Production of Food Grains: Trends and Patterns

Based on fourth advance estimates of 2021-22, Rajasthan is the fourth largest contributor of total food grain production (21.05 million metric tonnes) in India, next to Punjab, and Madhya Pradesh, while Uttar Pradesh contributes the highest (56.11 million metric tonnes) in total food grain production[22]. Overall, the share of total food grains production in Rajasthan to all-India production has increased from 6.1 percent in 2004-05 to 6.7 percent in 2021-22.. Moreover, the production of food grains has been rising across both Rajasthan and India over the years. The national production

22 Agricultural Statistics at a Glance, 2022, Government of India.

Source: RBI Handbook of Statistics on Indian States

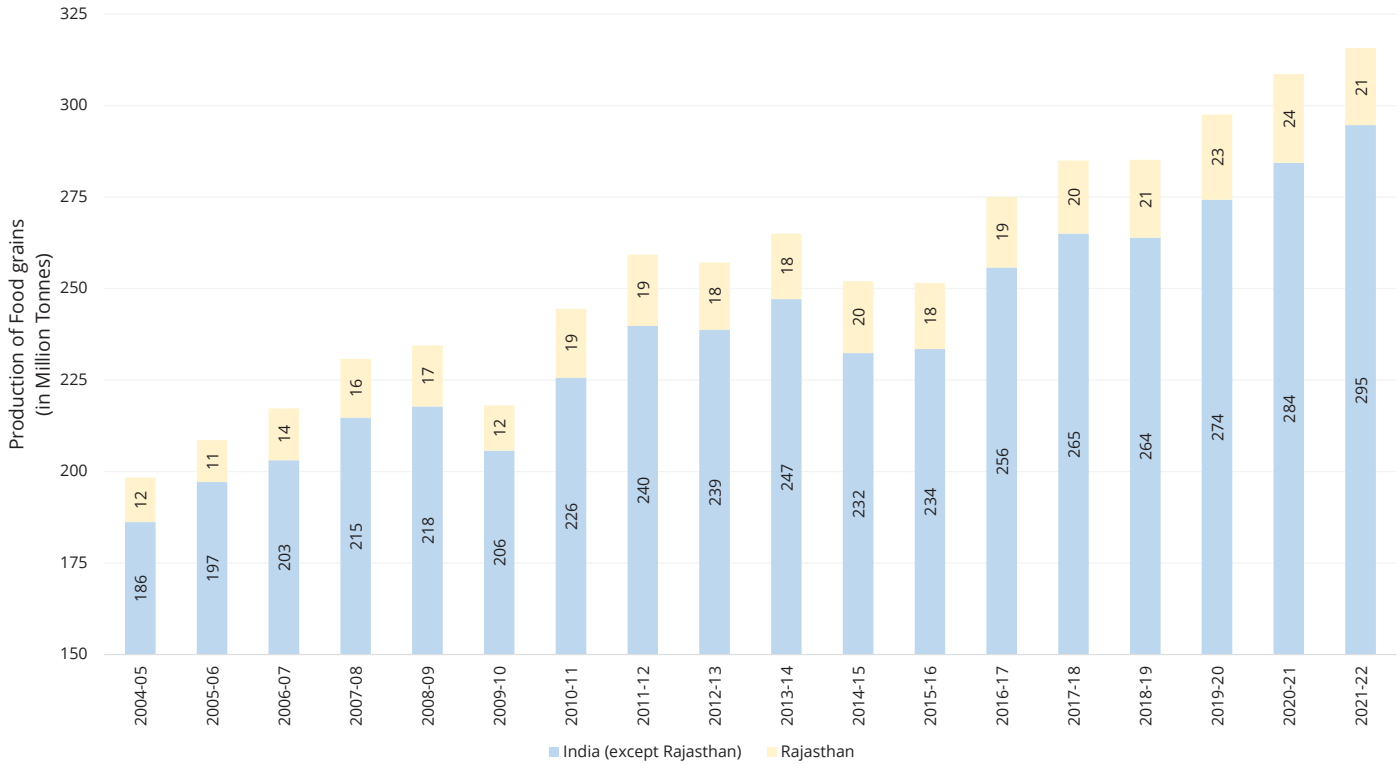


Figure 6: Trends of annual food grain production in Rajasthan and India (in Million Metric Tonnes)

has increased from 198 to 316 million metric tonnes between 2004-05 to 2021-22. In Rajasthan, the food grain production almost doubled from 12 to 21 million metric tonnes in the same period (Figure 6). This in a major way can be attributed to the successful implementation of the National Food Security Mission (NFSM), a centrally sponsored scheme launched in 2007 that targeted to increase the production of rice, wheat, and pulses by 10, 8 and 2 million metric tonnes respectively by the end of 11th five-year plan[23]. However, food grain production in Rajasthan is strongly dependent over rainfall. In 2009-10, Rajasthan received about 34 per cent less rainfall compared to the previous year and hence witnessed a significant dip of 26 percent in total production of food grains compared to 2008-09[24]. Similar dip in food grain production was also observed at the national level.

In Rajasthan, as of 2018-19, production of pulses is nearly one-fifth of the total cereals production (figure 7). While the production of total cereals has increased by 44 percent during 2006-07 to 2018-19, the production of pulses has witnessed the growth of upto 2.5 times

from 1.5 to 3.8 million metric tonnes between 2006-07 and 2018-19. The focus to produce more pulses has intensified since 2016-17, thereby improving the overall ratio of total pulses produced to total cereals produced in Rajasthan.

Despite higher production of cereals, the gap between quantity of cereals grown in Rabi and Kharif season has consistently widened post 2011-12, resulting in doubling of overall production of cereals in Rabi season compared to Kharif season. In contrast, the production of pulses remains nearly same in both Rabi and Kharif season since 2014-15 (See figure 8).

Rice, Jowar, Bajra (Pearl Millet) and Maize are the major cereals grown in Kharif season whereas Wheat and Barley

23 Patel, P.K. and Parmar, B.J., Impact of National Food Security Mission (NFSM) on Production and Stability of Foodgrains and Pulses in India.

24 Economic Review, 2009-10, Directorate of Economics and Statistics, Government of Rajasthan

Source: Agricultural Statistics, DES, Rajasthan

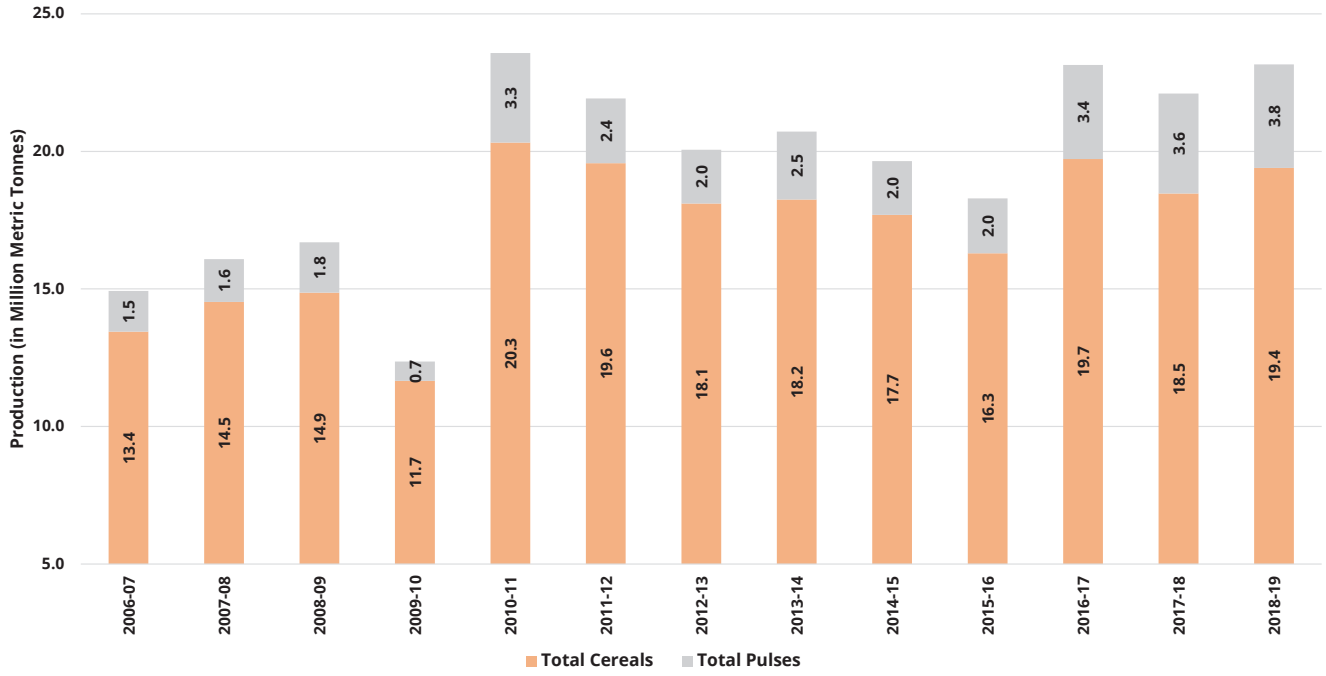


Figure 7: Trends in production of cereals and pulses in Rajasthan during 2006-07 to 2018-19 (in Million Metric Tonnes)

Source: Agricultural Statistics, DES, Rajasthan

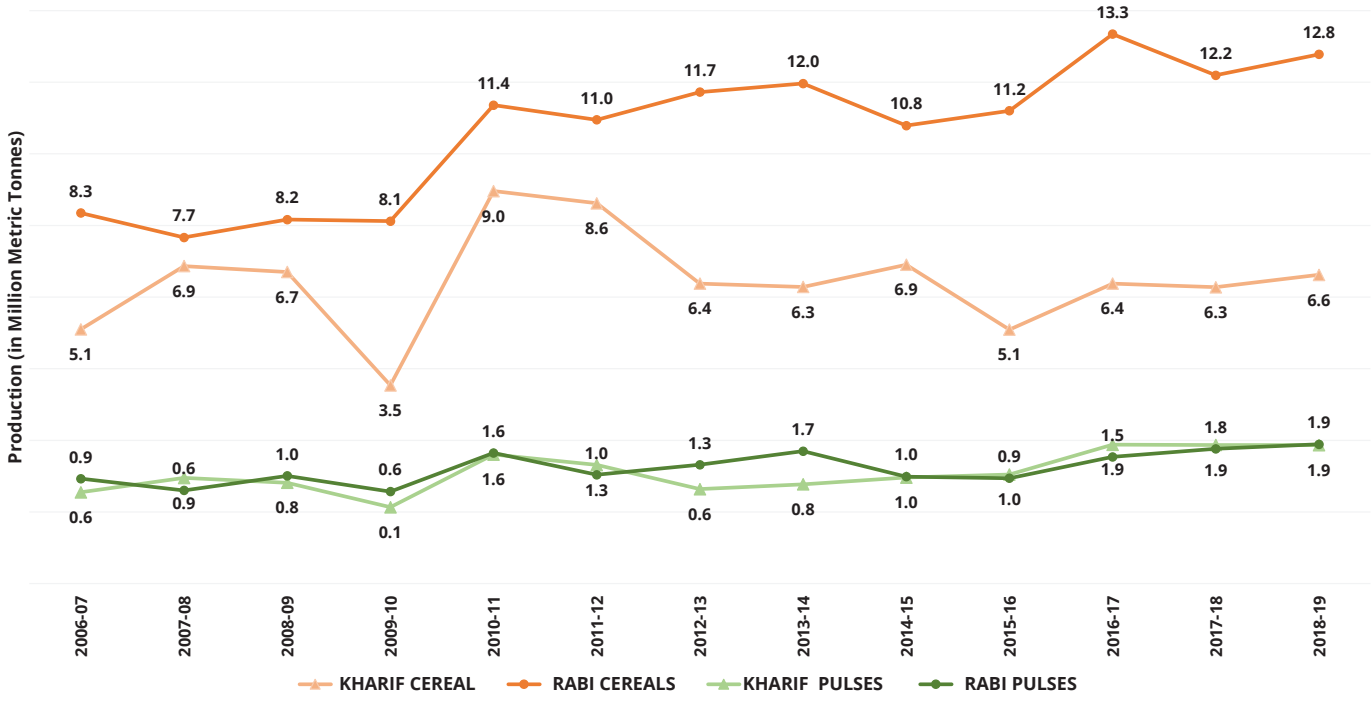


Figure 8: Trends in production of cereals and pulses in Rabi and Kharif seasons in Rajasthan during 2006-07 to 2018-19 (in Million Metric Tonnes)

are grown mainly in Rabi Season. Small Millets are also grown in relatively smaller quantities in both Rabi and Kharif season. Among pulses, Tur (pigeon peas), Moong (green gram), Moth, Urad (black gram) and Chaula are grown in Kharif season, while Gram, Masoor (red lentils), Batla and peas are grown in Rabi Season.

Among the cereals grown in Rajasthan, wheat takes the top position in terms of production followed by pearl millet (bajra) and maize (figure 9). Over the years, the production of wheat has experienced significant expansion, reaching 12 million metric tonnes in 2018-19 from 7.8 million metric tonnes in 2006-07. However, the growth in production of other cereals, except for rice, has remained almost unchanged. Rice production, on the other hand, has steadily increased from 0.2 million metric tonnes to 0.5 million metric tonnes between 2006-07 and 2018-19. **While Rajasthan is the largest producer of pearl millet (bajra) across India, its production is one-third of total wheat production in the State**. Except for years 2010-12, that witnessed maximum spurt in production of pearl millet up to nearly 6.3 million metric tonnes, the average production of pearl millet remained close to four million metric tonnes between 2016-19.

As of 2018-19, among the pulses, gram grown in Rabi season followed by green gram (moong) grown in Kharif season has the highest production of 1.8 million metric tonnes and 1.2 million metric tonnes respectively. While the production of gram has almost doubled compared to its production in 2006-07, the production of green gram (moong) has increased by nearly five times in the same period in Rajasthan. Average production of black gram (urad) has also improved by eight times between 2016-19 compared to 2006-09 from 0.05 million metric tonnes to 0.4 million metric tonnes. While the production of all other pulses remains almost same over the years (figure 10).

Further, the trends and geographic patterns in average production of total food grains, cereals, and pulses across districts in Rajasthan over two time periods – 2008-11 and 2016-19 were also examined. The trends indicate higher production of total food grains in districts clustered over the central and northern Rajasthan, and few districts on the south-eastern parts (figure 11). While the overall food grain production has improved in many districts between 2008-11 and 2016-19, districts in the western region continue to have lower food grain production as compared to other parts of Rajasthan due to arid agroclimatic conditions created by the Thar desert. Alwar, Ganganagar, Jaipur and Hanumangarh

Source: Agricultural Statistics, DES, Rajasthan

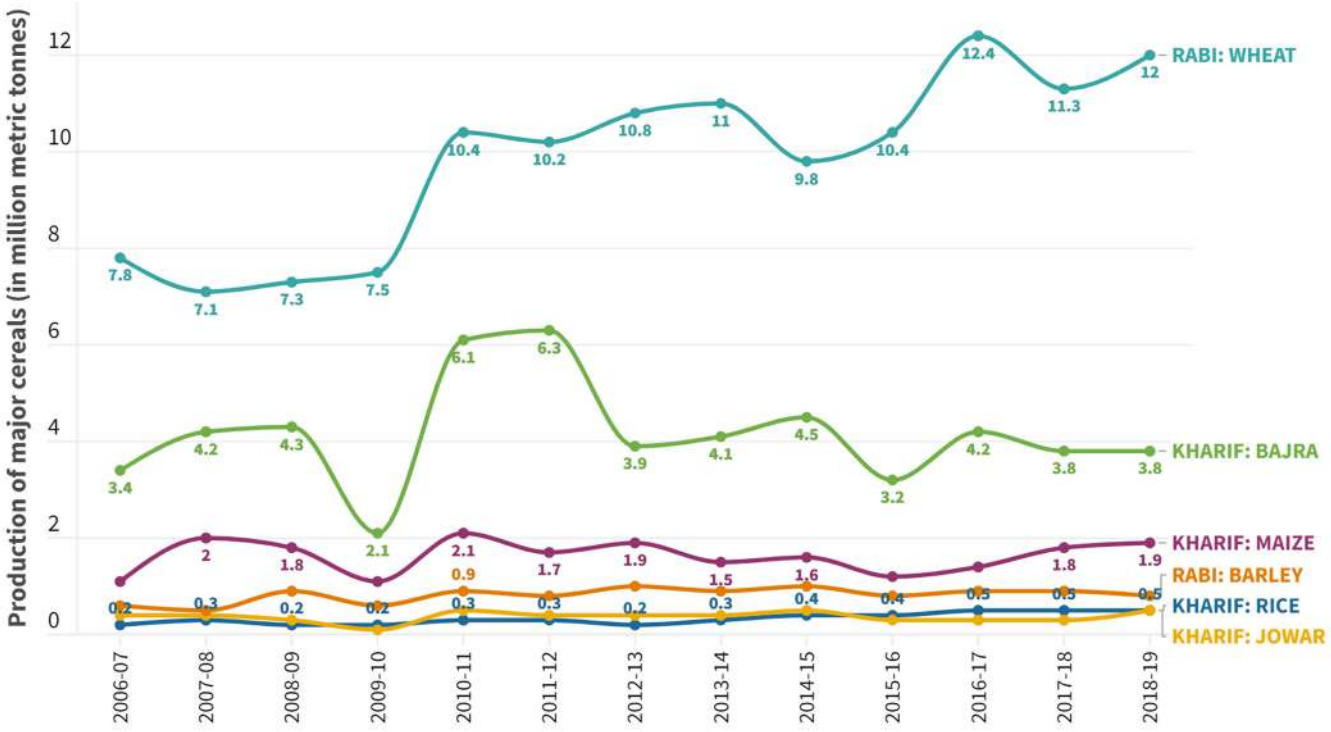


Figure 9:Trends in production of major cereals in Rabi and Kharif seasons in Rajasthan during 2006-07 to 2018-19 (in Million Metric Tonnes)

Source: Agricultural Statistics, DES, Rajasthan

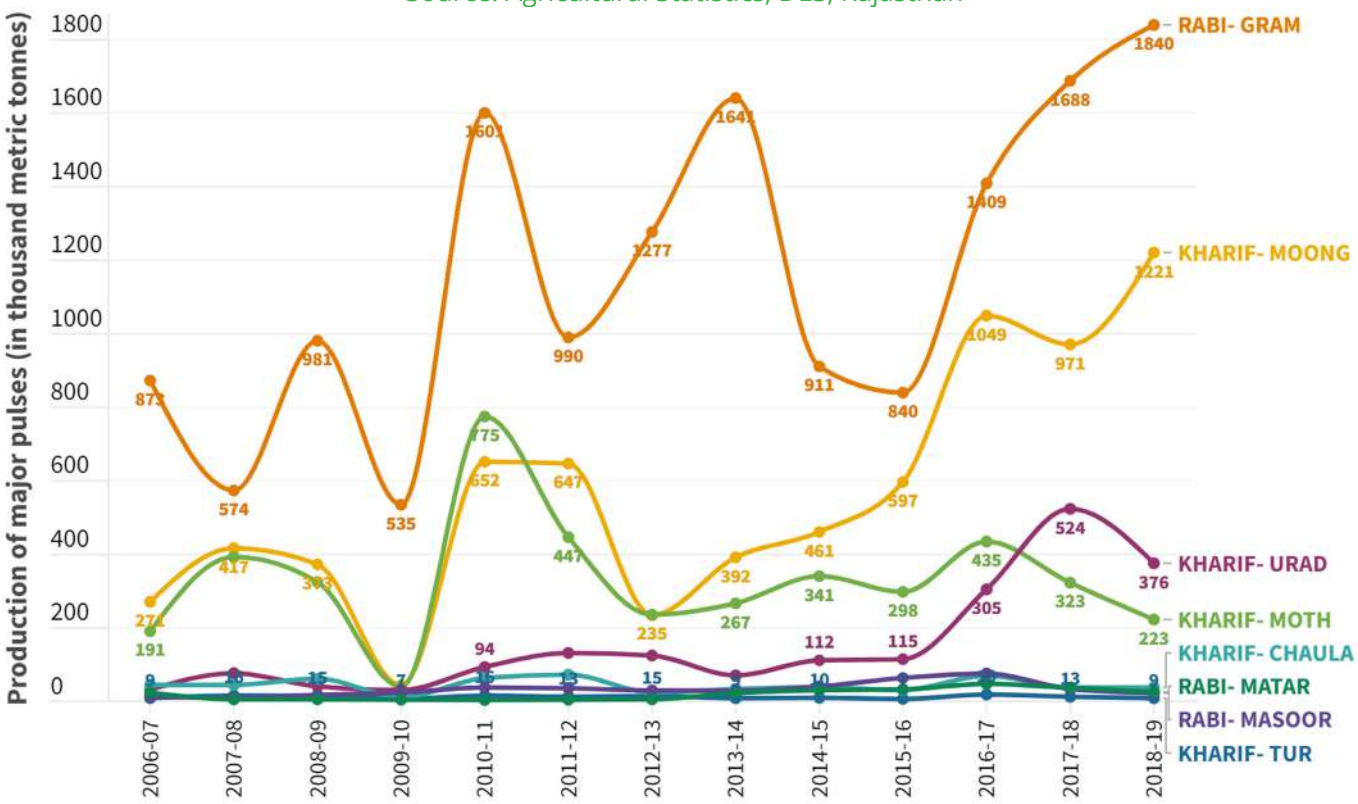


Figure 10: Trends in production of major pulses in Rabi and Kharif seasons in Rajasthan during 2006-07 to 2018-19 (in '00 thousand Metric Tonnes)

hold the highest share of total food grain production in Rajasthan in both the time periods. Jaisalmer, Sirohi, Rajsamand and Dungarpur hold the least share of total food grain production in Rajasthan both in 2008-11 and 2016-19. Total food grain production has almost doubled in Pali and Jaisalmer, showing maximum improvement in 2016-19 as compared to their production in 2008-11. Whereas total foodgrain production declined by 34 percent in Barmer between 2008-11 and 2016-19.

While production of total cereals continues to be highest in Alwar, Jaipur, Hanumangarh and Ganganagar, production of pulses remains high in Nagaur and Bikaner between 2008-11 and 2016-19 (figures 12 and 13). The production of cereals maximally increased by two folds in district like Rajsamand between 2011 and 2019 whereas production of pulses was eighteen times and twelve times higher in districts like Baran and Kota respectively, showing maximum improvement in pulse production during 2008-11 and 2016-19. On the contrary, production reduced by 50 percent for cereals in Jaisalmer and for pulses in Bharatpur, Barmer and Dholpur in 2016-19 compared to 2008-11. Overall, higher share of pulses production in Rajasthan is concentrated among districts in the central-northern region. The improvement in production of food grains including cereals and pulses across districts over a time seem to follow a pattern that are governed by common spatial and agroclimatic conditions.

Among cereals, trends in average production of wheat and bajra (pearl millets), over two time periods - 2008-11 and 2016-19 was examined (figure 14 and 15). In terms of wheat production, Hanumangarh, Ganganagar, Alwar and Bharatpur continue to dominate the overall share in Rajasthan in both the time periods. Nagaur and Jaisalmer show reduction in wheat production by 19 percent and 39 percent respectively. On the contrary, districts like Pali, Udaipur, Bhilwara, Dungarpur and Jhalawar have increased the wheat production by two folds or more, on an average. Overall, maximum production of wheat is concentrated towards the districts in the eastern part of the State, spreading from north to south.

The trends of bajra (pearl millets) production over two time periods – 2008-11 and 2016-19 across districts in Rajasthan reveal a worrisome picture, with about 22 districts showing decline in average production

Source: Agricultural Statistics, DES, Rajasthan

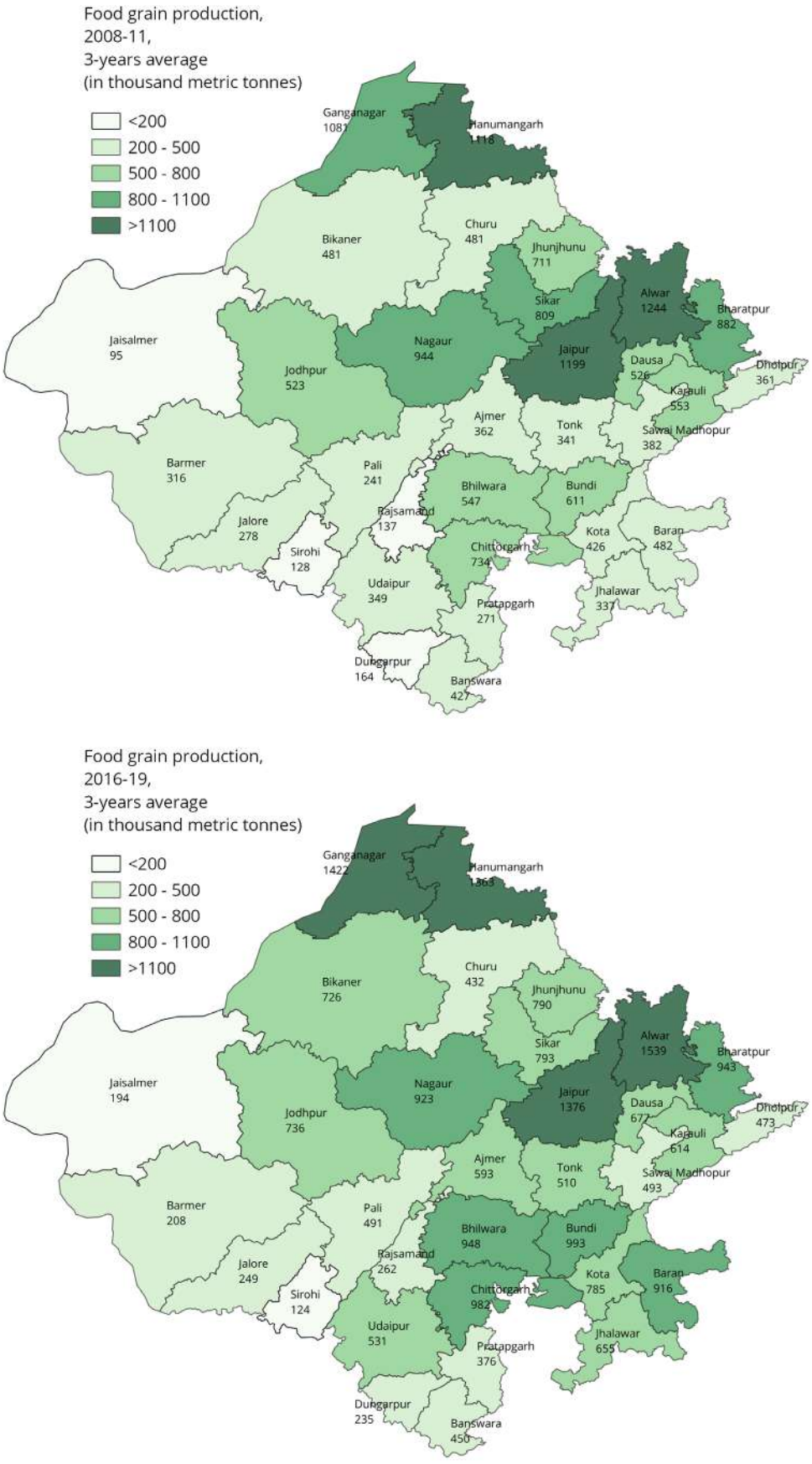


Figure 11: Trends of total food grains production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes)

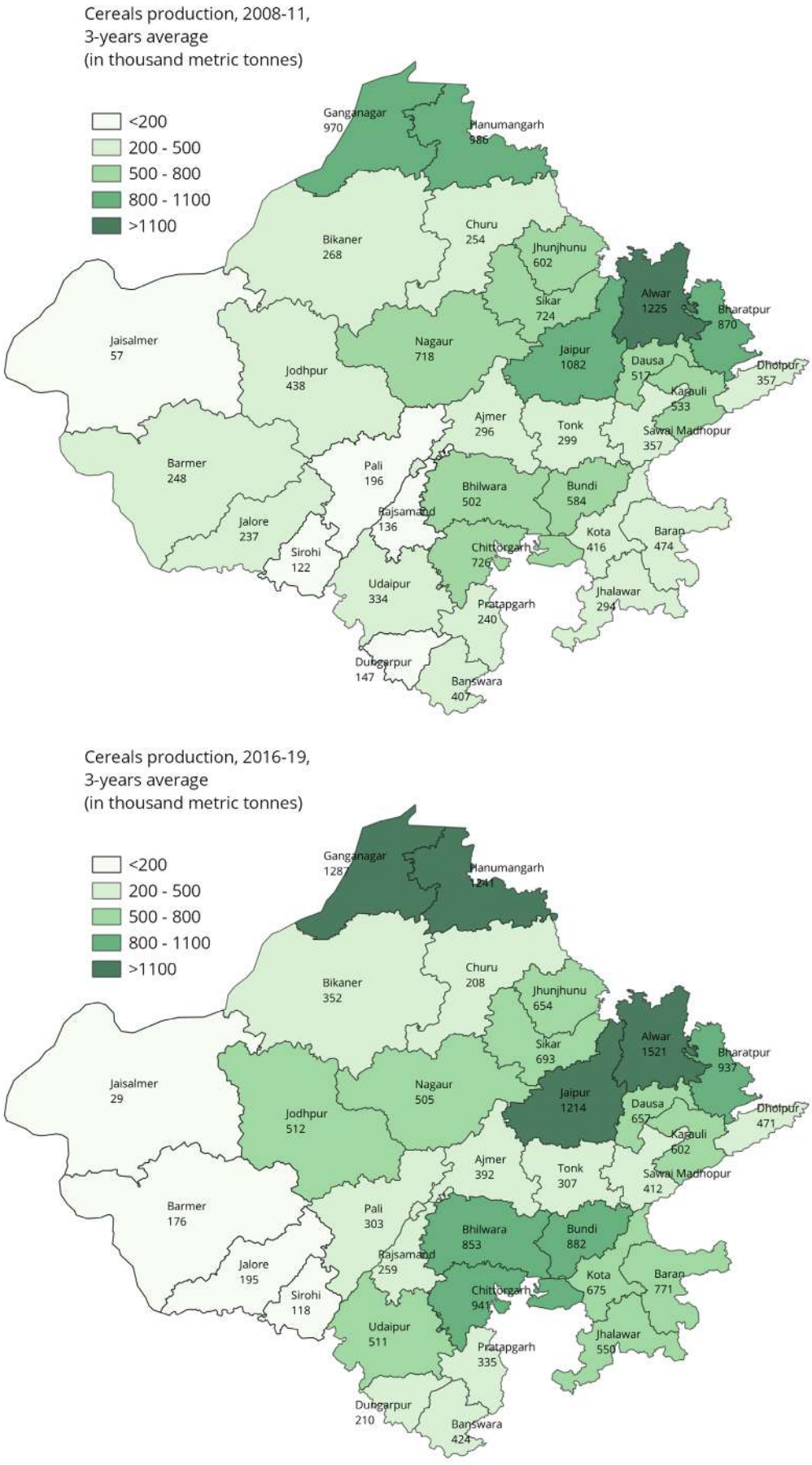


Figure 12: Trends of total cereals production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes)

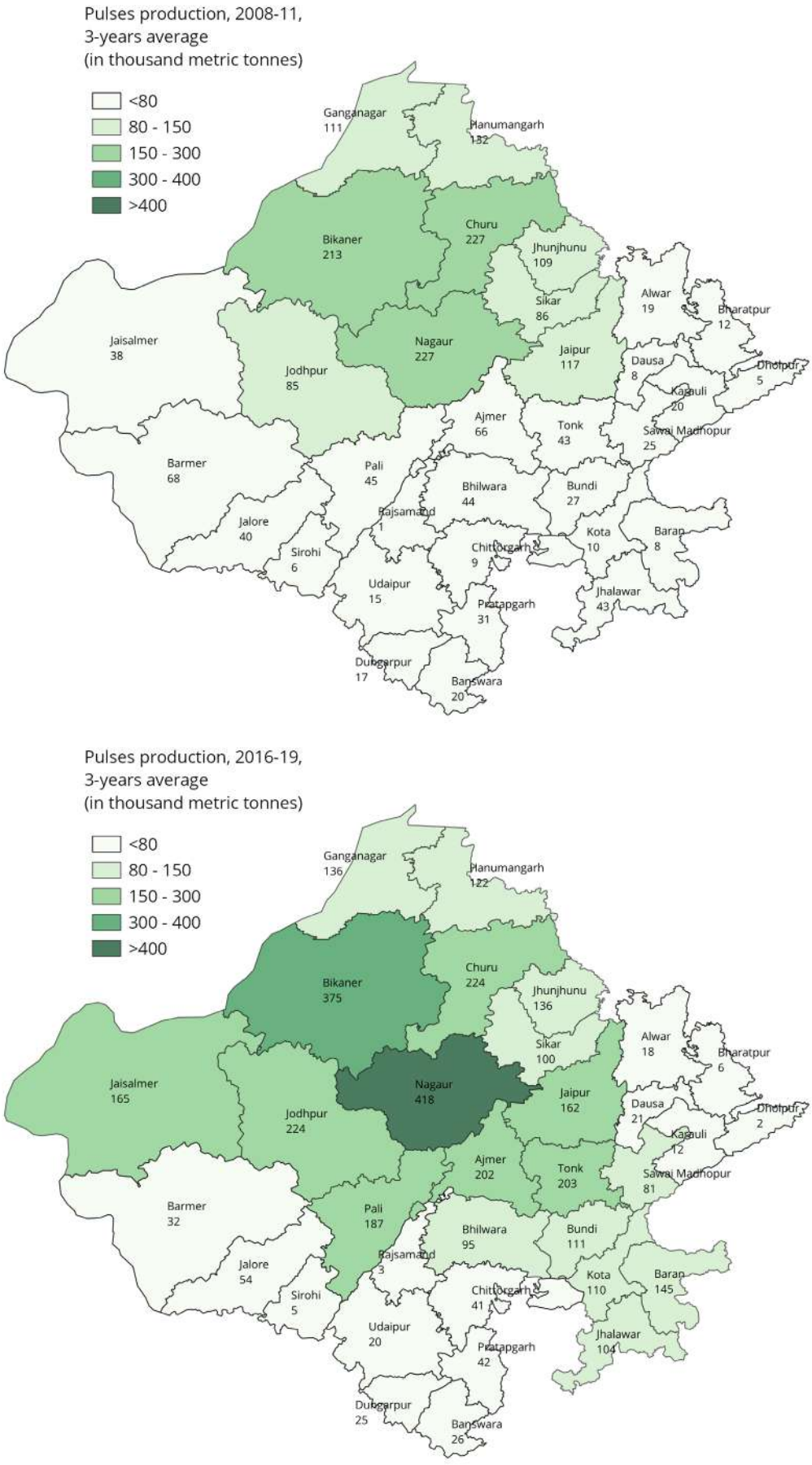


Figure 13: Trends of total pulses production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes)

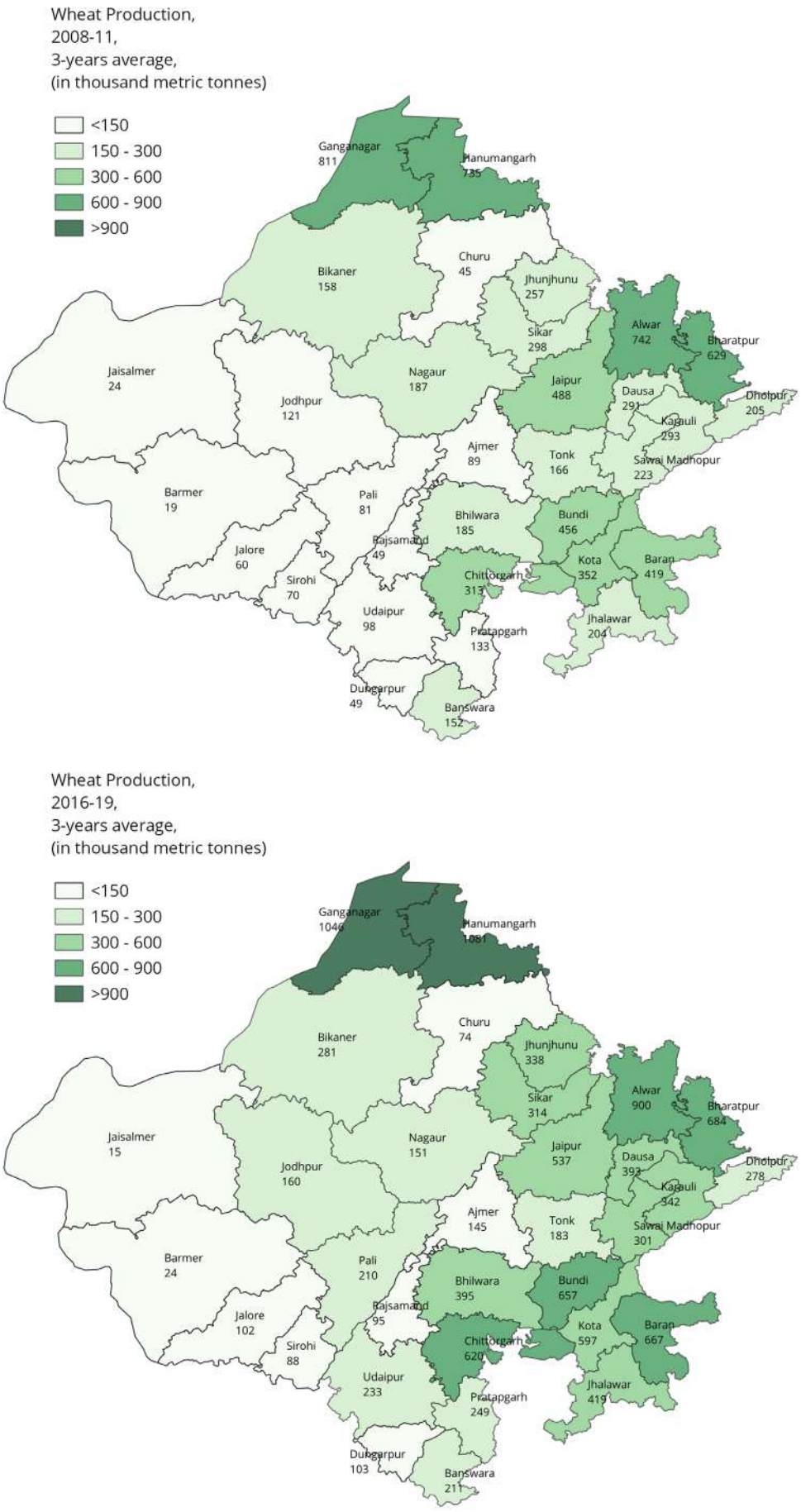


Figure 14: Trends of wheat production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes)

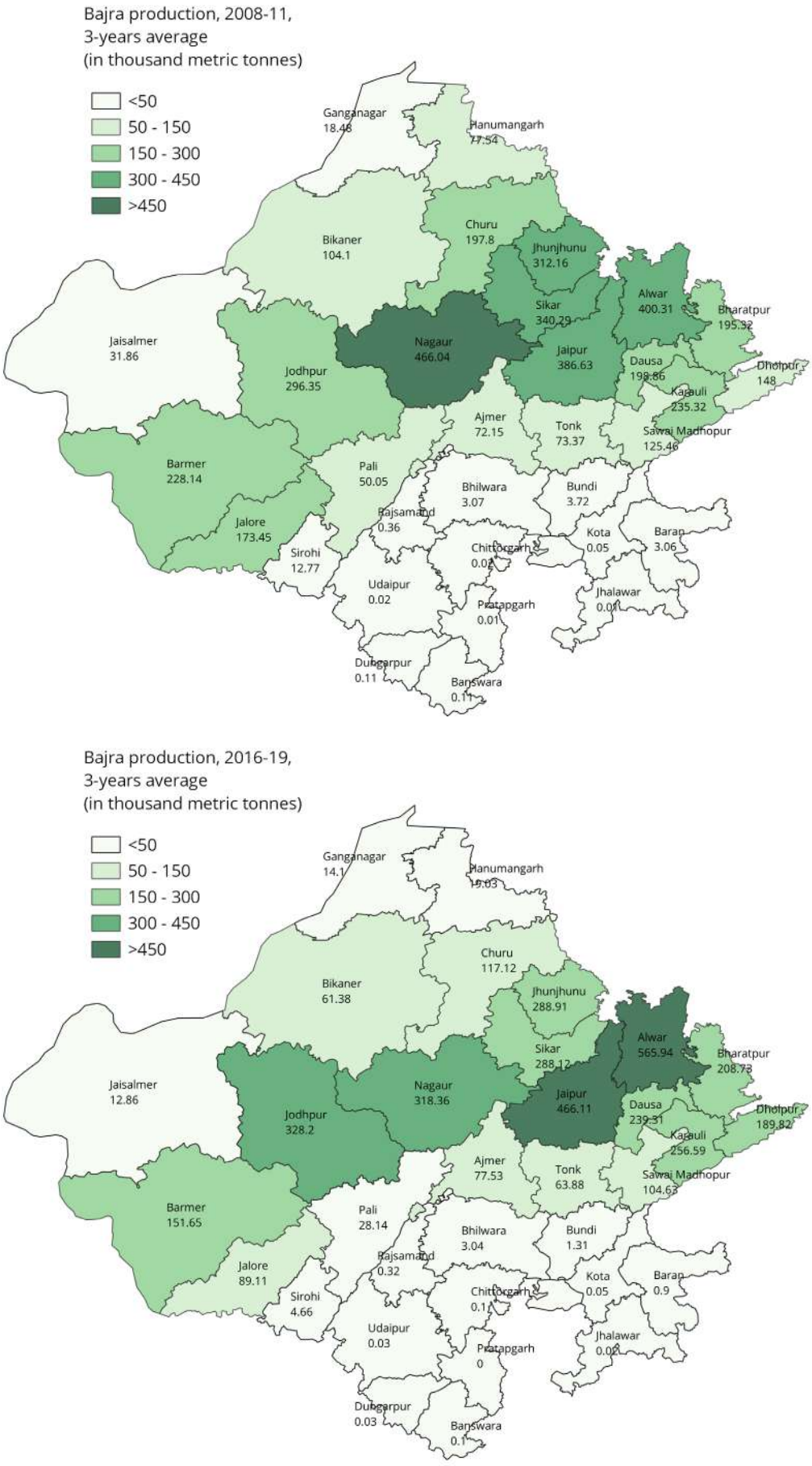


Figure 15: Trends of bajra (pearl millets) production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in thousand Metric Tonnes)

during 2011 and 2019. Maximum decline is observed in Hanumangarh district (75 percent reduction), followed by Dungarpur and Baran (71 percent reduction). Jalore, Pratapgarh, Jaisalmer, Sirohi and Bundi show decline in Bajra production between 50 and 75 percent. On the contrary, Chittorgarh shows maximum growth in Bajra production (about six times higher), followed by Jhalawar that shows two times more growth in bajra production in 2016-19 compared to production in 2008-11. Overall, Nagaur, Alwar, Jaipur and Jhunjhunu continue to have the maximum share in bajra production across districts in Rajasthan in both the time periods. Unlike the production of wheat, bajra production is concentrated in the central part of Rajasthan, from northeast to southwest corner. The southern districts have the lowest contribution in production of Bajra across Rajasthan.

Figure 16 and Figure 17 presents trends in production of major pulses - gram and moong grown over two time periods – 2008-11 and 2016-19 across Rajasthan. Except for one-third of the total districts in Rajasthan, the rest exhibit an improvement in gram production. Jodhpur, Jalore, and Baran demonstrate a remarkable growth of eleven to fifteen times in gram production between 2016-19 compared to 2008-11. On the other hand, districts like Dholpur show about 80 percent decline in gram production, followed by Churu, Bharatpur and Karauli, that show decline in the order of 40 to 55% over the two time periods. Bikaner, Ganganagar and Jhunjhunu continue to be among the top five districts, contributing the most in production of gram in Rajasthan. It is to be noted that while the production of gram was majorly concentrated in the northern districts along with Jaipur during 2008-11, however, its production rippled in the neighbouring districts like Jaisalmer bordering Bikaner

Source: Agricultural Statistics, DES, Rajasthan

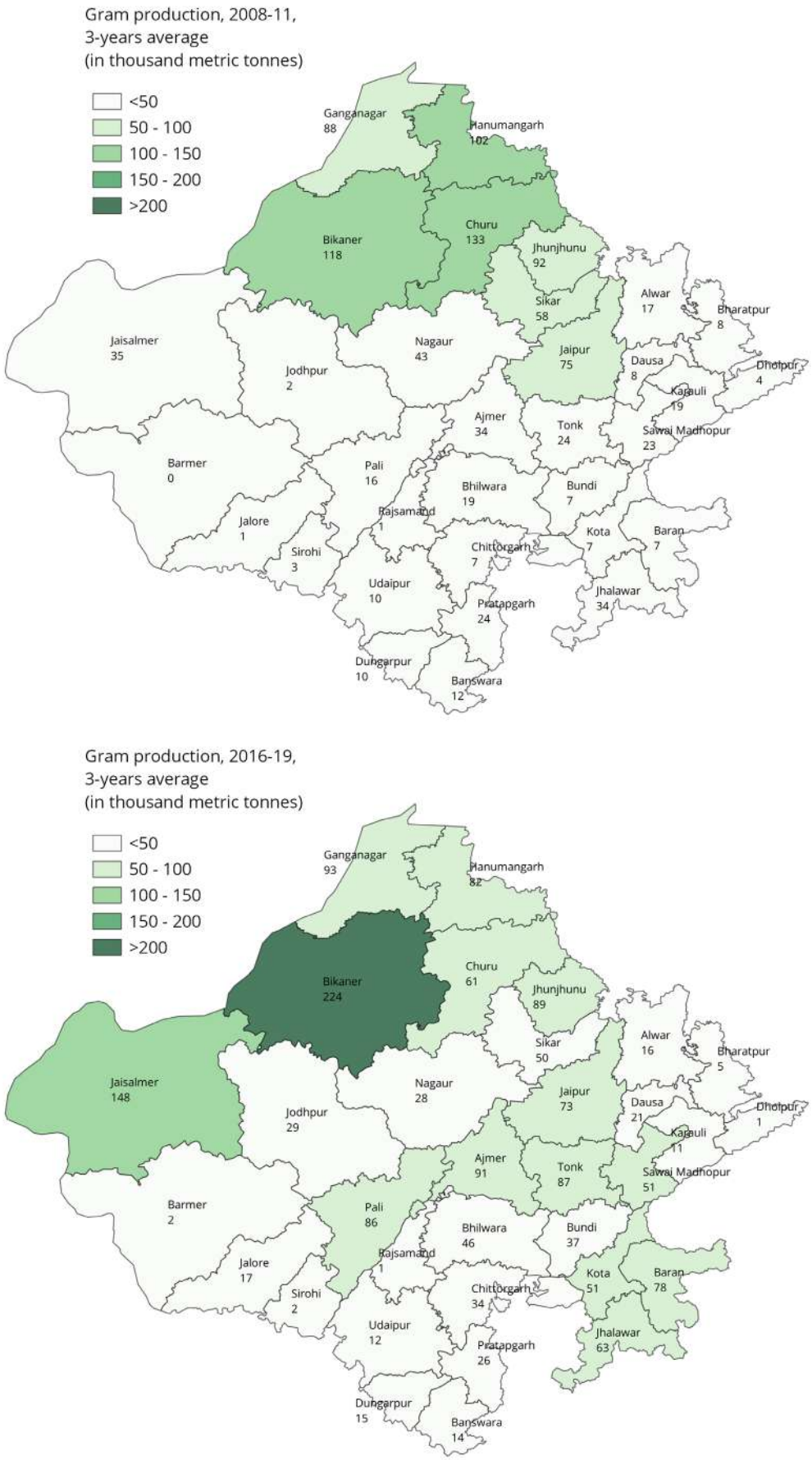


Figure 16: Trends of gram production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in Thousand Metric Tonnes)

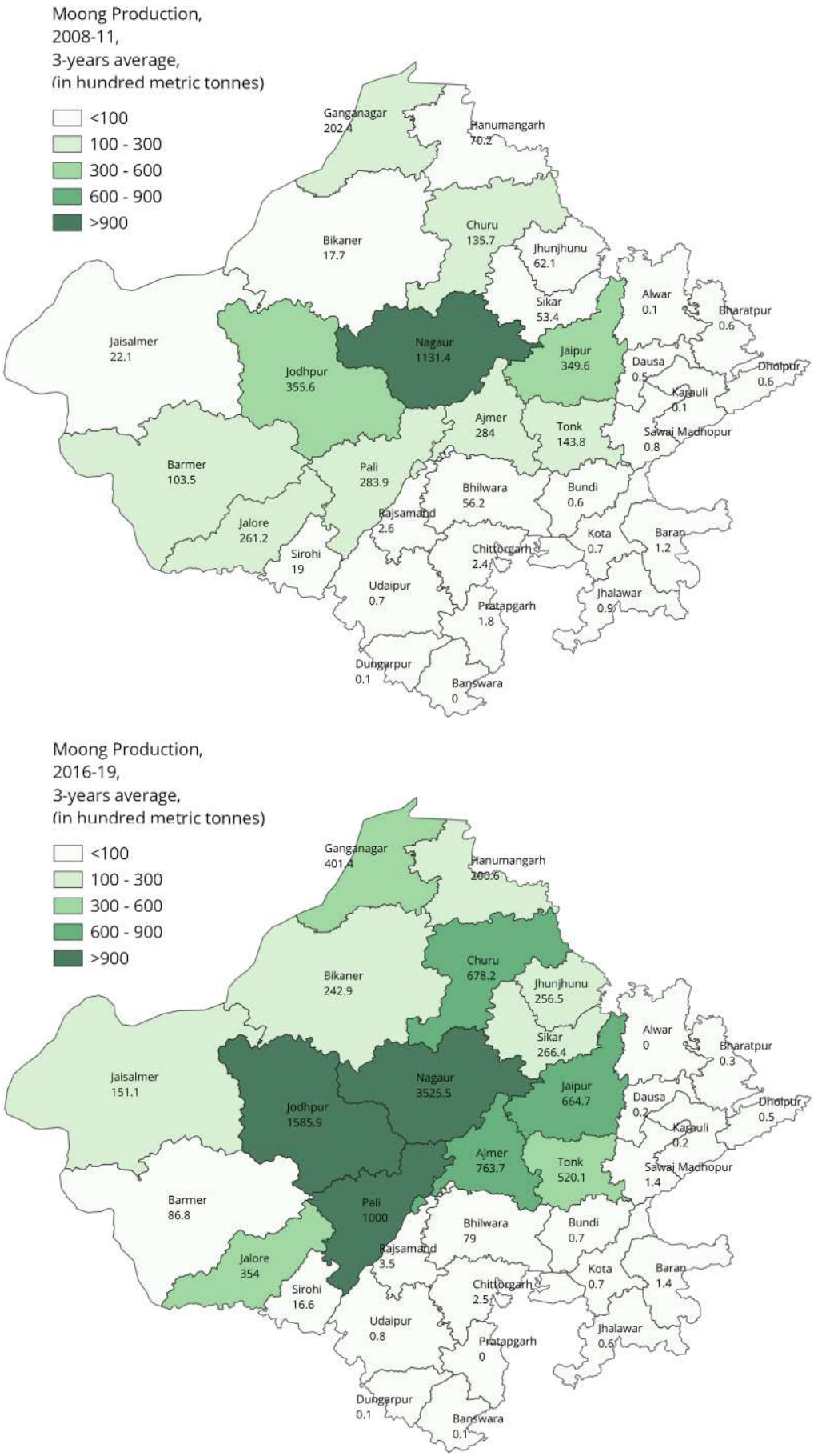


Figure 17: Trends of moong production across districts in Rajasthan in 2008-2011 and 2016-2019 (3 years averages, in '00s Metric Tonnes)

in the west and districts neighbouring Jaipur stretching towards central and south-eastern districts of Rajasthan.

Production of moong improves across 25 out of 33 districts between 2008-11 and 2016-19. Eleven districts more than double their moong production in 2016-19 compared to 2008-11, with Bikaner showing highest improvement (about fourteen times higher). Nagaur, Jodhpur, Pali, Ajmer and Jaipur continue to be the leading producers of moong in both the periods. Pratapgarh, followed by Alwar, Dausa and Bharatpur shows the maximum decline in moong production between the two time periods. Overall, production of moong is concentrated in the districts falling in the central, northern, and western part of Rajasthan, except Barmer, in 2016-19.

3.3. Productivity of Food Grains: Trends, Patterns, and Factors

Food grain productivity refers to the amount of food grains produced per unit area of land. In tandem with the food production, the yield of cereals, pulses and overall food grains has witnessed a consistent improvement over the years, except in 2009-10, when the state faced major drought. While productivity of cereals has increased by 51 percent, the productivity of pulses and total food grains went up by 38 percent and 32 percent respectively between 2006-07 and 2018-19 (figure 18). Among the food grains grown, productivity of wheat is the highest followed by barley, rice, maize, and gram. Despite wheat leading in terms of productivity, it shows slow increase of 32 percent from 2006-07 to 2018-19 in comparison to major food grains grown in this period. The productivity of maize has doubled between 2006-07 and 2018-19, while productivity of jowar (Sorghum), rice and barley increased by 50 percent, 45 percent, and 41 percent respectively (figure 19).

The trends in food-grain productivity across districts in Rajasthan shows an interesting pattern (figure 20). The food grain productivity is highest among the districts situated on the eastern periphery of Rajasthan spanning from North to South and shows a steady decline as one moves from east to west clearly following the agroclimatic zones from humid to arid regions. The western districts where maximum land is desert, has the least food-grain productivity. Churu is an exception because, despite located in the north-eastern region and surrounded by districts with higher food grain productivity, it has very

Source: Agricultural Statistics, DES, Rajasthan

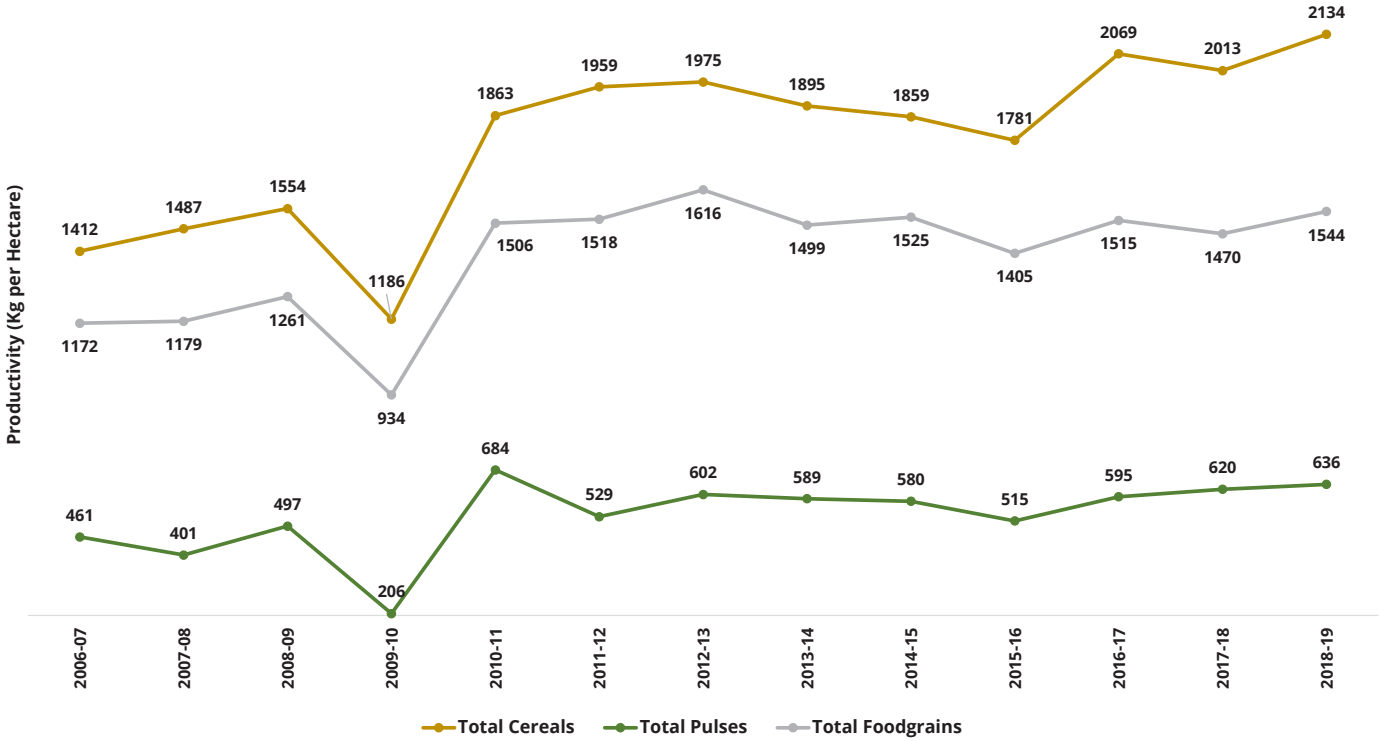


Figure 18: Trends of productivity of cereals, pulses, and total food grains in Rajasthan from 2006-07 to 2018-19 (in Kg per hectare)

Source: Agricultural Statistics, DES, Rajasthan

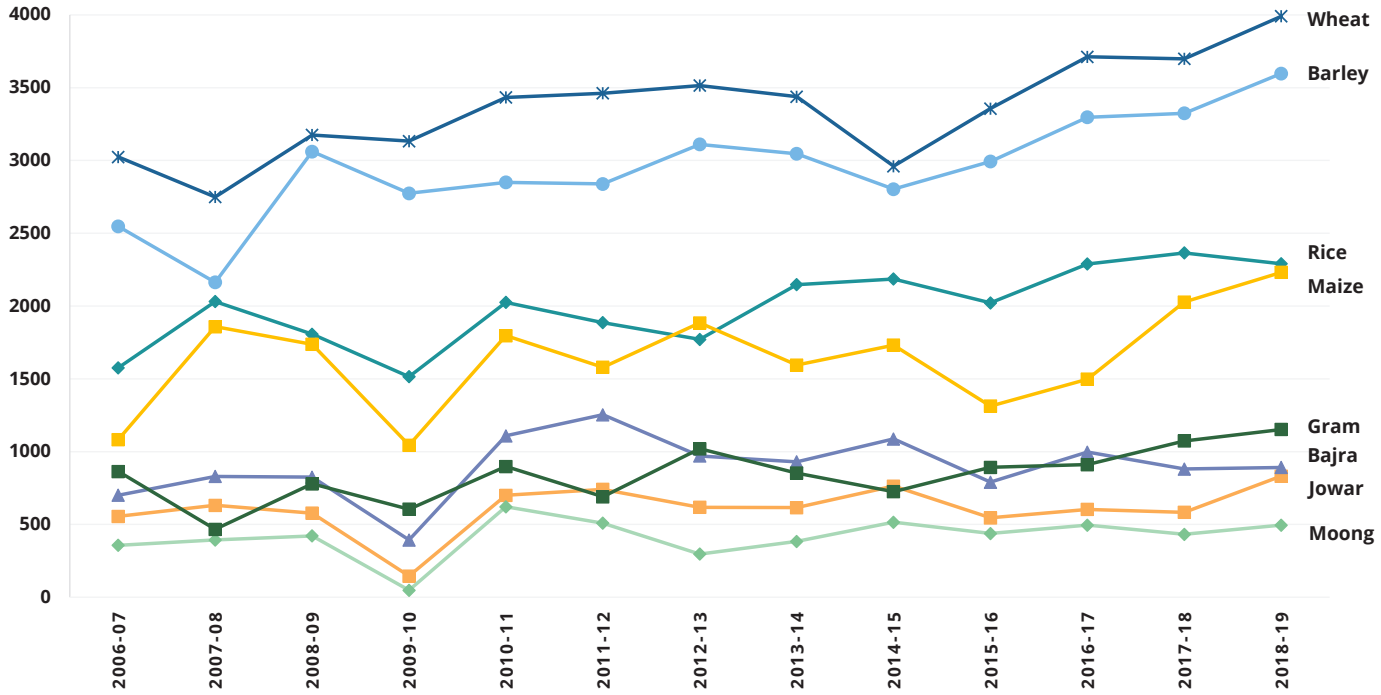


Figure 19: Trends of productivity of major food grains in Rajasthan from 2006-07 to 2018-19 (in Kg per hectare)

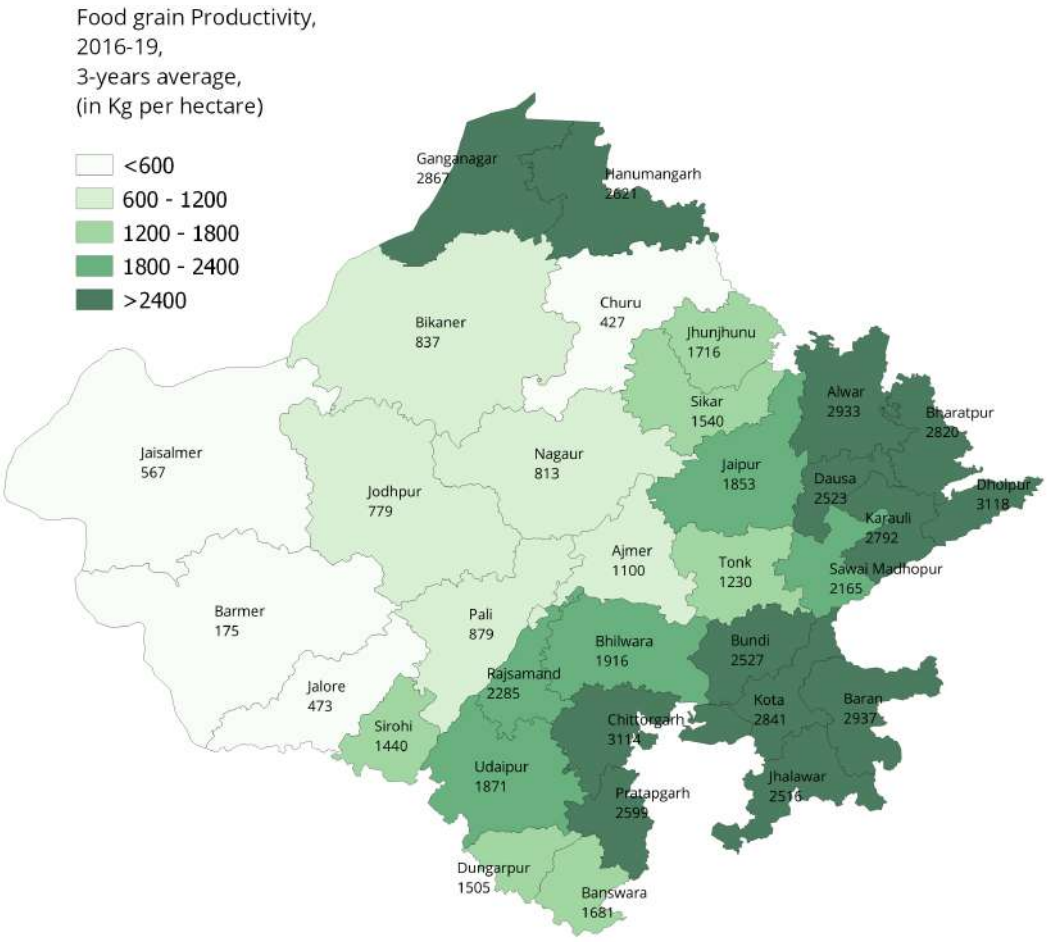


Figure 20: Trends of food grain productivity across districts in Rajasthan between 2016-17 to 2018-19 (in Kg per hectare), 3-years average

low food grain productivity—even lower than districts like Jaisalmer and Jalore in the western region, where the large portion of the land is desert.

Since agriculture in Rajasthan is majorly rainfed, the extent of irrigation plays a crucial role in cultivation of food crops and net productivity. Higher the irrigation of net sown area, higher is the food grain productivity (figure 21). Majority of districts that have higher irrigation extent, at least above the state average, have high food grain productivity and vice-versa, with few outliers (figure 22). For example, food grain productivity in districts like Sikar, Udaipur and Rajsamand is high despite irrigation extent being slightly lower than the state average. On the contrary, districts like Sirohi, Tonk and Jalore have poor food grain productivity despite high irrigation extent, which is worrisome. Churu has the lowest irrigation extent, while Kota has the highest, based on three years average from 2016-17 to 2018-19.

The irrigation facilities directly influence the cropping intensity which is the ratio of Gross Area Sown to the Net Area Sown. It implies to the number of crops a farmer grows on a piece of land in an agricultural year. If it is more than 100 percent, it shows that more than one crop is being grown on an agricultural land. As of 2018-19, Rajasthan's cropping intensity stands at 142.4 percent, comparable to states like Bihar and Jharkhand. States like Madhya Pradesh, that have relatively less area under sown (15.2 million hectare) have higher cropped area (26.1 million hectare), due to which its cropping intensity stands at 171.8 percent, higher than Rajasthan. Moreover, the cropping intensity in Madhya Pradesh registers a sharp 8 percent increase between 2016 and 2019, while it remains nearly same for Rajasthan in the same period. Overall, Rajasthan has registered an increase of only 11 percent post 2006-07. District wise average for a three-year period between 2016-17 and 2018-19, shows huge variations in cropping intensity across districts in Rajasthan. While districts like Jhalawar, Kota, Baran, Bundi, Chittorgarh and Alwar have very high cropping intensity above 175 percent, on the other hand there are districts like Barmer, Churu and Nagaur that have cropping intensity below 125 percent, on an average (figure 23).

Another crucial factor impacting agricultural productivity is fertilizer consumption. Fertiliser consumption in Rajasthan stands at 1.5 million tonnes in 2018-19, roughly 63 percent increased consumption compared to 2006-07. The fertiliser consumption is higher in Kharif season than in Rabi season and has witnessed a sharp 73 percent rise in consumption during Kharif season between 2006-07 and 2018-19. Three years average between the periods 2016-17 and 2018-19

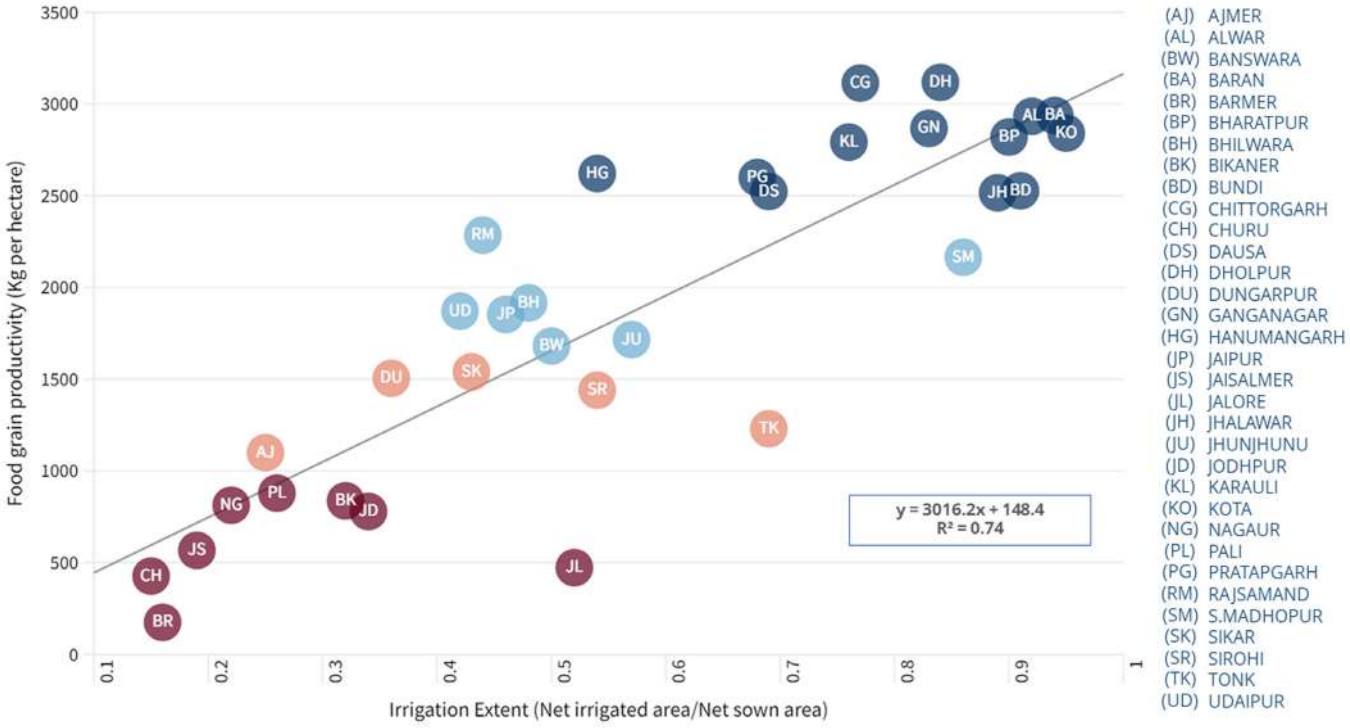


Figure 21: Irrigation Extent versus food grain productivity across districts in Rajasthan between 2016-17 to 2018-19, 3-years average

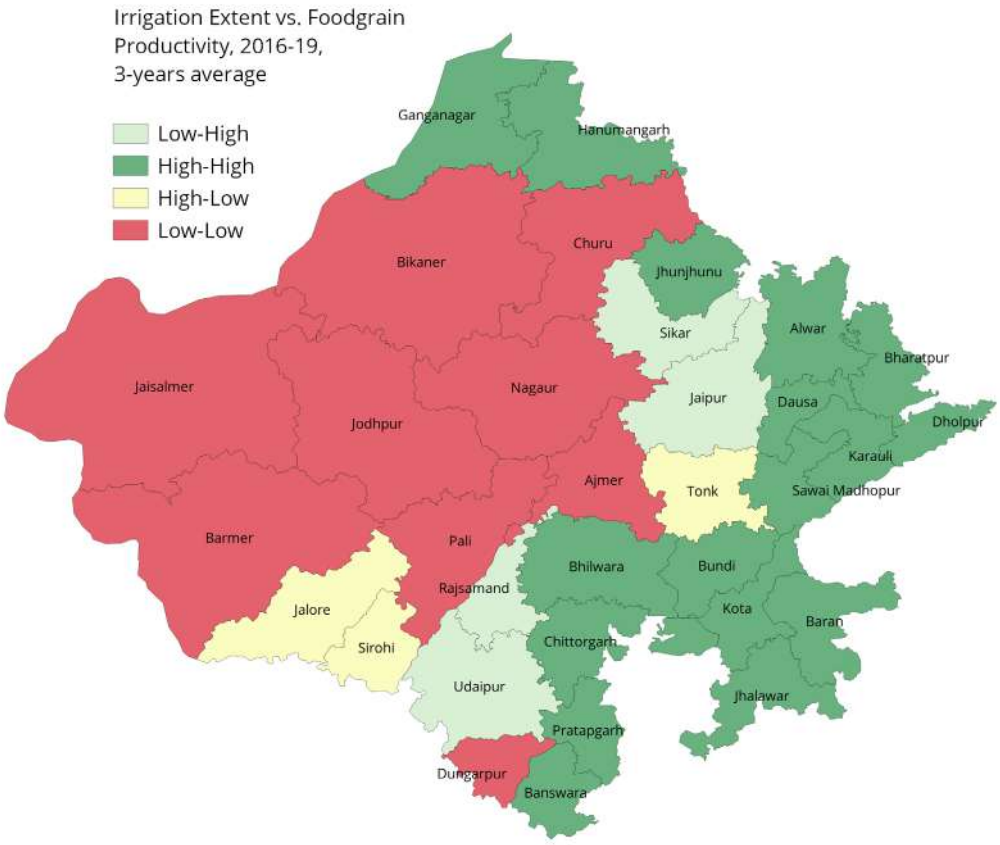


Figure 22: Clusters of districts with respect to Irrigation Extent versus food grain productivity across districts in Rajasthan between 2016-17 to 2018-19, 3-years average

indicate fertiliser consumption to be the highest in Ganganagar district at 114 thousand tonnes, followed by Hanumangarh at 87.6 thousand tonnes, whereas Dungarpur and Rajsamand have the least consumption of fertilisers across Rajasthan at 7.7 and 8.6 thousand tonnes respectively (figure 23).

3.4. Composition of Crops by Area under Production

The overall foodgrain availibility depends on the actual area available for growing crops and composition of different types of crops grown, which is impacted by agroclimatic conditions, the prevailing agricultural government policies and the pre-existing demand for certain crops**.** There has been change observed in the total area under crops in Rajasthan during 2006-09 to 2016-2019 period (figure 24).

Bajra (Pearl millets) has seen significant drop of 10 percent in its area (from 38% to 28%) among cereals whereas Moong (Green gram) has seen increment of 8 percent in its area (from 7 percent to 15 percent). The area for urad and wheat production has also increased by 3.6 and 1.9 percent respectively on an average in a span of ten years. Area for production of Maize, Jowar and Barley among cereals and Arhar, Moth and Chaula among pulses is observed to have declined marginally. The area for production of rice in cereals and gram and masoor in pulses has increased marginally.

The decrease in Bajra production in Rajasthan can be explained by two main factors. Firstly, the inadequate Minimum Support Price has resulted in Bajra being economically less profitable to grow, leading to a decline in its cultivation. This implies that guaranteed minimum support price for Bajra crop is not being implemented properly, making it a less attractive option for them. Secondly, there has been a shift in agricultural focus towards growing pulses, which require a shorter time to cultivate and offer higher economic returns to farmers. As a result, farmers are choosing to allocate their resources and efforts towards pulses cultivation, resulting in decrease in Bajra production in the region.

Source: Agricultural Statistics, DES, Rajasthan

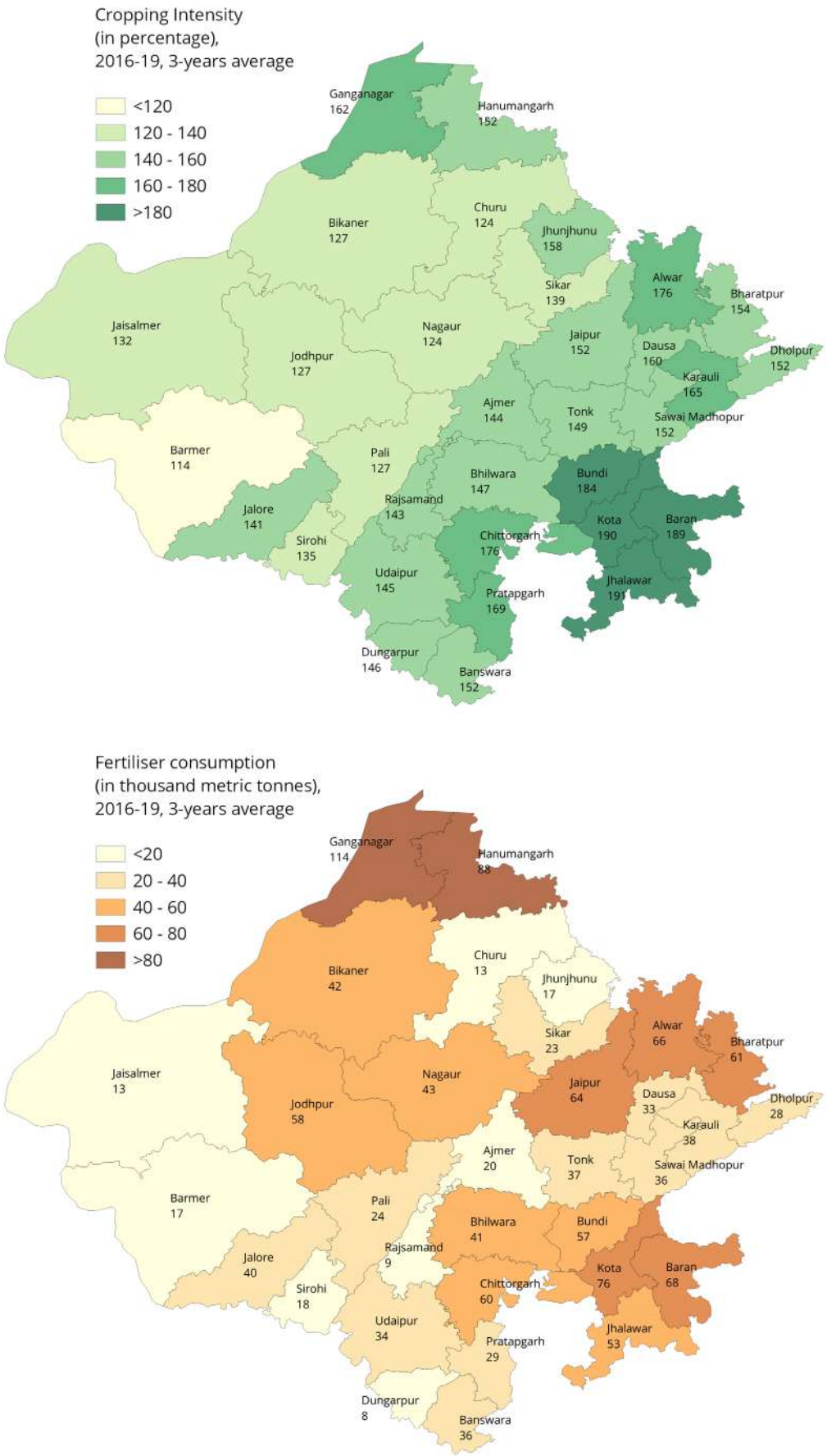


Figure 23: Trends of cropping intensity and fertiliser consumption across districts in Rajasthan between 2016-17 to 2018-19 (in Kg per hectare), 3-years average

Source: Agricultural Statistics, DES, Rajasthan

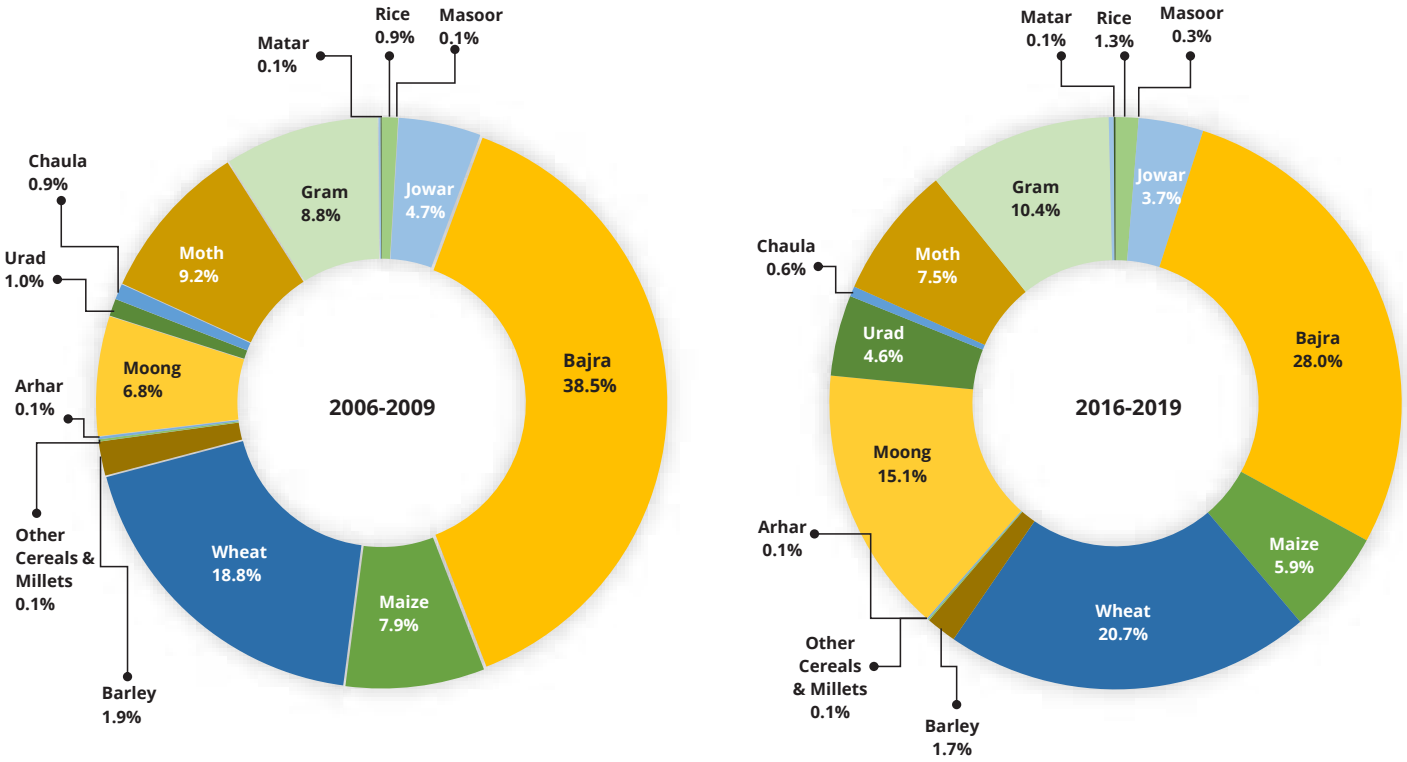


Figure 24: Food crops composition by total food grain area in Rajasthan (3-year average: 2006-2009 and 2016-2019, in %)

3.5. Adequacy in Production of Food Grains and Consumption Requirement

Figures 25 and 26, respectively, indicate the trends in recommended[25] and actual consumption[26] as well as in the production of cereals and pulses, respectively. Despite variations in wheat production in 2009–10 when the state experienced severe drought, the state has consistently maintained a surplus of cereals that surpasses the needs of its growing population, in terms of both actual and recommended intake. Even though production increased from 11.7 to 20.3 million tonnes during 2009–2010 and 2010–2011, it again experienced a continuous fall up to 16.3 million tonnes till 2015–2016. Nevertheless, production increased and reached 19.4 million tonnes in 2018–19, indicating that growth rates of cereal production will be sustainable, at least over the medium term. A district wise analysis for the triennium period of 2016-19 reveals that while most districts have surplus production of cereals, districts such as Barmer followed by Jaisalmer, Churu, Jalore and Sirohi do not have adequate local production to meet the actual or recommended intake for cereals for its population.

Rajasthan is producing more pulses than it consumes. Until 2015–16, production of pulses has only been adequate or low to meet the population's recommended daily intake. However, beginning in 2016–17, the state has seen an increase in pulse production that now exceeds both the actual and recommended intake, which must be sustained over the long term. However, sub-state level analysis suggests that districts like Bharatpur, Dholpur, Alwar, Rajsamand, Sirohi, Udaipur and Karauli need to boost the production of pulses to surpass the population's actual and recommended consumption requirement. In addition, districts like Dausa, Banswara, Barmer, Dungarpur and Jaipur too need to improve the pulses production to meet the recommended consumption requirement of their population.

25 Recommended consumption requirement was estimated based on @400 gram/adult/day for cereals and @80 gram/adult/day for pulses based on ICMR 2010 guidelines. Total population was converted into adult equivalent by adjusting with 88 percent of total population.

26 Actual consumption requirement has been estimated using the per capita monthly consumption pattern of the cereals (rice and wheat) and pulses (Toor, Moong, Masoor, Urad and Gram) provided in the NSSO 68th round report on Household Consumption Expenditure multiplied by the total population in Rajasthan in the particular year.

Source: Agricultural Statistics, DES, Rajasthan

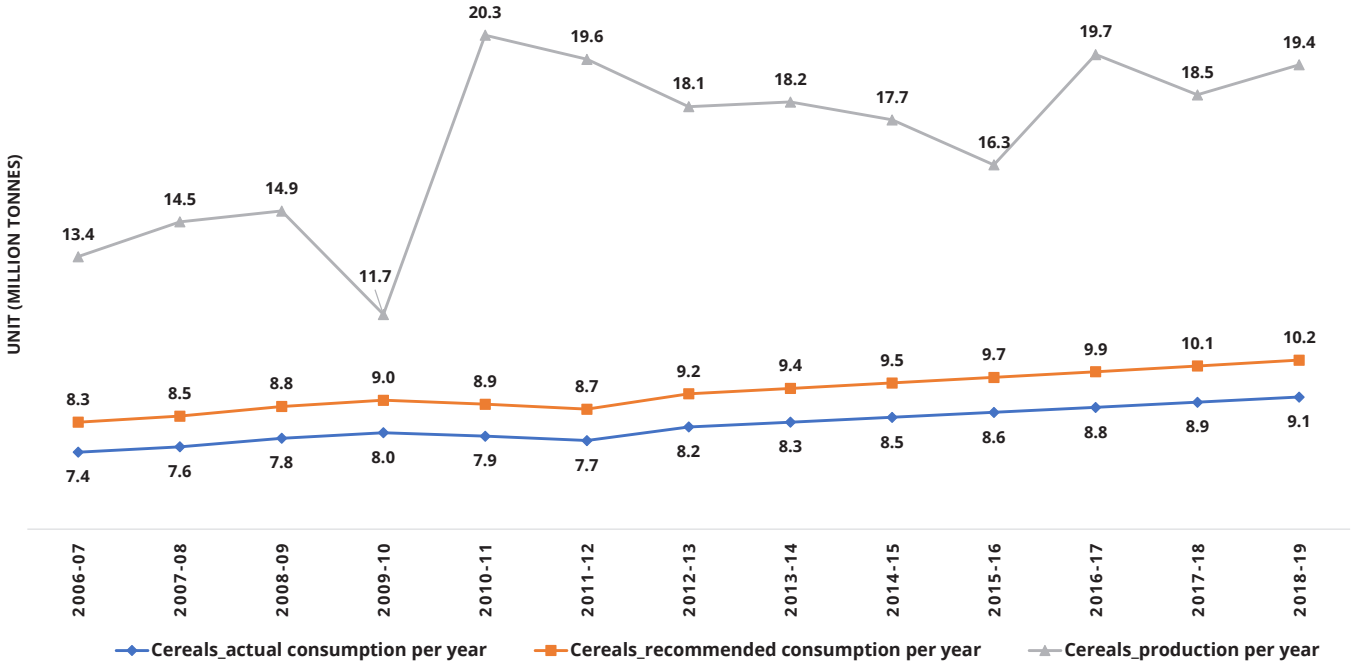


Figure 25: Trends of Consumption Requirement and Production of Cereals in Rajasthan, 2006-2019

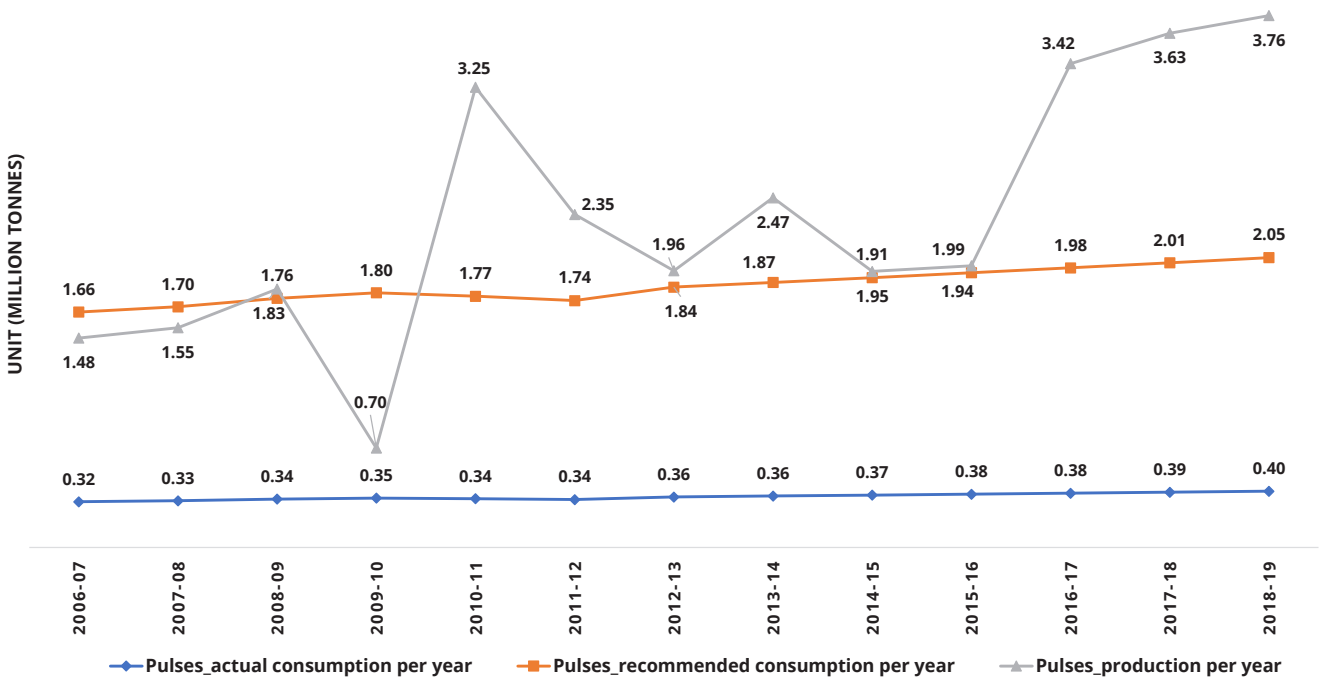


Figure 26: Trends of Consumption Requirement and Production of Pulses in Rajasthan, 2006-2019

3.6. Livestock Production

Produce from livestock is crucial from food and nutrition security perspective as it allows the local availability of nutritious animal products for household consumption and improvement in dietary diversity. Figure 27 presents the trends in major livestock production – milk, eggs, and meat. **Rajasthan is the largest contributor in milk production across India (15.05 % of total milk production). From 13.5 million metric tonnes in 2011-12 to 33.27 million metric tonnes in 2022, the state's milk output has increased by a net 146.44 percent.** Jaipur has the highest average production of milk of 1.88 million metric tonnes and

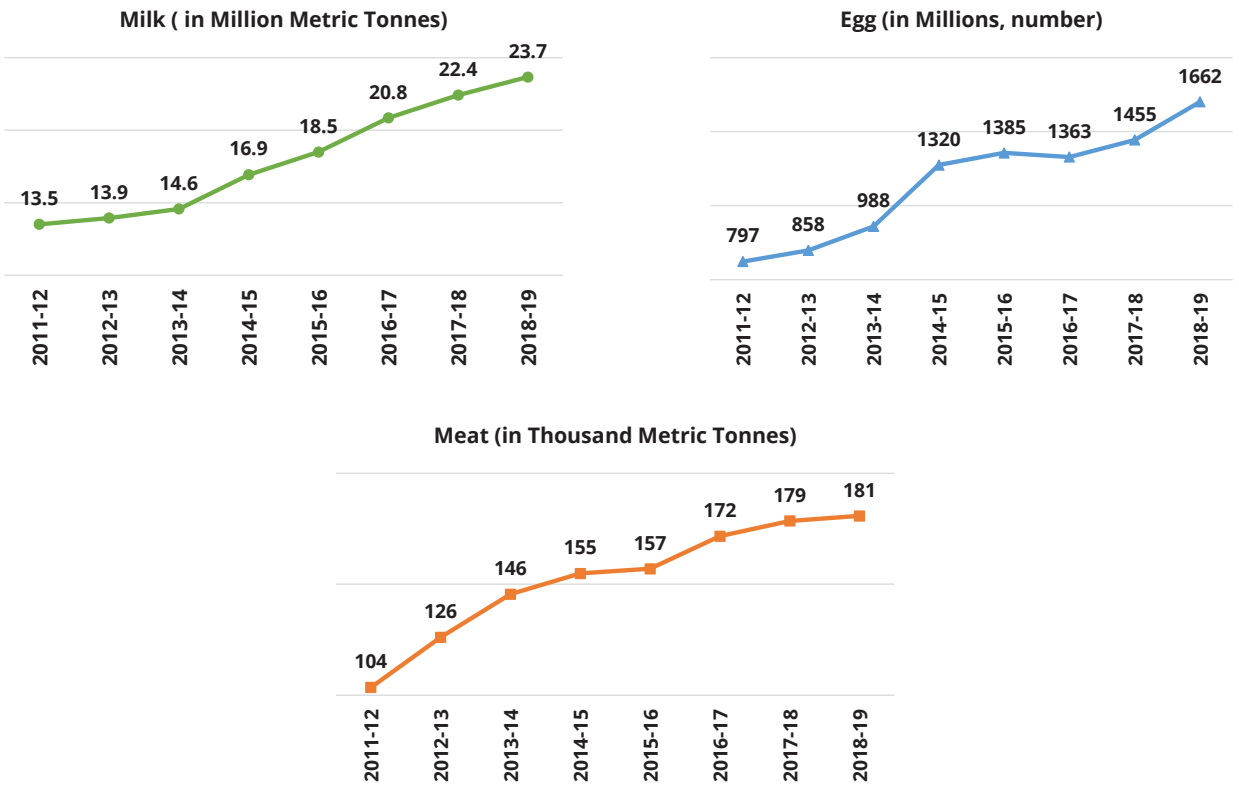


Figure 27: Trends in Livestock production (Milk, Eggs, and Meat) in Rajasthan, 2011-12 to 2018-19.

Dungarpur the least, of 0.2 million metric tonnes between 2016-17 to 2018-19 (figure 28). In contrast to other Indian states, Rajasthan's population does not rely heavily on the production of eggs and meat for consumption, also reflected by the state's overall production being low. Nevertheless, from 2011–12 to 2018–19, the production of both eggs and meat has nearly doubled. The production of eggs and meat varies greatly by district, with certain districts having a disproportionately high concentration of production. With respect to eggs production, Ajmer is the leading district with 848 million eggs produced annually on an average, followed by Jhunjhunu with average annual production of 103 million eggs, whereas districts like Dholpur and Jaisalmer fall under least producers with average production of 0.2 million and 1.5 million eggs per annum respectively between 2016-17 and 2018-19 (figure 29). Meat production is the highest in Barmer followed by Jodhpur, Nagaur and Jaipur at 20.3, 13.3, 12.9 and 12.6 thousand metric tonnes on an average per annum between 2016-17 and 2018-19, whereas lowest in Dausa, Jaisalmer and Dholpur, individually contributing to roughly less than a million production between 2016-17 and 2018-19 in Rajasthan (figure 30).

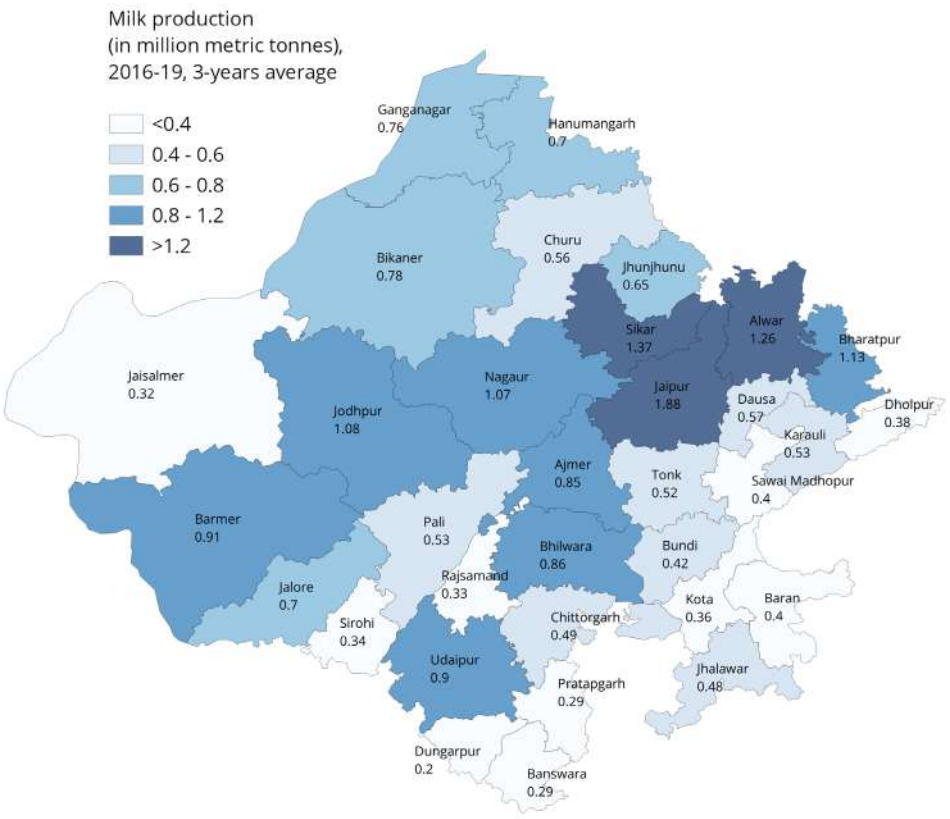


Figure 28: Milk Production across districts in Rajasthan, three years average, 2016-17 to 2018-19 (million metric tonnes)

Source: Animal Husbandry Annual Report 2019-20

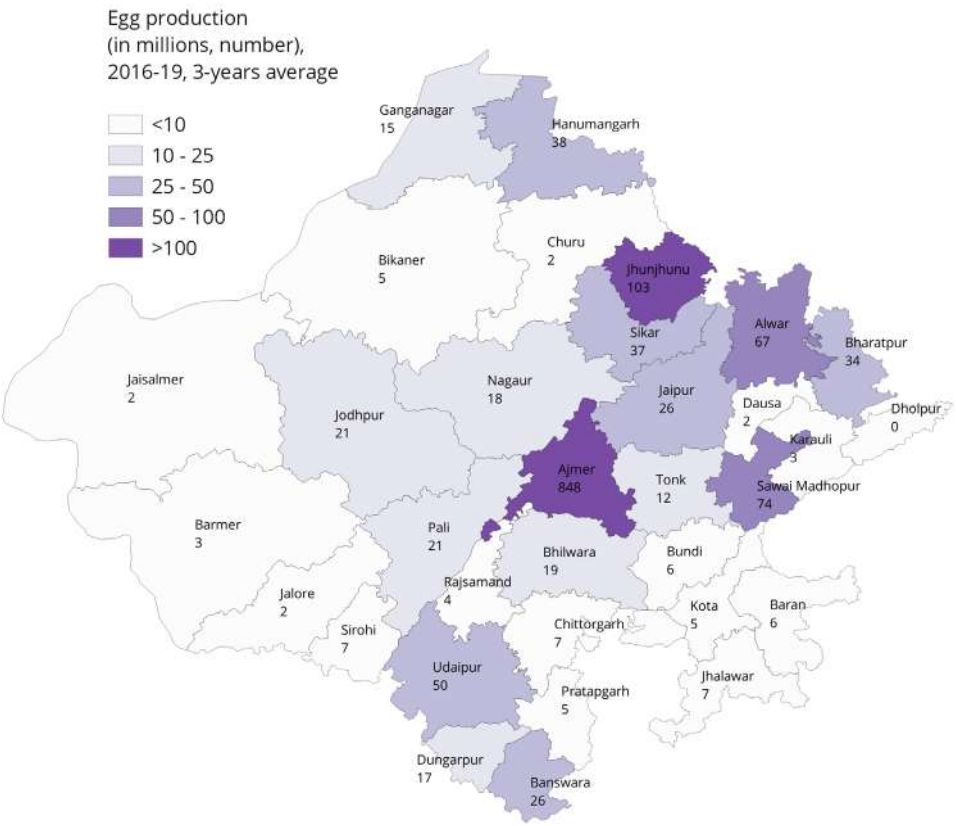


Figure 29: Egg Production across districts in Rajasthan, three years average, 2016-17 to 2018-19 (in millions)

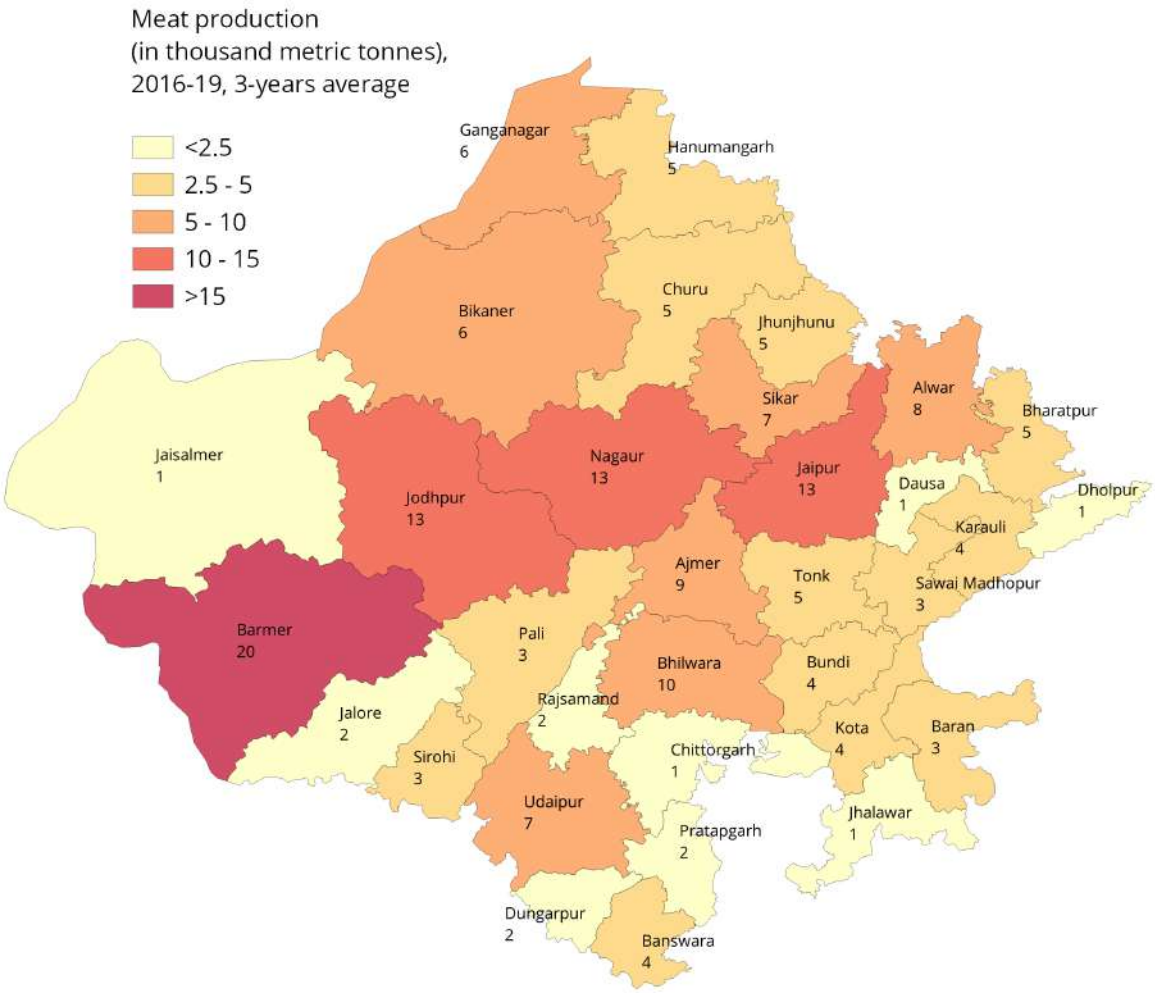


Figure 30: Meat Production across districts in Rajasthan, three years average, 2016-17 to 2018-19 (in thousand metric tonnes)

3.7. Utilization of Storage Facilities

Storage facilities play a crucial role in protecting the state's population from rapid food shocks, not just during natural disasters but also in the event of market failure, such as a sudden increase in the price of essential commodities because of price manipulations. All districts, except Churu and Jhunjhunu have warehouses, albeit of varying capacities to store the food grains ranging from 3.3 thousand metric tonnes in Sirohi to 482.4 thousand metric tonnes capacity in Sri Ganganagar (figure 31). However, the utilisation (including reserved) of these warehouse capacities also varies significantly across districts and is very disproportionate. As of March 2022, districts like Banswara, Jaisalmer, Nagaur, Bikaner, Pratapgarh and Kota have saturated the capacity of their warehouses (100 percent or more), while storage capacities of districts like Chittorgarh, Jodhpur, Dungarpur, Bhilwara, Tonk, Barmer, Dholpur and Ajmer have reached 80 percent or more. Districts like Sikar, Jhalawar, Baran, Udaipur, Jaipur, Sawai Madhopur, Hanumangarh, Dausa, Alwar and Sri Ganganagar have storage utilisation between 10 and 50 percent, while less than 10 percent of the storage capacity has been utilised in Bharatpur, Bundi and Sirohi.

3.8. Government Schemes and Programmes for Ensuring Food Availability in Rajasthan

The agricultural transformation in Rajasthan in the past decade is the result of the numerous initiatives by both Central and State government to support the various facets of food availability in Rajasthan. The **National Food Security Mission (NFSM)**, a centrally sponsored scheme on Wheat and Pulses launched in 2007-08 covers distribution of agri-inputs, including irrigation equipment for such as wheat, pulses, coarse cereals like maize, barley, and nutri-cereals. The **National Mission on Agriculture Extension and Technology (NMAET)**

Source: Rajasthan State Warehousing Corporation

Figure 31: Utilisation of Storage Capacities across Districts as of March 2022 (in thousand metric tonnes)

introduced in 2015-16 aims to restructure and strengthen agriculture extension, delivery of appropriate technology and improved agronomic practices to farmers, with a funding pattern from centre and state in 60:40 ratio. The **Rastriya Krishi Vikas Yojana (RKVY)** started in 2007-08 with an objective of preparing Integrated District Agriculture Plan, considering agroclimatic conditions and natural resource issues and technology. Another flagship scheme, **Pradhan Mantri Fasal Bima Yojana (PMFBY)** launched during 2016 provides a comprehensive insurance cover against failure of the crop thus helping in stabilising the income of the farmers at 2, 1.5 and 5 percent for Kharif crops, Rabi crops and commercial/horticulture crops respectively. Another restricted scheme, **National Mission for Sustainable Agriculture (NMSA)** focussing on climate change adaptation encompasses four specific sub-missions- Rain Fed Area Development, Soil health Management and Soil health card, Paramparagat Krishi Vikas Yojana (PKVY) and Sub-Mission on Agro-Forestry (SMAF). **National Horticulture Mission (NHM)** was started to increase the area, production, and productivity of different horticulture crops in 24 districts of Rajasthan. Schemes such as **Mukhyamantri Beej Swavalamban Yojana,** initially launched in three agro-climatic zones of Rajasthan - Kota, Bhilwara, Udaipur, has now got implemented in all ten agro-climatic regions, from 2018-19. The scheme aims to promote the production of crops from quality seeds by farmers. The State also provides seed and micronutrient mini kits to farmers to incentivize growth of new crop varieties in small farms and use of subsidized micronutrients for enhanced productivity. In 2023-24, the state government announced distribution of free seed mini kits to 2.3 million small/marginal farmers, that includes distribution of maize seed kits to 1.1 million farmers, mustard seeds to 0.7 million farmers, green gram (moong) to 0.3 million farmers, and Moth and Sesame to 0.1 million farmers each. As the **largest millet producer** in the country, the **state government has announced several measures to promote the production and consumption of millets** in the state. These include the **establishment of a Centre of Excellence for Pearl Millets (Bajra)** at Jodhpur Agriculture University, **a subsidy of 5 million USD (INR 400 million) for the first 100 millet processing units**, and support for millet production through **distribution of seed and nutrient kits**, **MSP procurement, and capacity building for start-ups and businesses on development of millet-based products**. The government also plans to **invest in R&D to develop high-yielding varieties** and improved production technologies and **include millets in PDS, mid-day meals, and other government schemes**. These measures aim to enhance the economic viability

and shelf life of millets, while also providing nutritious food options to the public.

Rajasthan also initiated Zero Budget Natural Farming (ZBNF) in three districts and scaled it up to fifteen districts where it provides training to selected farmers for efficient use of agri-inputs to grow chemical free produce. There have been consistent efforts to improve the irrigation and provision of water for agricultural activities. **Mukhyamantri Jal Swavlamban Abhiyaan (MJSA)** launched in January 2016 emphasizes on water conservation of available runoff especially in rural areas by treatment of catchment, proper utilization, renovation, and creation of new water harvesting structures. **Pradhan Mantri Krishi Sinchai Yojana launched in 2015** entails subsidized provision of drip and sprinkler techniques of micro-irrigation to different category of farmers. Under PM-KUSUM (Prime Minister Kisana Urja Suraksha and Utthan Mahabhiyan), **Solar Pump set Agri-connection scheme** was launched in 2019-20 for setting up of solar pump ranging from 3 HP to 10 HP, for farmers with pending agri-connection. **Rajiv Gandhi Jal Sanchay Yojana (RGJSY)** launched in August 2019 by state government aims to ensure maximum rainwater harvesting, water conservation and judicious use of available water sources in the state. Rajasthan also falls among the seven states in India covered under **Atal Bhujal scheme** launched recently in April 2020 that aims to prevent falling groundwater levels through community participation in seven states during 2020-21 to 2024-25. To strengthen the micro irrigation system, the state government is providing subsidy to small holder and marginal farmers from underprivileged communities and has increased the target for construction of farm ponds from 30000 to 50000 in the State.

The state has also intensified its efforts for promotion of agro-processing and supply chain management through schemes like **'Agri-Processing and Agri-Marketing Promotion policy'** since 2015. The electronic National Agriculture Market (**eNAM**) programme launched by the central government to create online mandis, in which 145 out of total 1361 mandis are from Rajasthan in India.

The state government also has several measures in place to ensure financial stability to vulnerable famers. **Rajiv Gandhi Krishak Sathi Sahayata Yojana**, provides financial assistance in case of accident during agriculture work. Similarly, **Mukhya Mantri Kamdhenu Pashudhan Bima Yojana** has been launched to protect farmers and livestock owners from loss caused by untimely death of their livestock (cow and buffalo). 500 USD (INR 40,000) will be provided to farmers in case of untimely death of their milk giving cattle (maximum up to two cattle per farmer).

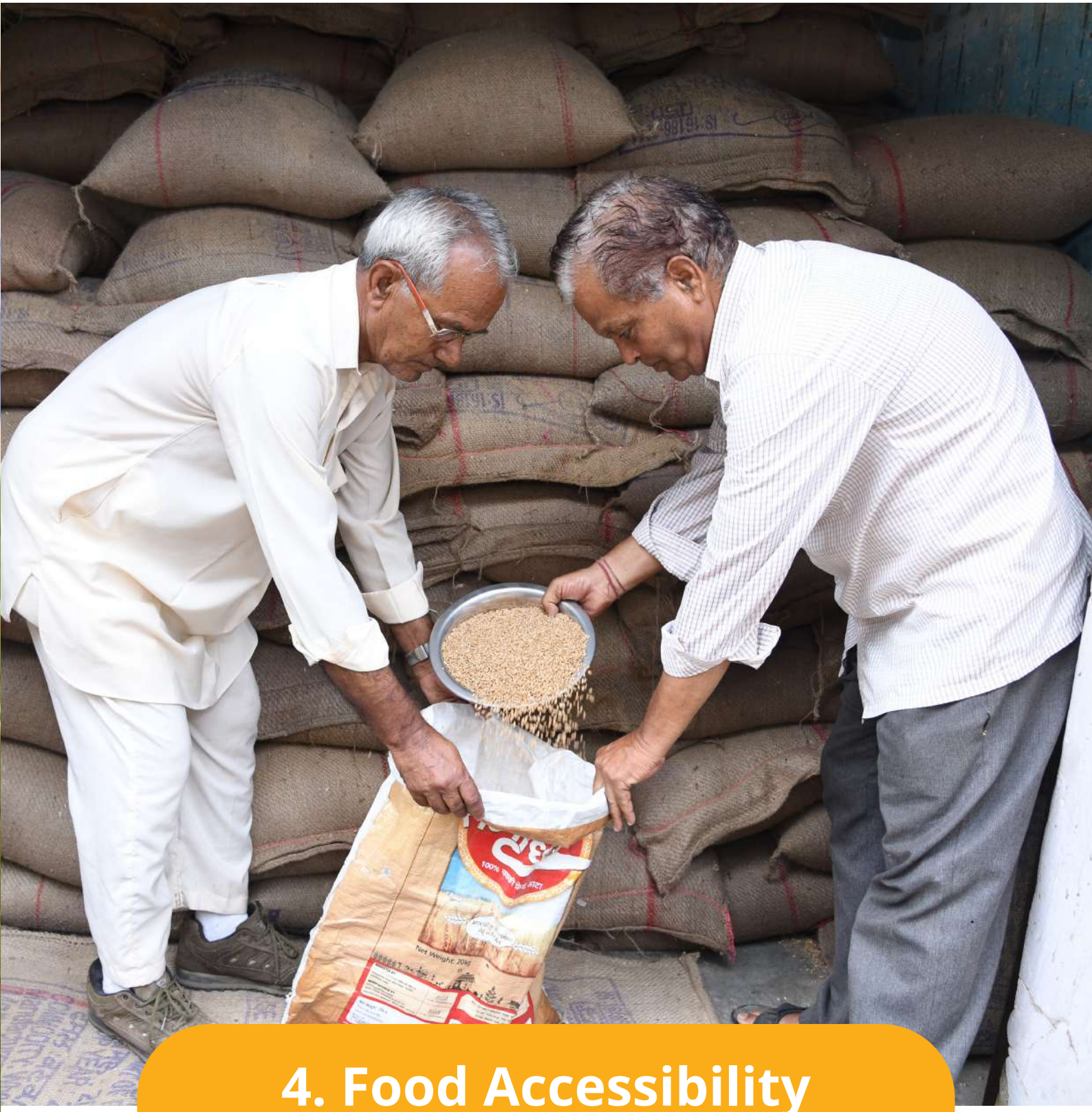
Over the past three years, the budget allocated for various schemes in the agriculture and allied sector, including the National Food Security Mission, National Mission of Agriculture Extension and Technology, National Horticulture Mission, and Gopalan Department, has seen a consistent rise. Specifically, the budget for the **Gopalan Department** has **doubled** from from 104.9 million USD (INR 8.39 billion) in 2021-22 to 223.4 million USD (INR 17.87 billion) in 2023-24, while the budget for the **National Mission of Agriculture Extension and Technology** has increased by 50% in 2023-24 compared to the budget estimate in 2021-22. More specifically, the budget provision under **Krishak Kalyan Kosh**, a fund setup for farmers to provide fair price for their products and provide them with high quality seeds and modern agriculture equipment, is increased from 625 million USD (INR 50 billion) in 2021-22 to 937.5 million USD (INR 75 billion) in 2023-24, marking a 50 percent increase. The expanding budget provisions reflects the government's strong emphasis on enhancing agricultural extension services to provide farmers with appropriate technology

and improved agronomic practices, as well as boosting milk and value-added production in Rajasthan.

3.9. Summary of Findings: Food Availability

- While the total food grain production in Rajasthan has doubled between 2004-05 to 2021-22, the state is strongly dependent over rainfall for continued and sustained food production.
- Pulse production accounts for approximately 20 percent of the total cereal production. Between 2006-07 and 2018-19, while the production of cereals as a whole increased by 44%, the pulse production surged significantly, growing by 2.5 times from 1.5 to 3.8 million metric tonnes. The intensified focus on pulse cultivation has resulting in an improved overall ratio of pulse production to total cereal production in Rajasthan.
- The production basket in Rajasthan is significantly narrowing over the years which is a huge concern from the perspective of diversification for better nutrient intake. The production basket consists of mainly wheat and bajra (pearl millets) in cereals and gram and moong in pulses. While wheat production has gained considerable momentum over the last decade, production of Bajra (pearl millets) has stagnated along with other millets such as Maize, Jowar and Barley. Even in pulses, except moong and gram production, production of other pulses such as Arhar, Moth and Chaula are witnessing a decline in their production.
- While the overall food grain production has improved in many districts between 2008-11 and 2016-19, districts in the western region, specifically Barmer continue to have lower food grain production as compared to other parts of Rajasthan over two time periods.
- Despite Rajasthan's largest share in Bajra (pearl millets) production in India, there has been a significant decline in production of Bajra across 22 districts in Rajasthan between 2008-11 and 2016-19. Maximum decline is observed in Hanumangarh district (75 percent reduction), followed by Dungarpur and Baran (71 percent reduction). Jalore, Pratapgarh, Jaisalmer, Sirohi and Bundi show decline in Bajra production between 50 and 75 percent. The decrease in Bajra production in Rajasthan can be explained by two main factors. Firstly, the inadequate Minimum Support Price has resulted in low economic returns for farmers, making Bajra a less profitable crop. Secondly, there has been a shift in focus towards cultivating pulses, which have a shorter growth period and offer higher economic returns to farmers. As a result, farmers have found it more financially viable to invest their resources and efforts into growing pulses instead of Bajra.
- Since agriculture in Rajasthan is majorly rainfed, the extent of irrigation plays a crucial role in cultivation of food crops and net productivity. Higher the irrigation of net sown area, higher is the food grain productivity. Districts like Churu, despite surrounded by districts with higher food grain productivity has low production due to poor irrigation extent.
- In contrast to other Indian states, Rajasthan's population does not rely heavily on the production of eggs and meat for consumption, as reflected by the state's overall production being low, hence production of diverse food grains along with dairy is crucial.
- Rajasthan is the largest contributor in milk production across India (15.05 % of total milk roduction). From 13.5 million metric tonnes in 2011-12 to 33.27 million metric tonnes in 2022, the state's milk output has increased by a net 146.44 percent.

> **"Despite Rajasthan's largest share in Bajra (pearl millets) production in India, there has been a significant decline in its production over the years."**



4. Food Accessibility

4. Food Accessibility

4.1. Background

The economic, social, and physical environment governs person's ability to access food. Economic environment is a factor of disposable income, food prices and access to social support. Whereas the physical environment comprises of the availability and quality of infrastructure including roads, railways, communication, food storage facilities and other installations that enable the functioning of markets. The social environment is influenced by person's caste, tribe, gender, age, and household support.

Prof. Amartya Sen[27] argued that mere physical availability of food does not ensure access to that food by all people, especially in an economic system dominated by market transactions. Sen's arguments paved way to examining intra-household distribution and allocation of food to individuals leading to the famous concept of 'entitlement'. Prof. Sen categorised entitlement into four categories – production based, trade based, own labour and inherited or transfer-based entitlements. A person must have at least one of the above four categories of entitlements to access the food. This is the reason why despite enough production and food availability at global, national, or local level, there persists a large group of population who are food insecure.

This chapter presents a comprehensive analysis of the economic, social, and physical factors such as household expenditure on food, food price inflation, wage rates, socially vulnerable groups, access to road, access to subsidised food and social support, to study the implications on the people of Rajasthan. The chapter also analyses the macro-nutrient intake (energy, protein, and fat) and its disparities across districts and among the poor and vulnerable communities to gain a wholesome perspective on the access to food in Rajasthan.

4.2. Patterns and expenditure of share of food in total household expenditure

Engel's law states that when the households have lower income (poor household), their ratio of food expenditure to total expenditure remains higher. More the income, lesser the proportion of households' expenditure being spent to access

27 Sen, A.K., 1981, *Poverty and famine: An essay on entitlement and deprivation*, Oxford University Press, Oxford.

food. Here, an attempt has been made to understand this ratio with the NSS Consumption Expenditure Survey data of three rounds – 55th (1999-2000), 61st (2004-2005) and 68th (2011-12).

As per the 68th NSS household consumption expenditure survey (2011-12)[28], **the proportion of expenditure on food in Rajasthan is similar to the national average**, with 48.1 percent and 48.6 percent among rural populations of Rajasthan and India, respectively, and 39.8 percent and 38.5 percent among urban populations of Rajasthan and India, respectively. Across all states in India, including Rajasthan, it has been observed that rural populations spend a higher proportion of their income on food compared to urban populations. **In terms of the ratio of food expenses to total expenditure, Rajasthan fares better than most larger states in India such as Assam, Bihar, Jharkhand, West Bengal and Odisha, and is equivalent to states like Maharashtra, Madhya Pradesh and Uttarakhand, both in rural and urban areas.** While Kerala has the least spending (35.4 percent in rural and 33.7 percent in urban) on food, the rural population in Assam (57.3 percent) and urban population of Bihar (45.1percent) account for the highest share of food expenses to total expenditure in India. The most vulnerable group in India, which constitutes the bottom 25 percent of the population based on monthly per capita expenditure (MPCE) fractile, spend more than half of their income on food, regardless of the state they are in. **However, it is worth noting that the bottom 25 percent in rural Rajasthan fare better than their rural counterparts in most other states in India, except for Goa, where food expenditure is relatively lower.** From 1999 to 2012, the proportion of expenditure on food compared to total expenditure consistently declined among both rural and urban populations in Rajasthan and India, with a steeper decline observed in rural areas. Between 2004 and 2012, the decline was slower among urban populations compared to rural populations in Rajasthan and India. Additionally, **Rajasthan is one among the three states in India where urban populations in the bottom 25 percent have slightly higher spending on food than their rural counterparts.** The other two states are Kerala and Jammu & Kashmir[29].

Overall, leaving aside nine districts in Rajasthan, the food expenditure contributes to half or more of the total expenses in the remaining 23 districts. Jhalawar has the highest and Jaipur has the lowest share on food expenses

28 Schedule Type 1, NSS 68th Round 2011-12

29 Undivided Jammu & Kashmir

Source: Various rounds of NSSO Consumer Expenditure Surveys published by the Ministry of Statistics and Programme Implementation, Government of India

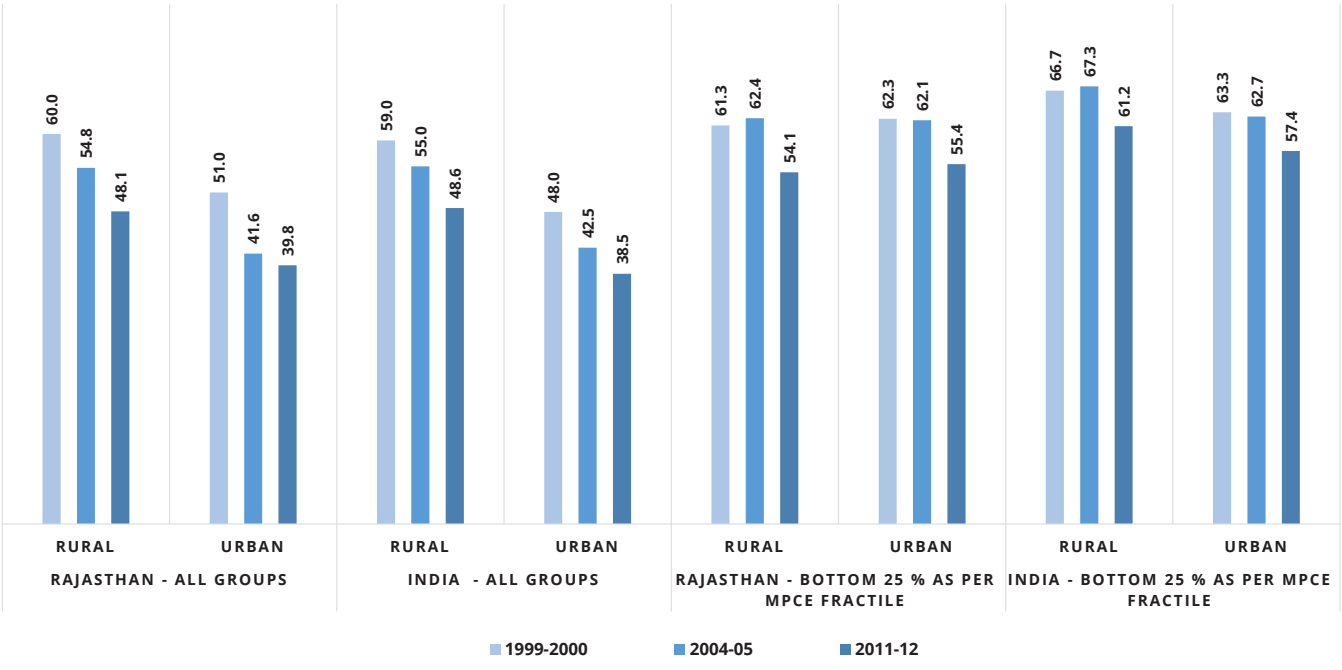


Figure 32: Share of food in Total expenditure in Rajasthan and India, 1999-00 to 2011-12, in percentage.

Source: Calculated from NSS 68th round of Consumption Expenditure Survey, 2011-12

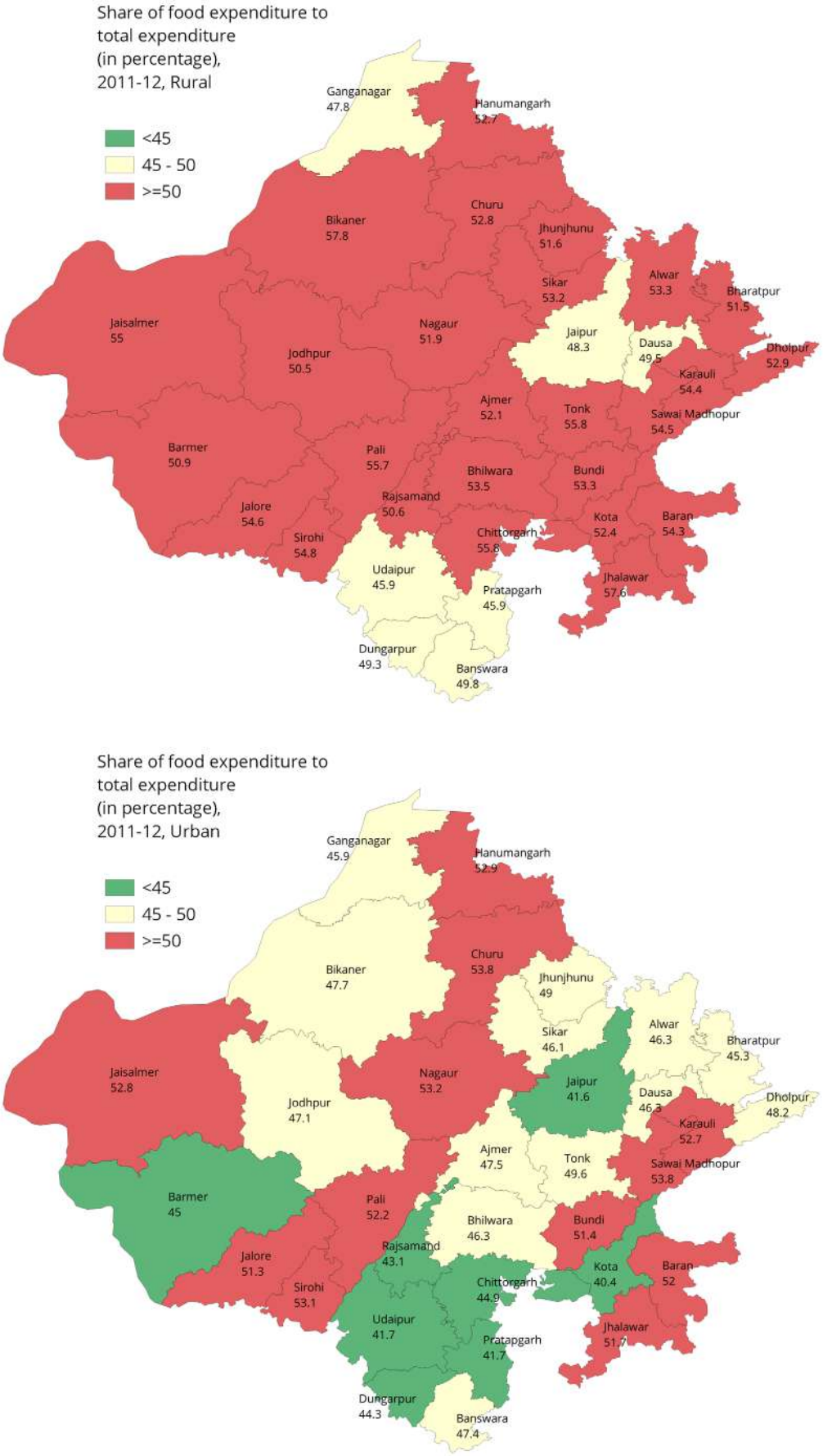


Figure 33: Share of food expenditure to total expenditure in a) rural and b) urban Rajasthan, 2011-12, in percentage.

in total expenses across all districts. Deeper analysis at district level (figure 33) reveals huge inequalities among rural and urban counterparts. The share of expenses on food ranges from 45.9 to 57.8 percent in rural areas, with 80 percent districts spending half or more of their total expenses on food. Whereas, in the urban areas, the share of expenses ranges from 40.4 to 53.8 percent with more than 60 percent districts sharing less than half of their total expenses on food.

However, the disparity in terms of share of food expenses is higher in urban than rural counterparts, where the latter exhibit a more uniform spending pattern. Bikaner (57.8 percent) and Jhalawar (57.6 percent) are among the districts that have the highest share on food expenses while Udaipur the lowest (45.9 percent) in rural Rajasthan. Whereas, in urban Rajasthan, Churu and Sawai Madhopur at 53.8 percent have the highest share while Kota (40.4) has the least share of food expenditure to total expenditure.

Even within districts, the pattern of food expenditure share to total expenditure varies widely (figure 34). Except Nagaur, Churu and Hanumangarh, in all remaining

Source: Calculated from NSS 68th round of Consumption Expenditure Survey, 2011-12

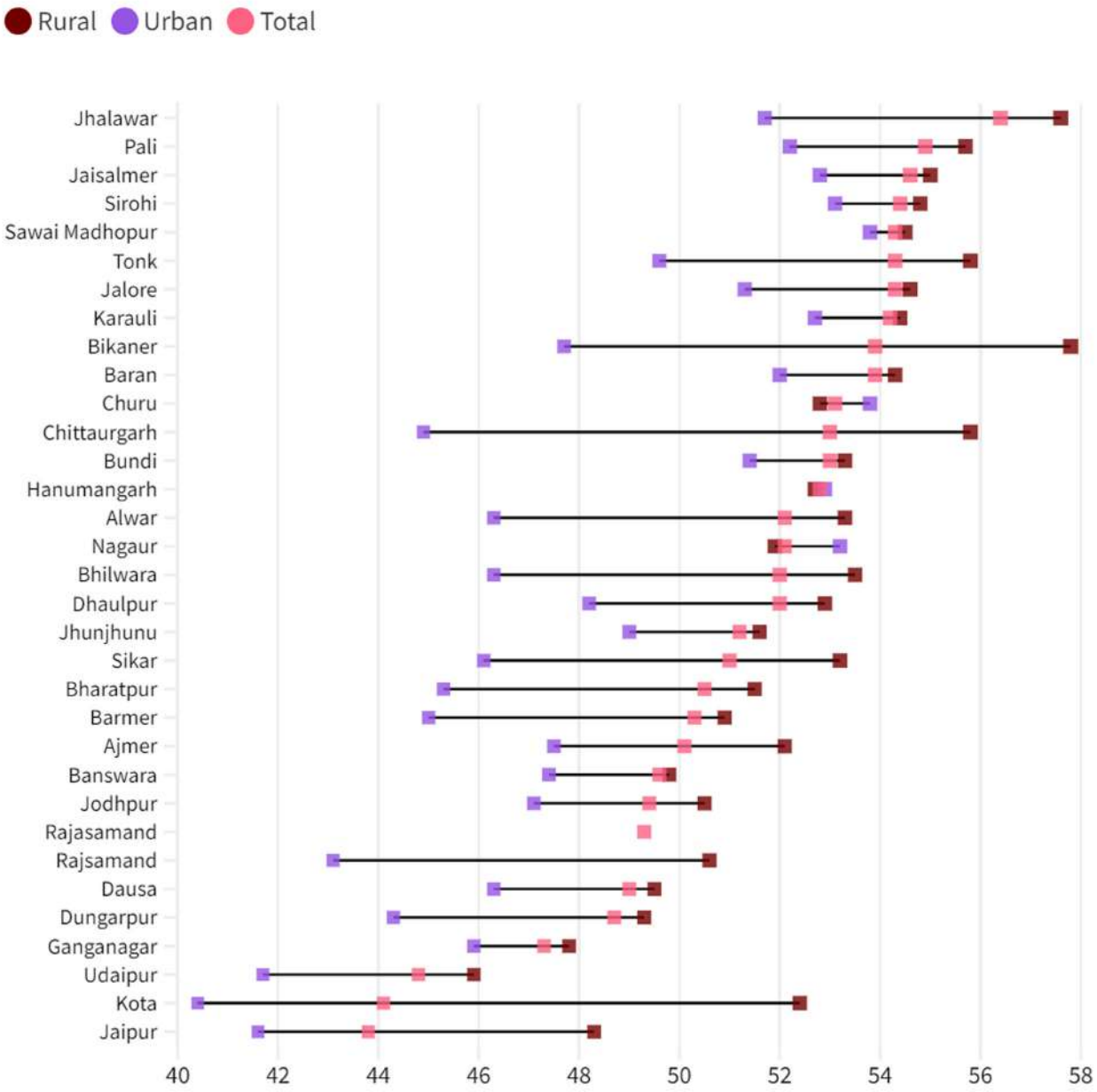


Figure 34: Percentage of Food expenditure to total expenditure (total MPCE levels) in across rural, urban, and total Rajasthan, 2011-12, in percentage.

districts, the share of food expenditure is higher in rural counterparts than in urban. Kota followed by Chittaurgarh and Bikaner show maximum difference (10-12 percent) between rural and urban counterparts with respect to the percentage of share of food expenditure to total expenditure, with rural contributing higher on food expenses than the urban.

4.3. Trends in Food Price Inflation

Food price inflation has a direct bearing on access to food particularly among those vulnerable households who are already spending most of their money to buy food. The graphs on Consumer Price Indices (CPI) with 2012 as base year, indicate that food inflation has been mostly consistent with the general inflation in Rajasthan, increasing secularly over the years. The food inflation was higher than general inflation between September 2019 and October 2020, with maximum spurt in November 2019 to January 2020, coinciding with onset of COVID-19 pandemic. While the rise in inflation in food and beverages dropped between November 2020 and March 2021 by 4.6 percent, it again gained momentum and rose by 6.8 percent by December 2021. The CPI for cereal and cereal products, shows a sharp increment of nearly 19 percent between January 2018 to February 2020 (figure 35). Interestingly, due to strategic measures by the national and state government in response to COVID-19, the CPI for cereals and cereal products showed a significant decline up to 7.7% from August 2020 to March 2021.

Furthermore, the CPI for major sources of protein and fat such as, pulses, milk and oil have also been increasing over the years, with highest inflation observed in oil and oil products. It is important to note, that except for cereals and cereal products, where the prices have been slightly higher in urban than in rural areas specifically after August 2020, the prices for all other food commodities such as pulses, oils, milk, and their products are much higher in rural areas compared to urban counterparts in Rajasthan.

4.4. Dietary Intake: Trends and Patterns

Food provides us energy and nutrition to lead an active and healthy life. The dietary changes that characterise the "nutrition transition" include both quantitative and qualitative changes in the diet. Income, prices, individual preferences and beliefs, cultural traditions as well as geographical, environmental, social, and economic factors all interact in a complex manner to shape the

Source: Consumer Price Indices for various year published by the National accounts Division, Ministry of Statistics and Programme Implementation, Government of India

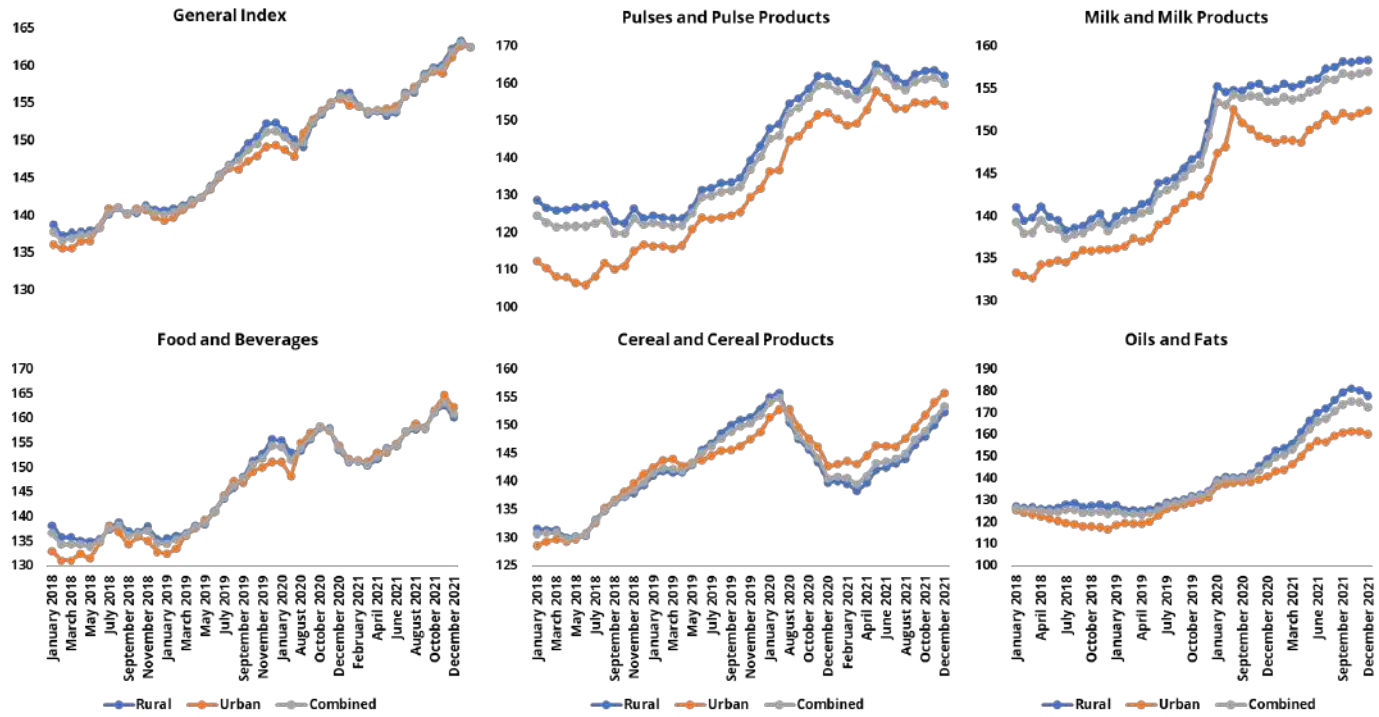


Figure 35: Trends of Consumer Price Indices (CPI) in Rajasthan, 2018 to 2021 (Base year 2012=100)

dietary consumption pattern (WHO, 2003). It is therefore not only important to understand the access to the food per se but also access to its macro-nutrients – energy, protein, and fat. Using the NSS consumption expenditure data, the energy, protein, and fat consumption have been analysed across various parameters like income levels, sector, social group, to understand the level of accessibility of these macro-nutrients in Rajasthan and its districts with respect to the norms set by the Expert Group on Poverty Measurement, 2014 for rural and urban population in India. The average per person per day calorie, protein, and fat intake in Rajasthan, both in its rural and urban areas has remained higher compared to all-India, and above the acceptable norms set by Rangarajan Expert Group. Overall, there has been a declining trend in energy and protein intake in both Rajasthan and India from 1999-2000 to 2011-12[30]. However, the fat intake remains twice high than the recommended norms and has increased substantially in rural areas (6.8 percent in Rajasthan) and in urban areas (5.2 percent in Rajasthan) specifically between 2004-05 and 2011-12. Similar gains in fat consumption are observed at national level from 2004 to 2012 in rural and urban areas respectively.

30 Schedule Type 1, 68th NSS round, 2011-12

Box-1: Energy, Protein and Fat Norms: Expert Group on Poverty Measurement, 2014 and NIN ICMR Norms, 2020

The energy norms based on which the Task Force (Alagh) poverty lines were derived, and which had been the basis for the poverty lines worked out by the Expert Group (Lakdawala), is 2,400 kcal per capita per day in rural areas and 2,100 kcal per capita per day in urban areas. The Expert Group chaired by Dr. C. Rangarajan was appointed by the Planning Commission to review the methodology for estimation of poverty in India. The Expert Group (Rangarajan) took a considered view that deriving the food component of the Poverty Line Basket by reference to the simultaneous satisfaction of the all three nutrients (Energy, Protein and Fat), norms would be appropriate when seen in conjunction with the emphasis on a full range of policies and programmes for child-nutrition support and on public provisioning of a range of public goods and services, aimed at the improvement of the disease environment faced by the population. Accordingly, the Expert Group (Rangarajan) computed the average requirements of energy, protein, and fat on ICMR norms (2009) differentiated by age, gender, and activity for all-India rural and urban regions to derive the normative levels of nourishment and worked out the energy requirement as 2,155 kcal per person per day in rural areas and 2,090 kcal per person per day in urban areas. The protein and fat requirements were estimated on the same lines as for energy: these requirements are 48 grams and 28 grams per capita per day, respectively, in rural areas; and 50 grams and 26 grams per capita per day in urban areas.

In 2020, NIN-ICMR released revised norms for macro and micronutrients intake segregated by age, gender, and activity for all-India.

	Energy (kcal/ capita/day)	Protein (gram/ capita/day)	Fat (gram/capita/ day)
Expert Group on Poverty Measurement, 2014			
Rural	**2,155**	**48**	**28**
Urban	**2,090**	**50**	**26**
ICMR – NIN Expert Group Report, 2020			
Male			
Sedentary	**2110**	**54**	**25**
Moderate	**2710**		**30**
Heavy	**3470**		**40**
Female			
Sedentary	**1660**	**46**	**20**
Moderate	**2130**		**25**
Heavy	**2720**		**30**

In contrast, for bottom 25 percent population (based on MPCE fractile), though the energy intake improved on an average by approximately 150 Kcal during 1990 to 2012, yet the consumption is far below the recommended norms for adequate energy intake both in rural and urban areas in Rajasthan. The consumption of protein among the bottom 25% remains marginally above the recommended norms both in urban and rural counterparts of Rajasthan in 2011-12. While the protein intake dipped by 1.3 grams per capita on an average in rural areas, the intake increased by 3.5 grams in urban counterparts between 2004 and 2012 in bottom 25% population in Rajasthan. In rural areas, the average fat intake per capita reached well above the recommended norms of 28 grams for the first time in 2011-12 among bottom 25 percent. In urban counterparts, the average fat intake that just remained marginally above the recommended norms until 2004-05, increased substantially from 28.9 grams in 2004-05 to 39.5 grams in 2011-12, among the bottom 25 percent in Rajasthan. However, **the intake of energy, protein, and fat in bottom 25 percent population in Rajasthan is higher than those at the bottom 25 percent at national level** (figure 36).

The per capita per day energy, protein and fat intake also varies with various subgroups both in rural and urban Rajasthan (figure 37). A person's capacity to spend, plays a crucial role in determining adequate intake of nutrients among population in both rural and urban households.

As captured by monthly per capita expenditure (MPCE) groups, a gradual increase in intake of energy, protein and fat is observed per capita per day, with upward increase in MPCE groups. **Those among the bottom 20 percent consume approximately a thousand calories less than those in top 20 percent both in rural and urban areas. Moreover, in rural areas, a person consumes 291 calories less on an average per day, while in urban areas, the average consumption is 367 calories less per day, with respect to the recommended energy intake, making them the most vulnerable, who require specific attention to address their nutritional needs.**

Social group is another important factor in determining adequate intake of nutrients. Those belonging to scheduled tribe or scheduled caste are observed to consume relatively less calories, protein, and fat per day than their counterparts. With respect to agroclimatic zones, those belonging to southern agroclimatic zone fare worse in terms of average energy, protein and fat intake per day compared to those belonging to other agroclimatic zones. Moreover, the average per day energy intake among person living in southern zone of rural Rajasthan is marginally less than the recommended energy intake. Among the livelihood groups, the per capita per day energy, protein and fat deprivation is highest among those employed as the casual labour in non-agriculture in rural areas, and casual labour in urban areas.

Source: Various rounds of NSSO Consumer Expenditure survey published by the Ministry of Statistics and Programme Implementation, Government of India

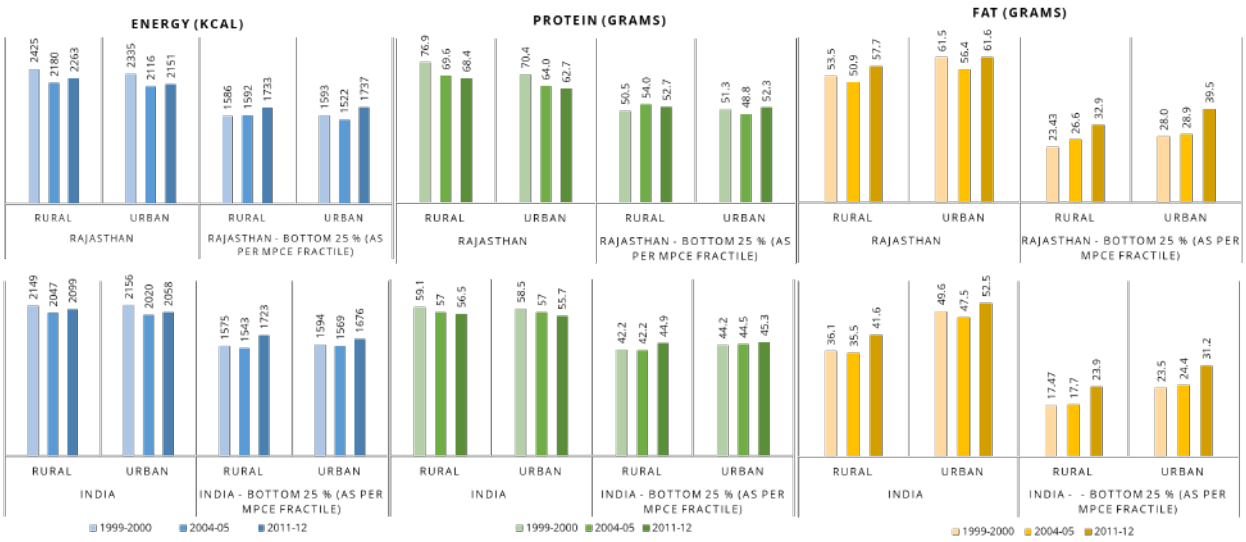


Figure 36: Trends of Per Capita Per Day Energy (KCal), Protein (in grams) and Fat (in grams) Intake in Rural and Urban Areas of Rajasthan and India and among the poorest 25 percent, 1999-2000 to 2011-2012.

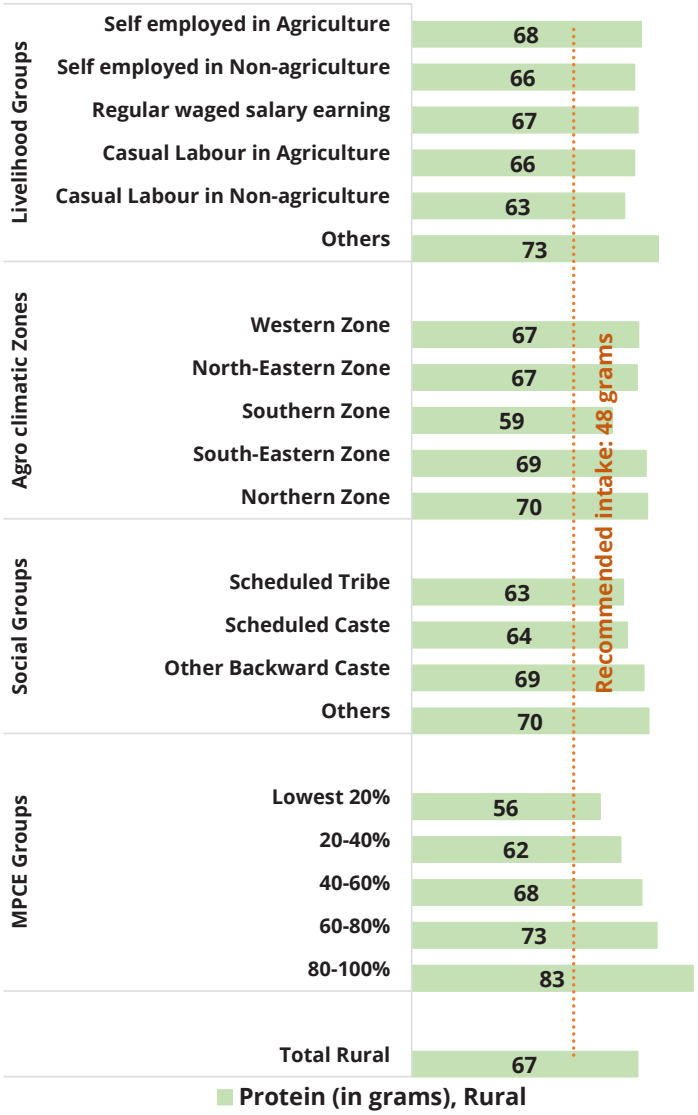
Source: Calculated from NSS 68th round of Consumption Expenditure Survey, 2011-12.

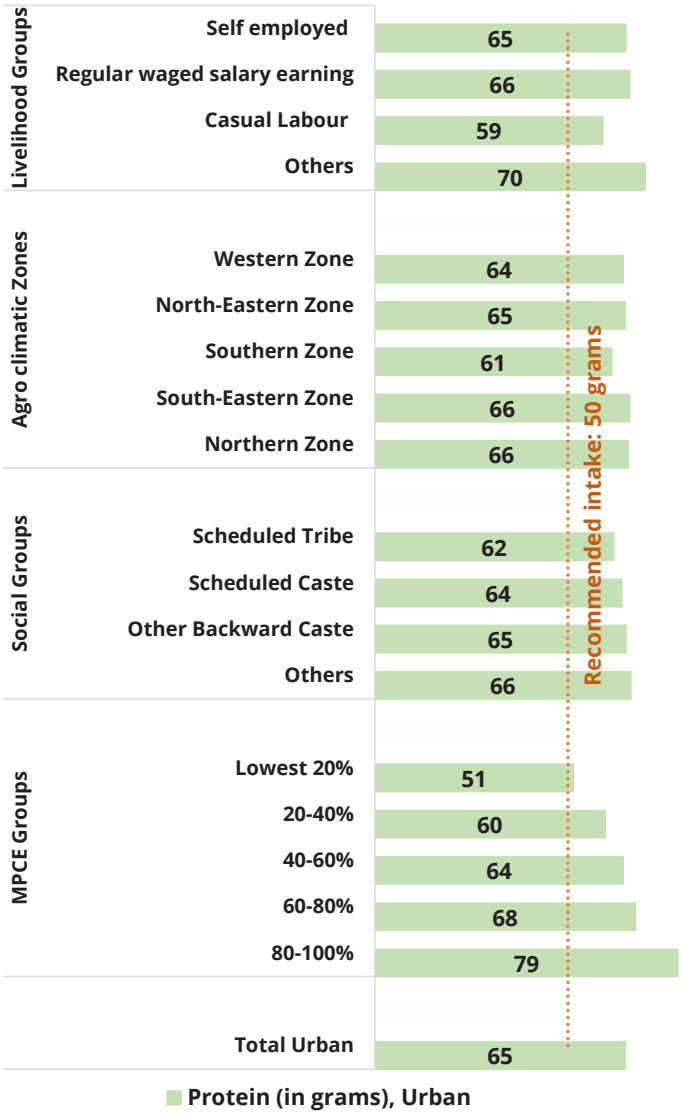
Figure 37: Per Capita Per Day Energy (in Kcal), Protein (in grams) and Fat intake (in grams) in Rural and Urban Rajasthan by Background Characteristics, 2011-12.

4.5. District Level Trends and Patterns of Nutrient Intake

The district level trends show wide disparity across Rajasthan in per day per capita energy, protein, and fat intake across Rajasthan both among urban and rural population, as per 68th NSS consumption expenditure survey (figures 38 to 40).

In rural areas, Jodhpur has the highest intake of energy per day per capita, while Udaipur has the least, approximately 1000 calories intake less on an average than consumed by person in Jodhpur. Whereas, in urban areas, average per day per capita energy intake is poorest among population in Tonk, and highest in Baran, with a difference of approximately 500 calories. In rural Rajasthan, six districts– Chittaurgarh, Tonk, Dungarpur, Sirohi, Dausa and Udaipur, majorly falling in the southern belt, fail to meet the daily recommended energy intake per person, while Bharatpur, Dausa and Tonk have the inadequate per capita per day energy intake in urban Rajasthan. There also exist significant difference in energy intake by per capita per day between the rural and urban counterparts within a same district. In 18 out of 32 districts, average energy intake per day is higher among rural population than in urban. However, districts like Bharatpur and Hanumangarh needs special attention, where the energy intake per person per day fails to meet the recommended norms in urban areas, while it is adequate in rural areas. Similarly, districts like Udaipur and Sirohi have shortfall in meeting the daily recommended norms energy intake per capita in the rural areas, while people in urban parts have adequate consumption. Interestingly, Jodhpur that leads in terms of energy intake per capita per day in rural areas across districts has the highest rural-urban difference, with people in urban Jodhpur consuming about 600 calories

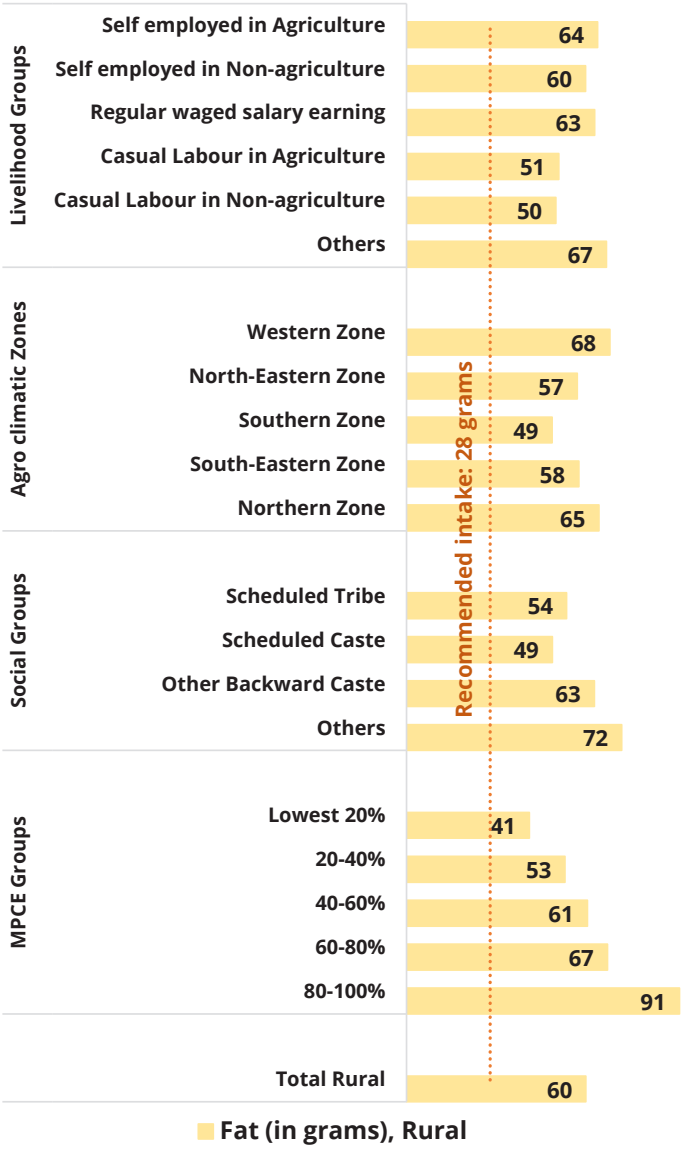


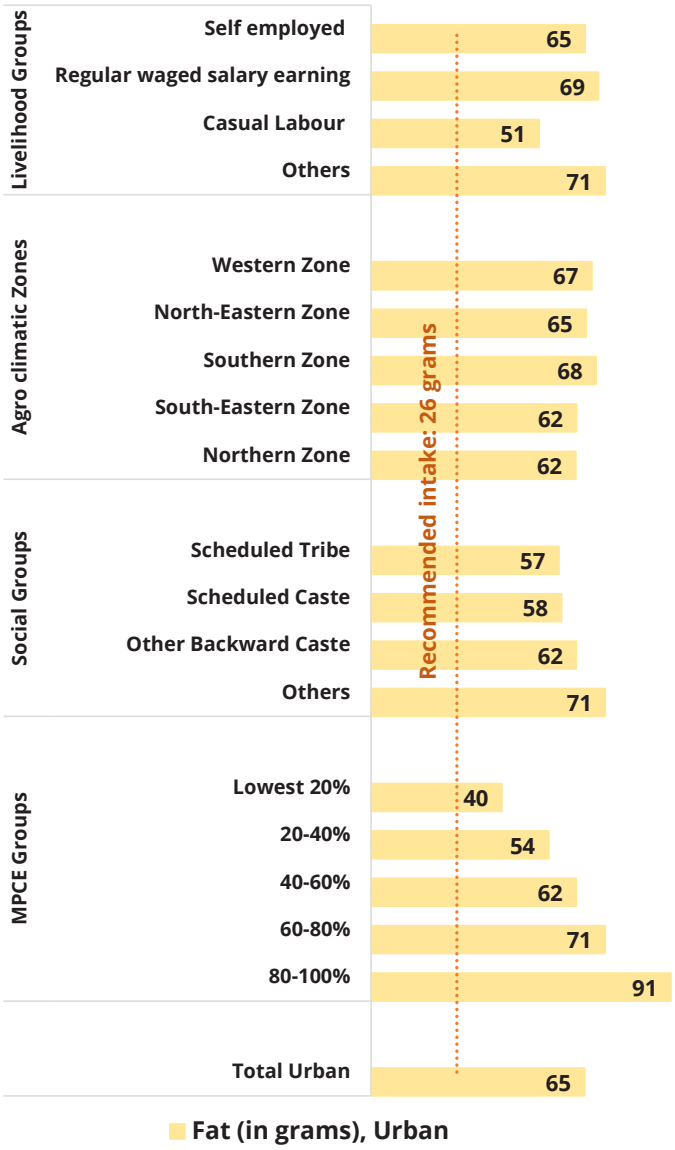


less per day on an average than those in rural areas.

In terms of protein intake, while all districts have adequate consumption, and above the recommended intake per person per day, yet there exist wide disparities in consumption across districts and within rural-urban counterparts in the same district in Rajasthan. In rural areas, Udaipur has the lowest protein intake of 54 grams, while Sri Ganganagar has the highest per day per capita intake at 81 grams. In urban areas, the lowest per day per capita intake of protein in observed in Tonk (57 grams) and highest in Baran (73 grams). Sri Ganganagar has the maximum difference in average daily protein intake per capita between the rural and urban counterparts, with urban populace consuming 19 grams less protein on an average than the rural counterparts per day.

The daily fat intake per capita is much higher than the recommended intake both in rural and urban Rajasthan and varies greatly within and across districts. In rural areas, Dungarpur has the lowest fat intake (45 grams) and Jodhpur the highest (93 grams), whereas in urban areas, Dhaulpur has the least (50 grams) and Chittaurgarh, the highest protein intake per day per capita at 77 grams.





The districts in the southern belt- Dungarpur, Banswara, Chittaurgarh, Sirohi and Udaipur have the maximum difference in the fat consumption per capita per day, i.e., 18 grams or more, higher consumption of fat in urban areas than in rural, whereas, in Jodhpur, the consumption of fat per capita per day is 27 grams higher in rural areas, than in urban. The urban areas within the central to southern belt-Chittorgarh, Udaipur, Ajmer, Jaipur, Bikaner, Sirohi, Pali, Banswara and Sikar in addition to Barmer and Jodhpur in the west tend to exhibit elevated daily average per capita fat consumption, whereas a cluster of districts in the north-western region-Jodhpur, Ganganagar, Jaisalmer, Nagaur and Bikaner displays increased daily average fat intake per capita in rural areas in Rajasthan.

4.6. Trends in Nutritional Intake Across Food Basket

In the NSS Consumption Expenditure surveys, food items are broadly grouped into nine major groups- cereals, roots & tubers, sugar and honey, pulses, nuts & oilseeds, vegetables and fruits, egg, fish & meat, milk & milk products, oils, and fats and, miscellaneous foods. Based on this classification, changes in major sources for calorie and protein intake among the rural and urban population in Rajasthan have been analysed between 2004-05 and 2011-12 using data from 61st and 68th rounds of NSS Consumption Expenditure Surveys respectively. Cereals constitute the major source of energy intake in both rural and urban Rajasthan in both the periods - 2004-05 and 2011-12, followed by milk and milk products. However, it is important to note that share of calorie intake from

Source: Calculated from NSS 68th round of Consumption Expenditure Survey, 2011-1

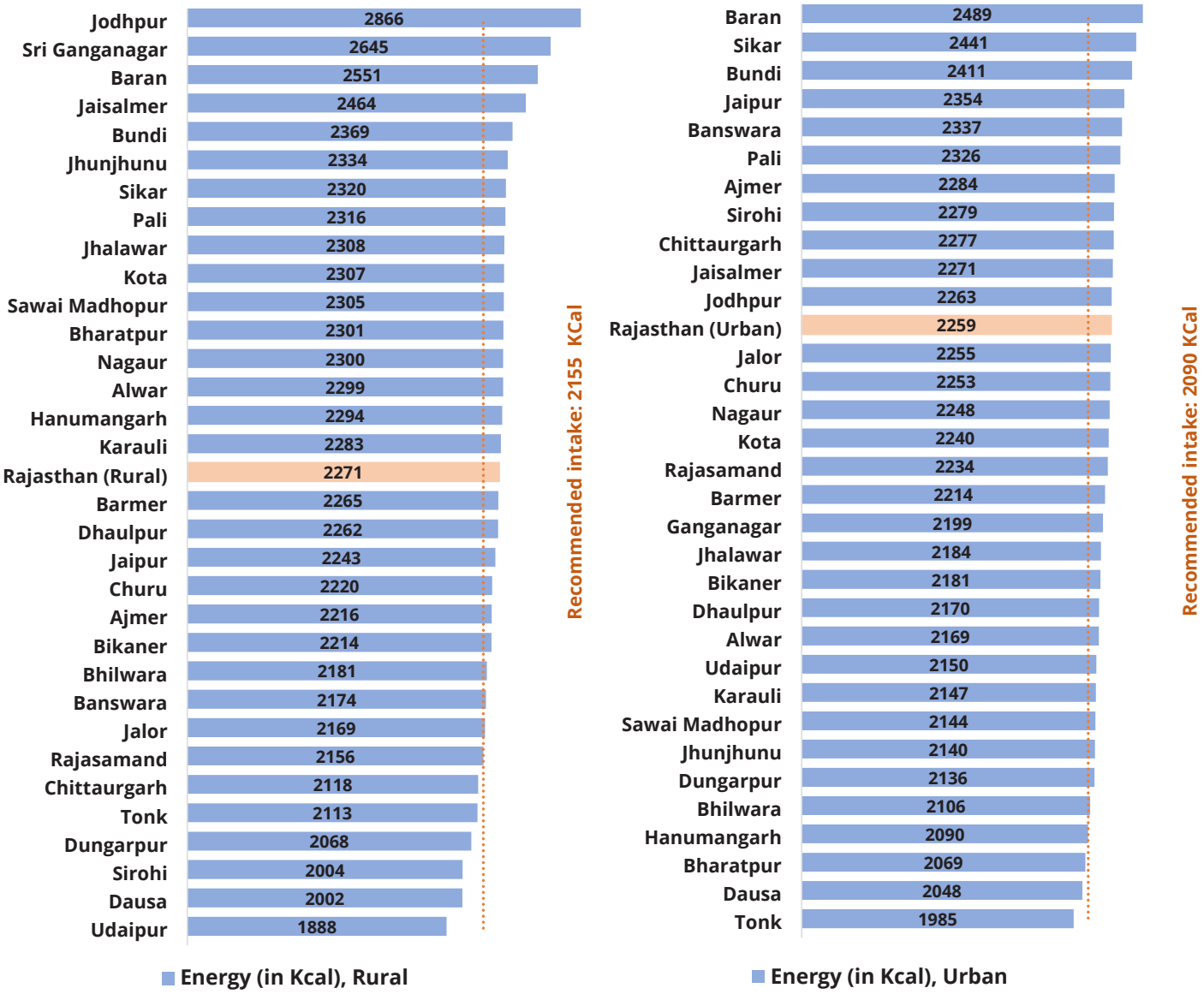


Figure 38: Per Capita Per Day Calorie (in Kcal) by districts in Rural and Urban Rajasthan, 2011-12

'cereals' has reduced both in rural and urban Rajasthan, while it has increased in equal proportion from oils and oil products and from miscellaneous sources between 2005-06 and 2011-12, indicating a transition in food choices for energy intake (figure 41).

'Cereals' continue to be the major source of protein intake in both rural and urban Rajasthan. Second major source of protein remains milk and milk products. The share of good quality animal protein in the form of egg, fish and meat remains at one percent in both rural and urban areas reflecting vegetarianism in the population. Whereas the share of plant-based protein from pulses remains stagnant at six percent between the period 2004-05 and 2011-12 in Rajasthan. It is important to note that cereals are deficient in essential dietary amino acids such as lysine, that are important for improving the muscle mass and preventing muscle loss[31], thereby offering a poor substitute for good quality protein. Therefore, despite the daily protein intake per capita meeting the recommended norms in Rajasthan, the quality of protein consumed remains a concern (figure 42).

The recent NFHS-5 findings also confirm the predominance of vegetarianism among population in Rajasthan, as

31 Minocha, S., Makkar, S., Swaminathan, S., Thomas, T., Webb, P. and Kurpad, A.V., 2019. Supply and demand of high-quality protein foods in India: trends and opportunities. *Global Food Security*, *23*, pp.139-148.

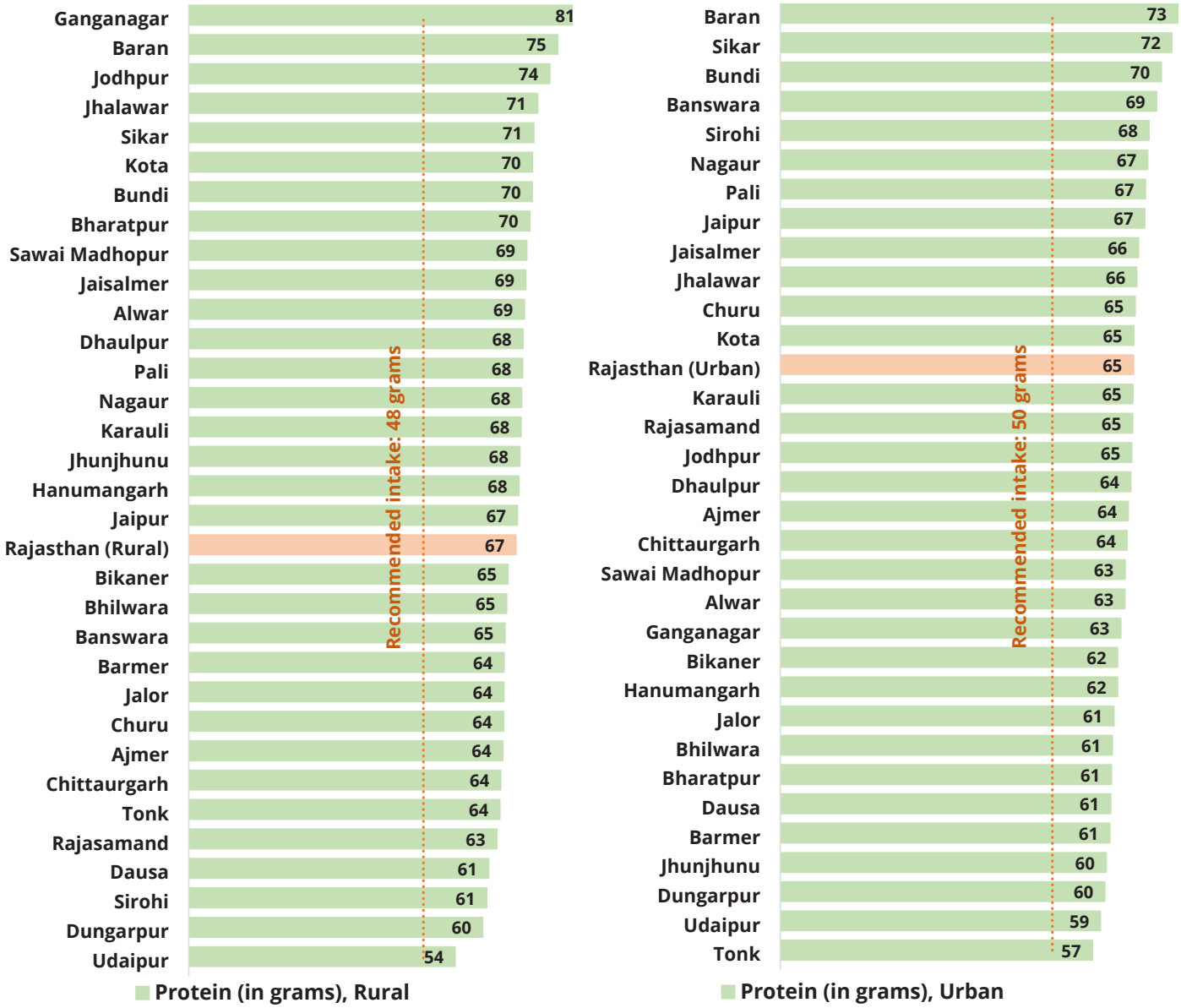


Figure 39: Per Capita Per Day Protein Intake (in grams) by districts in Rural and Urban Rajasthan, 2011-12.

reflected from low consumption of eggs, meat, and fish (figure 43). While 69 percent of women have reported to have never consumed eggs, 52 percent men consumed eggs daily, weekly, or occasionally. Women, specifically tend to opt for more vegetarian choices than men largely due to religious and cultural biases[32]. About seven in ten adults (both men and women) consume milk and curd daily, while only three in ten adults consume pulses or beans each day. Daily consumption of dark green leafy vegetables is higher among women than men. More than 50 percent men and women consume fruits only on occasional basis. Weekly consumption of fried foods is higher among women than men, while men tend to consume aerated drinks more frequently than women.

Next, we examine the factors such as occupational structure, agricultural wages, and access to paved roads, which crucial to enhancing the accessibility to food, specifically among the vulnerable households.

4.7. Occupational Structure

The contribution of agriculture sector in Rajasthan is roughly one-third in the state domestic product, accounting to a sizeable population (about 63 percent in rural areas) who are dependent on agriculture for their

32 Natrajan, B. and Jacob, S., 2018. "Provincialising" Vegetarianism: Putting Indian food habits in their place. *Economic and Political Weekly*, *53*(9), pp.54-64.

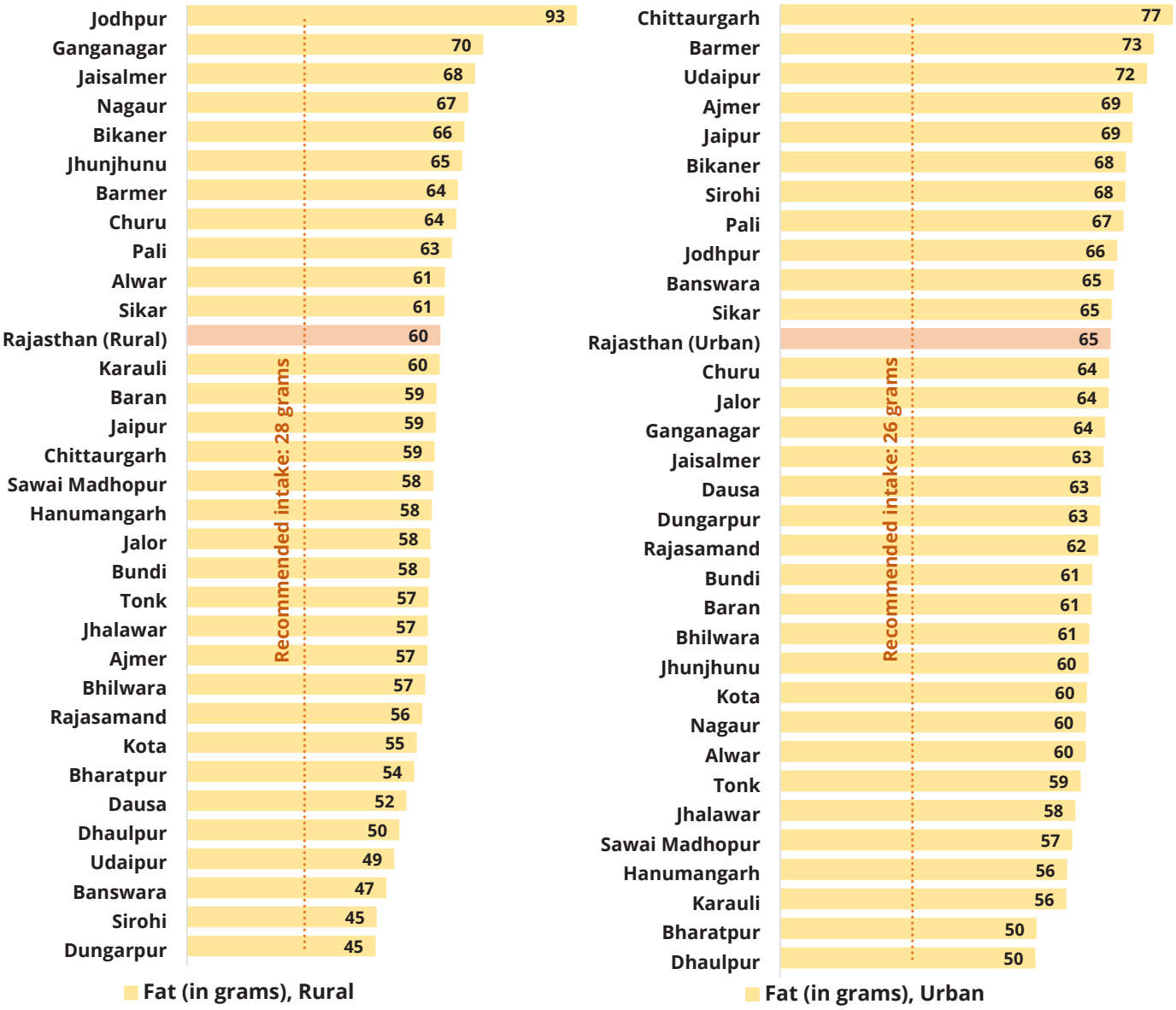


Figure 40: Per Capita Per Day Fat Intake (in grams) by districts in Rural and Urban Rajasthan, 2011-12.

livelihood within the state. As observed across India, benefits of economic growth do not necessarily trickle down equitably to all agriculture sector workers, leading to reduction in number of cultivators and rise in small and marginal farmers and agricultural labourers in recent times[33]. Therefore, the proportion of workforce engaged in agriculture is considered a sign of lack of alternative to better employment opportunities.

As per Census 2011, the work participation rate in Rajasthan stands at 43.6 percent, slightly above the national average of 39.8 percent. Of those who are employed, 16.5 percent work as agricultural labours in Rajasthan (figure 44). While overall labour force participation of males (51.5 percent) is greater than those of females (31.5 percent), the proportion of female agricultural labourers (24.2 percent) is twice the male agricultural labourers (11.7 percent) in Rajasthan (figure 45). Moreover, the proportion of agricultural labourers in rural areas is five times higher than those in urban areas, likely due to increased agricultural activity in rural areas than in urban.

Based on Census 2011 estimates, the district wise analysis shows that the work participation rate is highest (above 50 percent) in Pratapgarh, Chittaurgarh and Banswara and lowest in Kota, Sikar, and Jaipur (below 40 percent). Except Sri Ganganagar and Bharatpur,

33 Chandrasekhar, S., Dev, S.M. and Pandey, V.L., 2019. Pathways from agriculture to nutrition: implications of the occupation structure in rural India. *Gates Open Res*, *3*(894), p.894.

the districts having highest proportion of agriculture labourers (above 20 percent) are clustered in the southern (Dungarpur, Pali, Sirohi, Udaipur, Banswara and Pratapgarh) and south-eastern (Baran, Jhalawar, Bundi) belt of Rajasthan, whereas districts in the north-eastern part – Churu, Sikar, Jhunjhunu and Jaipur have the lowest proportion of agriculture labourers. At least, one in five workers in Dungarpur and Banswara fall in the category of marginal workers, highest proportion across Rajasthan. The proportion of female agricultural laborers is highest (above 40 percent) in Baran, Pali, Jhalawar and Dungarpur and lowest (below 10 percent) in Jaipur and Jhunjhunu (figure 46). In Kota the proportion of female to male agricultural labourer is highest (3.2 times), while Jhunjhunu has almost equal proportion of male and female agricultural laborers. It is to note that there are divergent views with respect to female worker population ratio, where the participation of female in labour market is hailed as an important yardstick of women empowerment, which directly impacts the food and nutrition security at household level. It is observed[3]

Source: 61st and 68th rounds of NSS Consumption Expenditure Surveys published by the Ministry of Statistics and Programme implementation, Government of India

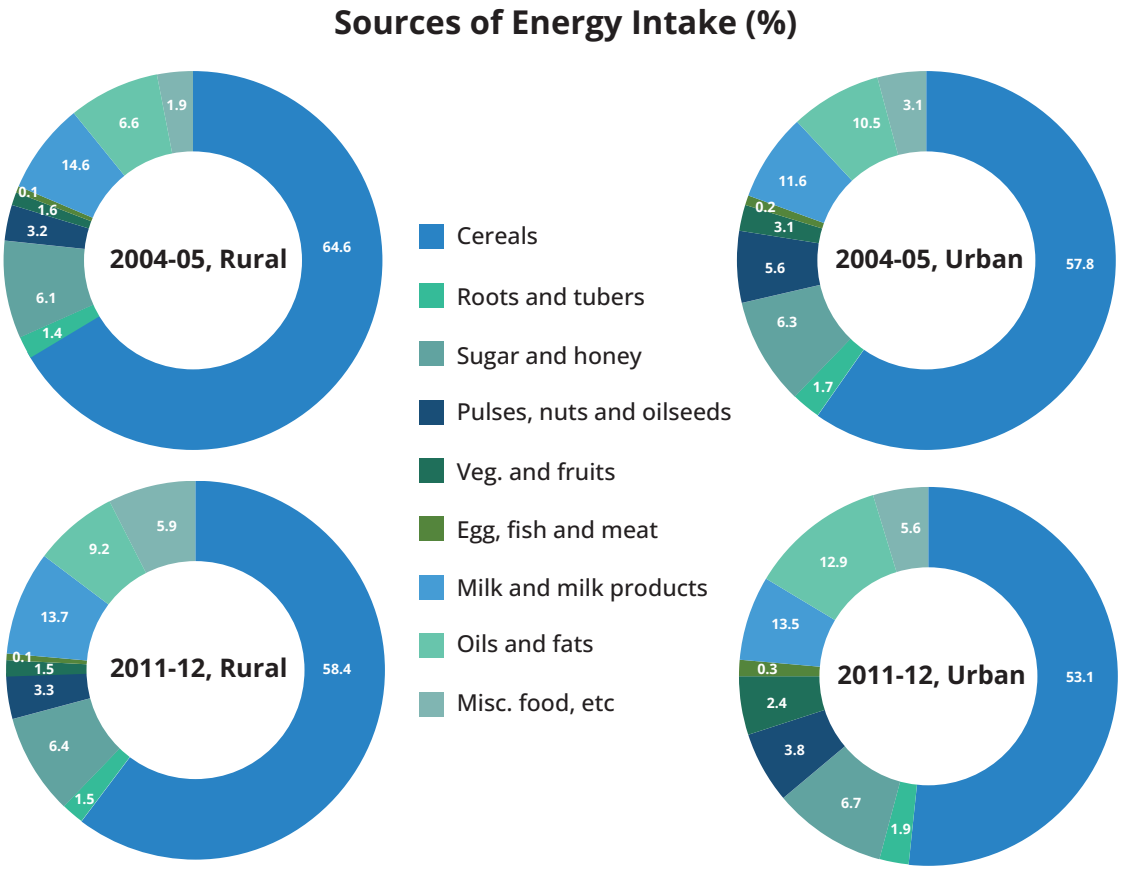


Figure 41: Changes in sources of energy intake in rural and urban Rajasthan, 2004-05 to 2011-12.

Source: 61st and 68th rounds of NSS Consumption Expenditure Surveys published by the Ministry of Statistics and Programme implementation, Government of India

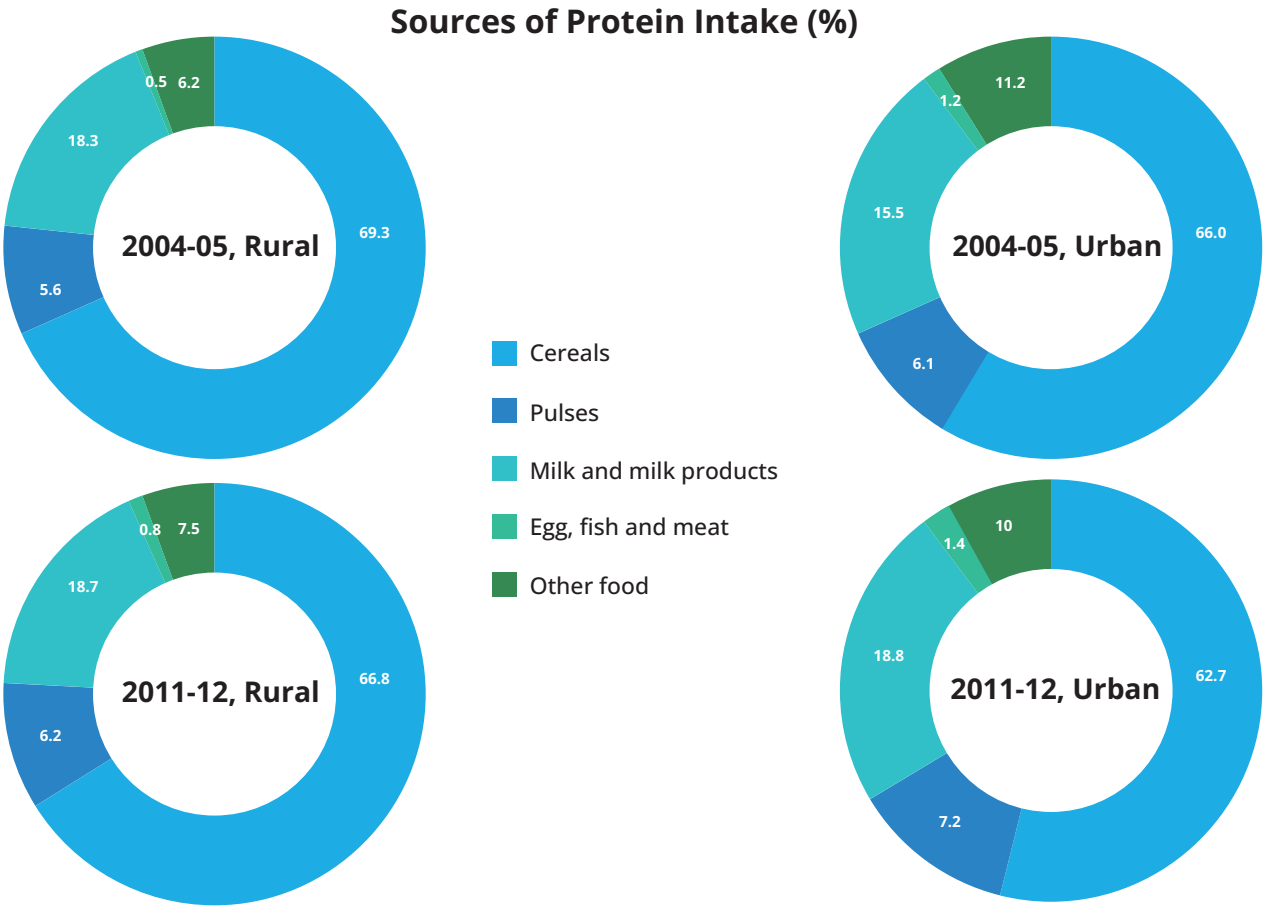


Figure 42: Changes in sources of Protein Intake in rural and urban Rajasthan, 2004-05 to 2011-12, in percentage.

Source: Rajasthan State Report, NFHS-5, 2019-21

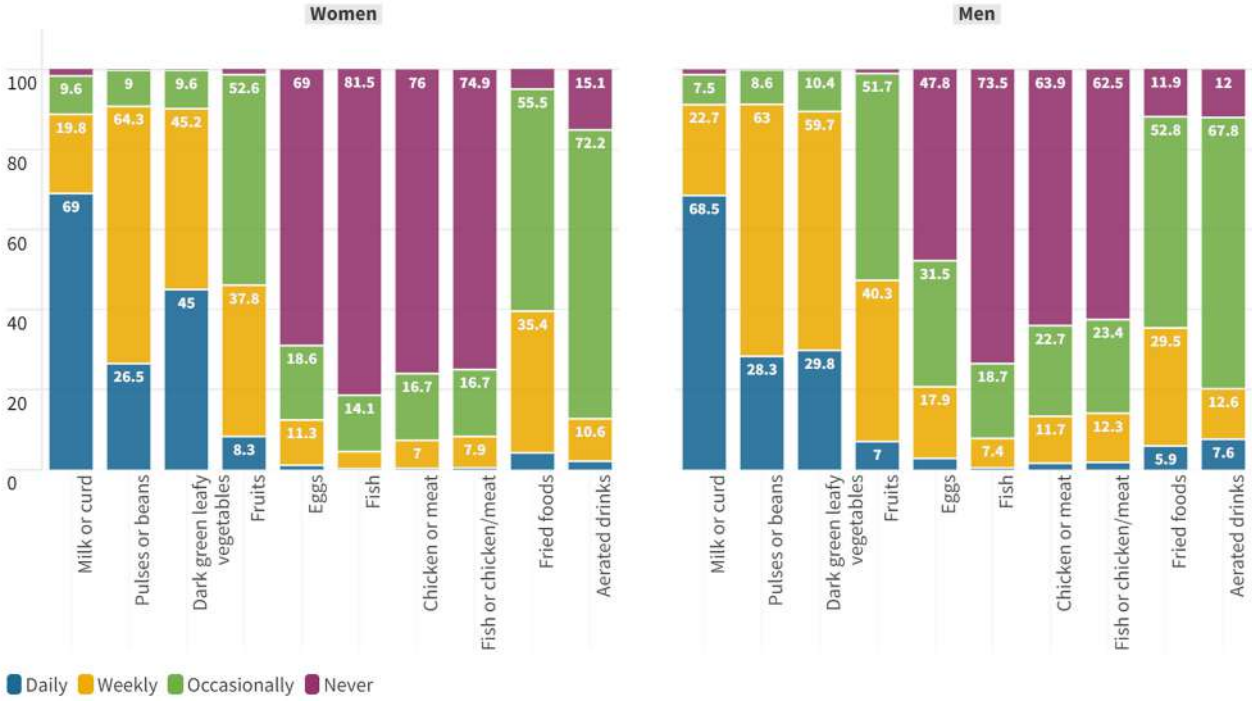


Figure 43: Frequency of consumption of major foods among women and men in Rajasthan, 2019-21, in percentage.

that higher women workforce participation rates translate into their improved socioeconomic status, improved ability to influence household decision making, intra-household food and nutrient allocation and desired dietary diversity.

4.8. Agricultural Wage Rates

In India, casual workers constitute **32.8 per cent** of the total workers. About **95.3 per cent** of casual labour do not have any written job contract[34]. Casual workers tend to be the least protected and have the lowest level of

34 Employment And Unemployment Scheme.2015-16. Labour Bureau of India.

Source: Census 2011

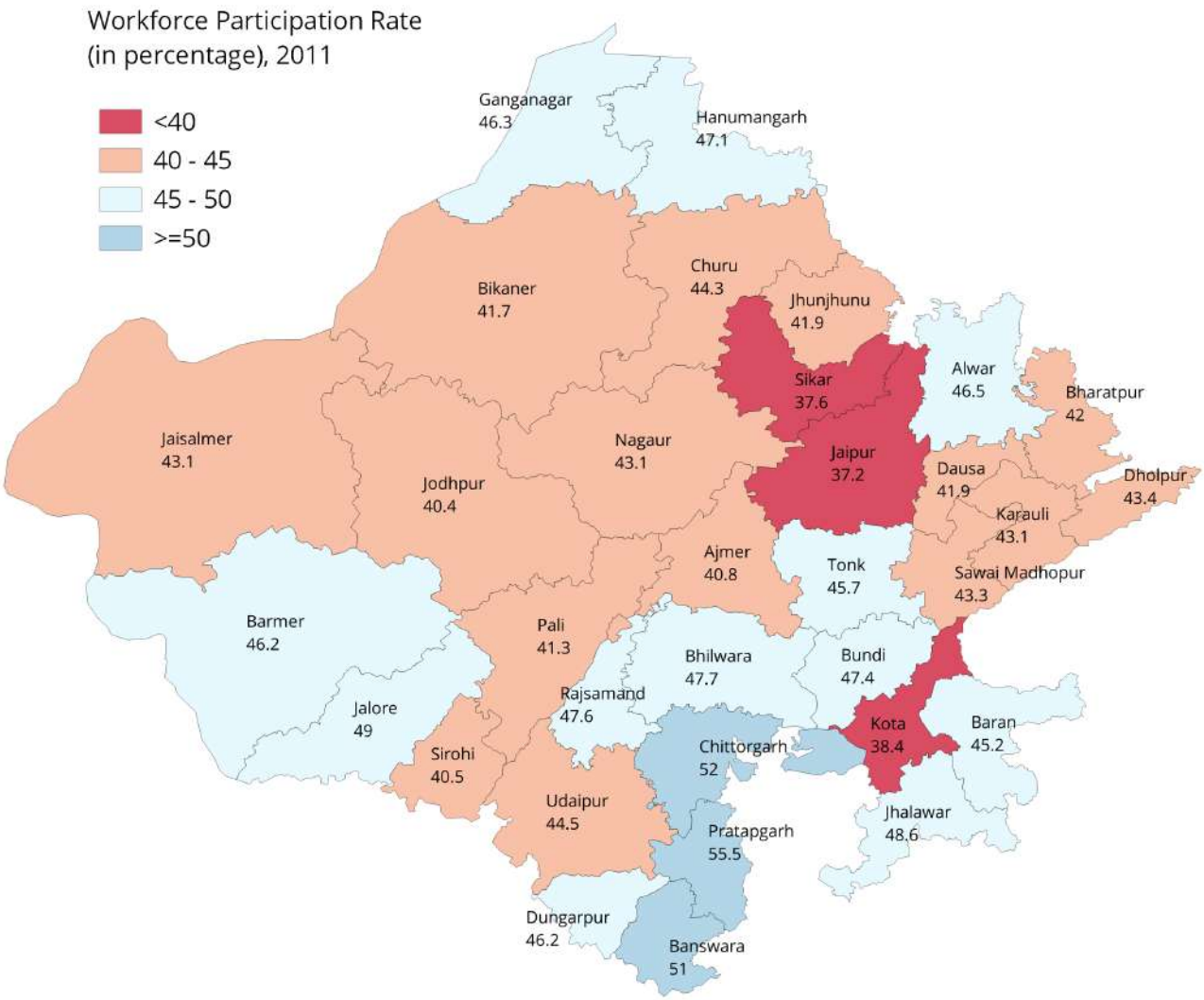


Figure 44: Workforce Participation Rate across districts in Rajasthan, 2011, in percentage.

Source: Census 2011

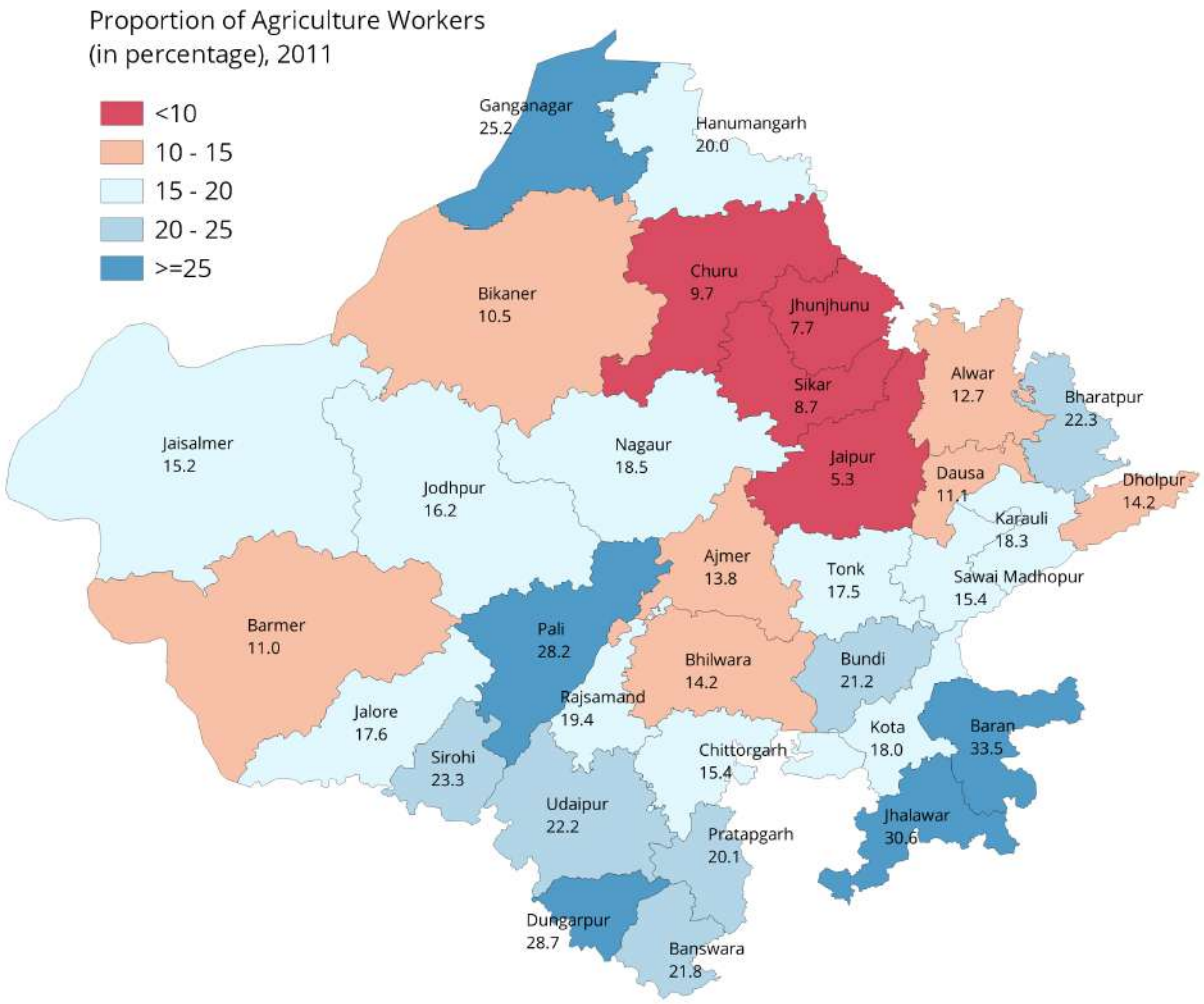


Figure 45: Proportion of Agriculture Labourers across districts in Rajasthan, 2011, in percentage.

earnings. The NSS defines the casual wage worker as one who was casually engaged in others' farm or non-farm enterprises (both household and non-household) and, in turn, received wages according to the terms of the daily or periodic work contract. Casual labour is usually hired based on an hour or day or for the performance of specific tasks. In the absence of income or expenditure-based headcount ratio, the growth in the real wages (i.e., nominal wages adjusted against retail inflation) of the casual workers is a good proxy to assess the trends in poverty. A growth in their real wages is anticipated to improve their purchasing power and lift them out of the poverty trap.

Agricultural labour, without the backing of self-produced food, is particularly vulnerable to food insecurity. The earnings of agricultural labour, are therefore, of a particular concern. Though average daily wage rates for both male and female field labours have improved over the years in Rajasthan (INR 368 for males and INR 303 for females) and stands far above the national average (INR 348 for males and INR 278 for females) as of 2019-20, yet the wages are lower compared to the major states like Kerala, Haryana, Punjab, and Uttarakhand.

Like any other commodity, wages of labour are also determined by the market forces of supply and demand rates and are determined by various factors such as status of agricultural development, including area and productivity of crops, size of holdings, and irrigation facilities.[35] These factors lead to wide variations in wage rates among various states and across districts in a State.

As observed in figure 47, on an average, highest daily

35 Acharya, S., 2005. Poverty and Labour Market Correlates in Nepalese Economy. *Economic journal of Hokkaido University*, *34*, pp.193-213.

Source: Census 2011

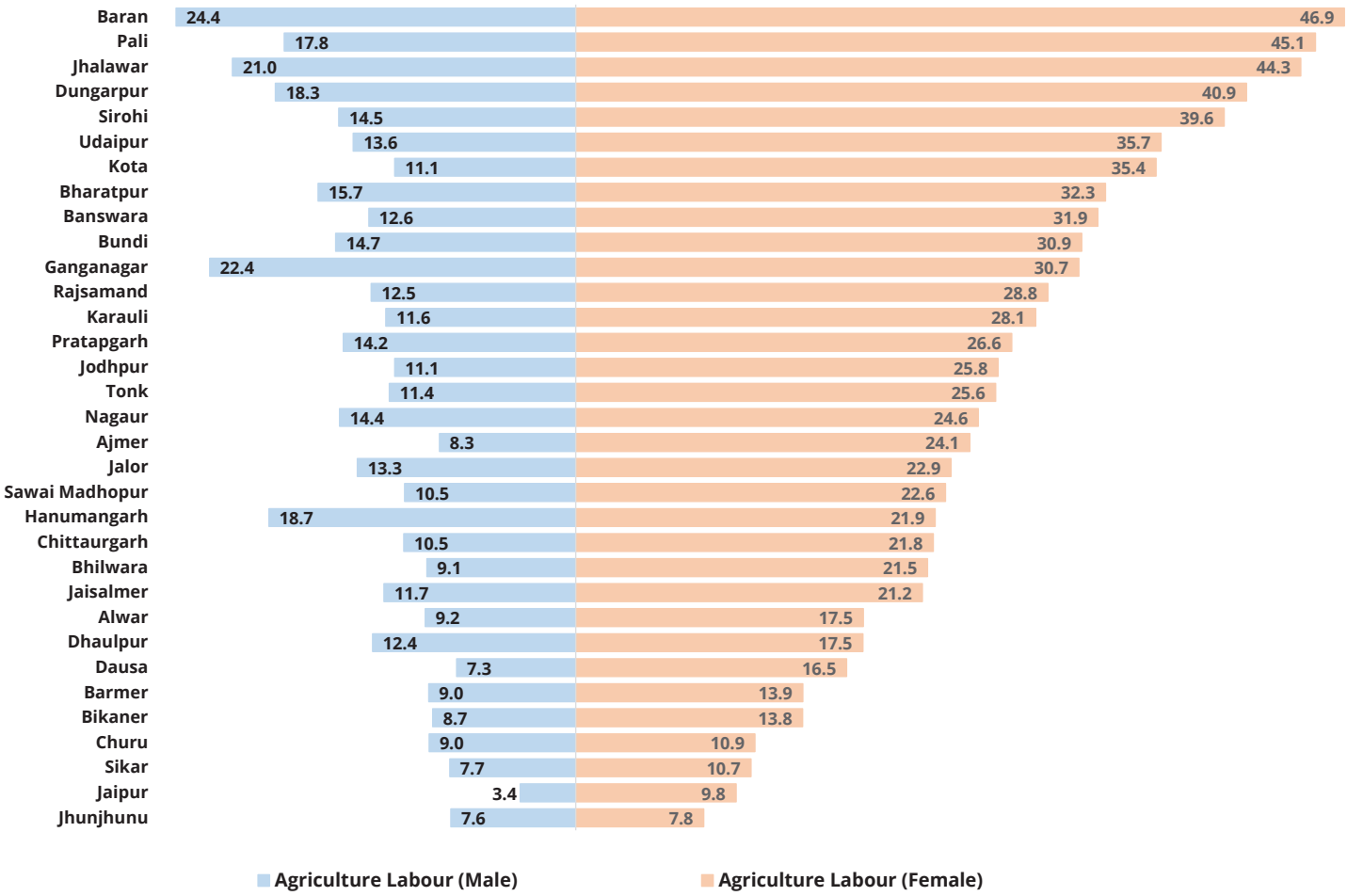


Figure 46: Proportion of Male and Female Agriculture Labourers across districts in Rajasthan, 2011, in percentage.

wage rates for male labours are provided by districts like Bikaner (INR 548 per day) and Jhunjhunu (INR 550 per day) followed by Hanumangarh, Jaipur, Sikar, Tonk and Dungarpur (INR 464-476 per day) while Hanumangarh, Churu, Jaipur, Jhunjhunu, Pali, and Sikar provide highest wage rates (INR 435-463 per day) for female labours. On the other end, Banswara, Kota, Pratapgarh and Jhalawar are among the districts that provided lowest wage rates for both male and female labours (INR 232-271 per day for males and INR 193-243 per day for females). Wide disparities in wages of male and female labours are observed across districts in Rajasthan, where female labourers are paid lower than the male labourers at most places. For instance, Bikaner provided almost 50 percent lower wages to females compared to males, followed by districts like Barmer, Sawai Madhopur, Dungarpur, Jaisalmer, Jhunjhunu that paid lower wages (difference of INR 100-125 per day) to the females than males. Whereas districts like Karauli, Churu, Bundi and Pali are the only districts that provided nearly same or marginally higher wages to female labours than male

Source: Agricultural Wages India: 2019-20, Ministry of Agriculture & Farmers Welfare, Government of India

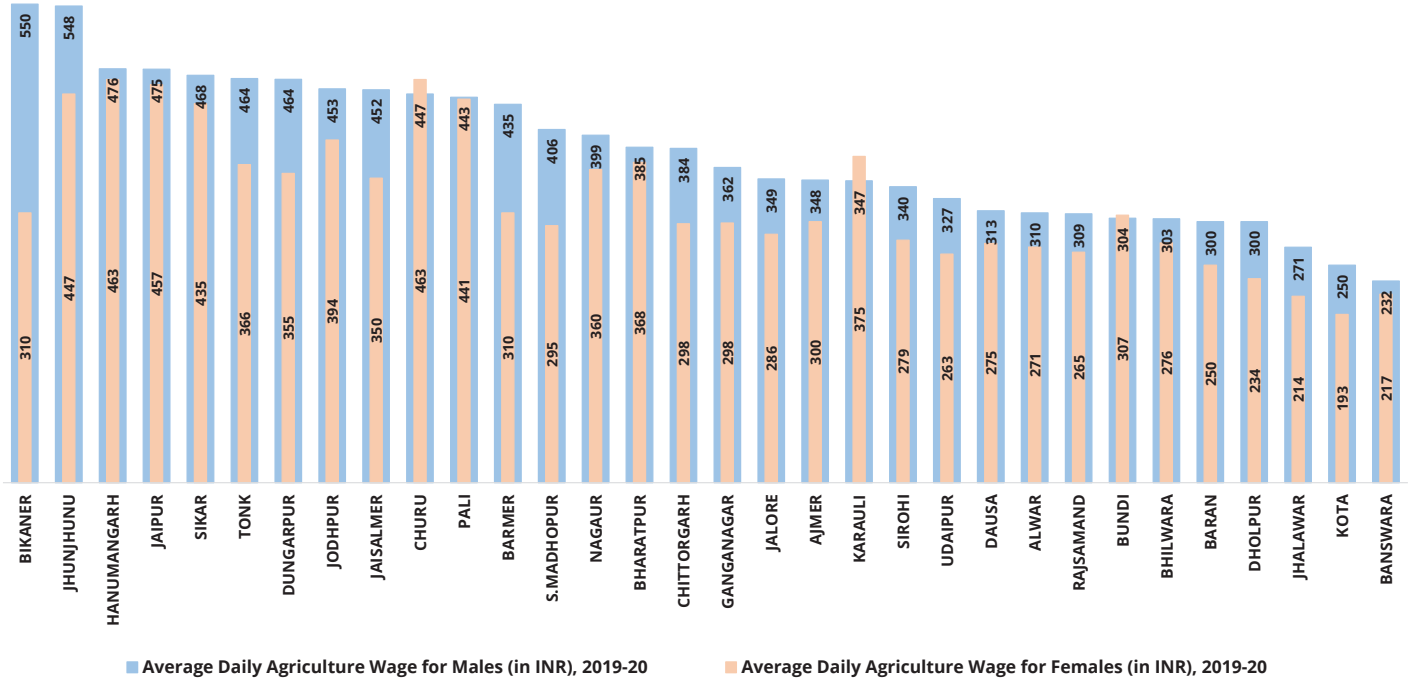


Figure 47: Average Daily Agriculture Wage Rates for Male and Female Workers across districts in Rajasthan, 2019-20, in INR.

labours indicating equal opportunities irrespective of gender. The gender bias in the casual wages needs to be minimized to encourage female participation in the work force and improve overall economic productivity.

4.9. Road Density and Rural Connectivity

Access to paved roads and improved rural connectivity plays a huge role in ensuring physical access to food at all times, especially for vulnerable households in remote locations. Not only does it reduces transportation and transaction costs, it has positive results on the prices realized by farmers. Improved roads can increase the options available to rural producers, connecting them with larger national, regional and even international markets. Studies of rural roads have shown that they raise the productivity and value of land for poor farmers[36]. Government spending on rural infrastructure, besides agricultural research and development, irrigation and rural development programmes targeted to the rural poor, have all contributed to reductions in rural poverty and increases in agricultural productivity and hence

36 Jacoby, H. (2000), 'Access to Rural Markets and the Benefits of Rural Roads,' *The Economic Journal*, No. 110, pp. 713–37.

contribute to their food and nutrition security. Marginal government expenditure on roads, in particular, have the largest positive impact on productivity growth[37]. The rate of growth of rural incomes and reduction in rural poverty are strongly influenced by the provision of rural and district road connectivity. There is a close link between rural connectivity and growth, be it in the area of trade, employment, education or healthcare. Improved connectivity between the growth production centres and the collection centres is vital for livelihood enhancements and that is possible only through the development of roads in remote areas.

As of March 2022[38], the road density of Rajasthan is 81.47 km per 100 square kilometre of total area, far behind the national road density of 165.23 kilometre per 100 square kilometre. As per 2021-22 statistics, the road density varied largely across districts in Rajasthan with Dungarpur having largest road density in the state of 115.7 kilometre per 100 square kilometre of area and Jaisalmer with the least road density of 14.6 kilometre per 100 square kilometre (only PWD roads). Moreover, the village connectivity data until March 2022[39] for Rajasthan indicates that despite 90.5 percent villages having road connectivity, more than half of villages with population below 250 still have no connectivity, implying people inhabiting smaller hamlets and those who are sparsely located have the most difficulty in accessing the services (figure 48). As per 2022 statistics, districts like Jalore, Jhunjhunu, Nagaur, Churu and Ajmer are leading in terms of road connectivity with almost all villages (>98 percent) having road connectivity. On the contrary, more than one-third villages in districts like Hanumangarh (31.3 percent) and one-fifth villages in Jaisalmer (23.0 percent) and Ganganagar (22.6 percent) have no road connectivity (figure 49).

Nonetheless, significant efforts are being made in improving the existing road network in recent years in Rajasthan. State Government is committed to ensure road connectivity for smaller villages that are yet unconnected through new schemes and plans. A special package for strengthening, renewal and repair of roads in rural areas of tribal and desert is being charted and constructing missing links in rural areas is being prioritised. As per

37 Fan, S., P. Hazell and S. Thorat (1999), *Linkages between Government Spending, Growth and Poverty in Rural India*, International Food Policy Research Institute, Washington DC.

38 Economic Review 2022-23, Department of Economic and Statistics, Government of Rajasthan

39 Annual Progress Report 2022-23, Public Works Department, Government of Rajasthan

Source: PWD, Government of Rajasthan

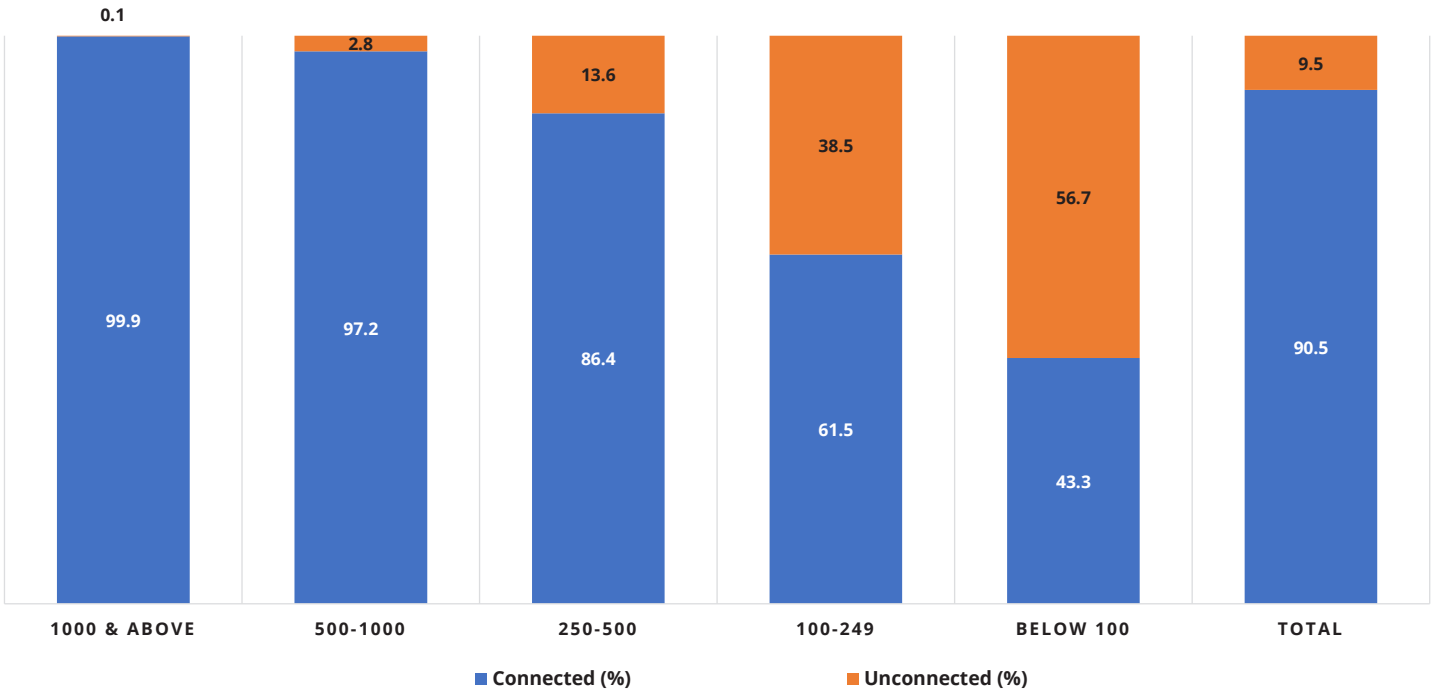


Figure 48: Village connectivity in Rajasthan with respect to population size until March 2022, in percentage.

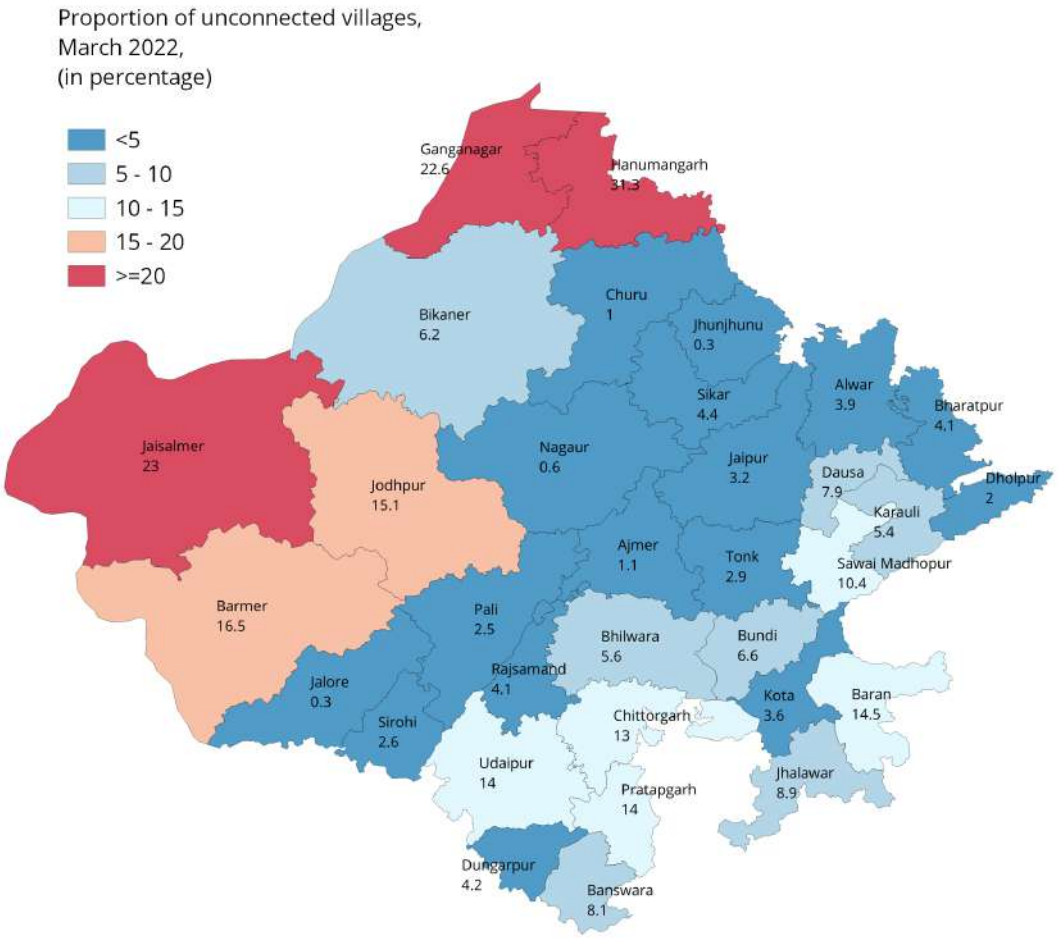


Figure 49: Proportion of Unconnected Villages across districts in Rajasthan until March 2022, in percentage.

budget announcement of 2019-20, Wall to Wall Vikas Path in each Gram Panchayat would be constructed in next five years. Vikas Path is to be constructed by cement concrete block with covered drains and utility services etc. Under Pradhan Mantri Gram Sadak Yojana-III, the main rural roads of 8662.50 km length will be selected and upgraded and strengthened.[40]

4.10. Safety Net Programmes and Government Schemes to Increase Access to Food in Rajasthan

Government of Rajasthan has been proactive in safeguarding its citizens by taking continuous measures for ensuring accessibility to food specifically among vulnerable populations by providing safety nets. First, by effective implementation of three large scale Government of India's flagship food safety net programmes – **Targeted Public Distribution System (TPDS), Integrated Child Development Scheme (ICDS) and Mid-day Meal scheme (MDM,** now referred as **PM POSHAN)** in the state.

Under TPDS, a total of 44 million beneficiaries covering 31 different categories avail benefits under National Food Security Act in Rajasthan. A quantity of 35 Kg of wheat per month is provided to about 0.6 million Antyodaya Anna Yojana (AAY) families, who constitute the poorest of the poor and 5 kg of wheat per person per month to Priority Household (PHH) members listed under NFSA, at highly subsidized price of INR 1 per Kg (from 2021 onwards), instead of INR 2 recommended by the Central Government. The Central government also provided additional 5 kg of wheat to the NFSA beneficiaries under Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY), launched by the Central Government as COVID relief measure, from April 2020 to 31st December 2022. As per budget provision for 2023-24, 10 million families will receive **Mukhyamantri Nishulk Annapurna Food**

40 Economic Review 2021-22, Department of Economic and Statistics, Government of Rajasthan

Packet, including one kg each of pulses, sugar, and salt, one litre of oil, and spices, in addition to the free ration provisions under NFSA scheme.

By ensuring effective implementation of ICDS, the state government caters towards the nutritional need of about 5 million population belonging to vulnerable section, covering pregnant and lactating mothers, and children from six months to six years of age. There are about 62020 Anganwadi centres in the state distributed across rural, urban and tribal areas serving the vulnerable population. The budget for supplementary nutrition under ICDS is estimated at 150.6 million USD (INR 12.05 billion) in 2023-24, a 50 percent increase compared to 2021-22 budget estimates.

The Mid-Day Meal programme or PM POSHAN covers 6 million students enrolled in grade 1 to grade 8 in 67,159 government schools and Institutions. The students are provided with hot cooked meals that contains a minimum of 450 calories and 12-gram protein for primary school students (Grade 1 to Grade 5) and 700 calories and 20-gram protein for students in Grade 6 to Grade 8. Ensuring that the nutritional needs of the students are not neglected during COVID when the schools were shut, the state government provided dry rations that included wheat/rice, pulses, oil, and spices to school children. The state also runs **Mukhyamantri Bal Gopal Yojana**, a scheme under which school going children were given milk twice a week. From 2023 onwards, the **frequency of milk provision has been increased from twice a week to daily** to meet the nutritional requirements in children. The budget provision under Mid-Day Meal Scheme has doubled from 132.7 million USD (INR 10.62 billion) in 2021-22 to 275.5 million USD (INR 22.04 billion) in 2023-24, of which two-fifth portion is allocated to the Mukhyamantri Bal Gopal Yojana.

In addition to the above large scale food safety nets, the state government of Rajasthan has continuously strived to strengthen each of these programmes, by bringing policy level systemic reforms when needed, taking several new initiatives, and adopting strategic measures to reach out to the vulnerable population in the State. One such initiative is Twenty Point Programme that identifies and puts special focus on monitoring schemes related to poverty alleviation, employment generation in rural areas, housing, education, health and family welfare, protection of environment among others that have a bearing on the quality of life, especially in the rural areas. The programme includes monitoring important programmes like **Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), National Rural Livelihood Mission (NRLM), Pradhan Mantri Gram Sadak Yojana, (PMGSY)** among others.

The state also has provisions for several conditional cash transfer initiatives directly to the beneficiaries through various schemes and programmes. For instance, in addition to **Pradhan Mantri Matru Vandana Yojana (PMMVY)** that provides conditional cash to women to upkeep their own and the children's health and nutritional status at the time of pregnancy and child birth, the state government launched another scheme **Indira Gandhi Matritva Poshan Yojana (IGMPY)** in November 2020

that provides INR 6000 in five instalments to pregnant women and lactating mothers in five tribal dominated districts - Pratapgarh, Dungarpur, Banswara, Udaipur and Baran, with an objective to reduce low birth weight and mortality. This scheme has now been extended to all 33 districts in Rajasthan. Similarly, there are various financial initiatives to support and protect the elderly, disabled and orphans in the State which supports them in ensuring the food and nutrition security.

4.11. Summary of Findings: Food Accessibility

- Overall, based on the NSS consumption expenditure survey trends from 1999-2000 to 2011-12, there has been substantial decline in the share of food expenditure to total expenditure in Rajasthan, the bottom 25 percent based on monthly per capita expenditure (MPCE) fractile are still found to be the most vulnerable, who empty more than half of their pockets to access food both in rural and urban areas. Moreover, while the ratio of food expenditure to total expenditure shows a steady decline from 1999 to 2012 both in rural and urban areas, the decline is faster in rural areas than in urban counterparts.
- District level analysis reveals that despite an improved scenario at macro level, in majority of districts (23 out of 33 districts), the food expenditure still accounts to half or more of the total expenses. With few exceptions, the trend is higher in rural areas than in urban reflecting wider disparity between rural and urban households, as per 68th NSS Consumption Expenditure Survey, 2011-12.
- While the food inflation has been in harmony with the general inflation over the years, it rose above the general inflation between September 2019 and October 2020, reaching maximum spurt in November 2019 to January 2020, coinciding with onset of COVID-19 pandemic. While the food safety nets like TPDS and introduction of PMGKY helped in combating the rise of CPI for cereals and cereal products from August 2020 to March 2021, however, similar strategic measures are required for pulses, milk, and oil to make them accessible, since their prices have been continuously increasing over the years, specifically in the rural areas.
- Analysis on dietary trends indicate that various socio-economic factors determine the per capita per day dietary intake. For instance, a gradual increase in intake of energy, protein and fat is observed per capita per day, with upward increase in MPCE groups. Though the energy intake among bottom 25 percent population improved on an average by approximately 150 Kcal from 1990 to 2012, yet the consumption is far below the recommended norms for adequate energy intake both in rural and urban areas in Rajasthan. Similarly, the dietary intake also varies by social group. Those belonging to scheduled tribe or scheduled caste are observed to consume relatively less calories, protein, and fat per day than those belonging to OBC or general category.
- The district analysis reveals that energy deprivation is higher in six districts - Chittaurgarh, Tonk, Dungarpur, Sirohi, Dausa and Udaipur, mostly falling in the southern belt, in the rural areas, while Bharatpur, Dausa and Tonk show inadequate energy consumption among people in urban Rajasthan. The protein and fat intake remain well above the recommended norms yet there exists substantial difference between rural and urban counterparts. While the intra-rural differences are higher than intra-urban, interestingly, rural areas of Ganganagar and Jodhpur fare better than its own urban counterparts and across other districts.
- Based on latest NSS consumption expenditure surveys, it is noted that there are no significant changes in the major sources of energy and protein intake from 2005 to 2012. The cereals form the primary source for both energy and protein, followed by milk and milk products. The increased consumption of food from miscellaneous sources, i.e., 'junk and processed food' is evident and indicates steady transition to unhealthy source of diet. Moreover, despite the daily protein intake per capita meeting the recommended norms in Rajasthan, the quality of protein consumed remains a huge concern, since it is mainly derived from cereals. The consumption of good quality animal protein in the form of egg, fish and meat remains at one percent, due to predominance of vegetarian population. Moreover, consumption of pulses also remains stagnant at six percent. Therefore, there is a need to diversifying the food basket for optimal nutrient intake. Increased fat consumption, about three times higher than the recommended intake in some districts, points towards the rising issue of overweight and obesity

and increased risk of non-communicable diseases like cardiovascular issues, diabetes among others.

- Increased food accessibility, particularly for vulnerable households, depends on factors including occupational structure, agricultural earnings, and availability to paved highways. According to Census 2011, Rajasthan has a work participation rate of 43.6 percent, which is slightly above the national average of 39.8 percent. 16.5 percent of people with employment in Rajasthan are agricultural labourers. In Rajasthan, the proportion of female agricultural labourers is twice than that of male agricultural labourers. Except for Sri Ganganagar and Bharatpur, districts in Rajasthan's southern (Dungarpur, Pali, Sirohi, Udaipur, Banswara, and Pratapgarh) and south-eastern (Baran, Jhalawar, Bundi) belts have the highest proportion of agriculture labourers (above 20 percent), while Churu, Sikar, Jhunjhunu, and Jaipur have the lowest proportion.
- Although the average daily wage rates in Rajasthan for both male and female field labourers have increased over time and are significantly higher than the national average (Rs. 348 for males and Rs. 278 for females), the wages are still lower than those in other major states like Kerala, Haryana, Punjab, and Uttarakhand. In Rajasthan, there are significant wage differences between male and female laborers between districts, with female workers typically being paid less than male workers.
- For vulnerable households in remote areas, access to paved roads and enhanced rural connectivity are essential for ensuring constant physical access to food. Rajasthan's road density, which as of March 2022, is 81.47 km per 100 square km of total area, is still a long way behind the national average of 165.23 km per 100 square km. More than half of Rajasthan's villages with a population of under 250 still lack connectivity, according to village connectivity data up to March 2021. This suggests that residents of smaller hamlets and those who live in sparserly populated areas face the most difficulties obtaining services.

> **There has been substantial decline in the share of food expenditure to total expenditure in Rajasthan, the decline is faster in rural areas than in urban.**


MAHAJAN
APPLES

5. Food Utilization

5. Food Utilization

5.1. Background

Food utilization refers to the person's ability to absorb and mobilize nutrients from the food they consume.[41] This includes balanced intake of both macro-nutrients and micro-nutrients. The absorption of nutrients from food is also influenced by the prevailing water quality, availability of health care facilities, and sanitation conditions. Good feeding practices, food preparation, diversity in the diet and intra-household distribution combined with good biological utilization of food consumed determines the nutritional status of individuals.[42] Inadequate nutrition, if neglected, results in an irreversible effect on the cognitive and physical development of an individual hindering the overall development of human capital and economic growth.[43] The malnourished population is more vulnerable to infections and diseases in childhood and non-communicable diseases in adulthood, and often this malnourished state is passed on to generations one after another.[44] Malnutrition in all its forms can be manifested in the same individual in one life span through childhood,

41 WFP (2009). CFSVA Guidelines

42 FAO. 2015. State of Food Insecurity in the World. Food and Agriculture Organization of the United Nations. Italy. Rome.

43 Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., & Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. The lancet, 382(9890), 427-451.

44 Hoddinott, J., Maluccio, J., Behrman, J. R., Martorell, R., Melgar, P., Quisumbing, A. R., ... & Yount, K. M. (2011). The consequences of early childhood growth failure over the life course. *Washington, DC: International Food Policy Research Institute Discussion Paper*, *1073*.

Box-2: Energy Measures of Malnutrition

The World Health Organisation (WHO), defines malnutrition as 'deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients.' The term 'malnutrition' is further classified to address three set of conditions: i) undernutrition; ii) micronutrient-related malnutrition and iii) overweight, obesity and diet-related noncommunicable diseases (*Malnutrition*, 2020).

Undernutrition

Undernutrition relates to poor anthropometric outcomes, especially in children, namely stunting (low height-for-age), wasting (low weight-for-height) and/or underweight (low weight-for-age).

Stunting indicates chronic from of undernutrition. It reflects a failure to reach linear growth potential as the result of prolonged food deprivation and/or disease or illness. It is divided into:

- Moderate stunting: Height for age < -2 to >= -3 median standard deviation (SD) of WHO Child Growth Standards
- Severe stunting: Height for age <-3 median standard deviation (SD) of WHO Child Growth Standards
- Wasting represents acute form of undernutrition. It results due to any recent consequences of food deprivation or illness or because of high incidence of infectious diseases.

Types of acute malnutrition:

- Moderate acute malnutrition (MAM): Weight for height <-2 to >= -3 median standard deviation (SD) of WHO Child Growth Standards
- Severe acute malnutrition (SAM): Weight for height <-3 median standard deviation (SD) of WHO Child Growth Standards

Underweight is influenced by both the conditions of stunting and wasting, reveals low body mass relative to chronological age. Underweight is therefore, more often used as a composite indicator to reflect both acute and chronic undernutrition, although it cannot distinguish between them.

Types of underweight:

- Moderate underweight: Weight for age < -2 to >= -3 median standard deviation (SD) of WHO Child Growth Standards
- Severe underweight: Weight for age <-3 median standard deviation (SD) of WHO Child Growth Standards

Micronutrient-related malnutrition

Relates to lack or excess of micronutrients (important vitamins and minerals). Micronutrients promotes the production of enzymes, hormones, and a host of essential factors that are crucial for proper functioning and development of human body. Deficiency of important micronutrients like Iodine, vitamin A, and iron represents a major threat particularly in children and pregnant women.

Overweight, obesity and diet-related noncommunicable diseases

Overweight, obesity and diet-related noncommunicable diseases are marked by excess weight with respect to height, increased Body Mass Index (BMI) or conditions such as cardiovascular diseases, diabetes, and some cancers. In children, overweight is marked by weight for height equal or greater than +2 median standard deviation (SD) of WHO Child Growth Standards. Overweight and Obesity in adolescents and adults is characterised by BMI. BMI >=25(kg/m^2) and <30(kg/m^2) represents overweight, whereas BMI >=30(kg/m^2) represents obesity.

adolescence and adulthood, as well as can exist in populations in one or different forms within the same country.[45,46] Food security and good nutrition is of utmost importance in achieving the national and global targets of Sustainable Development Goals and is thus not just an outcome but also a predictor of a country's future.

This chapter provides an overview of nutritional outcomes in children and adults in Rajasthan and the direct and indirect factors affecting the nutritional outcomes, thereby impacting the utilisation of food.

5.2. Malnutrition in Rajasthan: Macro-Trends

Recent findings from national surveys[47],[48] confirm that Indian states are grappling with triple burden of malnutrition– undernutrition, micronutrient deficiencies among many and emerging overweight/obesity in some. While undernutrition is mainly observed in children under the age of five, equal proportion of adults are found to be suffering with overweight/ obesity and micronutrient deficiency seems to affect all age groups equally.

5.2.1. Anthropometric Outcomes in Children

Malnutrition alone accounted for 68.2 percent of total deaths in children below the age of five and 17.3 percent of the total disability-adjusted life years (DALYs) in populations across all age-groups in India,[49] many of which are preventable through effective nutrition intervention.[50] While infant mortality (child death within one year of birth) is closely linked with maternal and child health facilities, care during pregnancy and new-born care, under five mortality (child's death under the age of five) is linked with factors such as poor immunization, poverty and childhood morbidity. Under five mortality is also an indicator of assessing the social practices, public policies, and their effectiveness.

During 2015-16 and 2019-21, Rajasthan shows improvement in its rank in most of the child

45 Fanzo, J., Hawkes, C., Udomkesmalee, E., Afshin, A., Allemandi, L., Assery, O., Baker, P., Battersby, J., Bhutta, Z., Chen, K., Corvalan, C., Di Desare, M., Dolan, C., Fonseca, J., Grummer-Strawn, L., Hayashi, C., McArthur, J., Rao, A., Rosenzweig, C., Schofield, D. (2019). Global Nutrition Report 2018: Shining a Light to Spur Action on Nutrition. Global Nutrition Report, London, UK. https://globalnutritionreport.org/reports/global-nutrition- report-2018/.

46 Wells, J.C.K., Briend, A., Boyd, E.M., Berkely, J.A., Hall, A., Isanaka, S., Webb, P., Khara, T., Dolan, C. (2019). Beyond wasted and stunted—a major shift to fight child undernutrition. The Lancet Child & Adolescent Health 3, 831–834. https://doi.org/10.1016/ S2352- 4642(19)30244-5.

47 IIPS. (2017). National Family Health Survey (NFHS-4), 2015–16. International Institute for Population Sciences (IIPS), Mumbai, India.

48 IIPS. (2021). National Family Health Survey (NFHS-4), 2019–21. International Institute for Population Sciences (IIPS), Mumbai, India.

49 Swaminathan, S., Hemalatha, R., Pandey, A., Kassebaum, N. J., Laxmaiah, A., Longvah, T., & Gupta, S. S. (2019). The burden of child and maternal malnutrition and trends in its indicators in the states of India: The Global Burden of Disease Study 1990–2017. *The Lancet Child & Adolescent Health*, *3*(12), 855-870.

50 Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., & Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. The lancet, 382(9890), 427-451.

undernutrition and mortality related indicators, especially among the EAG states[51], while **Uttar Pradesh, Bihar and Madhya Pradesh continue to be in the bottom ten**. Among 35 States/UTs for which comparable data on mortality are available for both the periods - 2015-16 and 2019-21 (Chandigarh excluded due to paucity of data), Rajasthan's rank has improved from 29 to 21 in Neonatal Mortality Rate (NMR), 29 to 21 in Infant Mortality Rate (IMR), 29 to 23 in Under-5 Mortality Rate (U5MR).

Figure 50 show the comparative nutritional status of children in some of the major states of India. Among the 36 States/UTs, Rajasthan's rank has improved 31 to 20 in stunting, 28 to 16 in wasting and 30 to 22 in underweight, between 2015 and 2021, except for anaemia, where Rajasthan's rank further declines from 25 to 31. The findings indicate a decline of about 7.3 percentage points in child stunting from 39.1 percent in NFHS-4 to 31.8 percent in NFHS-5 in Rajasthan, the highest decline in stunting compared to other states and UTs in India. The stunting prevalence in the state is below the national average of 35.5 percent in 2019-20. Displaying a similar achievement, Rajasthan shows second highest reduction of 9.1 percentage points in prevalence of underweight children in India from 36.7 percent in 2015-16 to 27.6 percent in 2019-20, thereby bringing the underweight prevalence lower than the national average of 32.1 percent. Rajasthan has also been successful at reducing the burden of wasting in children by 6.2 percentage points in past five years, i.e., from 23.0 percent in NFHS-4 to 16.8 percent in NFHS-5 percent. However, only one percentage point reduction is witnessed in prevalence of severe wasting, i.e., from 8.6 percent to 7.6 percent between NFHS-4 and NFHS-5 round, comparable to total prevalence of Severely Acute Malnourished (SAM) children in India of 7.7 percent.

Though there is a long way to go to achieve top performing status, it seems that there is a good momentum on key

51 Empowered Action Group (EAG) States are 8 states namely Bihar, Jharkhand, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Rajasthan, Odisha, and Assam (https://main.mohfw.gov.in/sites/default/files/CHAPTERpercent202.pdf)

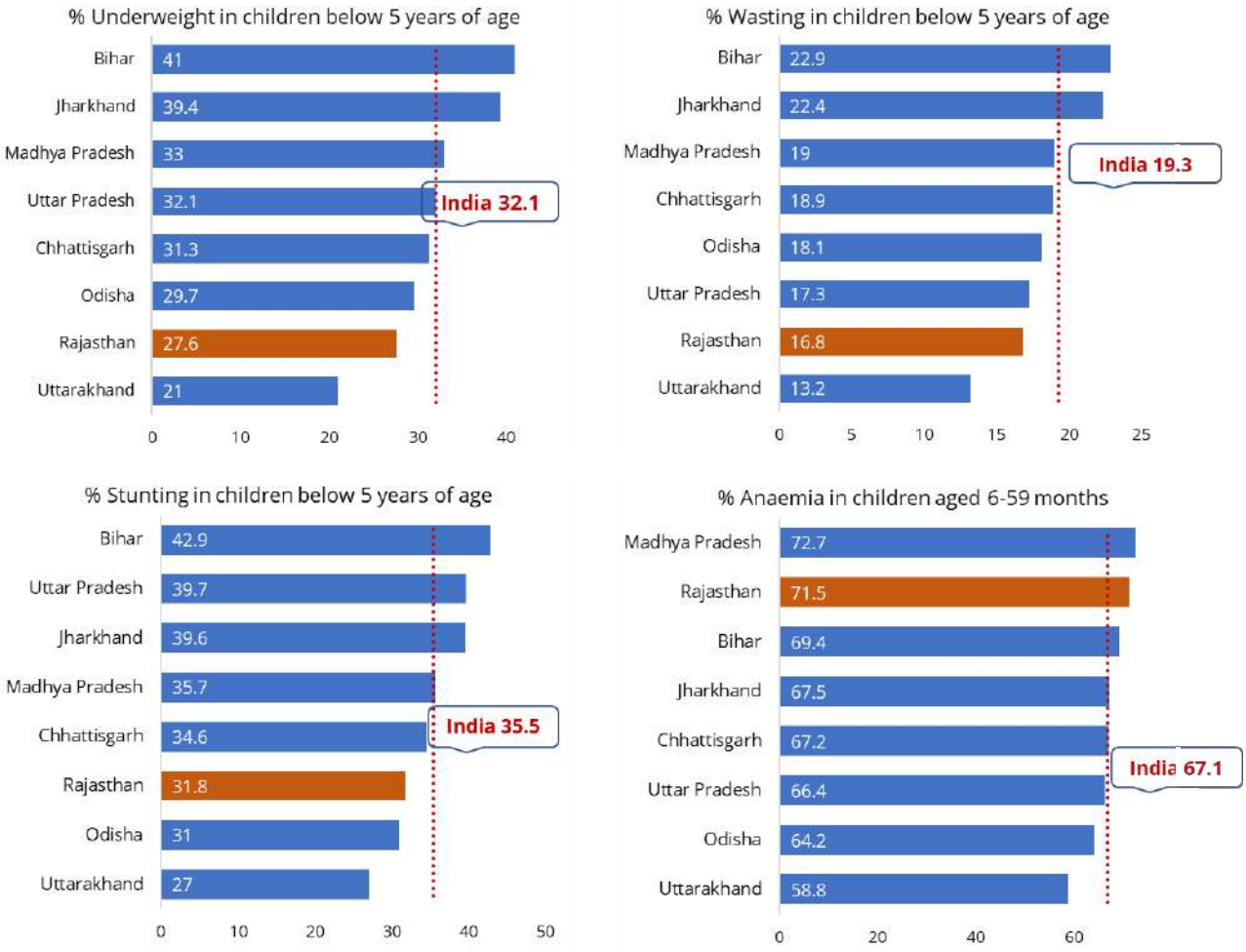


Figure 50: Malnutrition among Under five children in selected States of India including Rajasthan, NFHS-5 (2019-21), in percentage.

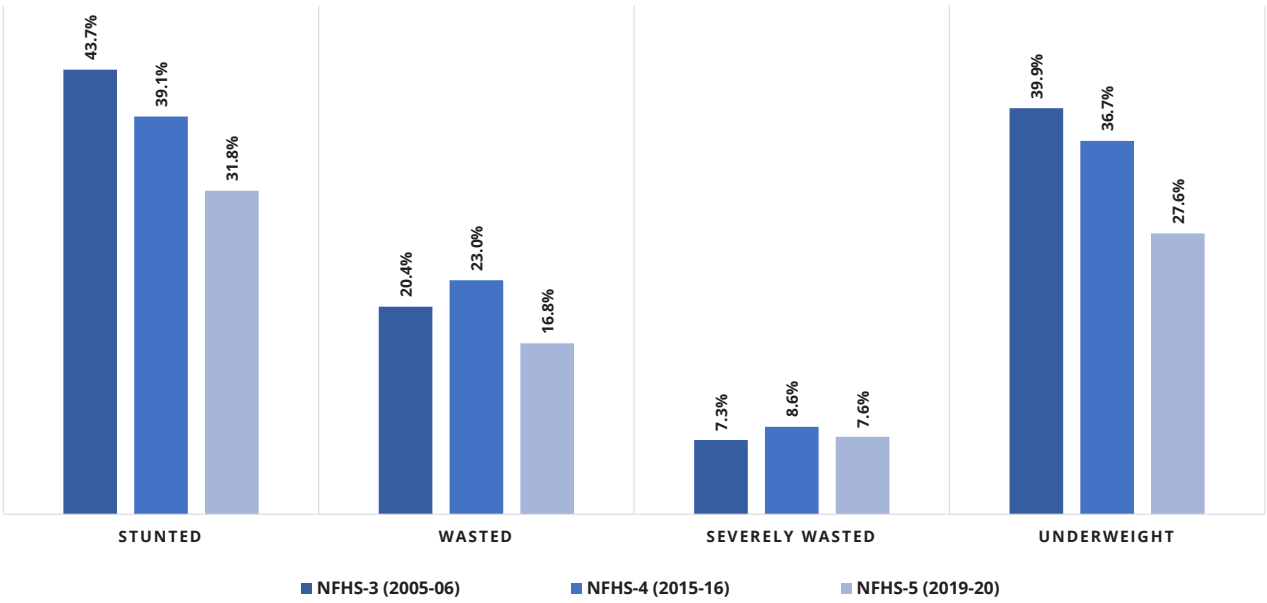


Figure 51: Change in prevalence of undernutrition in children below the age of five in Rajasthan from 2005-06 to 2019-21, in percentage.

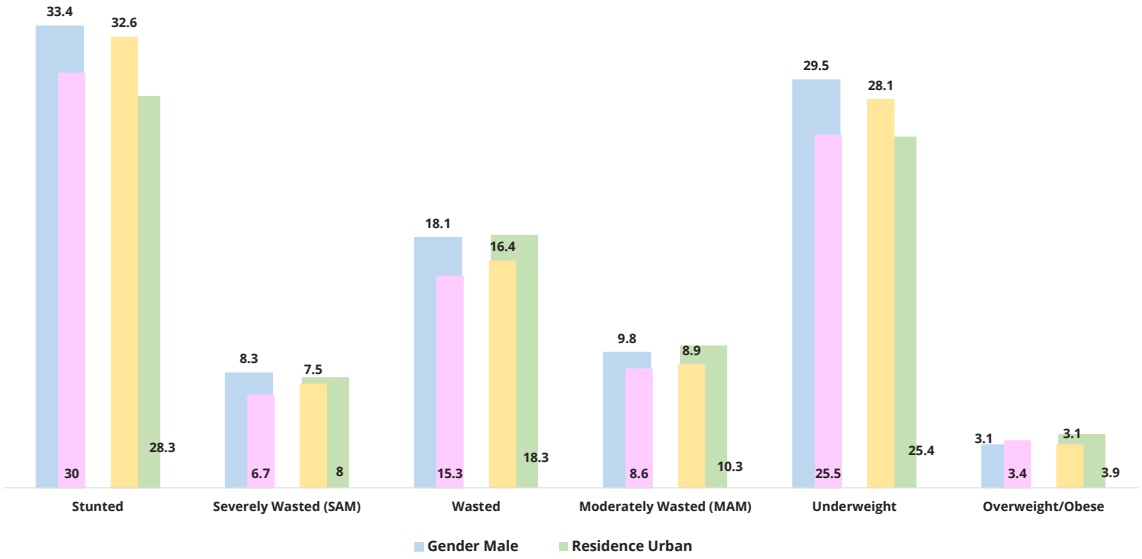


Figure 52: Prevalence of malnutrition in under five children with respect to place of residence and gender in Rajasthan, NFHS-5 (2019-21), in percentage.

essential nutrition actions. It should be noted that high malnutrition levels coupled with high mortality among children points towards inadequate feeding practices, health behaviour and many other factors that are important to be reviewed. Malnutrition is a complex phenomenon, multi-dimensional in nature influenced not only by feeding practices but also a range of factors such as age, gender, residence, paternal characteristics, socio-economic environment to name a few.

High proportion of stunted and underweight children below five years are observed in rural areas compared to urban areas. While urban areas have marginally higher prevalence of both wasted and overweight/obese children. With respect to gender, it is observed that the male children have slightly higher incidence of stunting, wasting and underweight than female children under the age of five (figure 52). With respect to age, there is a steep increase in proportion of stunted and underweight children after a child obtains 6 to 8 months of age until two years of age, reflecting on poor complementary feeding practices and neglecting of critical window of opportunity in the first 1000 days of life (figure 53).

Among the social groups, the prevalence of child malnutrition is the highest among the Scheduled tribe population with 35.9 percent stunting, 18.6 percent wasting, and 32 percent underweight among under-5

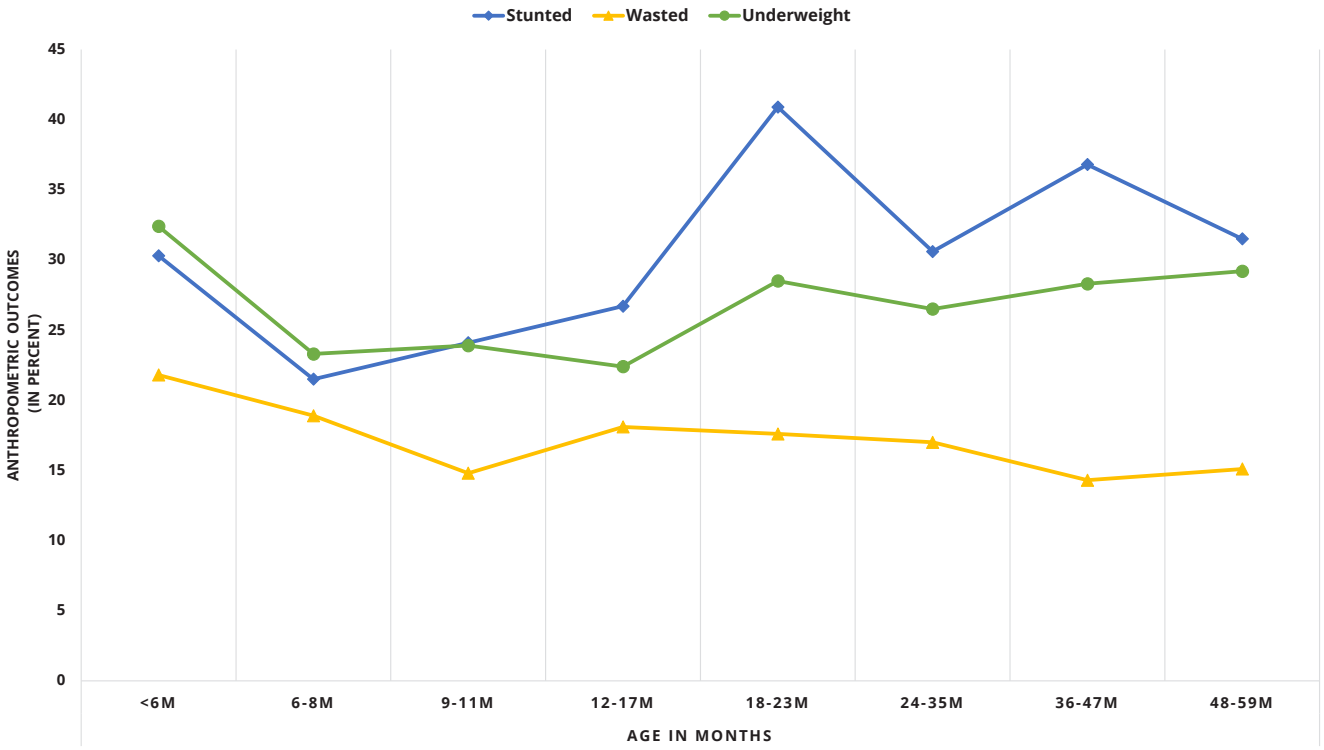


Figure 53: Prevalence of undernutrition in under five children with respect to age in Rajasthan, NFHS-5 (2019-21), in percentage.

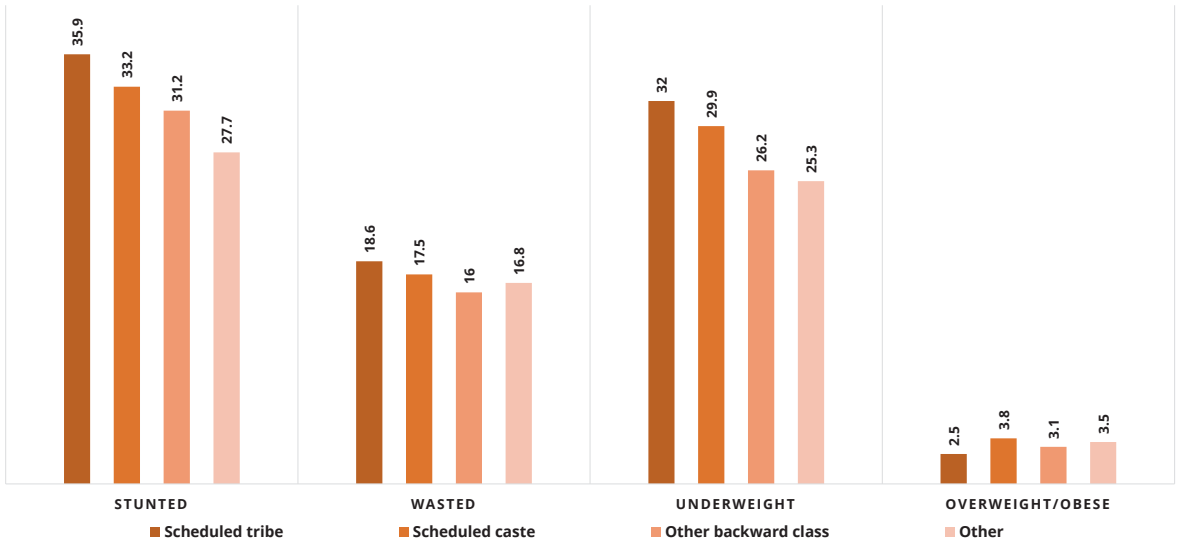


Figure 54: Prevalence of malnutrition in under five children with respect to social groups in Rajasthan, NFHS-5 (2019-21), in percentage.

children (Figure 54).

The nutritional status of the mothers also has a high bearing on the nutritional status of children. Among the under-5 children who are born to mothers with a low-BMI (<18.5), 37.5 percent are stunted, 18.3 percent are wasted, and 35.1 percent are underweight, which is much higher than for the mothers with normal BMI (Figure 55).

District level analysis reveals that the prevalence of stunting in under five children ranges from 20.9 percent

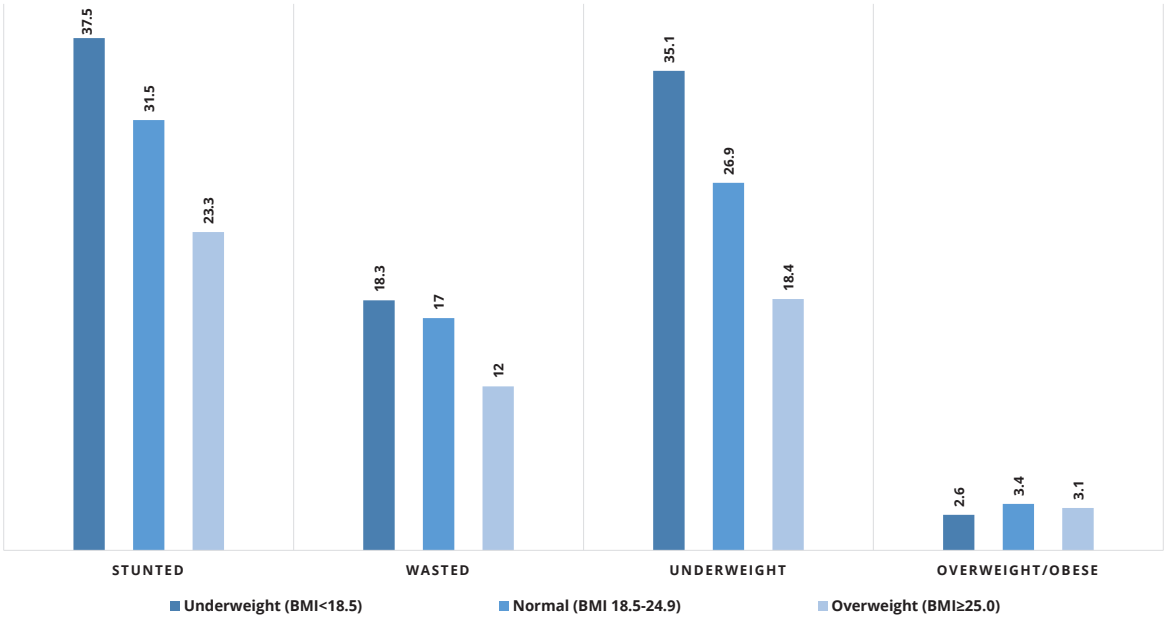


Figure 55: Effect of mother's nutritional status on child nutrition outcomes, NFHS-5 (2019-21), in percentage.

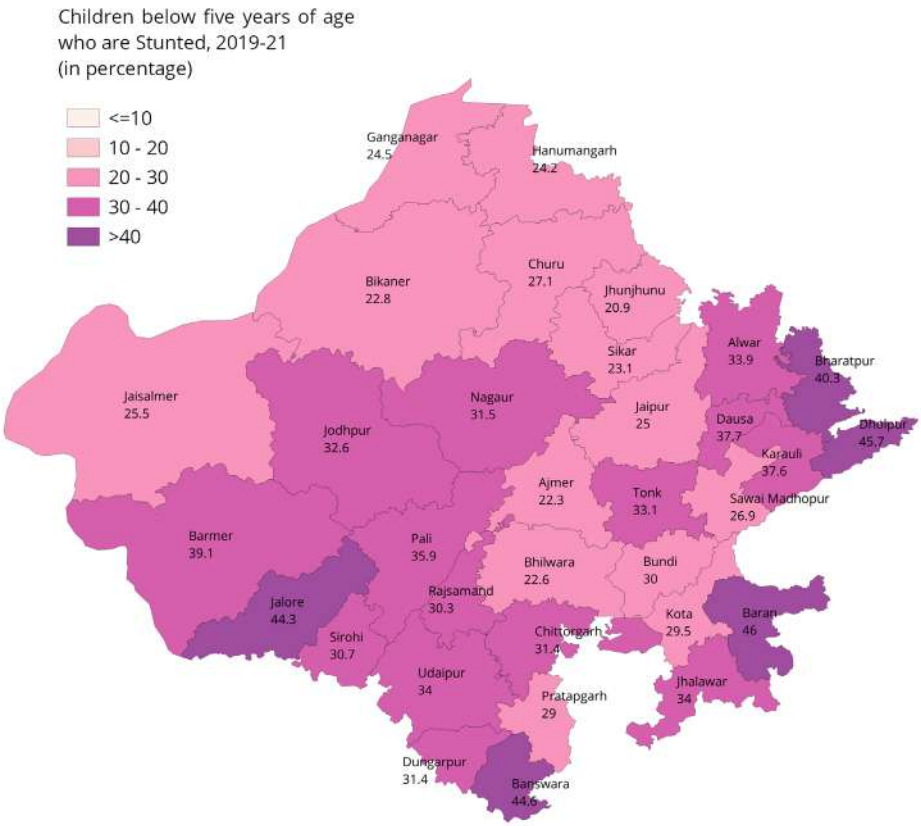


Figure 56: Prevalence of children who are stunted below the age of five years across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

to 46 percent across districts in Rajasthan. Baran district has the highest burden and Jhunjhunu district has the lowest, as per NFHS-5 (2019-21) findings (Figure 56). Majorly, districts running from central to south-western to southern and some districts bordering the Rajasthan periphery in the south-east form a cluster having the highest proportion of stunted children in Rajasthan. In terms of change between 2015-16 and 2019-21, all districts except Tonk, Barmer, Dausa and Baran show reduction in stunting. Pratapgarh district shows the maximum decline of 17.3 percentage points. On the contrary, **Tonk, Barmer, Dausa and Baran show**

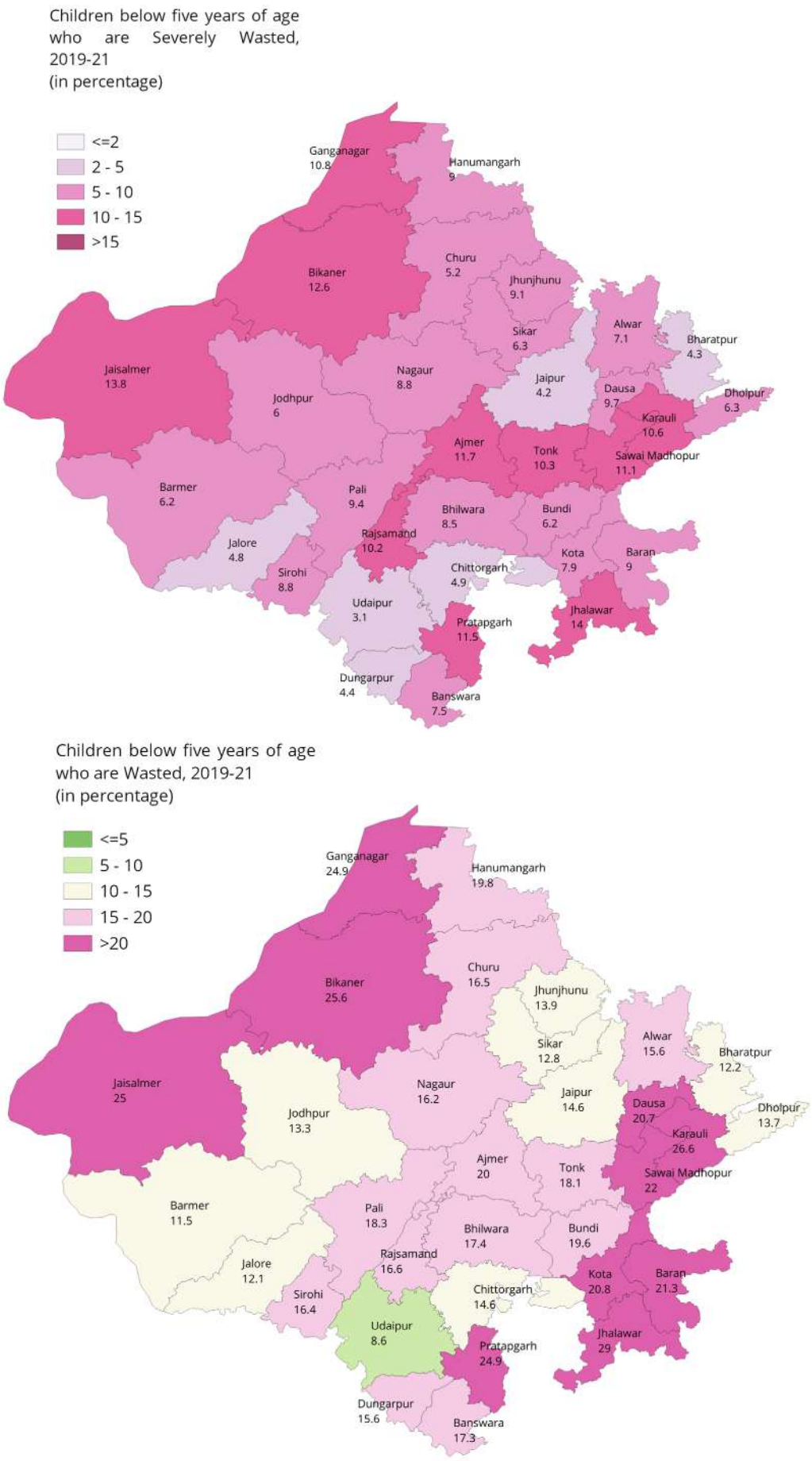


Figure 57: Prevalence of children who are wasted and severely wasted below the age of five years across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

increase in stunting by 1.1 to 5.8 percentage points respectively.

Similarly, wasting ranges from 8.6 percent to 29 percent in districts of Rajasthan with **Jhalawar district having the highest burden of wasted children and Udaipur, the lowest** (figure 57). Two distinct clusters of high burdened district emerge in terms of wasting – one forming a cluster in the western periphery running towards the north and another in the eastern periphery moving down towards the south. In terms of change between NFHS-4 (2015-16) and NFHS-5 (2019-21), **Dungarpur, Udaipur and Sirohi districts show the highest reduction in wasting of 21.9, 21.3 and 20.2 percentage points respectively, while districts such as Bikaner, Sikar, Jaipur, Jaisalmer, Ganganagar, Dausa, Sawai Madhopur, Karauli show an increase in the prevalence of wasted children in the range of 1.2 to 7.7 percentage points.**

Where neighbouring states like Haryana have been able to bring the level of severely wasted children from 9 percent to 4.4 percent in past five years, **Rajasthan shows a very meagre decline of 1 percent in severe wasting**. The proportion of severely wasted or severely acute malnourished (SAM) children ranges from 3.1 percent to 14 percent across districts in Rajasthan, where **Udaipur district has the lowest burden while Jhalawar district reports the highest burden of SAM children in 2019-21** (figure 57). While Dungarpur district shows the highest reduction in SAM children by 11.7 percentage points between NFHS-4 and NFHS-5, on the

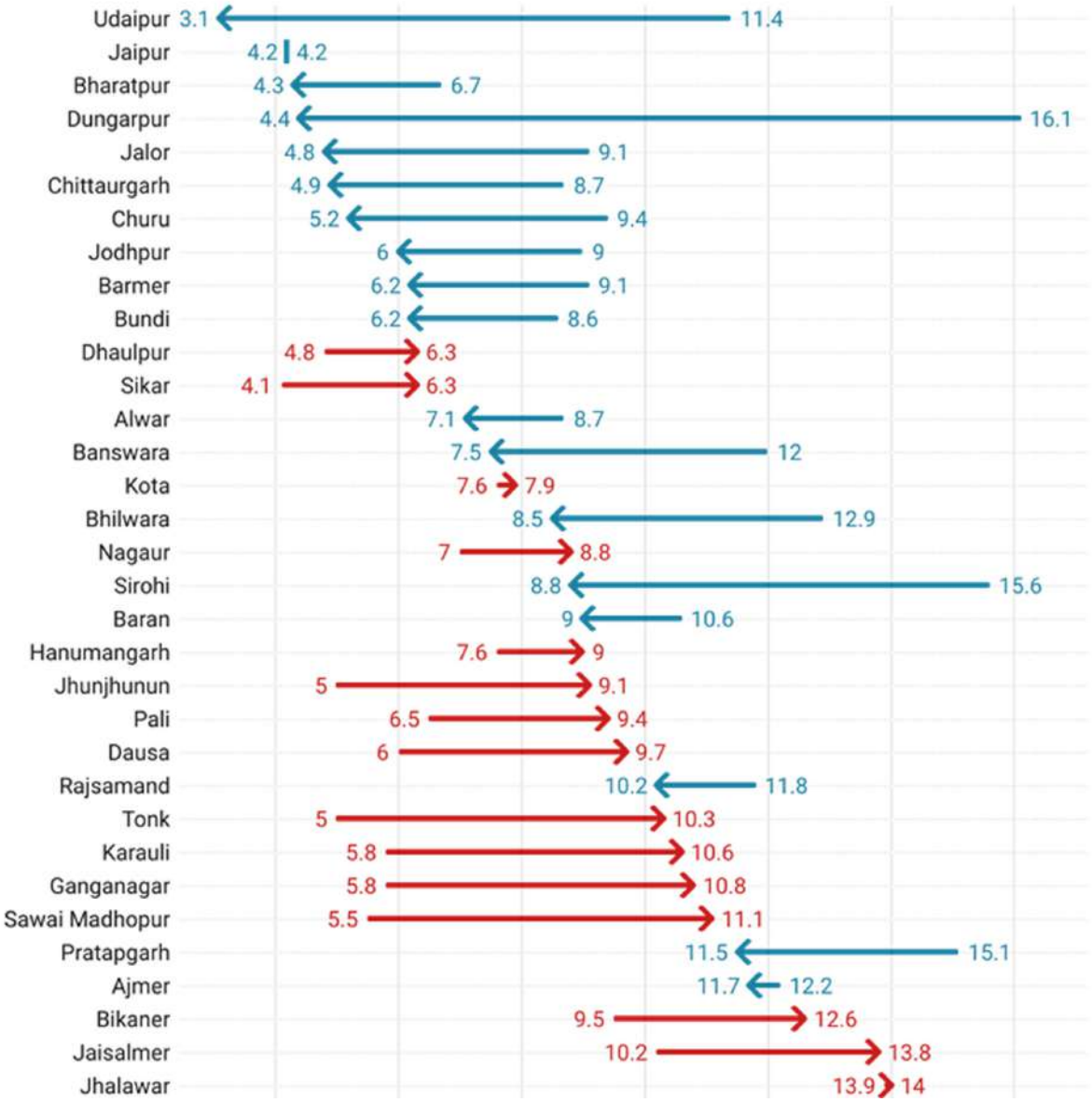


Figure 58: Shift in prevalence of severe wasting in children below 5 years from NFHS-4 (2015-16) to NFHS-5 (2019-21) across districts in Rajasthan, in percentage.

other hand **about 40 percent districts in Rajasthan shows 1.4 to 5.6 percentage points increase in the proportion of SAM children over the past five years** (figure 58).

As per NFHS-5 (2019-21) findings, there exist disparity by two-folds in terms of underweight prevalence in children, i.e., from 18.3 percent to 40.2 percent among **the best (Sikar) and worst (Baran)** performing districts in Rajasthan (figure 59). While Dungarpur district shows the maximum decline of 27.5 percentage points in the prevalence of underweight children between 2015-16 and 2019-21, **Karauli and Dausa observe an increment in the proportion of underweight children by 1.6 and 5.4 percentage points** respectively.

Increasing proportion of overweight/obese children under the age of five is a growing concern in Rajasthan over past 15 years. Prevalence of overweight in children below 5 years increased by 1.2 percentage points from 2.1percent in NFHS-4 to 3.3 percent in NFHS-5. While Pali and Sikar districts show less than 1 percentage point reduction in overweight proportion of children over past five years, all other districts have increased proportion of overweight/obese children, with highest prevalence in Jhunjhunu district (5.9 percent) and lowest in Pali district (0.9 percent).

5.2.2. Anthropometric Outcomes in Adults

Rajasthan has also been able to achieve significant reduction in adult undernutrition between 2015-16 and 2019-21 (figure 60). Among adults, malnutrition is generally measured through Body Mass Index (BMI). A BMI less than 18.5 Kg/m^2 reflects a current condition resulting from inadequate food intake, past episodes of undernutrition or poor health conditions. Rajasthan records the second highest reduction across the states/ UTs in the proportion of adult population with Body Mass Index below normal (<18.5 kg/m2). Proportion of women and men whose BMI is below normal reduced by 7.4 percentage points and 8.7 percentage points respectively between NFHS-4 and NFHS-5 survey. Rajasthan also lists among the only five states/UTs in India that show decline in percentage of women who are overweight (BMI ≥25.0

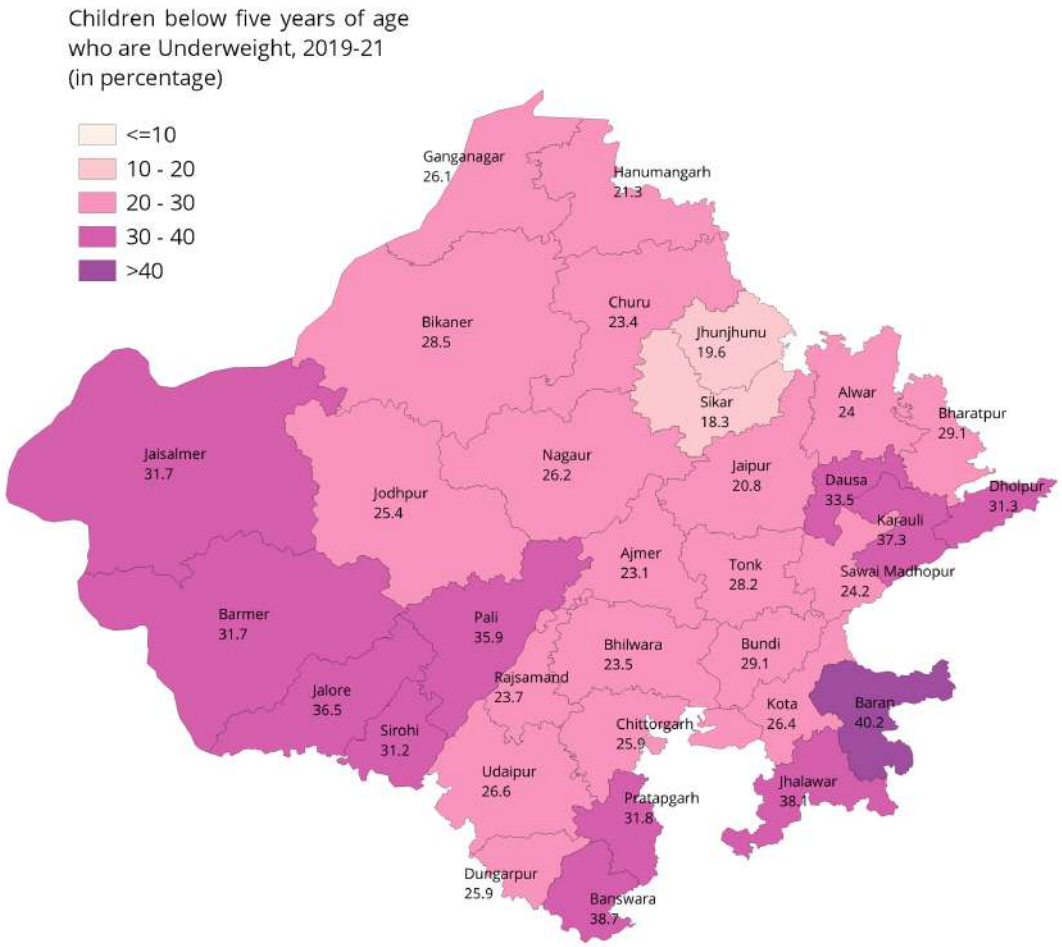


Figure 59: Prevalence of children who are underweight below the age of five years across districts in Rajasthan, NFHS-5 2019-21, in percentage.

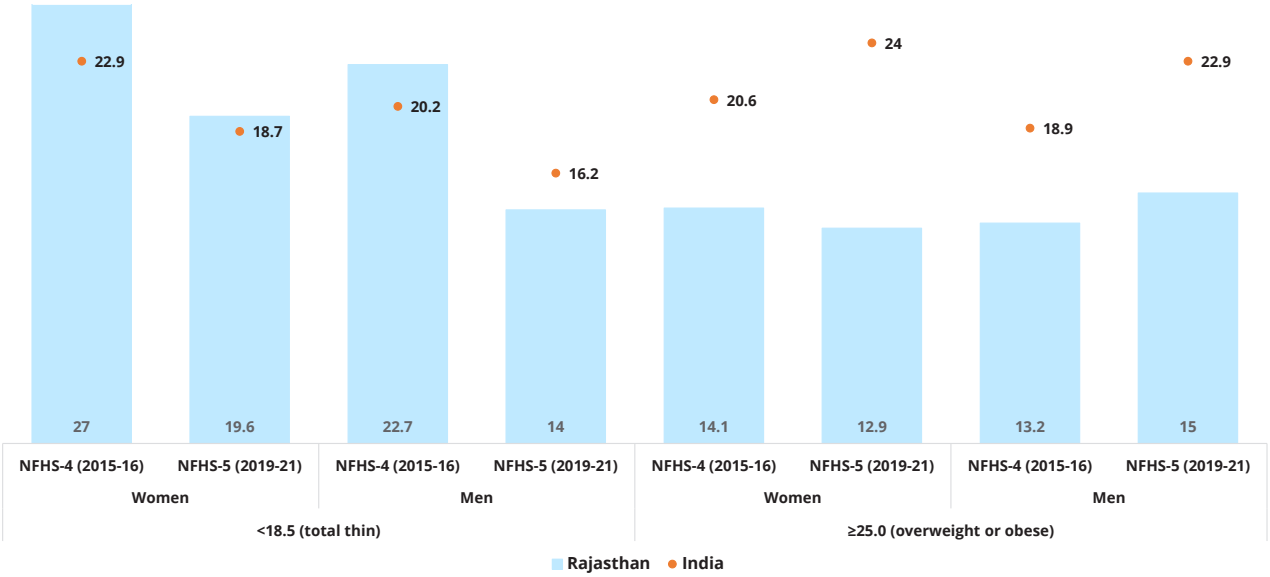


Figure 60: Change in Nutrition Status among Adults (15-49 years) in Rajasthan and India between 2015-16 and 2019-21, in percentage (NFHS).

kg/m^2). Proportion of women in overweight/obese category declined from 14.1 percent in 2015-16 to 12.9 percent in 2019-21, however the proportion of obese men in same time-period increased from 13.2 percent to 15 percent. The prevalence of overweight/obese women in Rajasthan (12.9 percent) is almost 50 percent lower than the national average of 24 percent, as per NFHS-5 findings, while prevalence of overweight/obesity in men is 7.9 percentage points behind the national average.

Nutrition outcomes in adults is also influenced with respect to age and social groups. While prevalence of low BMI declines with increase in age in both men and women, the chance of being overweight/obese increases with age. 40.1 percent adolescent girls and 34.7 percent

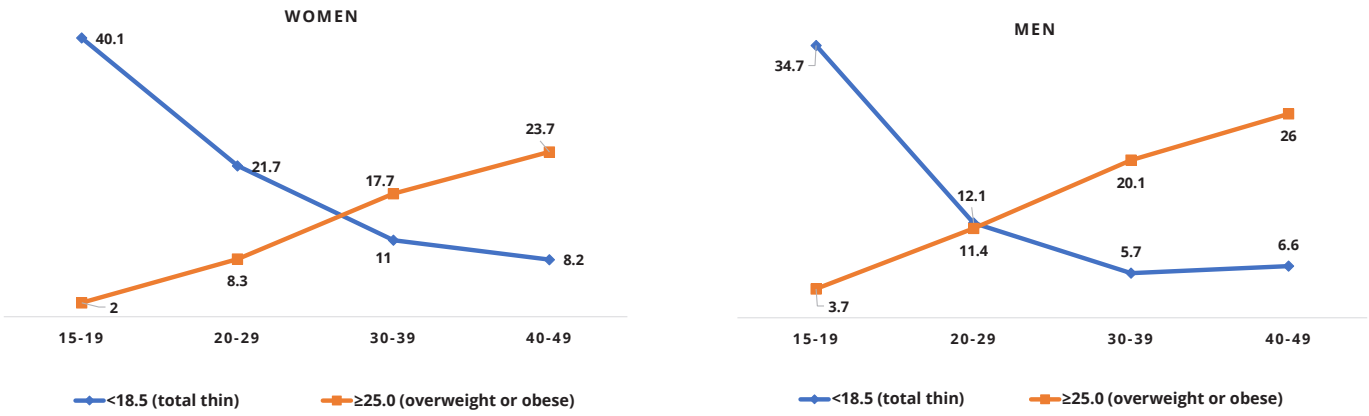


Figure 61: Nutrition status of adults (15-49 years) with respect to age in Rajasthan, NFHS-5 (2019-21), in percentage.

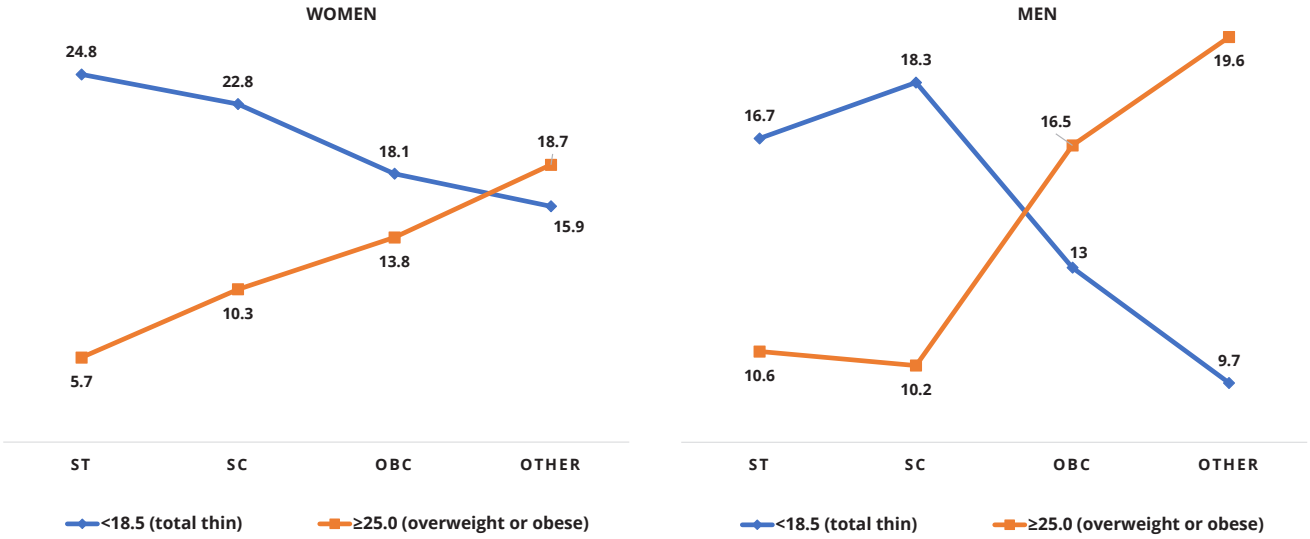


Figure 62: Nutrition status of adults (15-49 years) with respect to social groups in Rajasthan, NFHS-5 (2019-21), in percentage.

adolescent boys have BMI below normal. On the other side, 23.7 percent women and 26 percent men aged 40-49 years are obese or overweight (figure 61). Highest proportion of women with low BMI are from scheduled tribes (24.8 percent), followed by those belonging to scheduled caste (22.8 percent) (figure 62).

Districts on the eastern side flanking from north to south have higher proportion of women with low BMI compared to rest of districts in Rajasthan (figure 63). All districts except Jhunjhunu show reduction in proportion of women whose BMI is below normal. Maximum reduction is observed in Udaipur and least in Alwar district. Ajmer has the least prevalence of women with low BMI, while Bundi has the highest. On the other side, increasing overweight/obese population among adult population, both men and women aged 15-49 years in districts of Rajasthan is matter a of great concern, as this population has higher risk of non-communicable diseases and metabolic syndrome.

5.2.3. Anaemia in Children and Adults

Micro-nutrient malnutrition or 'hidden hunger' is a term used to refer the deficiencies caused by inadequate dietary intake of vitamins or minerals. More than two billion people in the world today are living with micronutrient malnutrition. Nearly half of such micro-nutrient deficient population are from India[52]. Vitamin A deficiency, iron deficiency anaemia, zinc deficiency and iodine deficiency disorders are the most common forms

52 Ritchie, H., Reay, D.S. and Higgins, P., 2018. Quantifying, projecting, and addressing India's hidden hunger. *Frontiers in Sustainable Food Systems*, *2*, p.11.

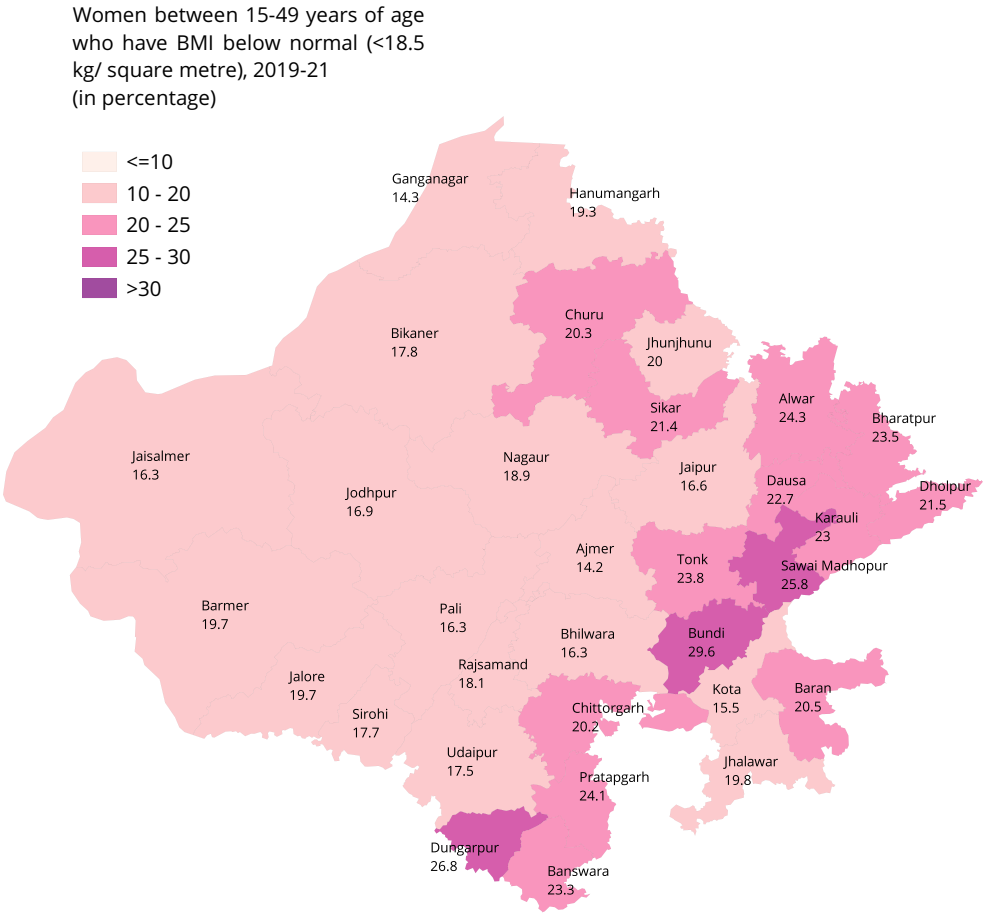


Figure 63: Prevalence of thinness (BMI<18.5 kg/m2) in women between 15-49 years of age across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

of micro-nutrient malnutrition. Micronutrient deficiency is a significant barrier to socioeconomic growth and feeds the cycle of underdevelopment such as stunting, increased susceptibility to infectious diseases, physical impairments, cognitive losses, blindness, and premature mortality. Its adverse implications on productivity, learning capacity, and health are extensive, mostly for the already disadvantaged groups.[53]

Rajasthan is among the bottom six States/ UTs in India with highest burden of anaemia in children between 6 and 59 months of age, with relatively lower prevalence than major states like Madhya Pradesh (72.7 percent) and Gujarat (79.7 percent). Neighbouring states such as Punjab and Haryana also report similar prevalence at 71.1 percent and 70.4 percent respectively. Figure 64 shows that the prevalence of anaemia has increased across all age groups in Rajasthan between 2015-16 and 2019-21. Prevalence of anaemia in women under 15-49 years age group, increased from 46.8 percent in NFHS-4 to 54.4 percent in NFHS-5, while anaemia in adolescent girls increased by 10.3 percentage points from 49.1 percent in 2015-16 to 59.4 percent in 2019-21. Even the burden of anaemia increased in adolescent boys (15-19 years) and men (15-49 years) by 11.9 percentage points and 6 percentage points respectively between the two NFHS periods.

Anaemia status in children and adults is also determined by various social, household, and maternal characteristics. As per NFHS-5 (2019-21) findings, rural areas (72.4 percent) have higher proportion of anaemic children than urban areas (68.3 percent). Despite high proportion of anaemia in all social groups, children belonging to scheduled tribe are the most anaemic at 77 percent. Anaemia in children is greatly influenced by mother's anaemic status. Highest proportion of anaemic children belong to mothers who are severely or moderately anaemic (figure 65).

In Rajasthan, 27.9 percent women are moderately anaemic, three times higher than men. Anaemia is higher in adults belonging to rural areas and scheduled

53 "The human and economic cost of hidden hunger", Food and Nutrition Bulletin, vol 28, no.2©2007, The United Nations University.

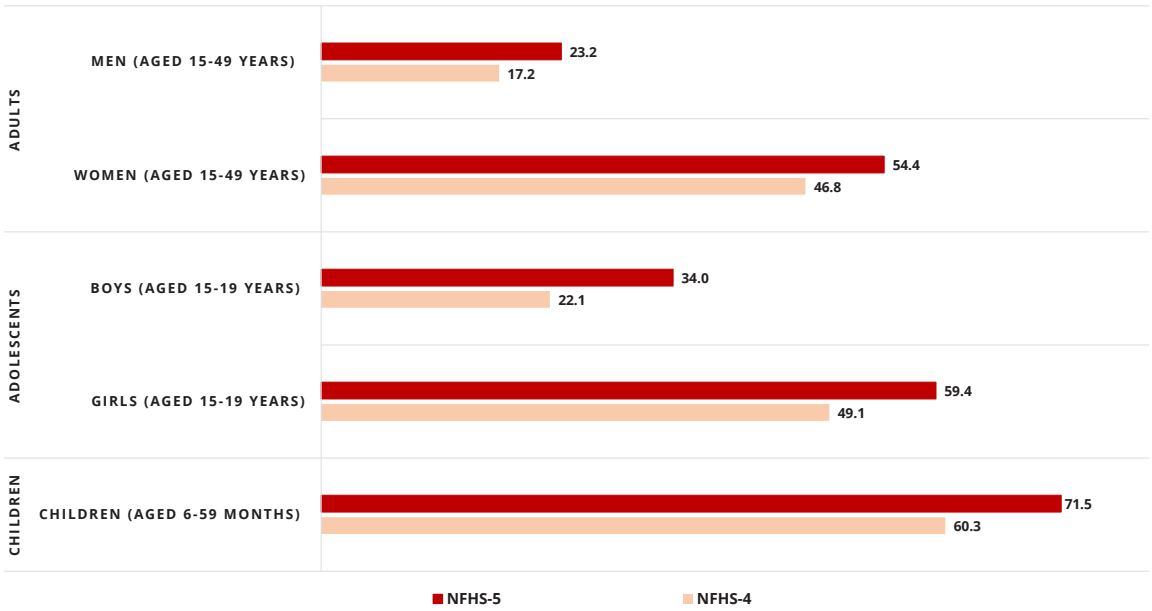


Figure 64: Change in anaemia prevalence across various age groups in Rajasthan between NFHS-4 (2015-16) and NFHS-5 (2019-21), in percentage.

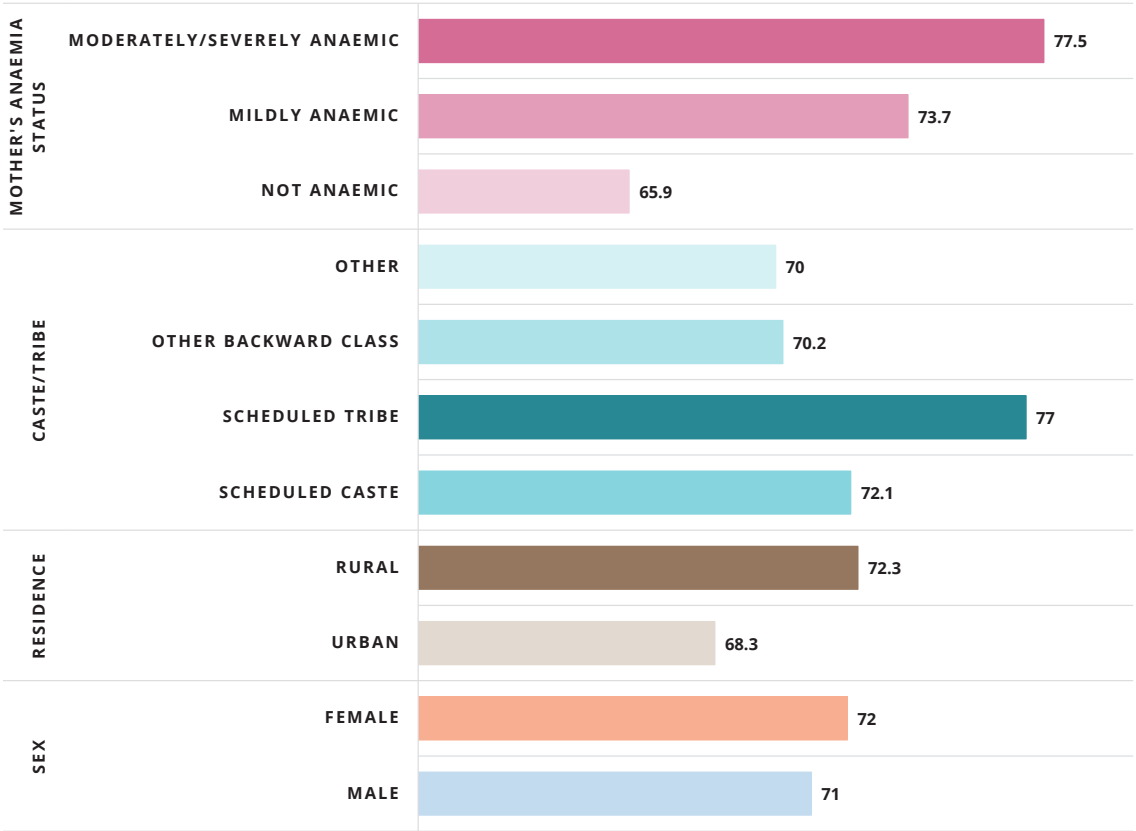


Figure 65: Prevalence of anaemia in children aged 6-59 months with respect to social groups in Rajasthan, NFHS-5 (2019-21), in percentage.

tribes. With respect to age, prevalence of anaemia is higher in adolescent girls and boys aged 15-19 years. Breastfeeding mothers are more anaemic compared to pregnant women (figure 66)

District level examination reveals the prevalence of child anaemia ranging from 58.6 percent to 84.3 percent across districts in Rajasthan, with Jaisalmer having the lowest prevalence and Rajsamand the highest (figure 67). Districts in the northern part and two longitudinal

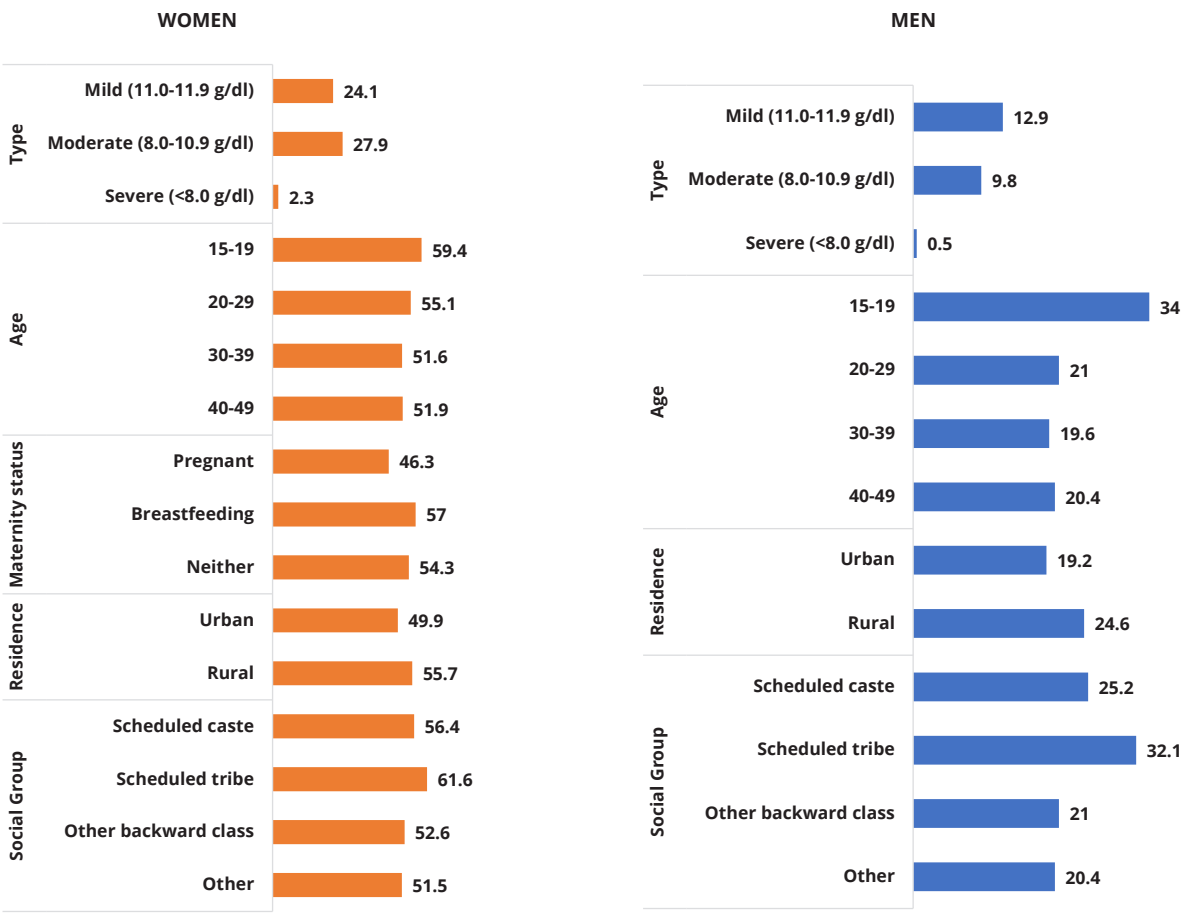


Figure 66: Anaemia status in adults with respect to various sub-groups in Rajasthan, NFHS-5 (2019-21), in percentage.

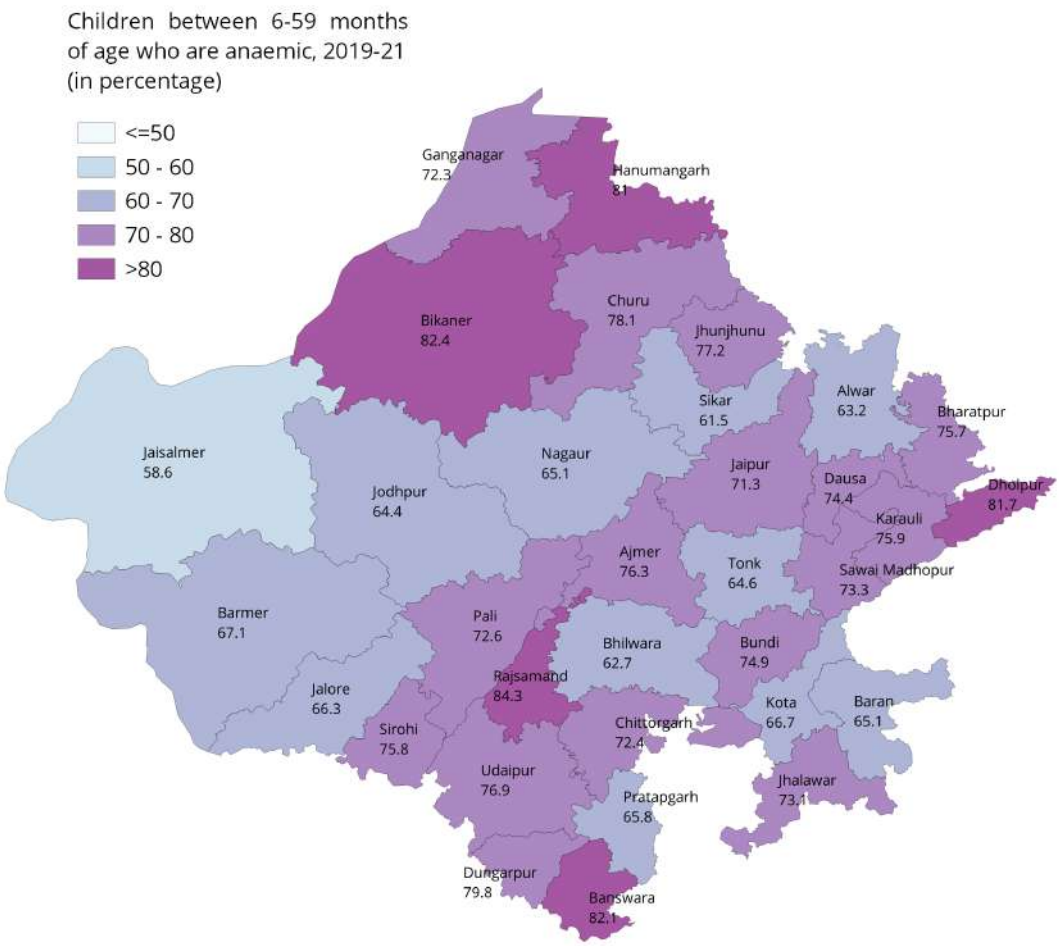


Figure 67: Prevalence of anaemia in children between 6-59 months of age across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

belts of districts running from east to central and moving towards the south have the highest proportion of anaemic children in Rajasthan (figure 67). Except Baran that shows the highest reduction of 11.2 percentage points and few other districts like Pratapgarh, Tonk, Bhilwara, Kota, Bundi, Jhalawar, Banswara, Udaipur and Jalore that show some reduction in the prevalence of child anaemia, all other districts show spike in prevalence of child anaemia between 0.8 and 35.9 percentage points between NFHS-4 and NFHS-5. **Churu district had the highest spike in the burden of child anaemia between 2015-16 and 2019-21, followed by Hanumangarh, Sri Ganagnagar, Dhaulpur, Bikaner and Jhunjhunu that show increase of more than 30 percentage points** between 2015-16 and 2019-21 (figure 68).

Similarly, anaemia in adolescent girls and women increased from 42.1percent to 77.3 percent and 43.4 percent to 72.6 percent respectively between NFHS-4 and NFHS-5 rounds. Dungarpur has the highest proportion of adolescent girls and women who are anaemic (figure 69).

Banswara shows 23.5 percentage points reduction in women anaemia and Udaipur shows 12.9 percentage point reduction in anaemia for adolescent girls with (figure 69). On the other hand, **more than 50 percent districts in Rajasthan show increase in prevalence of anaemia in women**, with Dhaulpur, Karauli, Ganganagar, Hanumangarh, Jaipur, Dausa showing an increase in the range of 22 and 33 percentage points. **More than 60 percent districts in Rajasthan show increase in prevalence of anaemia in adolescent girls,** with Sawai Madhopur , Bikaner, Dhaulpur, Jaisalmer, Jaipur, Karauli, Ganganagar, Dausa, Hanumangarh showing an increment in the range of 20 and 30.3 percentage points.

5.2.4. Dietary Practices among Children and Adults during critical period of care in Rajasthan

Proper infant feeding, from the time of birth, is crucial for child's physical and psychological development. Optimal feeding practices during infancy and early childhood, is

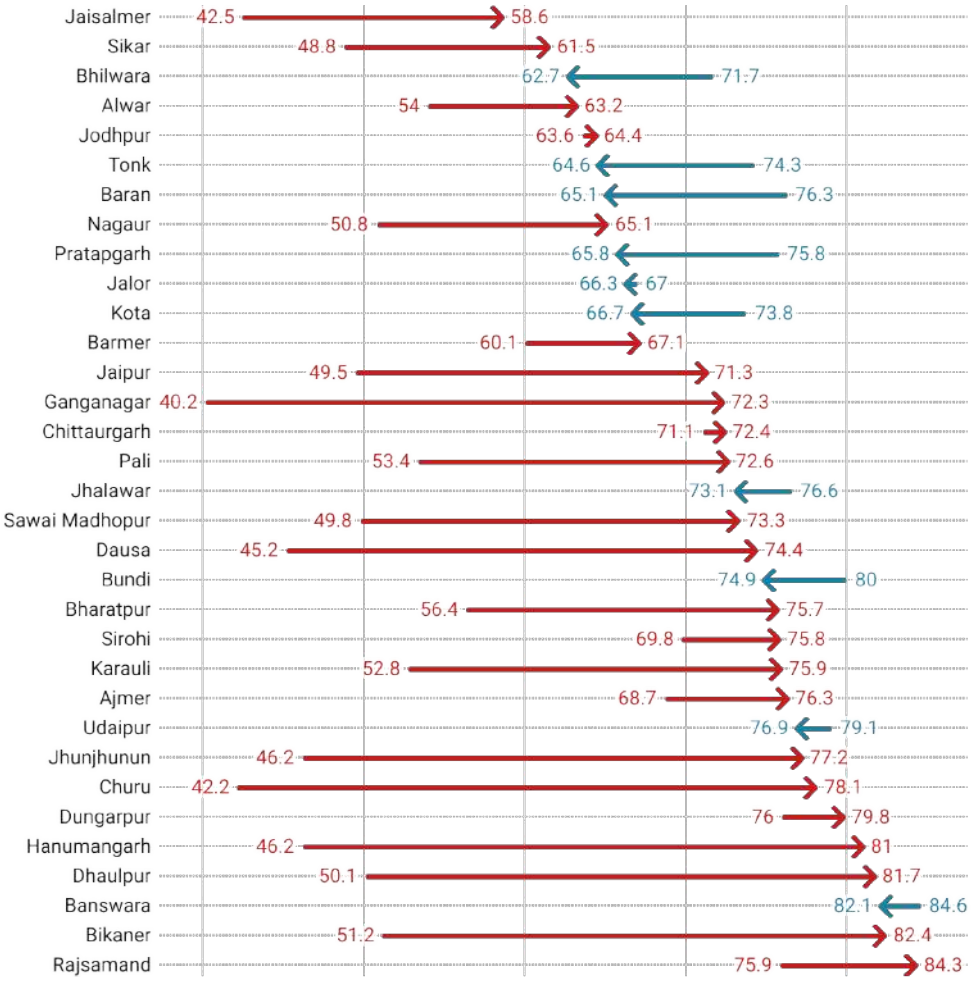


Figure 68: Shift in prevalence of anaemia in children between 6-59 months from NFHS-4 (2015-16) to NFHS-5 (2019-21) across districts in Rajasthan, in percentage.

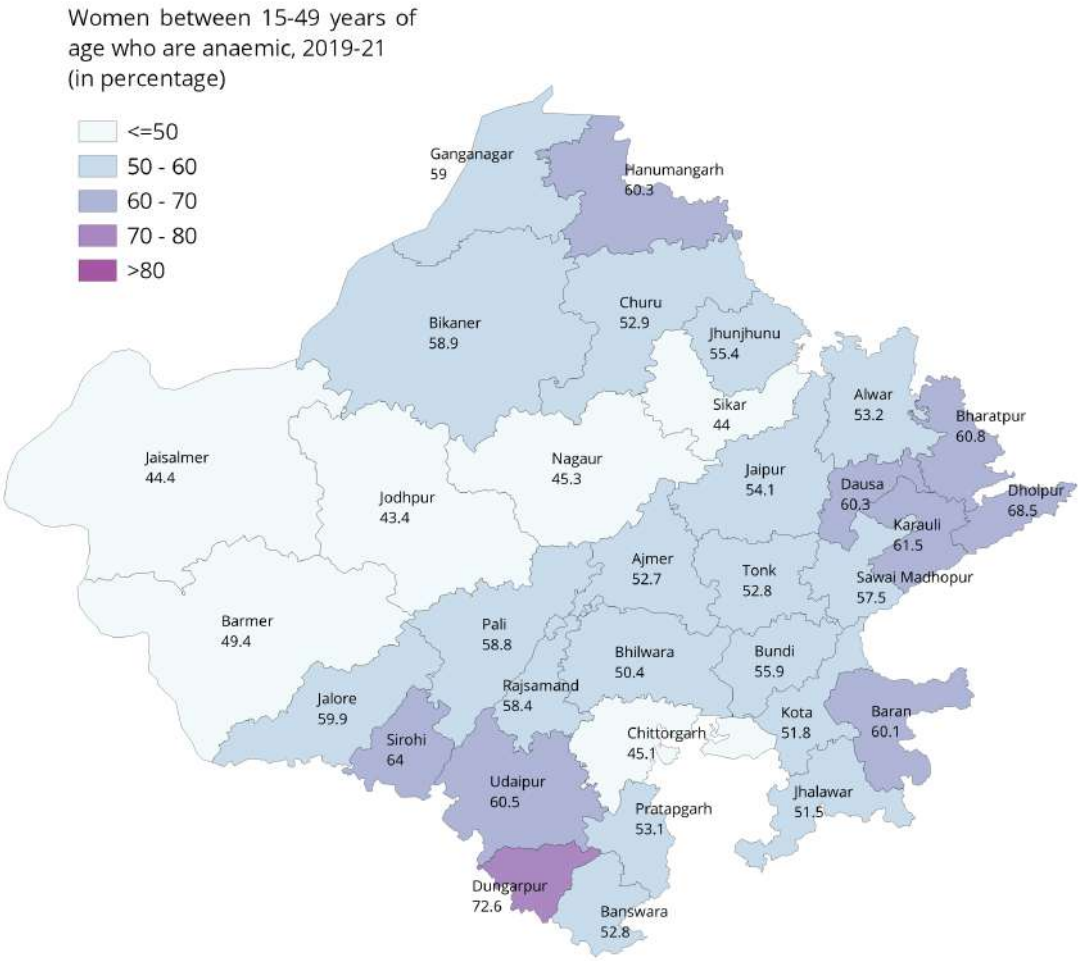


Figure 69: Prevalence of anaemia in women between 15-49 years of age across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

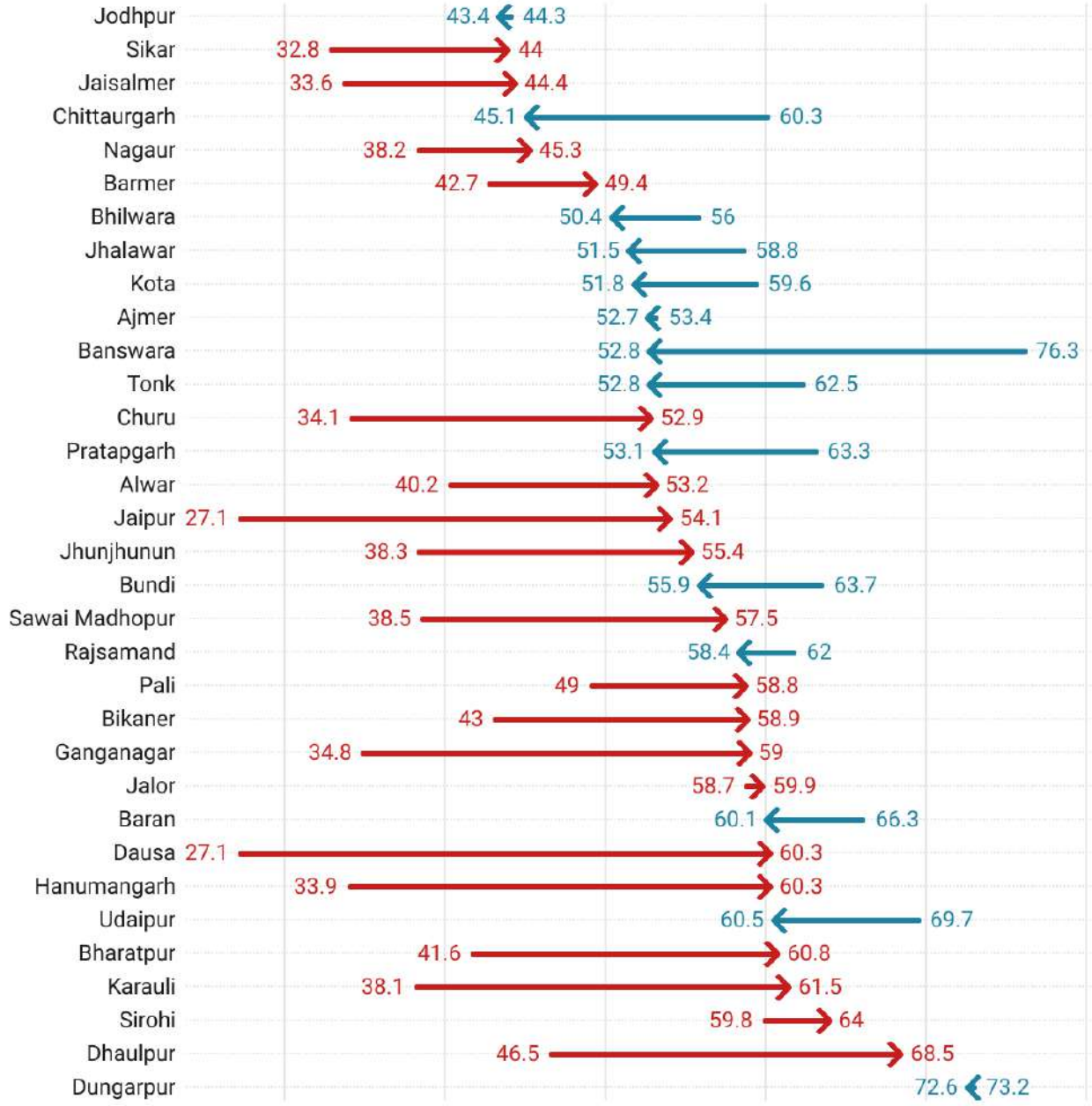


Figure 70: Shift in prevalence of anaemia in women between 15-49 years of age from NFHS-4 (2015-16) to NFHS-5 (2019-21) across districts in Rajasthan, in percentage.

measured by eight core indicators, outlined by World Health Organisation[54]: initiation of breastfeeding immediately after birth, exclusive breastfeeding for first six months, continued breastfeeding at one year, timely introduction of complementary foods at six months of age, adequate diet diversity and minimum meal frequency that form together minimum acceptable diet and consumption of iron rich food by children between 6 and 23 months of age. As the maximal brain growth occurs before child attains two years of age, growth faltering in this critical period can lead to stunting and suboptimal developmental outcome, affecting

54 World Health Organization, 2008. Indicators for assessing infant and young child feeding practices: Part 1 Definitions

generations, one after another. [55]

Rajasthan's performance on Infant and Child Feeding (IYCF) indicators shows steady improvement between 2015-16 and 2019-21 (figure 71). Early initiation of breastfeeding increased from 28.4 to 40.7 percent; proportion of children under 6 months who were exclusive breastfed increased from 58.2 to 70.4 percent, proportion of children aged 6-23 months who were timely introduced to complementary feeding increased from 30.1 to 38.0 percent and breastfeeding children aged 6-23 months receiving adequate diet increased from 3.4 to 8.4 percent, between NFHS-4 and NFHS-5. However, this progress still seems very far from optimal based on recent NFHS-5 findings and the state government needs to strengthen its implementation plan.

With respect to IYCF practices among children less than two years of age, except Churu, Tonk, Karauli and Jodhpur that show marginal decline, all remaining districts show improvement in early initiation of breastfeeding after the child's birth, between 2015-16 and 2019-21 in Rajasthan. Baran at 63 percent has the highest proportion and Jodhpur at 27.9 percent the lowest proportion of infants who were breastfed within an hour of birth (figure 73). A continuous stretch of districts extending from east to west through the centre of Rajasthan form a cluster having lower proportion (<40 percent) of infants breastfed in the early hours, cutting aside the better performing regions in the north and south of Rajasthan.

Except Tonk and Sirohi, the proportion of children between 6 months and below 2 years of age receiving adequate diet has improved in all districts of Rajasthan between 2015-16 and 2019-21 (figure 72). However, despite the improvement, the highest proportion of children who receive the adequate diet in the complementary feeding age-group stands at 12.5 percent (in Jodhpur). Sirohi (4.3 percent), followed by Dungarpur (4.7 percent) and Jalore (5.0 percent) have the least proportion of children who receive adequate

55 Jeyakumar, A., Babar, P., Menon, P., Nair, R., Jungari, S., Tamboli, A., Dhamdhere, D., Hendre, K., Lokare, T., Dhiman, A. and Gaikwad, A., 2022. Is Infant and Young Child-feeding (IYCF) a potential double-duty strategy to prevent the double burden of malnutrition among children at the critical age? Evidence of association from urban slums in Pune, Maharashtra, India. *Plos one*, *17*(12), p.e0278152.

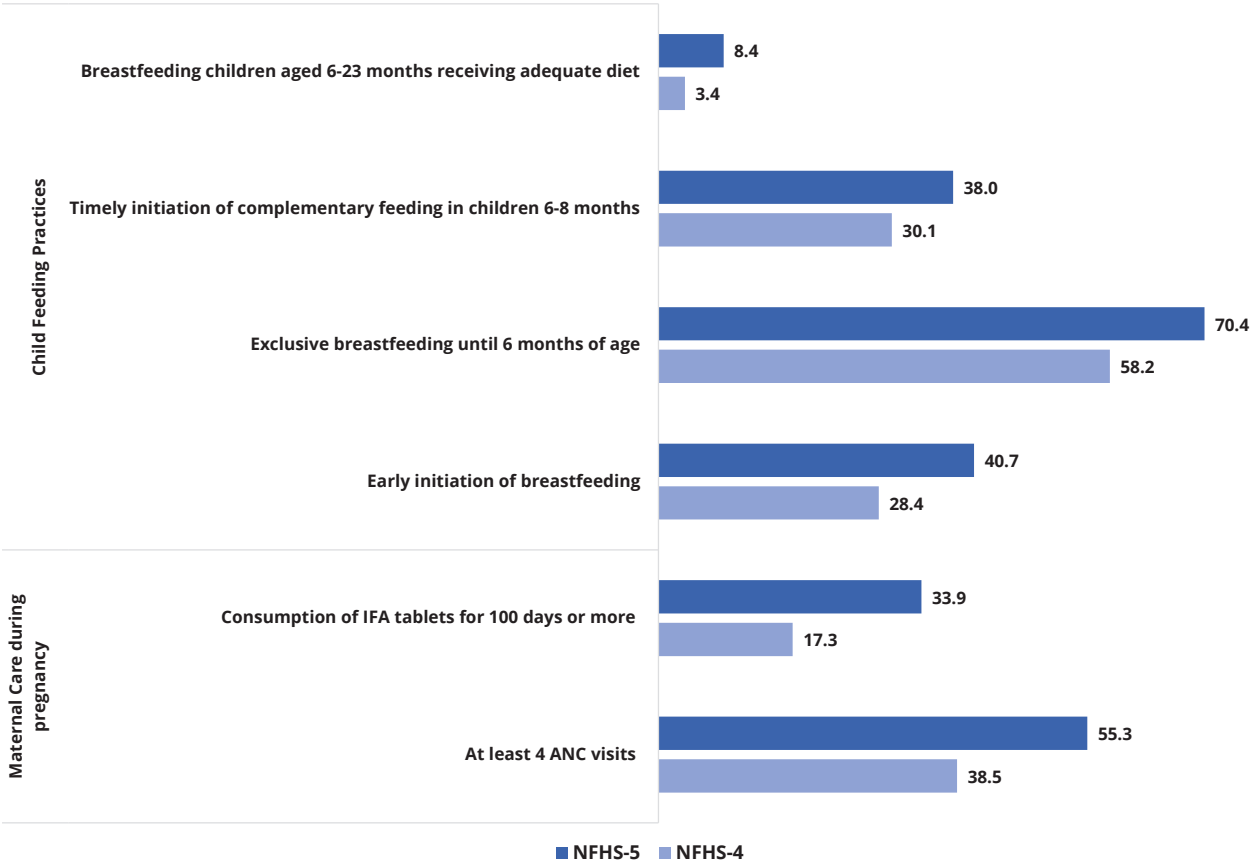


Figure 71: Performance of Rajasthan on indicators related to IYCF and antenatal care in Rajasthan between NFHS-4 (2015-16) and NFHS-5 (2019-21) (in percentage).

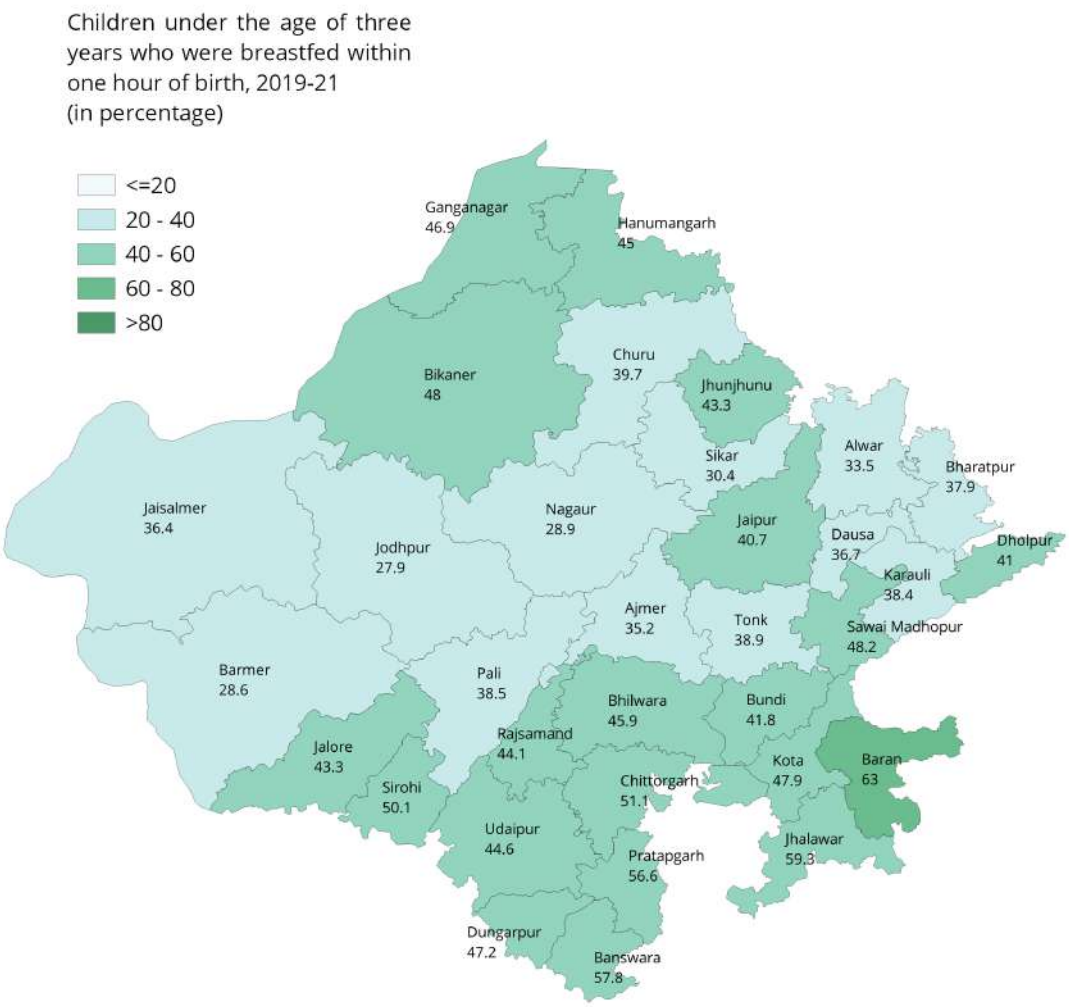


Figure 72: Proportion of children under the age of three years who were breastfed within one hour of birth across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

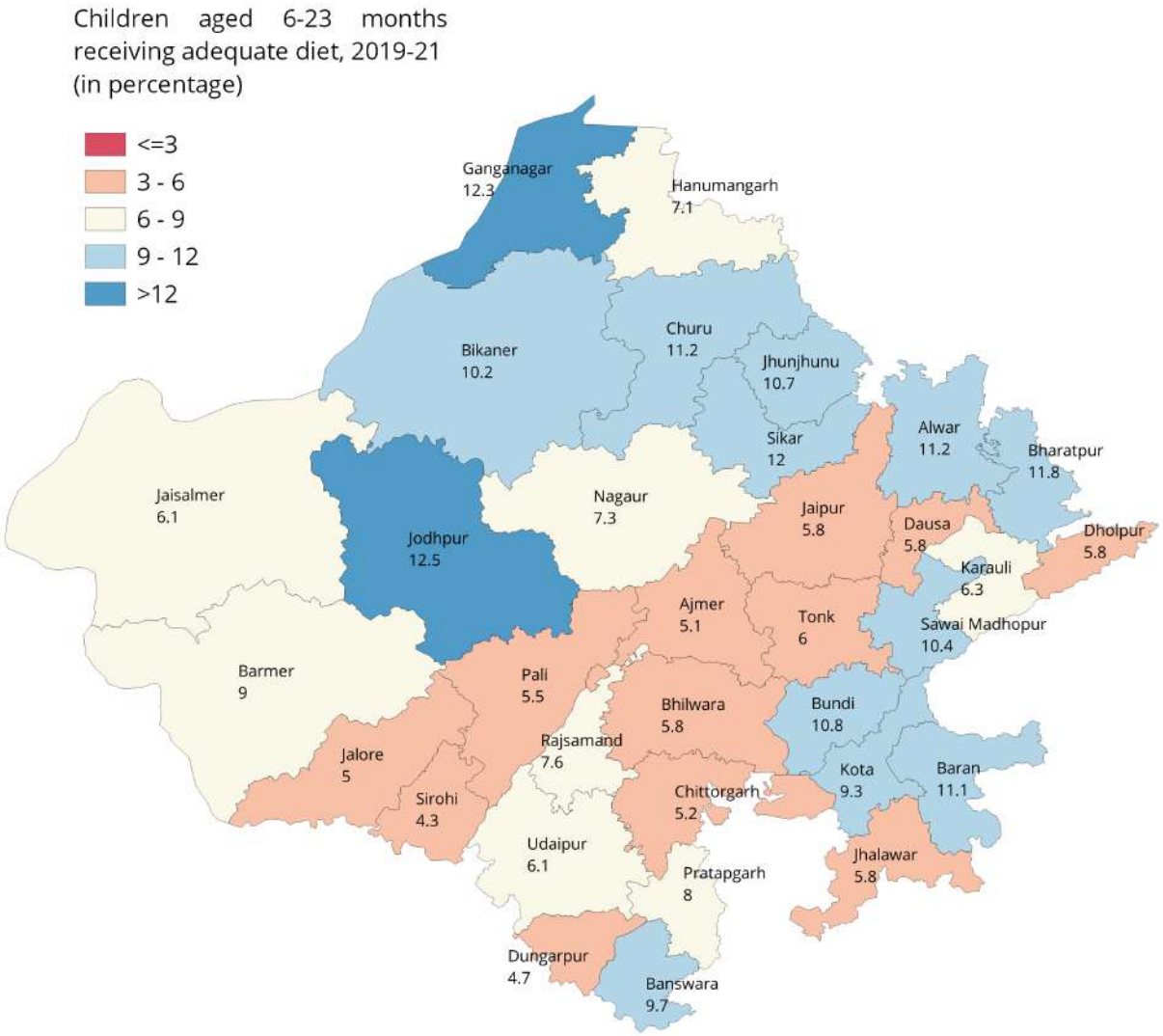


Figure 73: Proportion of children aged 6- 23 months receiving adequate diet across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

diet in the age group of 6 and 23 months in Rajasthan.

All districts in Rajasthan show improvement in Vitamin A supplementation among children aged 6 and 59 months of age between 2015-16 and 2019-21. Dungarpur, Rajsamand, Jaisalmer and Barmer show nearly three times growth in improving the Vitamin A supplementation among children. Barmer at 77.7 percent has the highest proportion of children who received Vitamin A dose while Bharatpur at 44.9 percent has the least proportion of children who received Vitamin A supplements in 2019-21 in Rajasthan as per NFHS-5 findings (figure 74).

With respect to iodine consumption, except Dhaulpur, the proportion of households consuming iodised salt is above 80 percent across all districts in Rajasthan as per NFHS-5 (2019-21) findings (figure 75). Districts like Banswara and Udaipur show nearly 10 percentage point increment between NFHS-4 (2015-16) and NFHS-5 (2019-21). However, despite the overall improved rates of

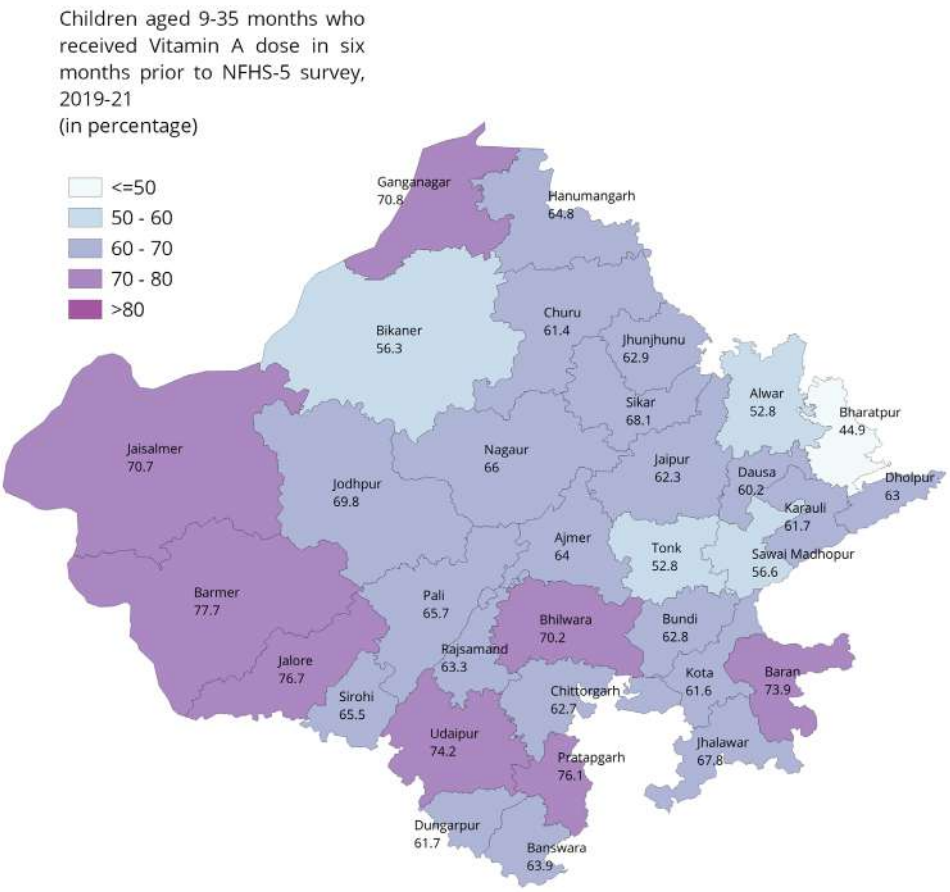


Figure 74: Proportion of children aged 9-35 months who received Vitamin A dose in six months prior to NFHS-5 survey across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

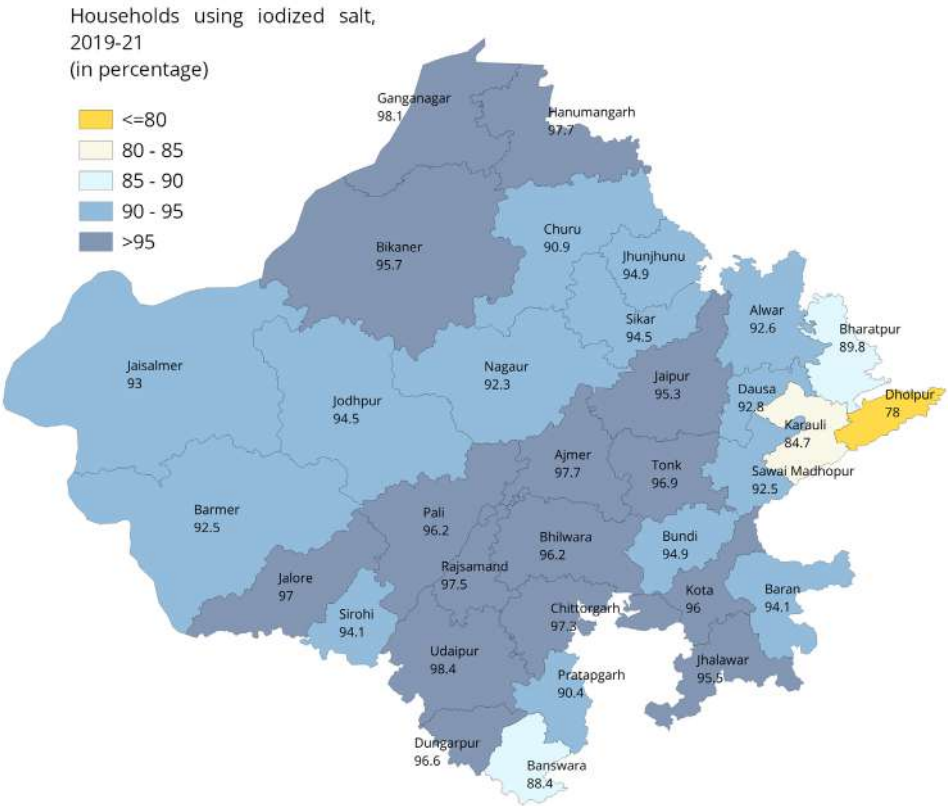


Figure 75: Proportion of households using iodized salt across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

consumption of iodised salt, in nearly 50 percent of total districts in Rajasthan, the proportion of households that consume iodised salt have either increased marginally or stagnated or shows a steady decline between NFHS-4 (2015-16) and NFHS-5 (2019-21). The districts that show decline of 5 percent or more in proportion of households consuming iodine are Dhaulpur (from 85.6 percent in NFHS-4 to 78 percent in NFHS-5) and Pratapgarh (from 95.2 percent in NFHS-4 to 90.4 percent in NFHS-5).

5.2.5. Nutrition Sensitive Indicators: Trends and Patterns

Rajasthan also sees improvement in key nutrition-sensitive parameters. For instance, percentage of women who underwent at least 4 antenatal check-ups (ANC) during pregnancy in past five years has increased from 38.5 percent in NFHS-4 to 55.3 percent in NFHS-5, showing an increase of 16.8 percentage points. Rajasthan is among the few states in India to have shown increment above 15 percent in 4+ANC visits over the past five years, as revealed through NFHS-5 findings. The rest states are Uttarakhand, Madhya Pradesh, Odisha, Uttar Pradesh, and Haryana. Similarly, consumption of 100+ IFA tablets by women during pregnancy nearly doubled in past five years, i.e., from 17.3 percent in NFHS-4 to 33.9 percent in NFHS-5.

However, a 24-hours recall of the micronutrient intake in Rajasthan during NFHS-5 (2019-21) survey revealed poor intake of micronutrients among children below five years of age. Less than five percent children between 6 and 23 months of age consumed foods rich in iron. Only one in four children were given iron supplements and five percent were given micro-nutrient powder before one week of the survey. Moreover, only 22.4 percent children were given deworming tablet in six months before the survey. Despite long standing government interventions and large-scale Vitamin A supplementation programme,

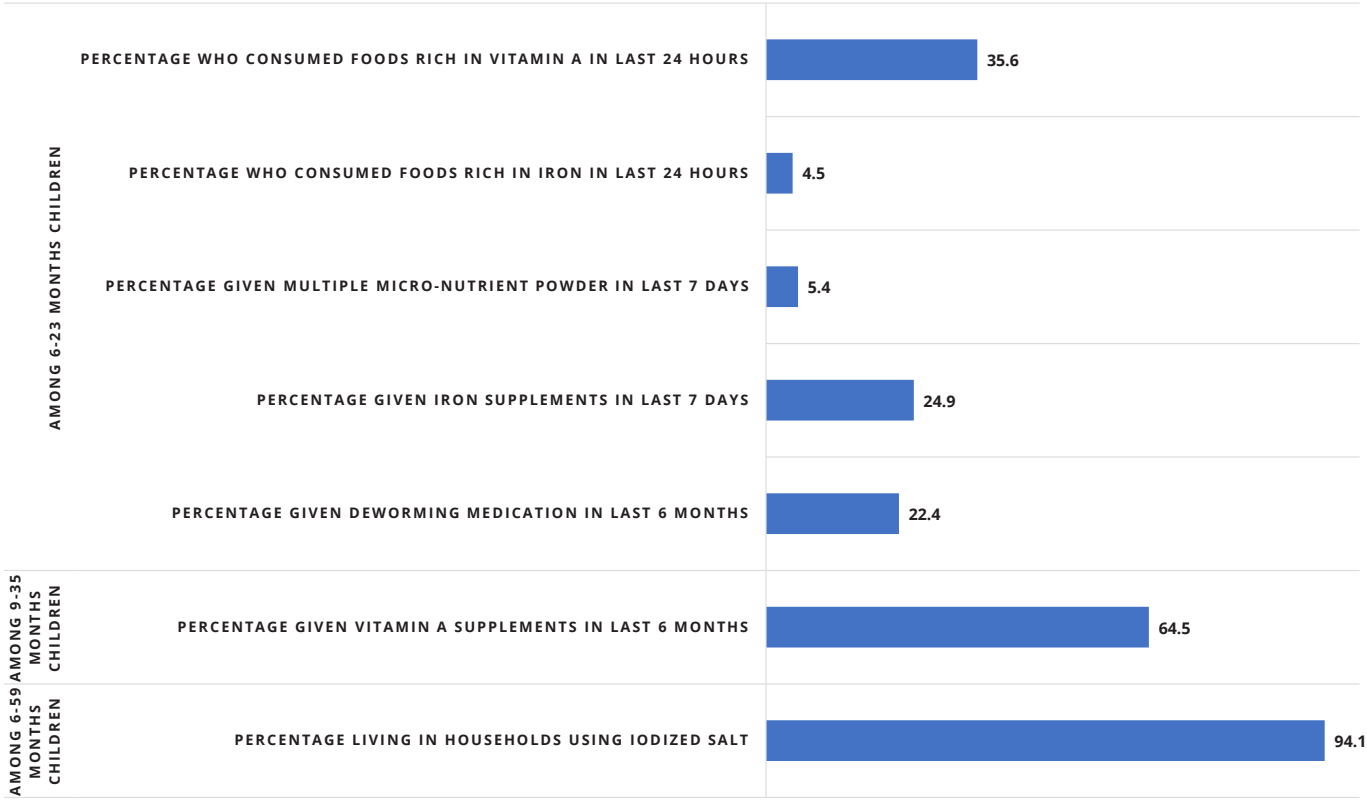


Figure 76: Micronutrient Intake among Children in Rajasthan, NFHS-5 (2019-21), in percentage.

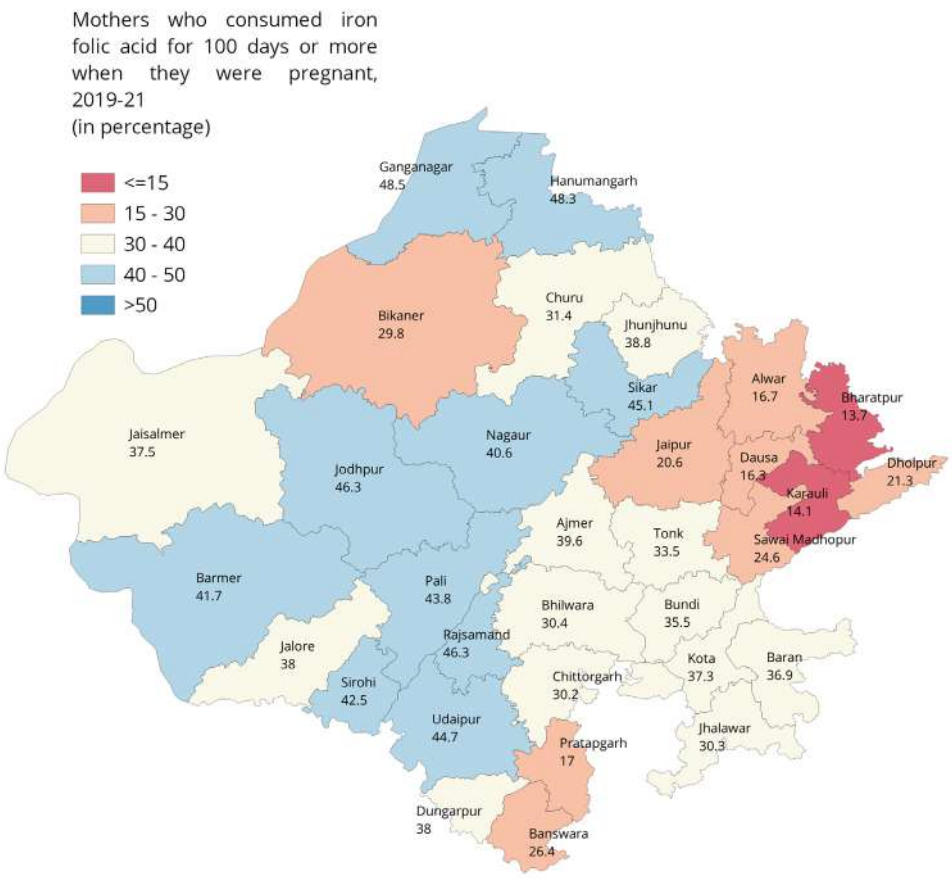


Figure 77: Consumption of iron folic acid tablets for 100 days or more by mothers when they were pregnant across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

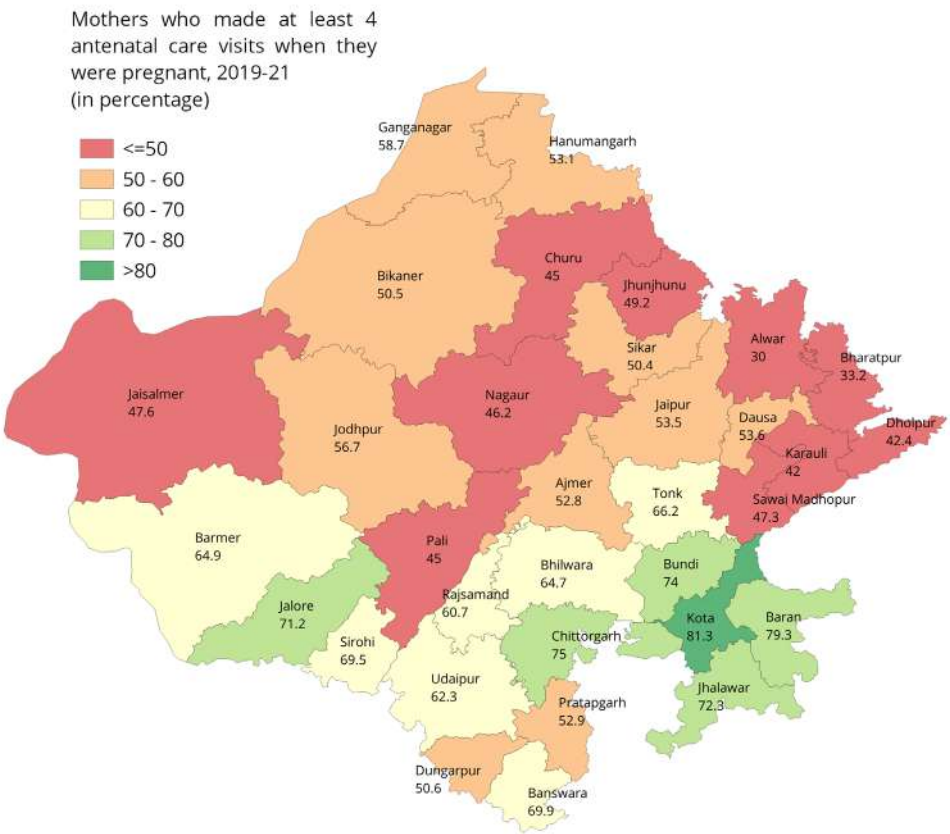


Figure 78: At least 4 Antenatal care visits made by mothers when they were pregnant across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

about four in ten children were still deprived of Vitamin A doses the in last six months before the survey (figure 76).

With respect to antenatal care, except Bhilwara, Dausa, Jaipur and Pratapgarh, all districts show increase in consumption of IFA tablets for 100 days or more, though disproportionately (Figure 77). Rajsamand shows the highest improvement of 37.7 percentage points, while Karauli shows the least improvement. Highest consumption is observed among mothers in Ganganagar district and least in Bharatpur district.

Huge variation across districts is observed for mothers who had at least 4 ANC visits during pregnancy. Kota is the best performing (81.3 percent) while Alwar is the poorest performing district in terms of minimum ANC visits made by women during pregnancy (30 percent). Chittaurgarh shows the maximum improvement in 4+ANC visits followed by Barmer with a jump of close to 50 percentage points since 2015-16 (figure 78).

Proportion of fully immunised children aged 12 to 23 months show massive increment in majority of districts, barring few. Barmer has the highest proportion of children fully immunised at 92.9 percent and shows nearly three-fold improvement in full immunisation of children aged 12 to 23 months between 2015-16 and 2019-21. Only Alwar and Sawai Madhopur are the two districts with less than 60 percent of children in the age group of 12 to 23 months who are fully immunised as per NFHS 2019-21 findings.

5.2.6. Environmental Factors: Trends and Patterns

Access to safe drinking water and availability of hygienic sanitation facilities are crucial for enhancing better absorption of food and indirectly addressing the underlying cause of malnutrition among vulnerable population. In Rajasthan, proportion of households with access to improved drinking water source continue to increase over the years from 93.7 percent in 2015-16 to 96.5 percent in 2019-21. Almost all households in urban areas (99.1 percent) have access to improved drinking water source, whereas in rural areas this proportion stands at 95.6 percent.

With respect to improved sanitation facility, there has been a considerable improvement, with 71.1 percent households having access to improved facilities for sanitation in 2019-21 as opposed to 46.1 percent in 2015-16. However, the difference in the proportion of households having access to improved sanitation facilities between rural and urban areas is 21.1 percent, with urban areas (87.2 percent) having higher access than the rural counterpart (66.1 percent) (figure 79).

All districts, albeit disproportionately, show improvement in terms of households with improved sanitation facility (figure 81). Barmer shows four-fold increment in the proportion of households with sanitation facility between 2015-16 and 2019-21, which is praiseworthy. Hanumangarh (83.8 percent) followed by Barmer (83.6

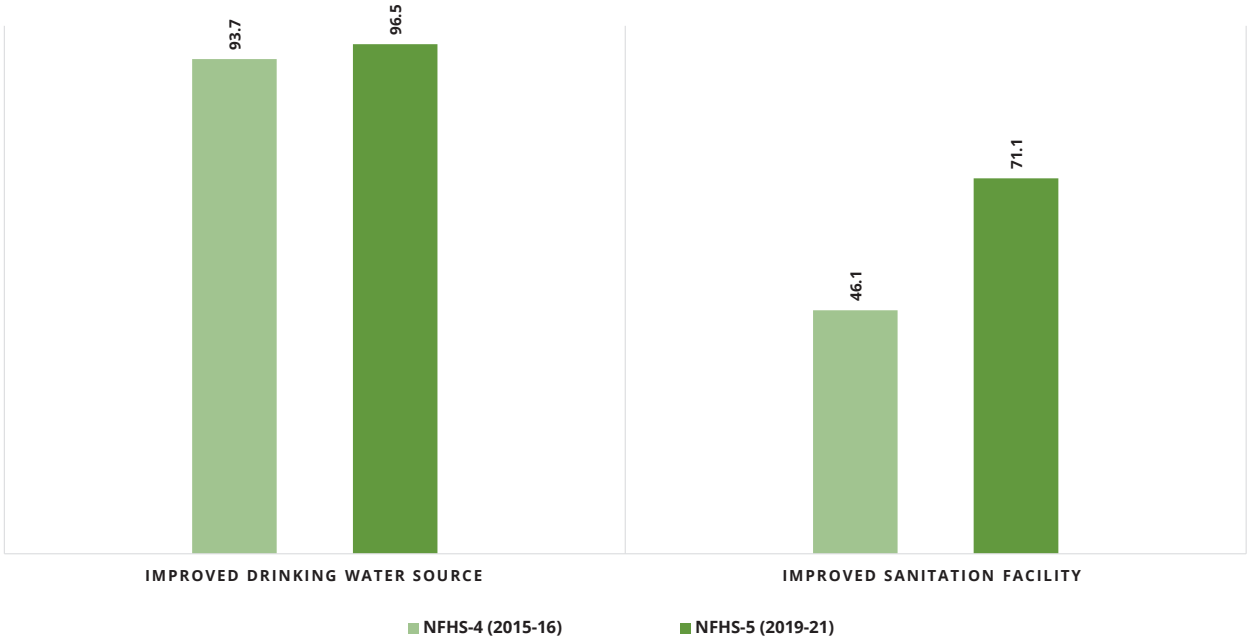


Figure 79: Proportion of households with access to safe drinking water source and improved sanitation facility in Rajasthan, NFHS-5 (2019-21), in percentage.

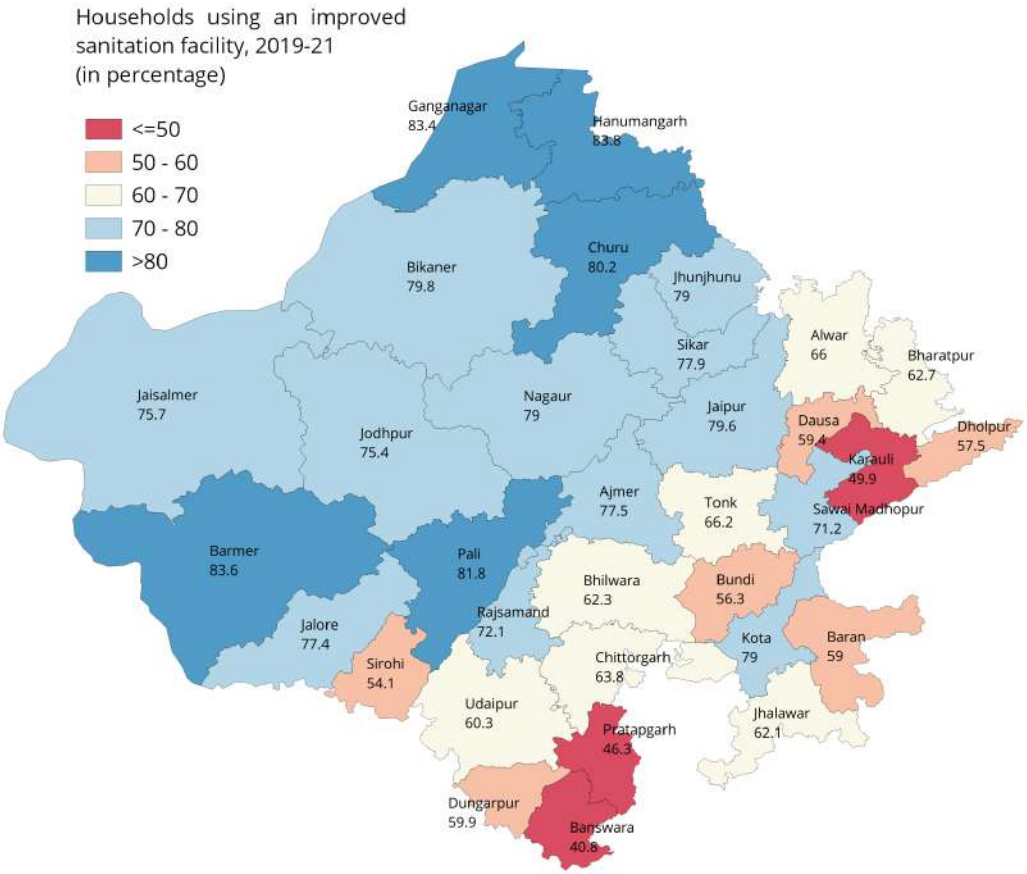


Figure 80: Proportion of households using an improved sanitation facility across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

percent) have the highest proportion of households with improved sanitation facility, while **Banswara has the least proportion (40.8 percent)**. Districts with proportion of households having improved sanitation facility below 70 percent appear to form a continuous cluster flanking from the eastern to south-eastern periphery in Rajasthan, excluding Kota and Sawai Madhopur where 70 percent or more households have improved sanitation facility.

As per NFHS-5 (2019-21) findings, except Pratapgarh, the proportion of households having improved drinking water source is 90 percent or more in all districts of Rajasthan. Districts like Jaipur, Barmer, Kota, Sikar and Dausa have approximately all households (>99 percent) with access to improved drinking water source (figure 80).

As far as access to health coverage is concerned (figure 82), there has been an enormous rise (nearly 3-folds to 15-folds higher) in proportion of households that has at least one member covered under a health insurance/ financing scheme across all districts in Rajasthan between NFHS-4 (2015-16) and NFHS-5 (2019-21). This can be linked to the successful roll out **of 'Mukhya Mantri Chiranjeevi Swasthya Bima Yojana'** in Rajasthan that was launched in 2021 aimed at universalising the health care for all the citizens of the State. In Barmer, the proportion of households with health finance cover has increased from 8.9 percent in 2015-16 to 97.8 percent in 2019-21, the largest proportion of households with health cover across all districts. Sawai Madhopur has the least proportion of households covered under health scheme compared to other districts in Rajasthan, despite increment from 31.6 percent in 2015-16 to 80.5 percent in 2019-21.

5.3. Composite Indicator of Anthropometric Failure (CIAF)

Acknowledging that at a given time, a child can suffer from one or more anthropometric failures, in the year 2000, development economist Peter Svedberg[56] formulated a composite tool to estimate the actual burden of

56 Svedberg P. *Poverty and Undernutrition: Theory, Measurement, and Policy*. Oxford, England, UK: Oxford University Press. 2000.

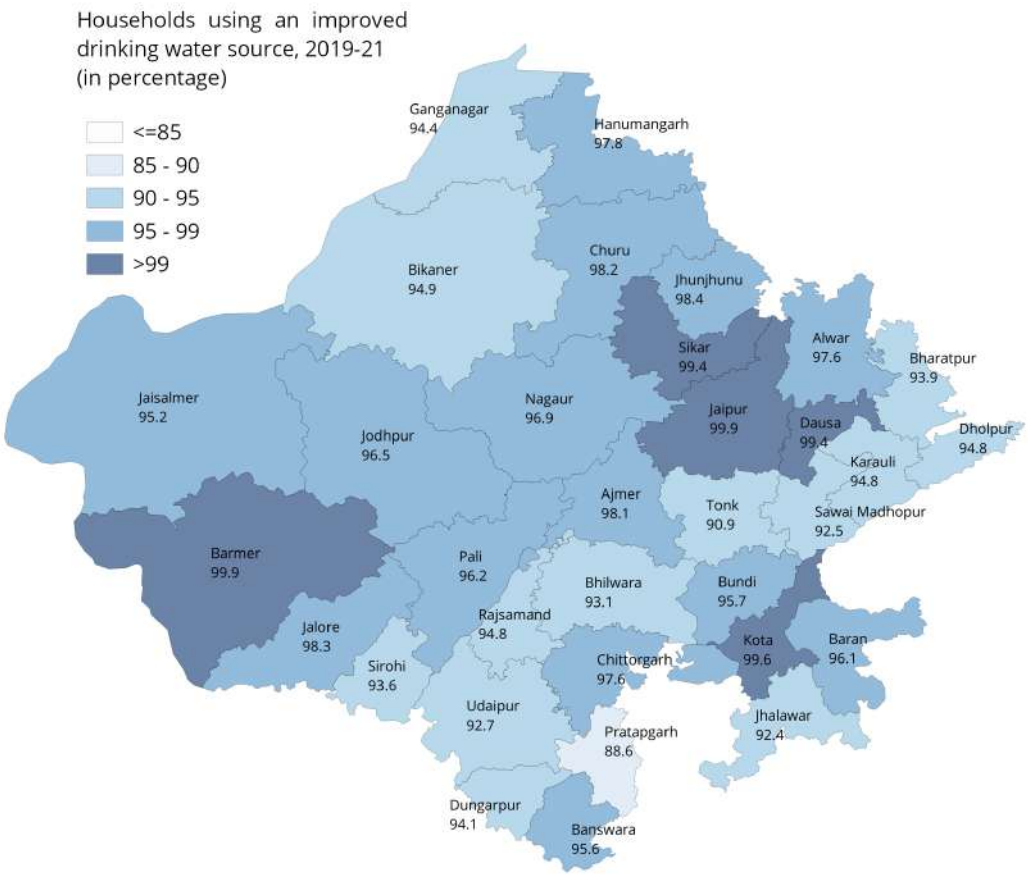


Figure 81: Proportion of households using an improved drinking water source across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

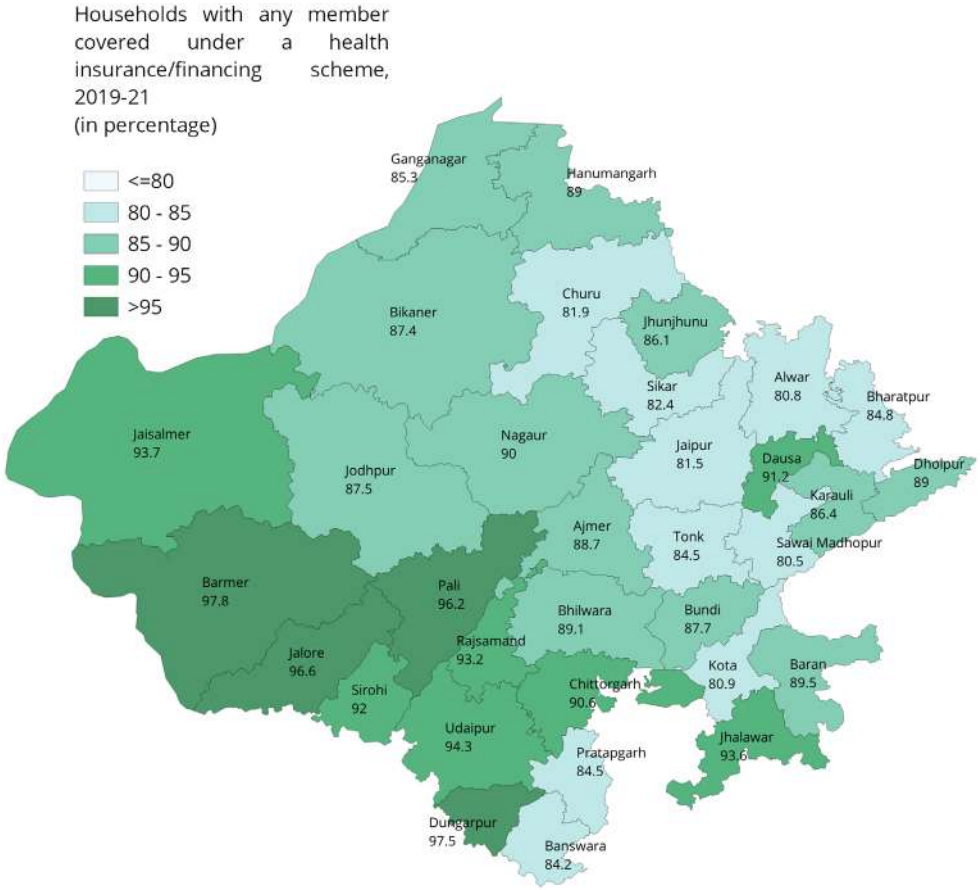


Figure 82: Proportion of households with any member covered under a health insurance/financing scheme across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

undernutrition in young children (below five years of age) in developing countries, popularly known as the Composite Index of Anthropometric Failure (CIAF). It was based on the three WHO classification of undernutrition, i.e., stunting (short height-for-age), underweight (low weight-for-age) and wasting (low weight-for-height). The original model consisted of six sub-groups of anthropometric failure (Groups i-vi); i: 'No anthropometric failure', ii: 'Only wasting', iii: 'Only stunting', iv: 'Wasting and underweight', v: 'Stunting and underweight', vi: 'Stunting, wasting and underweight'. Further, another category, 'only underweight' (Group vii) was introduced[57]. Later, two more categories, 'only overweight' (Group viii) and 'Stunting with overweight' (Group ix) were suggested[58], owing to increased evidence on simultaneous rise in overweight and obesity simultaneously with stunting in both developed and developing countries[59,60], to ascertain the dual burden of malnutrition in a holistic manner. Given that it is physically impossible for a child to have stunting and wasting at the same time and not be underweight, the combination of 'wasted and stunted' was not included in the CIAF classification. The revised CIAF classification is presented in table 2.

Based on the above CIAF classification, as per NFHS-5 (2019-21) analysis, one in every two children below the age of five years suffers from one or more anthropometric failure/s. This is despite 7.5 percentage point reduction in anthropometric failure from NFHS-4 (2015-16), see figure 83.

It is pertinent to note that in Rajasthan, the triple and double burden of undernutrition has significantly reduced between NFHS-4 (2015-16) and NFHS-5 (2019-21) (see table 3). **The proportion of children suffering from all three forms of anthropometric failures, i.e.,**

57 Nandy S, Irving M, Gordon D, Subramanian SV, Smith GD. Poverty, child undernutrition and morbidity: new evidence from India. Bull World Health Organ. 2005;83(3):210–6 DOI: /S0042-96862005000300014.

58 Kuiti BK, Bose K. The concept of composite index of anthropometric failure (CIAF): Revisited and revised. *Anthropol Open J*. 2018; 3(1): 32-35. doi: 10.17140/ANTPOJ-3-118

59 Shrimpton R, Rokx C. The double burden of malnutrition: A review of Global Evidence. Health, Nutrition and Population (HNP) Discussion Paper. 2012.

60 Gillespie SR, Haddad LJ. *The Double Burden of Malnutrition in Asia: Causes, Consequences, and Solutions*. New Delhi, India: Sage India.2003.

Table 2: Classifications used in the Composite Index of Anthropometric Failure (CIAF)

CIAF Sub-categories	WHO anthropometic classifications			
	Stunted (height for age Z score <–2 SD)	Wasted (Weight for Z score <–2 SD)	Underweight (Weight for age Z score <–2 SD)	Overweight/Obese (Weight for height Z score <–2 SD)
No anthropometric failure	☒	☒	☒	☒
Only Stunted	☑	☒	☒	☒
Only Wasted	☒	☑	☒	☒
Only Underweight	☒	☒	☑	☒
Wasted & Underweight	☒	☑	☑	☒
Stunted & Underweight	☑	☒	☑	☒
Stunted, Wasted & Underweight	☑	☑	☑	☒
Only Overweight/Obese	☒	☒	☒	☑
Stunted & Overweight/ Obese	☑	☒	☒	☑

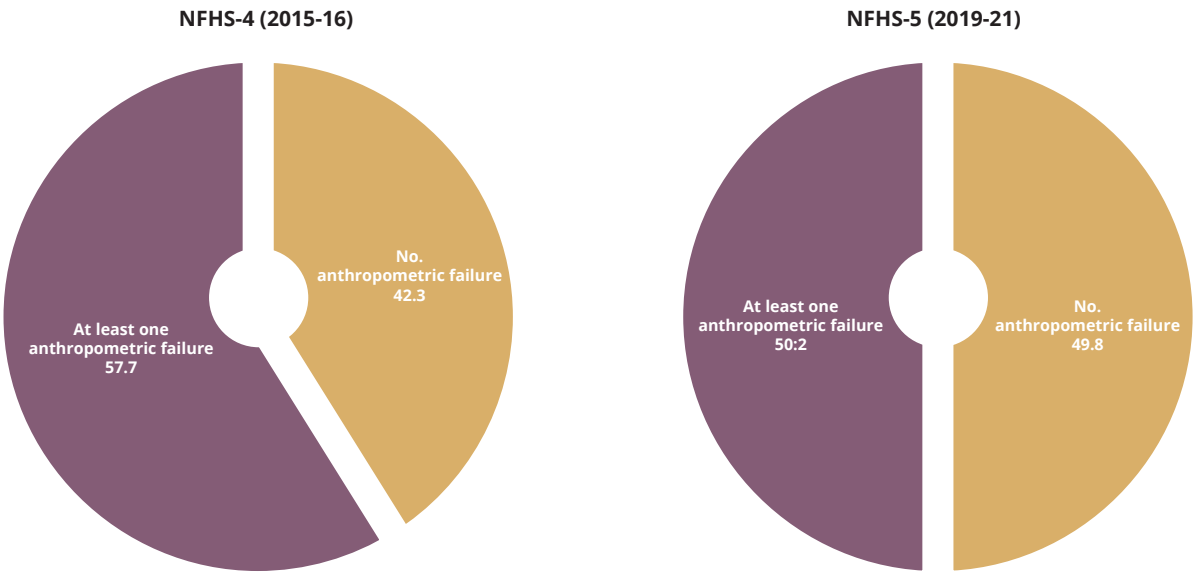


Figure 83: Anthropometric Failure in children below the age of five in Rajasthan between 2015 and 2021, in percentage.

stunting, wasting and underweight simultaneously, has reduced by almost 50 percent (from 7.2 percent in 2015-16 to 3.5 percent in 2019-21). Similarly, there is a significant reduction in the proportion of children suffering from dual forms of undernutrition, whether in the form of stunting and underweight (fell from 17.8 percent in 2015-16 to 12.9 percent in 2019-21) or wasting and underweight (reduced from 9.3 percent in 2015-16 to 6.4 percent in 2019-21). The proportion of children with one anthropometric failure, either in the form of 'only stunted' (remains at 12.6 percent between 2015 and 2021), 'only wasted' (fell from 6.5 percent in 2015-16 to 6.3 percent in 2019-21) or 'only underweight' (from 2.3 percent in 2015-16 to 1.8 percent in 2019-21), remains stagnant or shows a marginal decline. On the other hand, single and dual markers of overweight/ obesity have increased between 2015 and 2021. While the proportion of children with only overweight/obesity increased from

0.5 percent to 1.1 percent, the children with both stunting and overweight/obesity have increased from 1.4 percent to 1.6 percent.

The district level analysis reveals, Baran (65.9 percent) followed by Karauli (63.2 percent) has the highest proportion of children with a minimum of one or more anthropometric failure in Rajasthan, while Sikar (39.4 percent), followed by Jaipur (40.3 percent) have the least proportion of children with any anthropometric failures. Except five districts - Dausa, Baran, Tonk, Ganganagar and Karauli, that show increase in the proportion of children with one or more anthropometric failure/s in the descending order, remaining 28 districts have succeeded in reducing proportion of children in the same category between 2015 and 2022. Dungarpur, Udaipur, Sirohi and Bhilwara show the maximum reduction of 20 percent or more in prevalence of children with any one or more form of anthropometric failure between fourth and fifth round of NFHS survey.

As per NFHS-5 analysis, Karauli (7.3 percent) followed by Dausa (6.7 percent), Jhalawar (6.5 percent), Baran (5.9 percent) and Banswara (5.7 percent) have the highest proportion of children suffering from all three form of undernutrition simultaneously, while Sikar has the lowest (1.2 percent). It is to note that while most districts have reduced the prevalence of triple burden of undernutrition, specifically Dungarpur, Pratapgarh and Udaipur who have succeeded in reducing the triple burden by 10 percentage points or more, the proportion of children suffering with all three forms of undernutrition simultaneously has increased in the range of 0.3 to 2.9 percentage points in districts like Dausa, Karauli, Bharatpur, Ganganagar and Jaipur. It is pertinent to note that children who suffer from all three forms of anthropometric deficits simultaneously (stunting, underweight and wasting) have 12 times higher risk of mortality compared to those with no deficits,[61] hence these children are the most vulnerable and should be accorded highest priority in reduction of undernutrition in Rajasthan.

With respect to the prevalence of double forms of undernutrition, the proportion of children with stunting and underweight ranges from 6.6 percent in Jhunjhunun to 17.8 percent in Dhaulpur. While the proportion of children with wasting and underweight ranges from 3.1 percent in Bharatpur to 12.8 percent in Jhalawar, based on NFHS-5 analysis. The proportion of stunted and underweight children has increased in Jalor, Baran and Barmer while the proportion of wasted and underweight children have increased in the range of 2 to 4 percentage points in Karauli, Sikar and Pali, and marginally (< 1 percentage points) in Sawai Madhopur and Dausa, between 2015-16 and 2019-21.

Except Sikar, Bundi, Dausa, Banswara, Barmer that show reduction in proportion of only overweight/obese children in the range of 0.1 to 0.5 percentage points and Kota that show no reduction, all other districts except Bundi, Banswara, Chittaurgarh show a steady increment of only overweight/obese children below the age of five in the range of 0.2 to 2 percentage points. Bundi, Banswara, Chittaurgarh and Pali have no prevalence of only overweight/obese children, while Jhunjhunu has the highest prevalence of 'only overweight/obese' children at 3.0 percent. More than half of total districts in Rajasthan show a disturbing trend where there is an increased prevalence of children who are both stunted and overweight/obese. Dhaulpur (3.7 percent) followed by Jodhpur (3.0 percent) and Bharatpur (2.9 percent) have the highest prevalence of such children in Rajasthan. Only in Pali, the proportion of children with overweight/obesity along with stunting is nil.

The socio-economic analysis of the children below the age of five years, distributed as per the CIAF category using NFHS-5 (2019-21) data, reveals the importance of household characteristics such as place of residence, caste, wealth in determining the child's nutrition status along with the factors like child's gender and geography in which the child is located. As observed in the table 5.3 household wealth plays out quite significantly in determining the risk of child having single, double or triple forms of undernutrition or with single or dual forms of overweight/obesity. For instance, children born in richest quintile 11 percent less, 53 percent less and 55 percent less chances of having single, double or triple form of undernutrition respectively. Conversely, the children born in the richest household have 50 percent more likelihood to be only overweight or obese compared to the poorest counterparts.

Children belonging to the Scheduled tribes have highest proportion of children having double (15.3 percent) or

61 McDonald, C.M., Olofin, I., Flaxman, S., Fawzi, W.W., Spiegelman, D., Caulfield, L.E., Black, R.E., Ezzati, M., Danaei, G. and Nutrition Impact Model Study, 2013. The effect of multiple anthropometric deficits on child mortality: meta-analysis of individual data in 10 prospective studies from developing countries. *The American journal of clinical nutrition*, *97*(4), pp.896-901.

Table 3: Distribution of children in Rajasthan based on CIAF classification as per their socio-economic characteristics, in percentage.

Socio-economic parameters		Undernutrition (in percentage)			Overweight/Obesity (in percentage)	
		Single burden (Only S, Only W or Only U)	Double burden (S+U or W+U)	Triple burden (S+U+W)	Single burden (Only O)	Double burden (S+O)
Place of Residence			p<0.01			
	Urban	20.8	10.2	3.7	1.7	1.7
	Rural	21.4	13.5	3.5	1.0	1.6
Caste			p<0.01	p<0.01	p<0.05	
	Scheduled caste	22.3	13.9	3.6	1.4	1.5
	Scheduled tribe	21.0	15.3	5.2	0.7	1.4
	Other backward class	21.6	12.3	3.1	1.0	1.8
	None of them	18.5	11.0	3.0	1.5	1.4
	Don't know	19.9	12.7	4.8	0.0	2.8
Wealth Index		p<0.05	p<0.01	p<0.01	p<0.05	
	Poorest	22.7	16.9	4.2	0.7	1.4
	Poorer	22.3	13.8	4.5	1.1	1.3
	Middle	21.2	14.0	3.5	1.4	1.6
	Richer	19.5	10.6	3.1	1.2	2.2
	Richest	20.2	8.0	1.9	1.4	1.5
Gender			p<0.05	p<0.01		
	Male	22.0	13.4	4.1	1.1	1.4
	Female	20.4	12.3	2.9	1.1	1.8
State Divisions		p<0.05	p<0.01	p<0.01	p<0.01	
	Ajmer	20.2	10.5	3.5	1.5	1.5
	Bharatpur	23.6	14.8	4.8	1.3	2.5
	Bikaner	22.0	9.0	3.3	2.1	1.2
	Jaipur	20.7	9.6	2.8	1.5	1.6
	Jodhpur	20.1	17.2	3.0	0.8	1.7
	Kota	23.8	13.7	5.3	0.2	1.5
	Udaipur	21.1	14.7	3.6	0.5	1.4

Note: i) S represents Stunted, W represents Wasted, U represents Underweight, and O represents Overweight/Obesity.
ii) P represents chi-squared statistical probability at 95 percent significance (p<0.05) and at 99 percent significance (p<0.01) level.

triple forms (5.2 percent) of undernutrition, followed by children belonging the scheduled castes and other backward castes, while children belonging to general category have the least prevalence of double (11.0 percent) or triple forms (3.0 percent) of undernutrition. On the other hand, children belonging to scheduled tribes have least proportion of only overweight/obese children (0.7 percent) compared to other caste categories.

The analysis reveals that statistically, a child born in rural areas has 24 percent higher chances of having double forms of undernutrition. Similarly, a male child under the age of five has about 8 percent and 29 percent greater risk of having double and triple forms of undernutrition respectively, significantly.

The geography in which child is located also emerge as a significant variable in determining child's nutrition status. With respect to seven administrative divisions in Rajasthan, Kota division followed by Bharatpur division have the highest proportion of children with both triple form and single form of undernutrition. While Jaipur division and Jodhpur division have the least proportion of children with triple and double forms of undernutrition.

However, Jodhpur division has the highest proportion of children with double forms of undernutrition and Bikaner division has the least. Interestingly, Bikaner division has the highest proportion of children with only overweight/ obesity, about 10 times higher than Kota division that has the least proportion of only overweight/obese children across the seven divisions in Rajasthan.

5.4. Special Policy Initiatives Taken by Government of Rajasthan for increased uptake of Food Utilization

Improved nutrition and well-being of children and mothers has been at the forefront of development agenda of both central and state government of Rajasthan. Through the large-scale safety nets programmes - **Integrated Child Development Services (ICDS**), **Mid-Day Meal Scheme (PM POSHAN)** and **Targeted Public Distribution System**, government ensures that the nutritional needs specifically of the vulnerable population is being met, as discussed in length in Chapter 4 'Food Accessibility'.

'Poshan Abhiyaan' or **National Nutrition Mission,** Government of India's flagship mission was launched from Jhunjhunun district in March 2018, aimed at community mobilisation through enhanced social behaviour change communication (SBCC) to reduce undernutrition among children and mothers. The State government has also taken various initiatives to promote healthy nutrition behaviours and generate awareness among community with the support of Anganwadis under the ICDS. For effective real-time monitoring of services being provided at Anganwadi centres, the 'Poshan Tracker' application developed by the Ministry of Women and Child Development, Government of India has been rolled out in all the districts of the State. The State Government is also taking the initiative of developing 'Poshan Vatikas' or nutri-gardens in selected Anganwadi centres to promote good nutrition and dietary practices in vulnerable households. Rajasthan is leading the efforts and serves as a role model across country for community-based management of Severely Acute Malnourished (SAM) children through the launch of **Acute Malnutrition Management and Action (AMMA) Program**, that is now scaled up in the entire state.

Mother and Child Health and Nutrition (MCHN) Days is organized regularly as an essential component of routine immunization to enhance immunization coverage in the State. **Village Health & Sanitation Committees** have been constituted in 43,440 villages that includes an elected member from the Panchayati Raj, along with ASHA Sahyogini, Anganwadi Worker, ANMs and representatives from SHGs, NGOs and non Mahila Swasthya Sangh (MSS) among others. **Nand Ghar Yojana** has been launched to increase public participation in ICDS services, that

focusses on construction and refurbishing of Anganwadi centres.

Moreover, the State government has been proactive in including nutrition component in various other development programmes. For example, under '**Nirogi Rajasthan Abhiyan**' launched in December 2019, a special component to address adolescent health, vaccination, communicable and non-communicable diseases was included, to be facilitated by health volunteers referred as "Swasthya Mitra" in village and urban ward. Like Central government's **Ayushman Bharat (Health & Wellness Center)**, the State has undertaken additional initiative to provide good quality primary healthcare services to urban poor & vulnerable population of the state in the proximity of slum areas, dense area where there is no health facility nearby, by launching **"Janta Clinics"** in Jaipur city, twelve of which are currently operational. The state provides free universal healthcare, and the per-family insurance amount under the **Mukhya Mantri Cheeranjeevi Swasthya Beema Yojana** which has been increased from 12.5 thousand USD (INR 1 million) to 31.3 thousand USD (INR 2.5 million) in 2023-24.

Along with health and nutrition component, the State government is continuously striving to improve the ease and access to safe drinking water sources and improved sanitation facilities. Rajasthan received the Open Defecation Free (ODF) status on 31st March 2018. The government is leaving no efforts to sustain the ODF status of villages and to improve the levels of cleanliness in rural areas through Solid and Liquid Waste Management activities, making villages ODF Plus under the second phase of **Swachh Bharat Mission Gramin.**

With the launch of **Jal Jeevan Mission** in August 2019, the Government has been successful in its efforts to a very large extent to provide potable water supply through Functional Household Tap Connections (FHTC) to every rural household.

5.5. Summary of Findings: Food Utilization

- From 2015-16 to 2019-21, Rajasthan shows improvement in its rank and performance in most of the child undernutrition parameters, however anaemia remains a major concern, showing gigantic increment in prevalence across all age groups.
- High proportion of stunted and underweight children below five years are observed in rural areas compared to urban areas. While urban areas have marginally higher prevalence of both wasted and overweight/obese children. Among the social groups, the prevalence of child malnutrition is the highest among the Scheduled Tribe population with 35.9 percent stunting, 18.6 percent wasting and 32 percent underweight children below the age of five. The nutritional status of the mothers has also a high bearing on the nutritional status of children. Among the under-5 children who are born to mothers with a low-BMI (<18.5), 37.5 percent are stunted, 18.3 percent are wasted, and 35.1 percent are underweight, which is much higher than for the mothers with normal BMI. While majority of districts show reduction in stunting and underweight in under five children, albeit disproportionately, many districts show increase in prevalence of wasting and severe wasting.
- Rajasthan is amongst the bottom six States/ UTs in India with highest burden of anaemia in children between 6 and 59 months of age. Prevalence of anaemia in women under 15-49 years age group, increased from 46.8percent in NFHS-4 to 54.4percent in NFHS-5, while anaemia in adolescent girls increased by 10.3 percentage points from 49.1percent in NFHS-4 to 59.4 percent in NFHS-5. Even the burden of anaemia increased in adolescent boys (15-19 years) and men (15-49 years) by 11.9 percentage points and

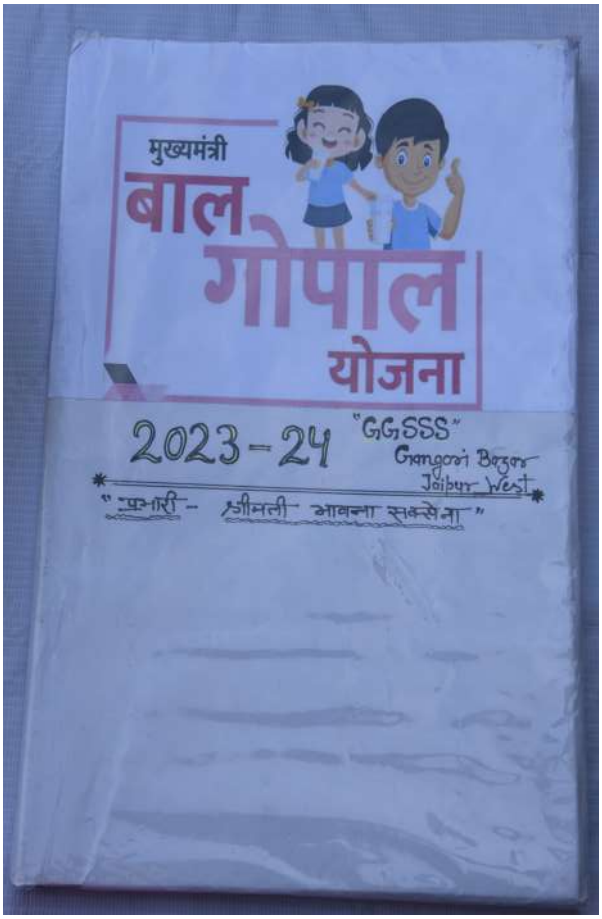
6 percentage points respectively between NFHS-4 and NFHS-5. 27.9 percent women are moderately anaemic, three times higher than men. Anaemia is higher in adults belonging to rural areas and scheduled tribes. With respect to age, prevalence of anaemia is higher in adolescent girls and boys aged 15-19 years. Breastfeeding mothers are more anaemic compared to pregnant women. District analysis reveals, 50 percent or more districts have increased proportion of child anaemia, the increment ranging from 0.8 and 35.9 percentage points between NFHS-4 (2015-16) and NFHS-5 (2019-21). Baran district shows the highest reduction of 11.2 percentage points in the prevalence of child anaemia along with few other districts - Pratapgarh, Tonk, Bhilwara, Kota, Bundi, Jhalawar, Banswara, Udaipur and Jalore.

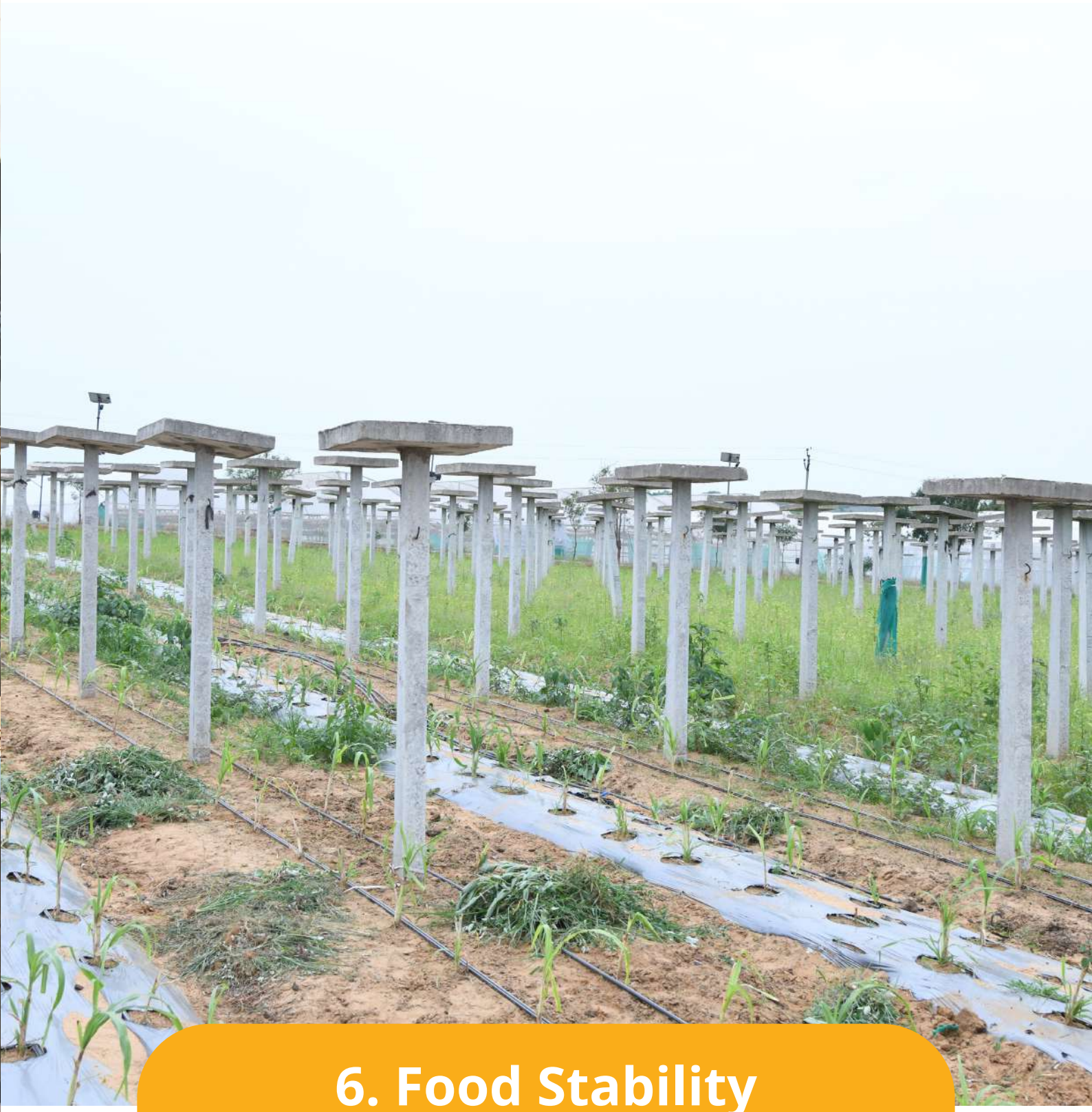
> **"Rajasthan shows improvement in its rank and performance in most of the child undernutrition parameters, however anaemia remains a major concern"**

- Rajasthan has achieved impressive progress in reducing adult undernutrition (Body Mass Index below normal, <18.5 kg/m2) between 2015-16 and 2019-21, recording the second highest reduction compared to other states/UTs in India. Rajasthan also lists among the only five states/UTs in India that show decline in percentage of women who are overweight (BMI ≥25.0 kg/m2). Highest proportion of women with low BMI are from scheduled tribes (24.8 percent), followed by those belonging to scheduled caste (22.8 percent). About 4 out of 10 adolescent girls and boys have BMI below normal in Rajasthan, which is a matter of worry, with prevalence of low BMI found higher in girls than boys. While prevalence of low BMI declines with increase in age in both men and women, the chance of being overweight/obese increases with age, with 23.7 percent women and 26 percent men aged 40-49 years being obese or overweight in 2019-21.
- Rajasthan's performance on IYCF indicators shows steady improvement from 2015-16 to 2019-21. Early initiation of breastfeeding increased from 28.4 to 40.7 percent; proportion of children under 6 months who were exclusive breastfed increased from 58.2 to 70.4 percent, proportion of children aged 6-23 months who were timely introduced to complementary feeding increased from 30.1 to 38.0 percent and breastfeeding children aged 6-23 months receiving adequate diet increased from 3.4 to 8.4 percent, between NFHS-4 and NFHS-5. However, this progress still seems very far from optimal. District level analysis also confirm that despite more children between 6 and 23 months of age receiving adequate diet, the highest proportion of children who receive stands meagrely at 12.5 percent (in Jodhpur).
- In Rajasthan, the key nutrition-sensitive parameters related to service delivery such as full immunisation of children 12 to 23 months of age, four or more ante natal visits by the mother and consumption of iron-folic acid show considerable improvement between 2015-16 and 2019-21. Rajasthan is among the few states in India to have shown increment above 15 percent in 4+ANC visits post 2015-16. Similarly, consumption of 100+ IFA tablets by women during pregnancy nearly doubled in from 17.3 percent in

2015-16 to 33.9 percent in 2019-21. Despite these improvements, government needs to go an extra mile to bring the consumption of IFA tablets by pregnant women to optimal levels. District wise analysis reveals districts in the eastern periphery – Alwar and Bhartapur are common defaulters with poor service delivery.

- Additional efforts are required to improve the provision of iron and vitamin A supplements to children 6 and 23 months of age along with their deworming every six months for improved absorption of minerals and nutrients by the body. Even with respect to consumption of iodised salt in households, NFHS-5 findings indicate stagnation or decline in nearly 50 percent districts post 2015-16, which is worrisome.
- Analysis of environmental factors reveal that with implementation of schemes like Jal Jeevan Mission and Swachh Bharat Mission, the State government has been able to improve the access to safe drinking water and sanitation facility across all districts in Rajasthan post 2015-16.
- Based on the above CIAF classification, as per NFHS-5 (2019-21) analysis, one in every two children below the age of five years suffers from one or more anthropometric failure/s in Rajasthan. However, it is noteworthy that the incidence of triple and double burden of undernutrition has significantly reduced between NFHS-4 (2015-16) and NFHS-5 (2019-21). Karauli (7.3 percent) followed by Dausa (6.7 percent), Jhalawar (6.5 percent), Baran (5.9 percent) and Banswara (5.7 percent) have the highest proportion of children suffering from all three form of undernutrition simultaneously, making them the most vulnerable geographies in Rajasthan, that need timely attention to save the children from the short- and long-term impact of malnutrition. Analysis of socio-economic parameters reveal that household wealth, caste, and geography in which the child resides play a vital role in influencing the nutrition outcomes in children.





6. Food Stability

6. Food Stability

6.1. Background

Food Stability refers to a situation when the three food security pillars – availability, accessibility and utilisation are stable, such that the individuals, households or entire population are food secure at all given times. Food stability is thus governed by broader climatic, political, social and economic issues. Food instability can be short-term, resulting in acute food insecurity or medium- to long-term leading to chronic food insecurity, posed by incidences of sudden shocks, seasonal or transitory events.[62,63]

This chapter examines and reports the status of some crucial indicators- climate change, natural calamities, morbidities, employment, and education, essential for ensuring food stability in Rajasthan. The policies and programmes run by the state government to ensure food stability specifically among the vulnerable segments of society is also discussed.

6.2. Climatic Factors affecting Food Stability: Change in Annual Rainfall and Ground Water Availability in Rajasthan

Rajasthan receives much less rainfall than the rest of the country. Due to the arid climate, a substantial portion of the annual rainfall falls towards the start of the monsoon, where it helps in moistening the soil, and is also prone to evaporation loss. The normal annual rainfall of Rajasthan is 549 mm.[64] Between 2006-07 to 2021-22 (figure 84), highest

62 FAO, IFAD, UNICEF, WFP and WHO. 2022. *The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable*. Rome, FAO. https://doi.org/10.4060/cc0639en

63 Practical, G., 2008. An Introduction to the Basic Concepts of Food Security.

64 Ground Water Yearbook, Central Ground Water Board, Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti

Source: Department of Economics and Statistics, Rajasthan.

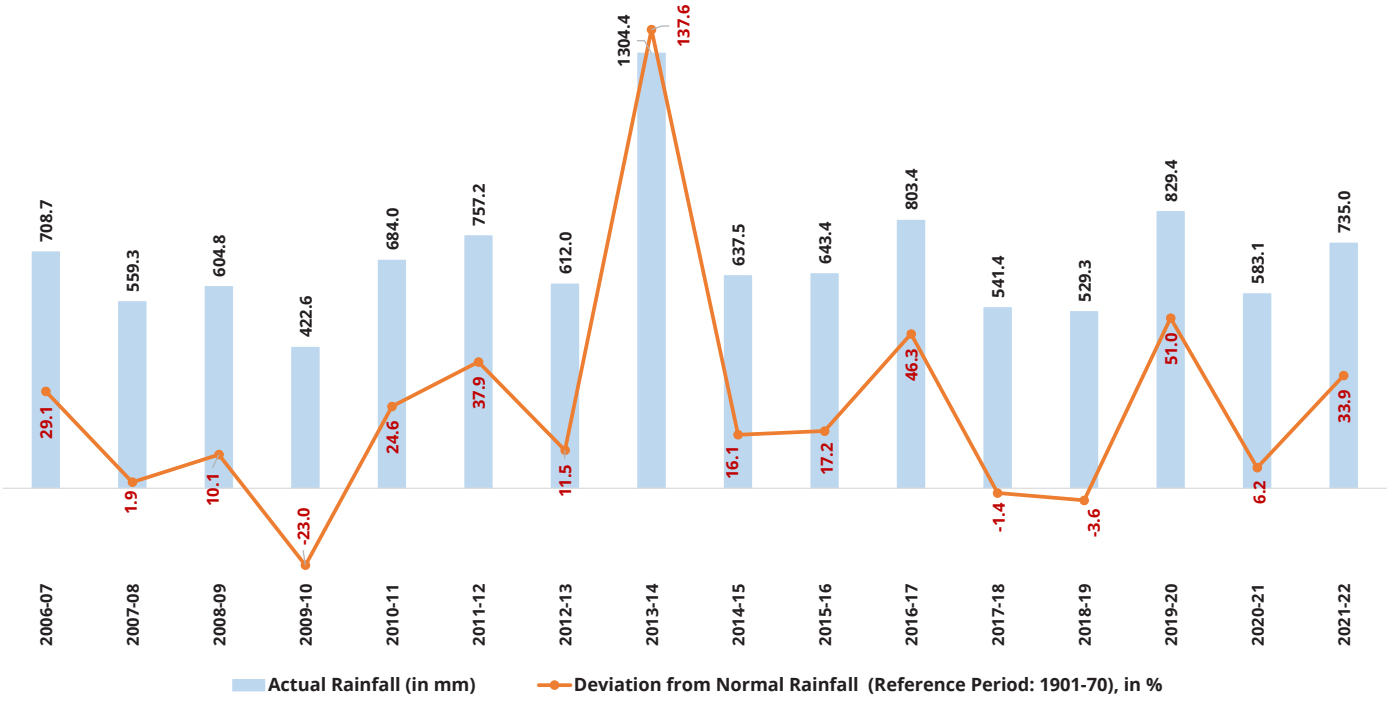


Figure 84: Annual Rainfall (in millimetres) and Change (in percentage) from normal rainfall between 2006-07 and 2021-22.

annual rainfall of the State was in the year 2013-14, 137.6 percent more than the normal annual rainfall[65] and lowest in the year 2009-10, 23 percent lower than the normal. Post 2013-14, Rajasthan witnesses a higher peak in annual rainfall after a gap of every two years, i.e., in 2016-17 and in 2019-20. The decadal average annual rainfall between 2012-13 and 2021-22 is 31.5 percent more than the normal annual rainfall.

The district analysis (figure 85) reveals formation of two distinct clusters of districts – one receiving high rainfall, spanning from eastern to southern-east periphery and the second receiving lower rainfall, flanking from northern to south- western belt, in Rajasthan. Taking three-year averages, between 2008-11 and 2016-19, the clusters of districts receiving higher and lower amounts of rainfall across Rajasthan remained similar, with few exceptions. However, comparing the intensity of rainfall received by districts in the each of the two clusters, the districts located in the extreme south and south-east (Pratapgarh, Jhalawar, Sirohi, Chittorgarh, Banswara and Baran) received higher amounts of rainfall on an average compared in 2008-11. While the cluster in the northern and western belt (Ganganagar, Jaisalmer, Hanumangarh, Bikaner, Barmer and Jodhpur) that usually receives low amount of rainfall, received lower rains in 2016-19 compared in 2008-11, highlighting the rise of two diverging scenarios in Rajasthan. The districts receiving higher rainfall have increased food grain production, specifically cereals, between 2008-11 and 2016-19. On the contrary, production of millets like Bajra and pulses is higher in the cluster that receives less rainfall between 2008-11 and 2016-19.

Rainfall is the primary source of ground water recharge in Rajasthan. As per 2022 assessment[66], the stage of ground water extraction in the state is 151.07 percent, falling under the 'over-exploited' category, an 8 percent increment from 2017 assessment. Except Dungarpur, Hanumangarh, Banswara and Ganganagar, all districts in the state face exploitation of groundwater resource beyond annual replenishable quantity, as of 2022 (figure 86). The stage of ground water extraction stands above 200 percent in Jaisalmer, Jodhpur, Jaipur, Jhunjhunu, Alwar, Dausa and Sikar as per the 2022 assessment. The stage of ground water extraction in Tonk and Bundi

65 Normal Annual Rainfall refers to reference period 1901-1970, obtained from Ground Water Yearbook, Central Ground Water Board, Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti

66 National Compilation on Dynamic Ground Water Resources of India, 2022

Source: Department of Economics and Statistics, Rajasthan.

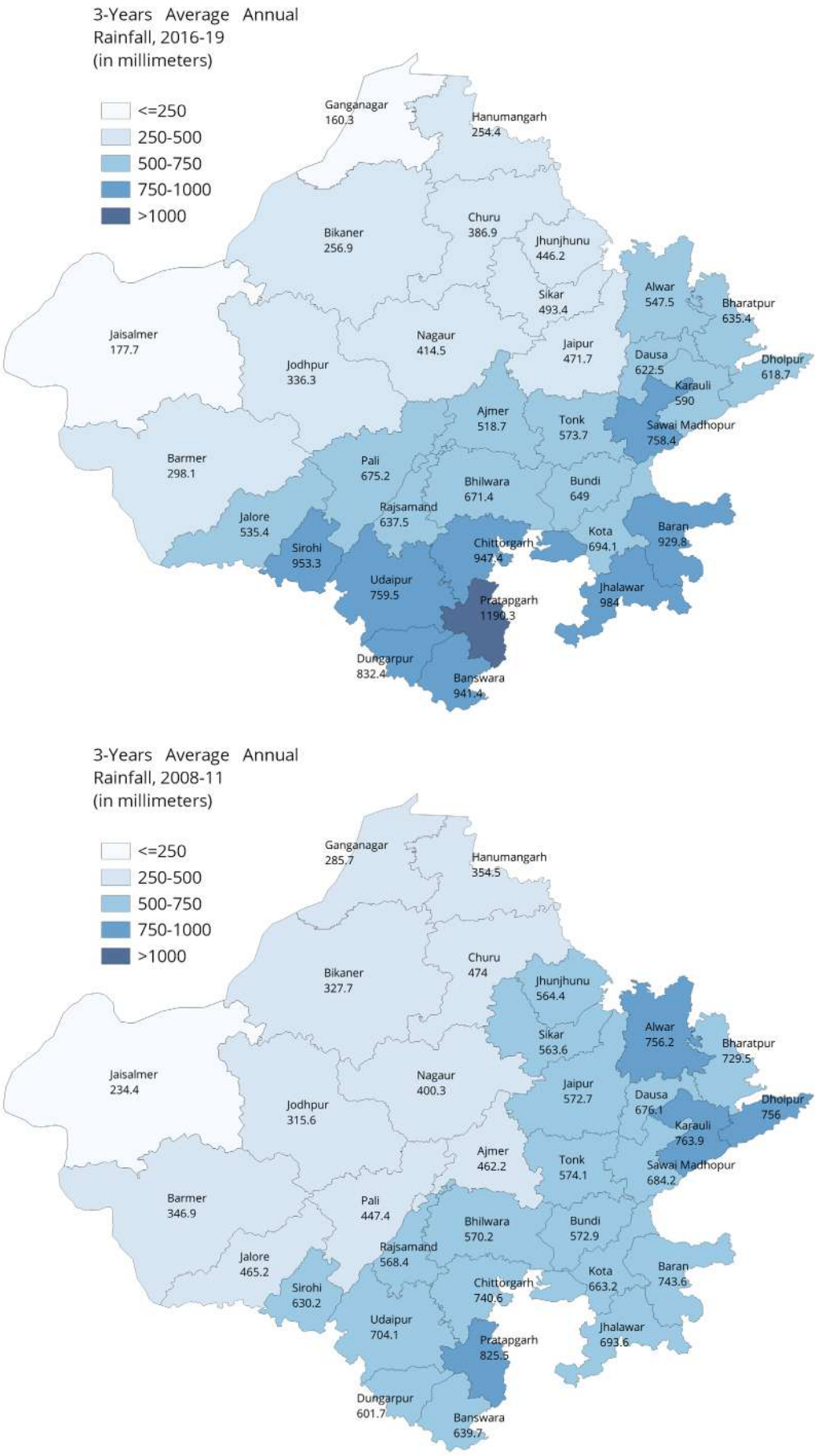


Figure 85: Average Annual Rainfall between 2008-11 and 2016-19, three years average, in millimetres.

Source: National Compilation on Dynamic Ground Water Resources of India, 2017 and 2022

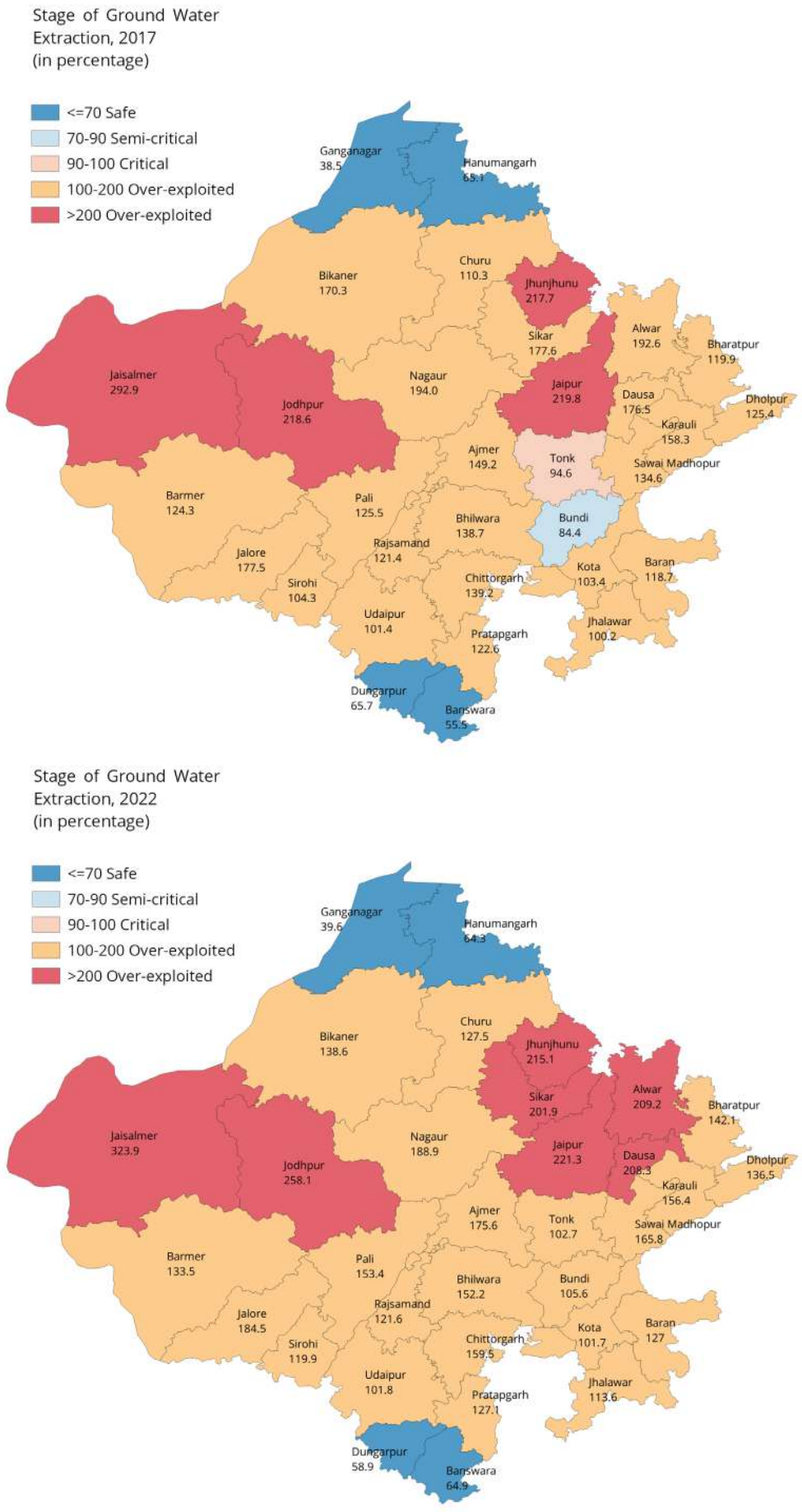


Figure 86: Stage of Ground Water Extraction in 2017 and 2022, in percentage.

districts was within 'critical' and 'semi-critical' limits respectively in 2017 have also fallen into 'over-exploited' category, indicating the worsening trend of the ground water availability across Rajasthan. Depleting annual ground water recharge has direct implication on food production, since 85 percent of extracted water is used for irrigation purposes in Rajasthan.

6.3. Natural Calamities Affecting Food Stability in Rajasthan

Natural disasters have a direct influence on agricultural output, rural livelihoods, nutrition, and the overall economy in turn significantly impacting the food stability, specifically when they occur frequently and with a high intensity.[67] Droughts, famine, hailstorms, floods and recently locust attacks are few of natural catastrophes that affect the population in Rajasthan on regular accounts. The state has also experienced some significant calamities in the past such as, the floods in Barmer in the year 2006, the stampede in Jodhpur in 2008, the fire at the Indian Oil Corporation (IOC) oil depot in Jaipur in 2009, the collapse of the Chambal Bridge in Kota in 2009 to name a few[68], including the COVID-19 outbreak that affected many across the globe. Moreover, several regions of the state fall in seismic zones II and III.

Between 2004-05 and 2021-22 (figure 87), Rajasthan was worst hit with scarcity due to famine in 2009-10, affecting 42.9 million people across 27 districts in Rajasthan due to scanty rainfall. Most recently, in 2019-20, 15.1 million people were affected in 21 out of 33 districts in Rajasthan due to floods. More than eight in ten people were affected in Jaisalmer, Dungarpur, Pratapgarh, Jhalawar and Banswara by any form of natural disaster in 2019-20.

Because of its low average rainfall and the erratic monsoons, Rajasthan is one of the States most vulnerable to drought in the country. Between 2017-18 and 2022-23, Rajasthan witnessed incidences of droughts during Kharif season, affecting 4.2 million population on an average, incurring a total loss of 2.6 billion USD (INR 208 billion) due to damage of crops. The districts spanning the western region from north to south were among the worst hit by droughts, with districts like Barmer and Jaisalmer that faced drought every year, followed by Bikaner, Jodhpur and Pali.

In recent years, due to erratic monsoon and heavy rain days in some parts of Rajasthan, incidences of floods have increased. Districts located the east and southern-east part of Rajasthan (Baran, Bundi, Dhaulpur, Jhalawar, Kota, Sawai Madhopur and Tonk) are among the most affected, with incidences of floods reported three times between 2017-18 and 2022-23, during Kharif season

67 https://www.fao.org/resources/digital-reports/disasters-in-agriculture/en/

68 http://dmrelief.rajasthan.gov.in/documents/sdmp-eng.pdf

Source: Economic Review-2021-22, Rajasthan

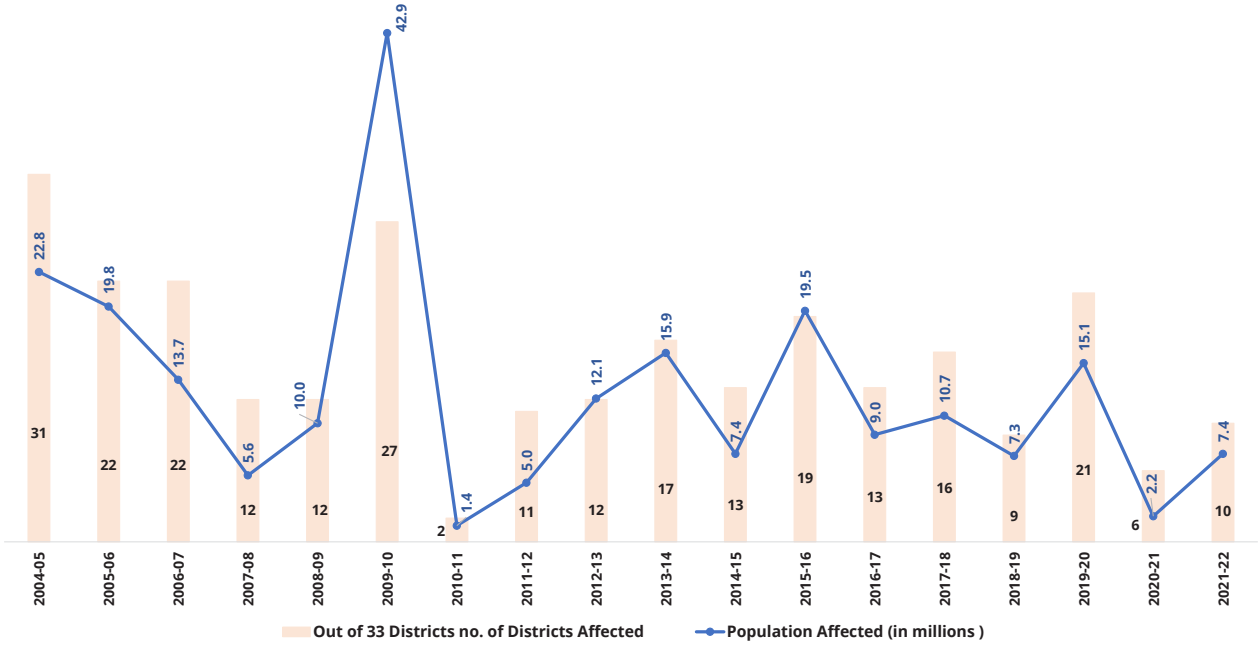


Figure 87: Districts (in numbers) and population (in millions) affected in Rajasthan due to extent of scarcity from 2004-05 to 2021-22.

Source: Administrative Report 2017-18 to 2022-23, Disaster Management, Relief & Civil Defence Department, Government of Rajasthan

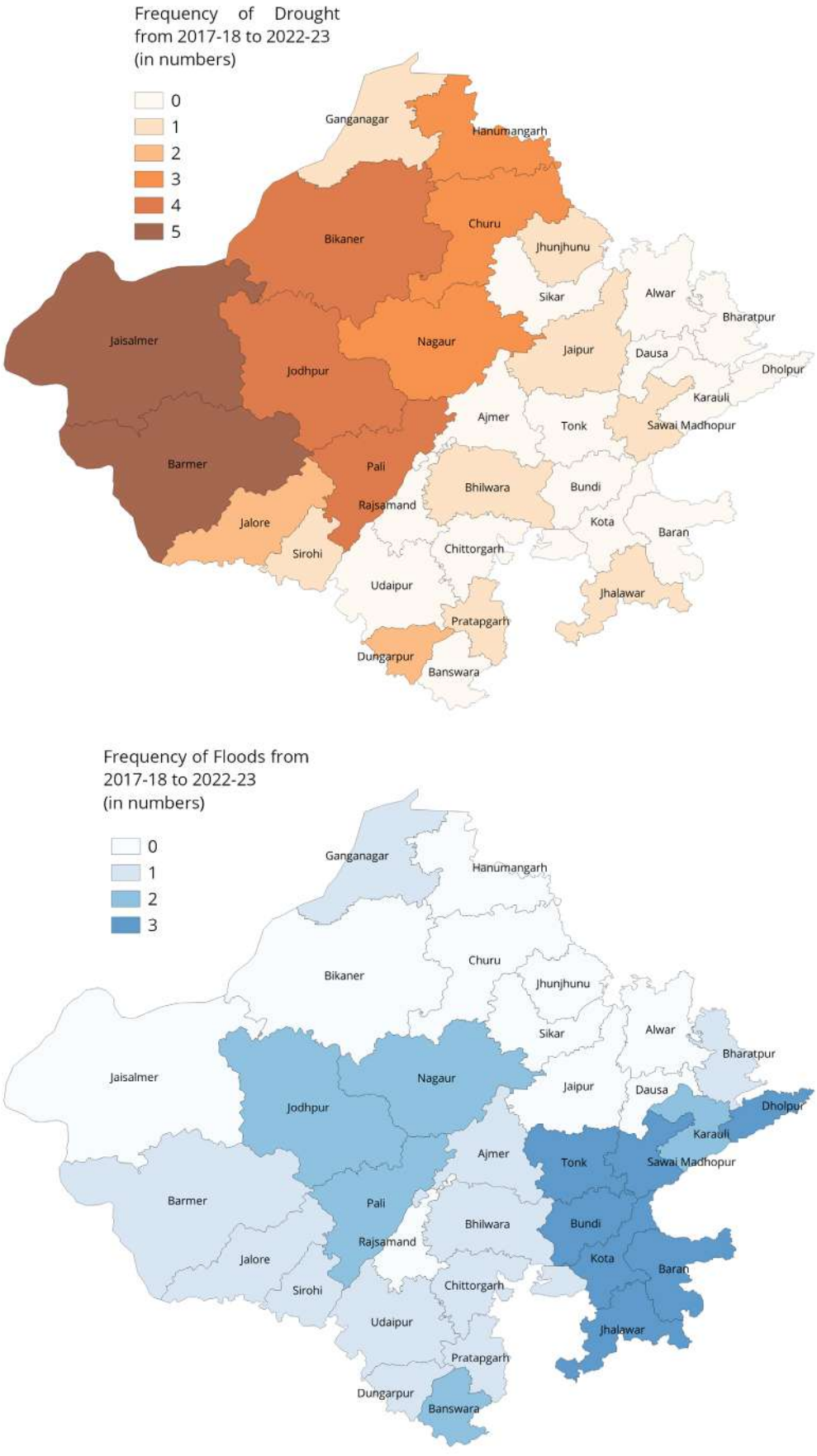


Figure 88: Frequency of droughts and floods across districts during Kharif Season in Rajasthan from 2017-18 to 2022-23, in numbers)

(figure 88). Overall, floods affected 8.3 million people on an average annually, with total crop loss of over 3.1 billion USD (INR 248 billion) between 2017 and 2022.

While incidence of hailstorms is a common phenomenon, locusts attack affected various parts of Rajasthan recently. In 2019-20, combined incidences hailstorms and locust attacks affected 2.9 million people across Rajasthan and incurred crop damage of 2.27 billion USD (INR 181.6 billion).

6.4. Increased Morbidity Affecting Food Stability in Rajasthan

Emerging infectious diseases and resulting morbidities, restrict the production and distribution of food, contributing directly or indirectly to global food insecurity.[69] In Rajasthan, as per the data obtained from Integrated Disease Surveillance Programme (IDSP) for year 2016 to 2019, acute respiratory infection or influenza like illnesses emerge as the most prevalent disease reported in 8.5 million population on an average annually, followed by fever, diarrhoeal disorders, and malaria (figure 89).

The prevalence of infectious diseases are also a marker of poor living conditions, poor sanitation and hygiene practices, and poor access to health care services. Based on the NFHS-5 (2019-21) findings, the prevalence of diarrhoea in children preceding two weeks before the survey ranged from 2.2 percent to 15.3 percent, highest in Bharatpur and lowest in Hanumangarh (Figure 90). The overall incidence of diarrhoeal prevalence in children was higher compared to 2015-16 findings, that ranged between 2.4 percent and 13.2 percent, highest in Jaipur and lowest in Baran. Though prevalence of diarrhoea

69 Trivellone V, Hoberg EP, Boeger WA, Brooks DR. 2022 Food security and emerging infectious disease: risk assessment and risk management. R. Soc. Open Sci. 9: 211687.https://doi.org/10.1098/rsos.211687

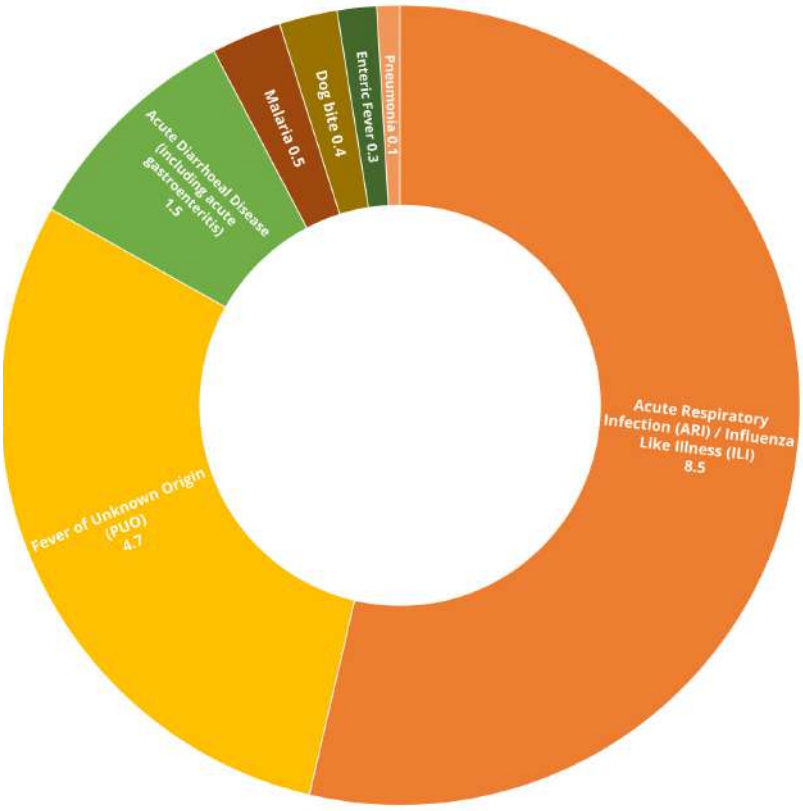


Figure 89: Most common infectious diseases affecting population (in millions) in Rajasthan from 2016 to 2019 (MoHFW).

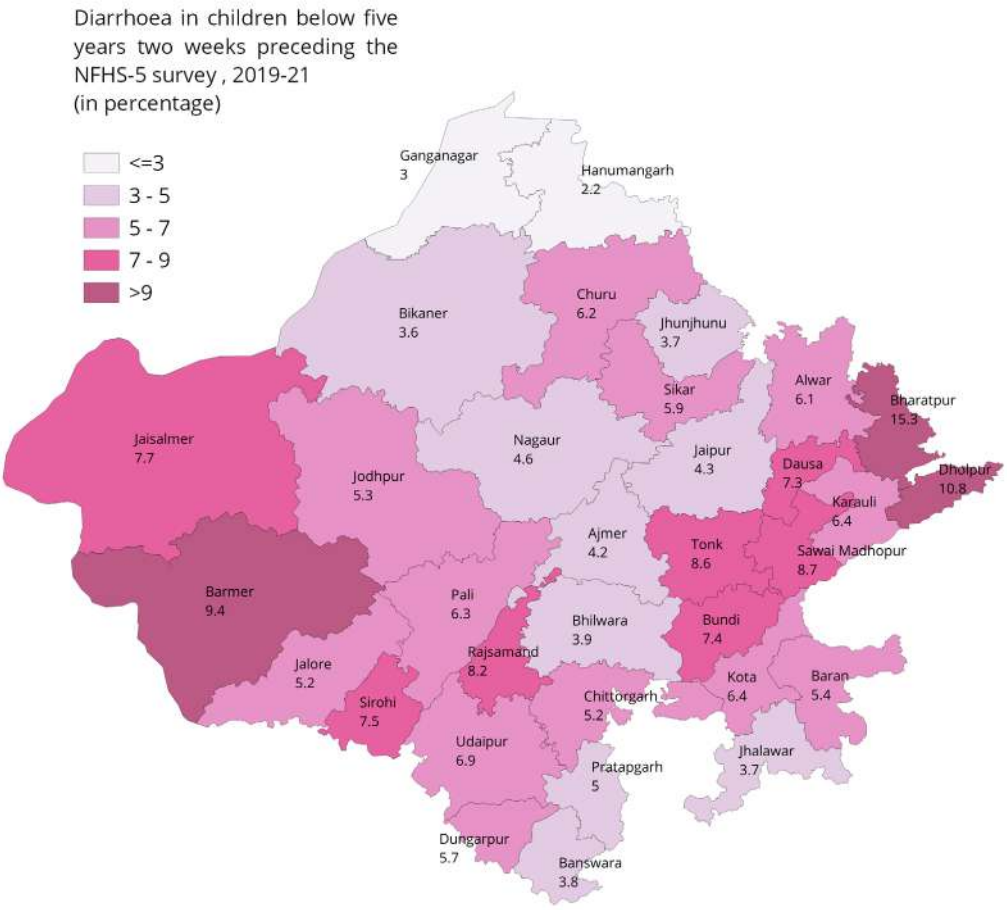


Figure 90: Prevalence of diarrhoea in children below five years two weeks preceding the NFHS-5 survey across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

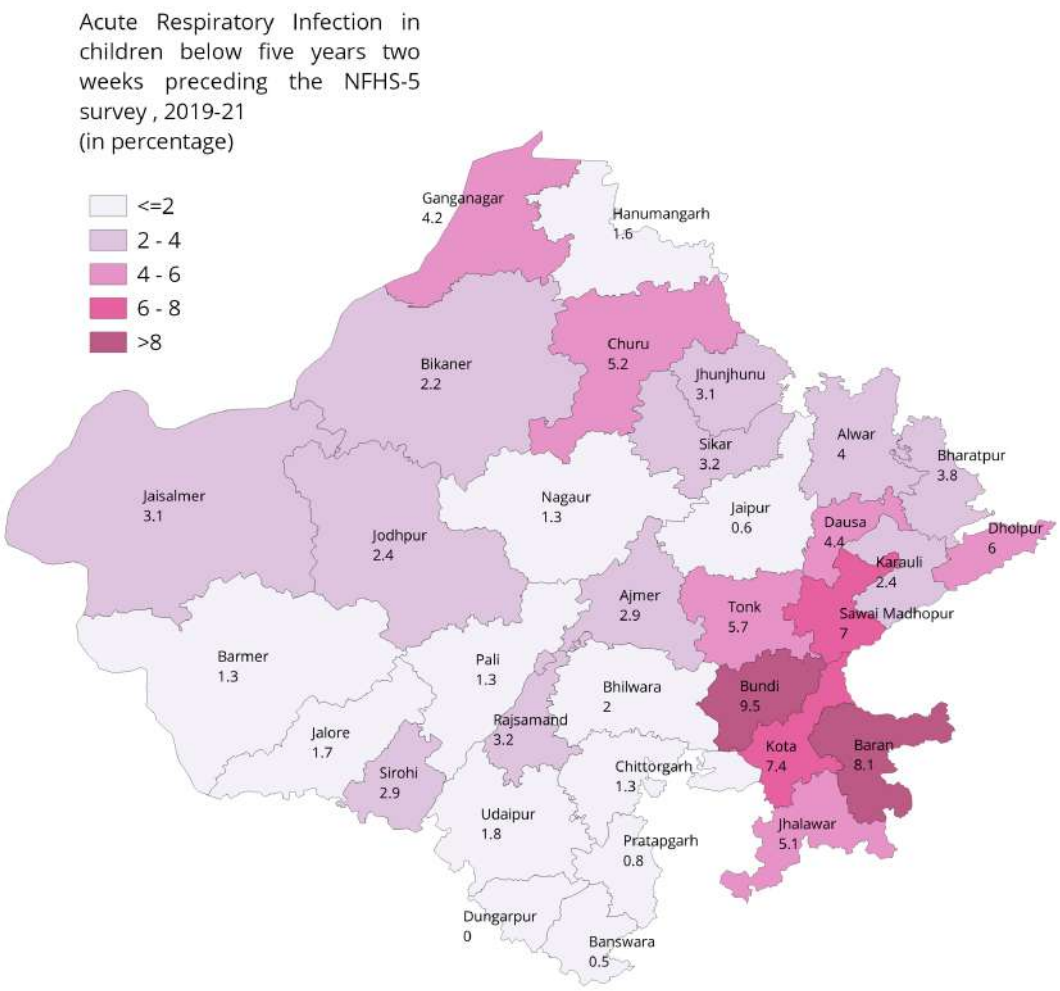


Figure 91: Prevalence of symptoms of acute respiratory infection in children below five years two weeks preceding the NFHS-5 survey across districts in Rajasthan, NFHS-5 (2019-21), in percentage.

can be influenced by season in which the interview was held, prevailing hygiene conditions in the households or community where child lives, it is noted that districts like Bharatpur and Dhaulpur had high and increased diarrhoeal incidences in both the survey periods. The prevalence of acute respiratory infections (ARIs) in children preceding two weeks of survey was higher (ranging from 0 to 9.5 percent) in 2019-21 compared to 2015-16 (0.2 percent to 5.2 percent). The districts in the south-eastern part of Rajasthan- Bundi, Baran, Kota, Sawai Madhopur and Dhaulpur reported the highest prevalence (>=6 percent) of ARI in children two weeks before the survey (figure 90).

6.5. Education, Employment, and Other Socio-Economic Factors Affecting Food Stability in Rajasthan

Poverty, food insecurity and malnutrition are intertwined in a complex nexus. People living in poverty often face financial restrictions to access safe, sufficient, and nutritious food, manifesting into poor nutrition outcomes and increased susceptibility to infectious diseases, leading to reduced productivity which in turn has bearing on overall economic growth.[70,71]

Based on 2021 NITI Aayog's Multi-Dimensional Poverty Index (MDPI), 29.46 percent of population in Rajasthan are multidimensionally poor[72], with rural populace (35.22 percent) having three times higher rates of poverty than urban counterparts (11.52 percent). Rajasthan is among the bottom ten states/UTs in India with highest

70 Banerjee A, Duflo E. More than 1 billion people are hungry in the world. Foreign Policy. (2011). p. 66–72.

71 Siddiqui F, Salam RA, Lassi ZS and Das JK (2020) The Intertwined Relationship Between Malnutrition and Poverty. Front. Public Health 8:453. doi: 10.3389/fpubh.2020.00453

72 India's MDPI has three equally weighted dimensions – health, education, and standard of living - which are represented by twelve indicators.

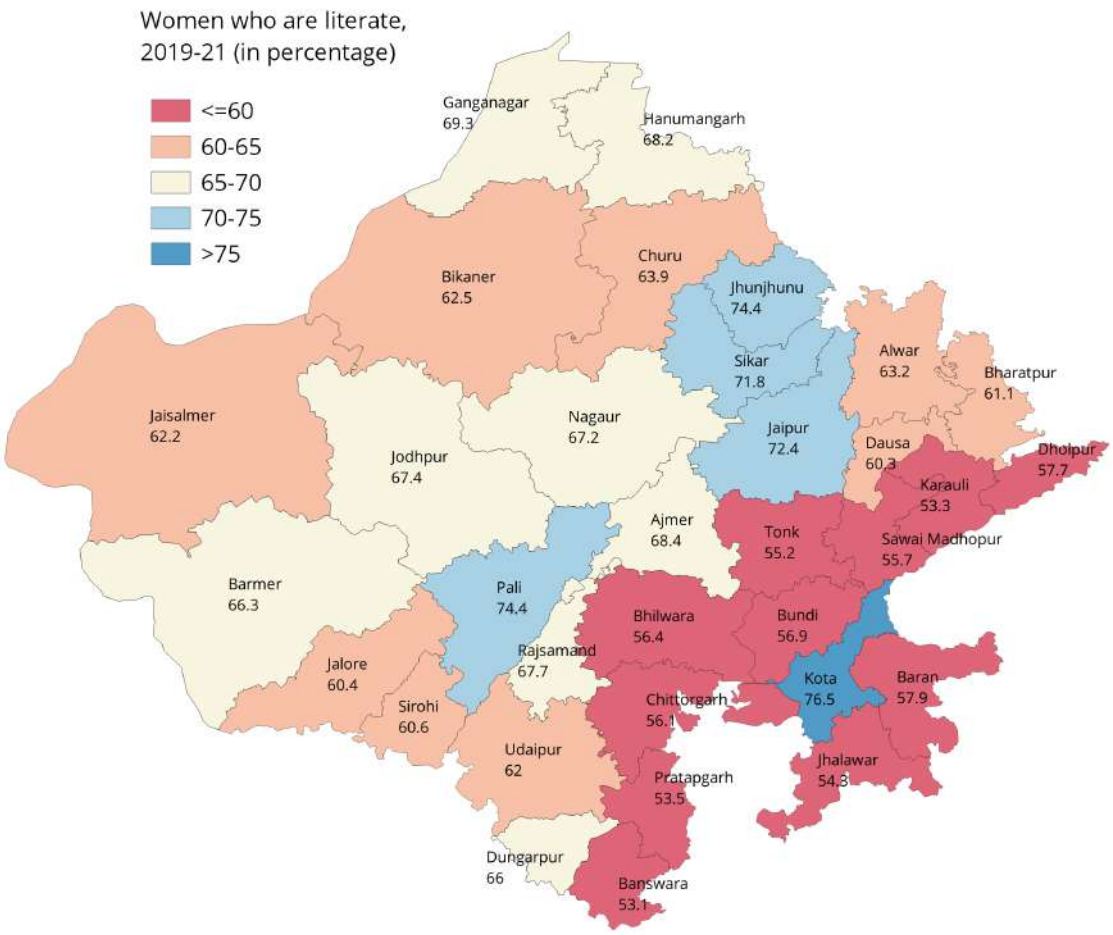


Figure 92: Proportion of Women who are literate in Rajasthan, 2019-21, in percentage (NFHS-V).

poverty headcount ratio. District level examination of multidimensional poverty reveals a very disproportionate picture varying from 12.80 percent in Jhunjhunu to 56.13 percent in Barmer. Districts contributing highest to multidimensional poverty (more than 40 percent) form a continuous belt of cluster on the western to south -western periphery of Rajasthan.

Literacy is another important indicator impacting global food stability both in short and long term. Studies have revealed strong negative association between poor maternal education and food and nutrition security outcomes, often more pronounced in the poor and vulnerable households.[73] It is argued that higher literacy rate among women is more likely to enhance their roles in decision-making within the household, increase their share of household consumption, also enable them to contribute productively to the overall economic growth, thereby, enacting as a catalyst to achieve zero hunger.[74] At the same time, higher women's literacy will lead to better knowledge of nutritional systems, improved health practices and better utilisation of health care services in the household resulting in improved nutrition outcomes in children.[75]

As per NFHS-5, 2019-21 findings, literacy[76] among women aged 15 to 49 years stands at 64.7 percent, 24.2 percentage points lower than men (88.9 percent) in Rajasthan. While literacy among men in Rajasthan exceeds national average by 4.5 percent, on the other hand female literacy is 6.8 percentage points behind the national average for literate women. **Compared with 36 states/ UTs in India, Rajasthan stands at third position from the bottom, next to Bihar and Jharkhand in terms of female literacy.** Moreover, while there is only 3.4 percentage point difference in male literacy among urban and rural counterpart, female literacy in rural areas is 20.2 percentage points lower than in urban areas in Rajasthan. This reflects the wide and persistent gender gap in literacy and prioritisation of educating males over females, more specifically in rural areas in Rajasthan. Similarly, district level analysis (figure 93) reveals that female literacy varies between 53.1 percent and 76.5 percent, lowest in Banswara and highest in Kota district. Sikar, Jaipur,

73 Khan, J. and Das, S.K., 2020. The burden of anthropometric failure and child mortality in India. *Scientific reports*, *10*(1), pp.1-16.

74 Mukherjee, R., Chaturvedi, S. and Bhalwar, R., 2008. Determinants of nutritional status of school children. *Medical Journal Armed Forces India*, *64*(3), pp.227-231.

75 Porwal, A., Acharya, R., Ashraf, S., Agarwal, P., Ramesh, S., Khan, N., Sarna, A. and Johnston, R., 2021. Socio-economic inequality in anthropometric failure among children aged under 5 years in India: evidence from the Comprehensive National Nutrition Survey 2016-18. *International Journal for Equity in Health*, *20*(1), pp.1-10.

76 Women/men who completed standard 9 or higher and who can read a whole sentence or part of a sentence.

Source: Periodic Labour Force Survey Annual Report 2017-18 to 2020-21.

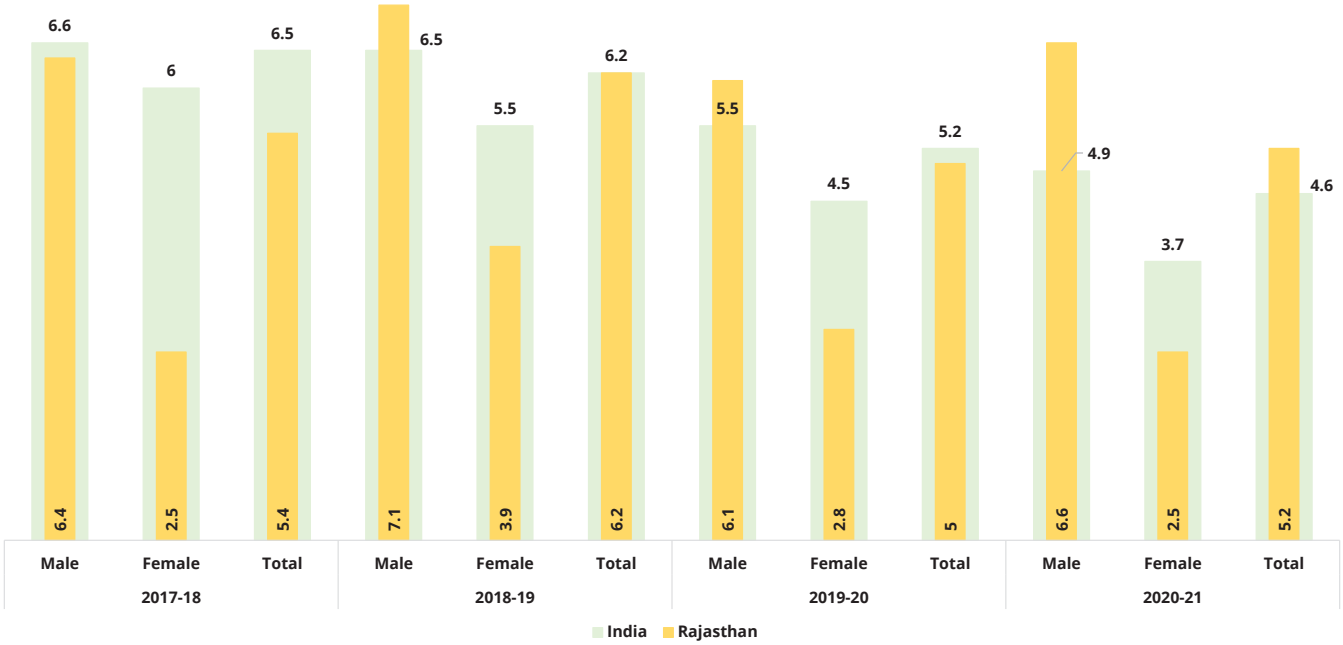


Figure 93: Unemployment Rate in Rajasthan and India for population 15-59 years of age according to usual status between 2017-18 and 2020-21, in percentage.

Jhunjhunu, Pali and Kota are the only districts with female literacy above 70 percent in Rajasthan, as per NFHS-5 2019-21 findings.

Unemployment too is detrimental to food security especially in the developing economies.[77] As a result of unemployment, negative income shock and income unpredictability increases the risk of poverty, thereby adversely affecting household food consumption.[78] Annual data from Periodic Labour Force Survey, shows a steady decrease in unemployment rates in Rajasthan from 2018-19 to 2020-21, however the unemployment rate in Rajasthan stands slightly above the national average in 2020-21 (figure 94). An urban-rural comparison in Rajasthan reveals that unemployment has been significantly higher in urban than rural counterparts both for men and women (figure 95). As of 2020-21, overall rates of unemployment are three times more in urban than rural areas. More so, females are significantly more likely to be unemployed in urban areas than in rural areas.

While rural areas are driven by agriculture as primary source of income generation, both males and females are likely to absorbed in agriculture activities as their main source of livelihood. On the contrary, employment opportunities in the urban areas are more formal in nature, and therefore the livelihood opportunities are driven by person's education and skills. The displacement of the workforce from primary and secondary sectors in rural areas, and their non-absorption in the formal urban economy, has inevitably led to serious problems of unemployment, informal employment, and poverty, leading to increased risk of food insecurity.[79]

As per Census 2011, proportion of migrant workers to total population in Rajasthan, ranges from 0.45 to 3.58 percent, less than one percent in Banswara, Churu, Dungarpur, Bharatpur, Nagaur, Barmer, Pratapgarh, Karauli and more than three percent in Jaisalmer, Ganganagar and Kota (figure 96). Moreover, based on Census 2011 the Age Dependency Ratio,[80] is above 50 percent in all districts ranging from 51.85 to 85.64 percent, lowest in Kota and highest in Barmer. From a developmental standpoint, the presence of a significant number of children and elderly individuals, leading to a heavy reliance on the working age group, does not yield

77 Haini, H., Musa, S.F.P.D., Wei Loon, P. and Basir, K.H., 2022. Does unemployment affect the relationship between income inequality and food security? *International Journal of Sociology and Social Policy*.

78 Huang, J., Kim, Y. and Birkenmaier, J., 2016. Unemployment and household food hardship in the economic recession. *Public Health Nutrition*, *19*(3), pp.511-519.

79 Kundu, A., 2011. Trends and processes of urbanisation in India.

80 Age Dependency ratio is calculated as population in the age group of 15 to 59 divided by the sum of child population in the age group of 0 to 14 years and population above 59 years.

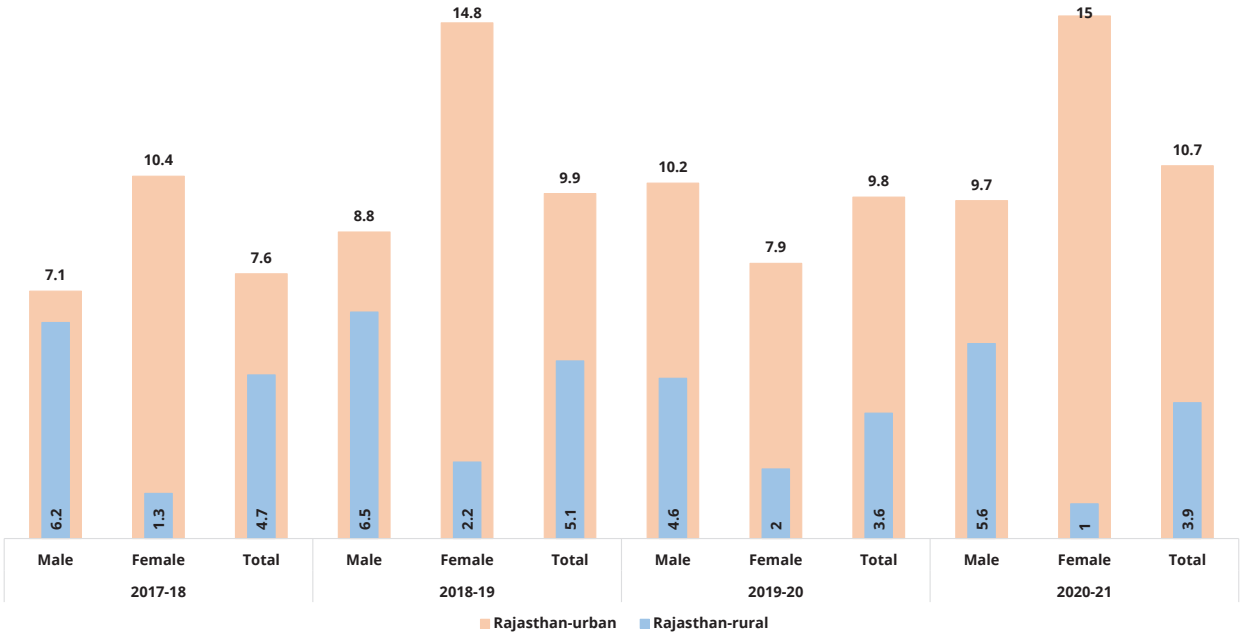


Figure 94: Unemployment Rate in rural and urban Rajasthan according to usual status between 2017-18 and 2020-21 for population 15-59 years of age, in percentage.

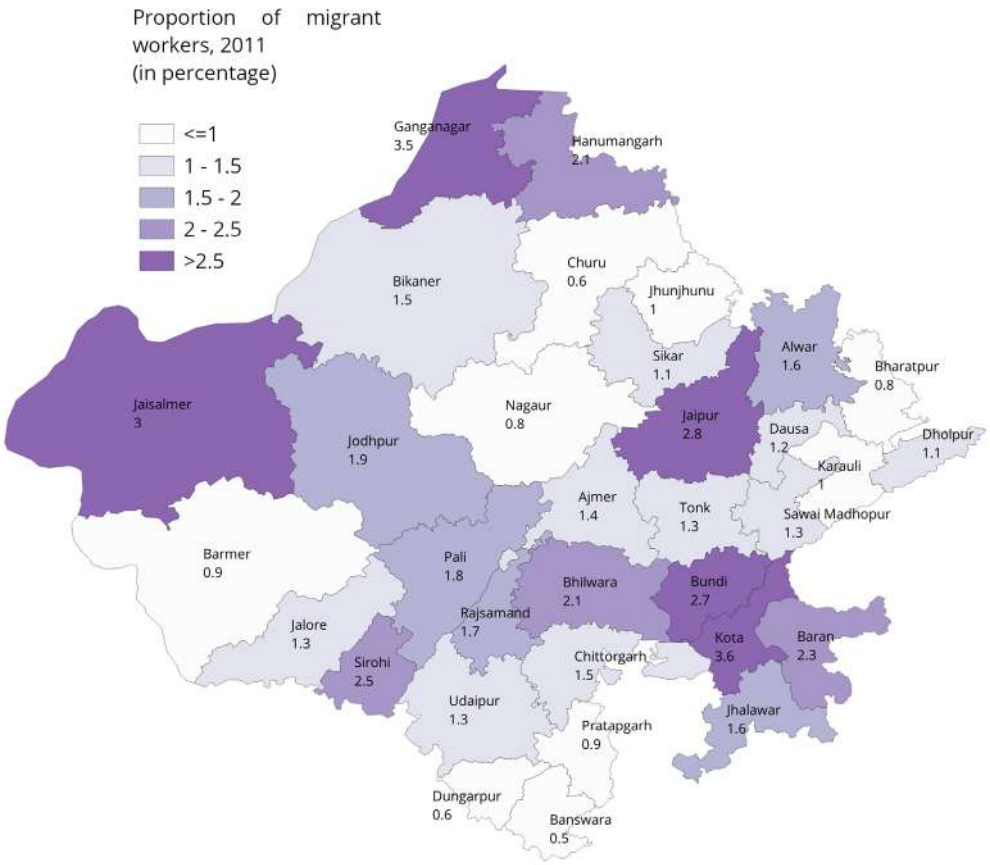


Figure 95: Proportion of Migrant workers in Rajasthan, 2011, in percentage (Census 2011)

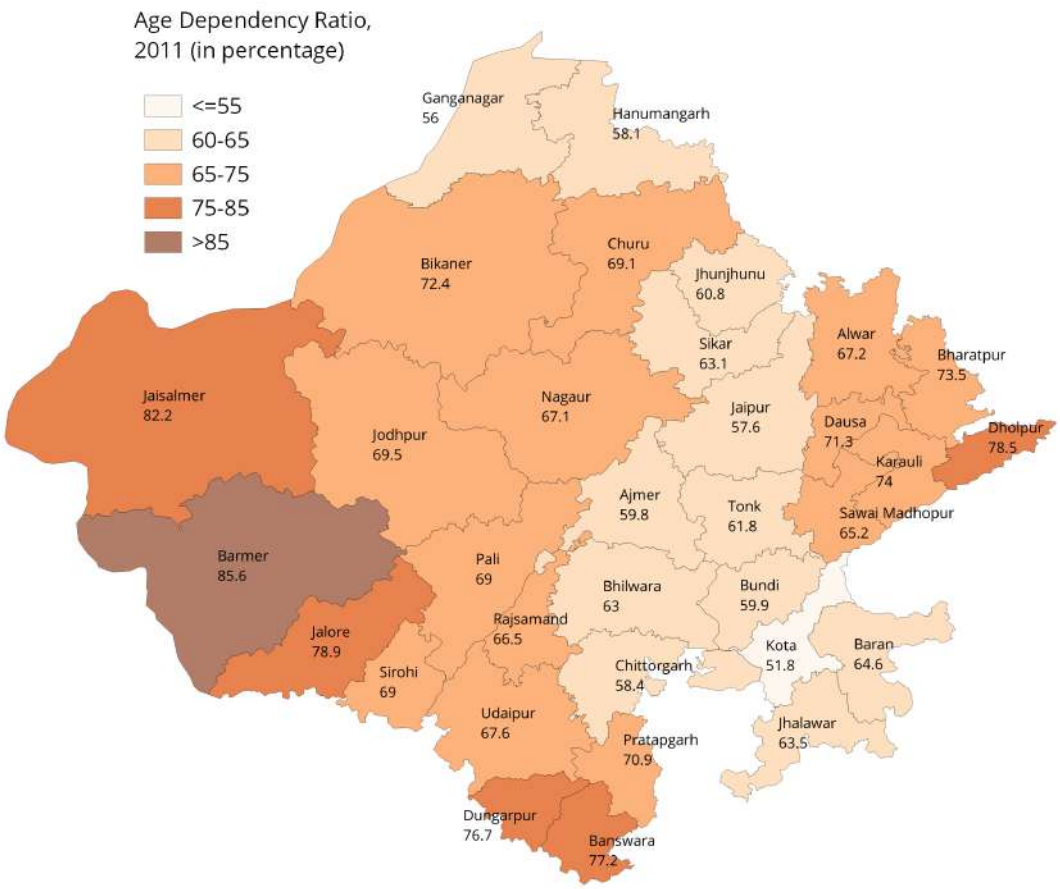


Figure 96: Age Dependency Ratio in Rajasthan, 2011, in percentage (Census 2011).

positive outcomes.

6.6. Measures Taken by Government to Protect Vulnerable Population from Food Instability

Rajasthan is characterised by its arid climate, with low annual rainfall, highly uneven distribution of rainfall, both temporally as well as spatially, leading to low ground water recharge and water scarcity. Given sensitive climatic conditions, Rajasthan is highly vulnerable to climate change with lowest adaptive capacity.[81] Due to its arid climate, the State experiences regular droughts in some parts, while there is also an increase in the incidences of flood in few parts. Since the state agriculture is largely dependent upon the rainfall with limited irrigation coverage, the stability of food and nutrition security for its population requires greater government's attention. Government of Rajasthan and Government of India have taken initiatives to ensure the food stability in the state.

Both national and state government cater to disaster related issues through set up of **National Disaster Response Fund (NDRF)** and **State Disaster Response Fund (SDRF)**. Crop insurance through schemes like **Pradhan Mantri Fasal Bima Yojana (PMFBY)** implemented by the state government addresses the vagaries of the weather-related uncertainty and ensure food stability during the rabi and kharif season. Improvement in budget provisions are also indicative of Government's tiring efforts in catering to issues that have direct bearing of food stability in Rajasthan. For instance, under climate change and combating desertification, the budget estimated at 22.1 million USD (INR 1.77 billion) in 2023-24, is approximately three-fold increase compared to 2021-22. Similar increase in budget allocation is observed under watershed development and soil conservation which has nearly doubled in 2023-24 compared to budget estimate in 2021-22, from 3.4 million USD (INR 272 million) to 6.2 million USD (INR 496 million).

There are several social safety net scheme and programme in place which caters to the needs of the most vulnerable population of the state by providing access to food and cash to ensure their food and nutrition security in a stable and sustainable manner. Among the direct food transfer programme, the **National Food Security Act (NFSA)** and schemes – **TPDS, PM-POSHAN and ICDS** are major programme, already been discussed in detail in the previous chapters. Government of Rajasthan tops up these national schemes by its own provisions by further subsidising wheat in the TPDS. It also runs a highly subsidized hot cooked meal scheme for people called Indira Rasoi Yojana by establishing 2000 kitchens (both rural and urban areas).

Besides, there are national and state schemes of cash transfer for elderly, disabled and widowed and for those temporarily affected by disasters or economic recession. The national level **Indira Gandhi Disability Pension Scheme (IGNDPS)** and the state level **Chief Minister Disability Pension Scheme (CMDPS)** in Rajasthan attempts to provide social security benefits to its disabled population. Maximum share of beneficiaries under these two schemes are concentrated in the western and eastern districts of the state.

There are also schemes in place which promotes the livelihoods among the poor, specifically the **Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)**. Rajasthan has performed very

81 https://environment.rajasthan.gov.in/content/dam/environment/RPCB/Reports%20n%20Papers/ClimateChange_09_04_2012.pdf

well in the implementation of the MGNREGS and has been rated as the leading State on various parameters of MGNREGA implementation. State government has topped up 25 days of employment to the eligible rural families completing the stipulated 100 days in a year. Indigenous Tribes like Kathodi and Seheriya, along with specially-abled persons, will be provided with 200 days of minimum employment guarantee instead of 100 days. The budget for MGNREGS in 2023-24 is estimated at 591.4 million USD (INR 47.31 billion), 86 percent increase from the budget allocated in 2021-22. The State has also led in the creation of man-days and effectively implemented the mobile monitoring system[82]. The state government is equally committed to meet the livelihood requirements of urban poor and has announced the launch of **'Indira Gandhi Urban Employment Scheme'**[83]. Moreover, the budget allocated to Indira Mahila Shakti Yojana has increased significantly over the years. This substantial increase reflects the government's strong commitment towards empowering women in the state.

82 https://www.thehindu.com/news/national/other-states/rajasthan-rated-as-leading-state-on-mgnrega-parameters/article65398746.ece

83 https://cmo.rajasthan.gov.in/cmoadmin/Program/Pdf/b24c9e9ece4b4c118ddd2a1a4b49d848_R-22-05-2022-02.pdf

6.7. Summary of Findings: Food Stability

- Due to arid conditions, Rajasthan receives much less rainfall than the rest of the country. Post 2006-07 to 2021-22, State received lowest annual rainfall in the year 2009-10 and highest in 2013-14, 137.6 percent more than the normal annual rainfall. The district level analysis reveals formation of two distinct clusters of districts – one receiving high rainfall, spanning from eastern to southern-east periphery and the second receiving lower rainfall, flanking from northern to south-western belt, in Rajasthan. Taking three-year averages, between 2008-11 and 2016-19, the clusters of districts receiving higher and lower amounts of rainfall across Rajasthan remained similar, with few exceptions.
- Rainfall is the primary source of ground water recharge in Rajasthan. The stage of ground water extraction in the state at 151.07 percent, falls under the 'over-exploited' category, with close to 90 percent districts face exploitation of groundwater resource beyond annual replenishable quantity, as per 2022 ground water assessment.

- Rajasthan is hit by droughts, famine, hailstorms, floods and recently locust attacks on regular accounts affecting millions of people and incurring huge loss of crops. While districts spanning the western region from north to south were among the worst hit by droughts, on the contrary, districts located the east and southern-east part of Rajasthan were among the most affected with incidences of floods, during Kharif season between 2017-18 and 2022-23.
- With respect to morbidities rising due to prevalence of infectious diseases, between 2016 and 2019, acute respiratory infection or influenza like illnesses emerge as the most prevalent disease reported in 8.5 million population on an average annually, followed by fever, diarrhoeal disorders, and malaria, as per Integrated Disease Surveillance Programme (IDSP) in Rajasthan.
- One in three people, on an average, are multidimensionally poor in Rajasthan with rural population having three times higher rates of poverty than urban counterparts at 35.22 percent and 11.52 percent respectively. Rajasthan is among the bottom ten states/UTs in India with highest poverty headcount ratio, as per NITI Aayog's Multi-Dimensional Poverty Index for the year 2021.
- As per NFHS-5, 2019-21 findings, Rajasthan at 64.7 percent occupies bottom third position, in terms of female literacy, next to Bihar and Jharkhand. There exists wide and persistent gender gap in male and female literacy, with literacy among women falling 24.2 percentage points behind male literacy (88.9 percent) in Rajasthan. The rural-urban comparison further reveals large gaps in female literacy, 20.2 percentage points lower than their urban counterparts, while the proportion of males who are literate varies marginally by 3.4 percent in rural and urban areas in Rajasthan.
- While there is steady decline in unemployment rates in Rajasthan post 2018-19, the unemployment rate in Rajasthan stands slightly above the national average in 2020-21. As of 2020-21, overall rates of unemployment in urban are three times more than rural areas. More so, females are significantly more likely to be unemployed in urban areas than in rural counterparts.
- As per Census 2011, the Age Dependency Ratio is above 50 percent in all districts in Rajasthan ranging from 51.85 to 85.64 percent, lowest in Kota and highest in Barmer.

Food and Nutrition Security indices were developed using a suite of indicators influencing food availability, accessibility, utilisation, and stability.

7. Rajasthan Food and Nutrition Security Index

7. Rajasthan Food and Nutrition Security Index

7.1. Background

This chapter seeks to develop a composite index on Food and Nutrition Security for districts in Rajasthan to rank and categorize districts that can serve as a robust policy tool to monitor and evaluate the progress made over time by the district in ensuring food and nutrition security in the state. Food and Nutrition Security Index (FNSI) is developed by aggregating its four dimensions: Food availability, Food accessibility, Food Utilisation and Food Stability. First, separate indices for each of these dimensions were developed to understand the status of districts on individual dimensions and then a combined Food and Nutrition Security Index (FNSI) was computed. The districts are then ranked to identify the priority (lagging) and performer (leading) districts. Methodology adopted for calculating individual indices for Food availability, Food accessibility, Food Utilisation, Food Stability is same. The overall Food and Nutrition Security Index (FNSI) is a composite of all the four dimensions.

7.2. Brief Methodology

The indices have been computed following the five steps: i) selection of indicators, ii) normalisation, iii) weighting; iv) computation of index v) ranking and categorisation of districts. Precisely, five indicators each under Food Availability Index (FAvI) and Food Accessibility Index (FAcI), three indicators under Food Utilisation Index (FUI) and four indicators under Food Stability Index (FSI) were selected. Raw data for the most recent year for each of the identified indicators under the four pillars- availability, accessibility, utilisation, and stability was compiled for each district in Rajasthan and also for the state as a whole. A brief description of the indicators by pillar is provided below in Indicators Matrix in Table 4 including the rationale for selection of the indicator, the year for which the most recent data was available and the source from where the data was obtained. A total of seventeen indicators that best capture the essence of the four pillars of food security, and which comprise of a concise list with wide available official data for all 33 districts in Rajasthan were included. To make data comparable across indicators, values for each of the selected indicators were rescaled from

its raw form into a score ranging from 0-100, where 0 denoted the lowest value and 100 denoted the highest value, using the Range Equalisation Method (REM), also known as max-min approach, for individual districts and Rajasthan. The normalised scores were tabulated using the following formula:

$$\text{Normalised Value} = \frac{X_i - Min}{Max - Min} * 100$$

Where X_i denotes the values for district/state for the selected indicator for a particular year, *Max* denotes the maximum set value and *Min* denotes the minimum set value. All the indicators were given **equal weightage**, for calculating a particular index.

The indices have been computed using geometric mean method, using the following equation:

$$Index_k = [\sqrt[n]{m_1 * m_2 * m_3 \dots m_n}] * 100$$

Where:

$m = y_{ij}$ for positive indicator and $m_{ij} = 100\text{-}y_{ij}$ for negative indicator.

y represents normalised score for the given indicator, *i*.

j represents a given district or state (Rajasthan)

n represents number of indicators used for calculating the given index.

k represents the index for which the data is aggregated (FAI, FAcI, FUI, FSI or FNSI)

The scores obtained for each of the index ranges between 0 and 100. The higher the score, better is the performance of district on the respective index. The districts were ranked in descending order of the scores. The districts were further categorised into five categories: ***extremely insecure, severely insecure, moderately insecure, moderately secure, secure.*** The cut-offs were set by dividing the range of the respective indexes into five equal parts; thus, the cut-offs were different for each of the five indices.

> **A total of 17 indicators that best capture the essence of the four pillars of food and nutrition security in Rajasthan have been included.**

Table 4: Indicators Matrix selected for Food and Nutrition Security Index.

S. No.	Indicators	Unit	Rationale	Year	Source
A. Food Availability Index (FAI)					
1	Food Grain Productivity	Kg/hectare	Indicates the amount of food grains produced per unit area of land. Rising agricultural productivity increases rural incomes and lowers food prices, making food more accessible to the poor. Productivity enhancements are key to greater food security for households with limited access to food markets.	2018-19	Department of Economics and Statistics, GoR
2	Irrigation extent	Percentage	Defined as net area irrigated to net sown area. Irrigation plays a key role in both stabilizing agricultural production as well as increasing the cropping intensity, productivity, and employment, improving a district's food security position. Coverage of irrigation facilities is an important indicator that ensures food security in the region.	2018-19	Department of Economics and Statistics, GoR
3	Per capita production of cereals, pulses (3 yearly average)	MT per Thousand Person	Examines the availability of food groups per capita	2016-17 to 2018-19	Department of Economics and Statistics, GoR
4	Per capita value of agriculture output	Rupee	Agricultural output is one of the initial indicators of food security that reflect the per capita food production in rural areas, with an assumption that availability of food depends on the level of a district's production.	2020-21	Department of Economics and Statistics, GoR
5	Milk Production	in thousand tons	This is a proxy indicator of diversification of agriculture and livelihoods, as it plays an important role in the state's economy. Increasing income from livestock such as through milk production is necessary for improving food security specially in regions where the maximum land is a desert.	2018-19	Department of Economics and Statistics, GoR
B. Food Accessibility Index (FAcI)					
6	Share of Food in Total Expenditure in population under bottom 30%	Percentage	Higher share of food expenditure indicates higher vulnerability of households to access food.	2011-12	NSS 68th Round Consumption Expenditure Survey
7	Proportion of agriculture worker to total worker by districts	Percentage	Low and subsistence level of income among the vulnerable population, especially in rural India, can be linked to the heavy reliance on the agriculture sector and a high dependency ratio, marked by overcrowding and low productivity	2011	Census of India

S. No.	Indicators	Unit	Rationale	Year	Source
8	Road density (only PWD roads)	km of road per 100 sq. km of land area	Access to paved roads has a big role in development. It reduces transport costs and can reduce transaction costs, with possible positive results on the prices realized by farmers.	2021-22	Department of Economics and Statistics, GoR
9	Gross District Domestic Product (GDDP) in rupees at real price by districts	Rupee	Used to evaluate the economic growth of districts and the share of individual sectors (especially agriculture) in the growth of district's economy	2020-21	Department of Economics and Statistics, GoR
10	Agricultural casual wage rate	Rupee	Reflective of income and the purchasing power	2019-20	
C. Food Utilisation Index (FUI)					
11	Access to safe drinking water	Percentage	WASH is an established indicator to enhance nutrition absorption and reduce illnesses	2019-21	5th National Family Heath Survey, India
12	Access to improved sanitation facility	Percentage		2019-21	5th National Family Heath Survey, India
13	Households with any usual member covered under a health insurance/financing scheme	Percentage	Coverage under health scheme or health insurance can mitigate adverse effects of food and nutrition insecurity by supporting health care access and financial support.	2019-21	5th National Family Heath Survey
D. Food Stability Index (FSI)					
14	Women who are literate	Percentage	Hunger is highly correlated with educational deprivation. Education for rural people, especially females can be seen as a key factor for promoting overall food security.	2019-21	5th National Family Heath Survey
15	Age dependency ratio	Ratio	A higher number of dependents, especially in a rural setup, leads to very low allocation of income as well as food among individuals in a household.	2011	Census of India
16	Proportion of population affected by any natural disaster	Percentage	Incidence of more frequent natural calamities implies a riskier agriculture and hence more sensitivity.	2019-20	Department of Economics and Statistics, GoR
17	Proportion of migrant workers	Percentage	The relationship between food security and migration can be direct when people do not see viable options other than migrating to escape hunger. The linkages between agriculture, food security and migration can also be indirect as a strategy by households to cope with income uncertainties and food insecurity risks.	2011	Census of India

7.3. Food Availability Index

Overall, based on the state's average, Rajasthan falls in the moderately insecure category on food availability index. Six districts - Ganganagar, Hanumangarh, Baran, Chittorgarh, Bundi and Alwar are identified as secure while three districts- Barmer, Dungarpur and Churu fall under extremely insecure category. Only one-third of total districts flanking towards the north and eastern periphery in Rajasthan fall in secure and moderately secure categories in the availability index, while the remaining two-thirds occupy moderate to extremely insecure position on the food availability index.

The food availability index for districts in Rajasthan ranges from 5.77 to 65.33. This huge variation across districts is a result of high fluctuations in values of indicators across districts. For instance, districts like Bundi have 11 folds higher per capita production of food grains (cereals and pulses) compared to Barmer. Likewise, food grain productivity in Barmer is 24 times lower than Chittorgarh, the district with the most surplus yield in Rajasthan in 2018-19. Similarly, the difference in milk production between the best performing (Jaipur) and poorest performing (Dungarpur) district is about nine times.

7.4. Food Accessibility Index

On Food Accessibility Index (figure 99), only Jaipur emerges as a secure district. Remaining all 32 districts are identified as insecure, with 7 districts- Jaisalmer, Baran, Jhalawar, Banswara, Pratapgarh, Kota and Chittorgarh falling under extremely insecure category. These districts appear to form a continuous cluster in the south-eastern part of Rajasthan, except Jaisalmer that occupies the western region. Overall, based on the state's average, Rajasthan falls in the severely insecure category on food accessibility index, that ranges from 10.29 to 82.73, with Baran securing the bottom most position and Jaipur the top-most. The wide range of accessibility index indicates

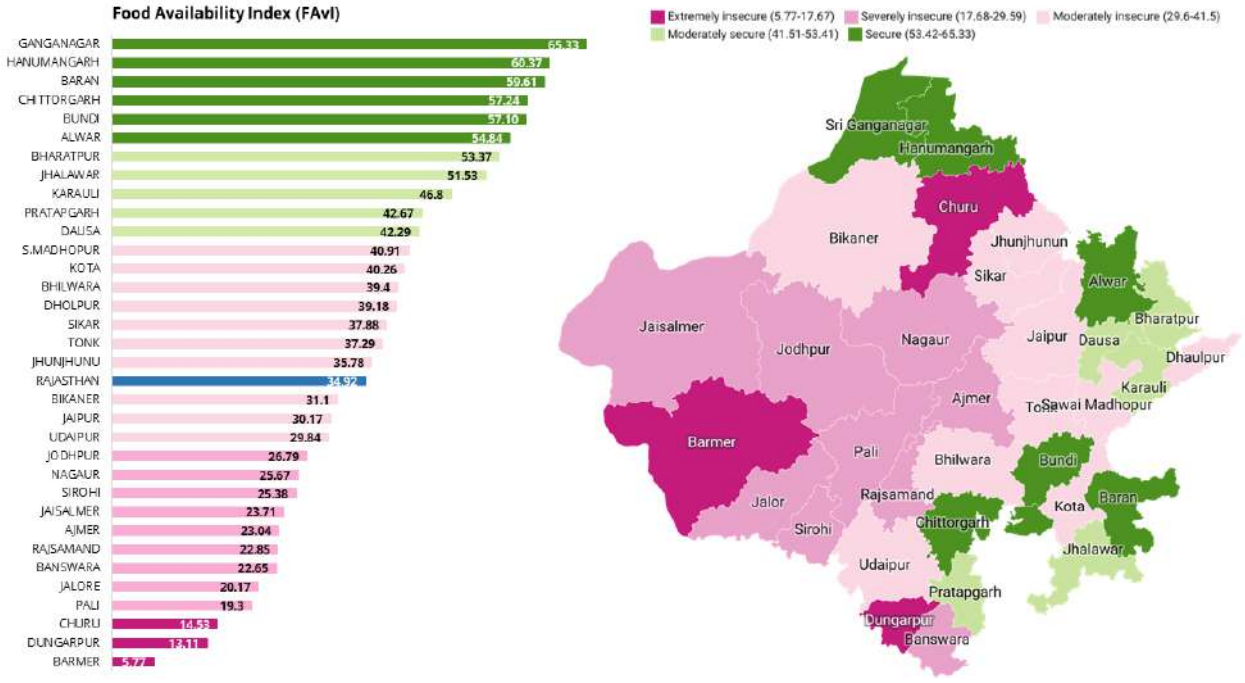


Figure 97: Performance of Rajasthan's districts in Food Availability Index (FAI).

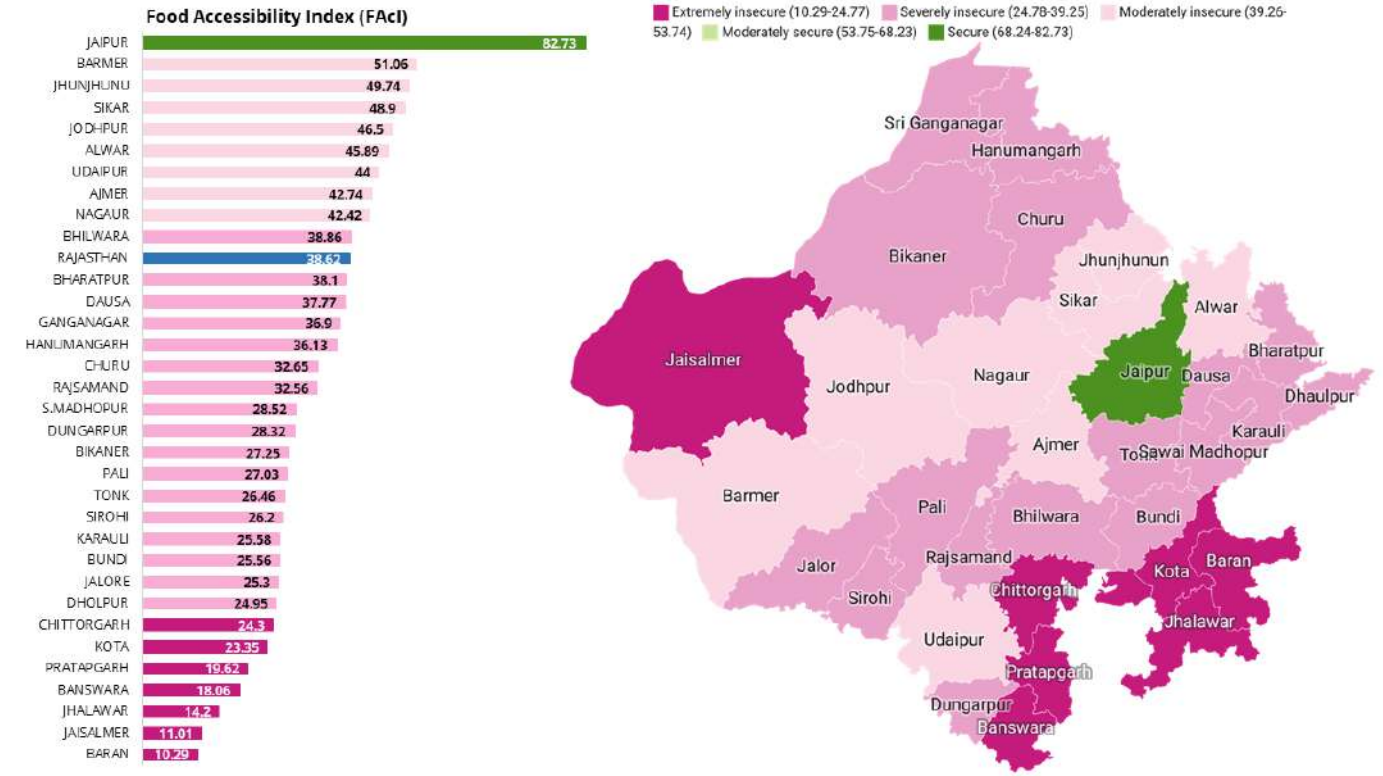


Figure 98: Performance of Rajasthan's districts in Food Accessibility Index (FAcI).

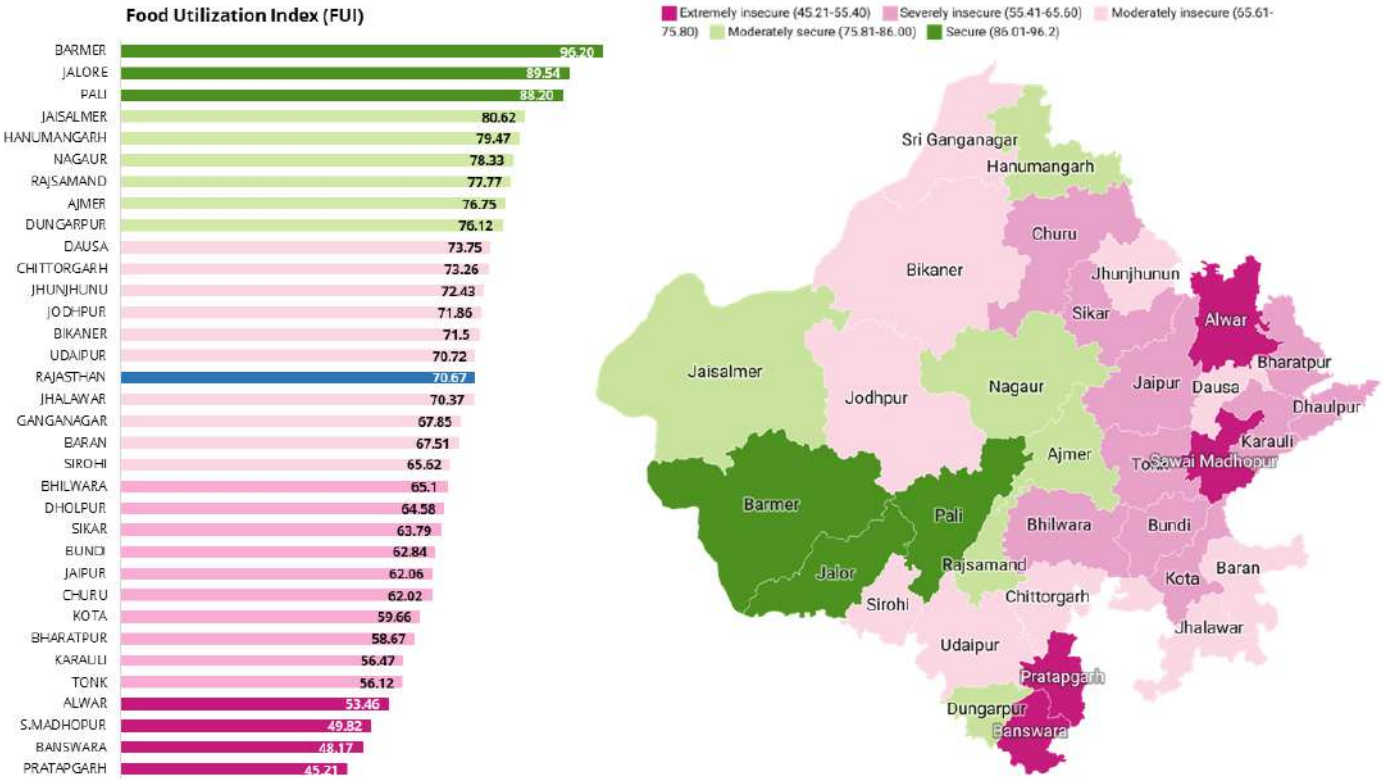


Figure 99: Performance of Rajasthan's districts in Food Utilization Index (FUI).

the challenge of inequitable access to food among people across districts in Rajasthan. The population under bottom thirty percent across 25 districts spends more than half of their income on food out of their total expenditure. Districts like Baran and Jhalawar that have the highest agricultural work force participation have very meagre agriculture wage rates. These challenges along with unpaved roads and poor district's economy as reflected by GDDP, aggravate the issue in accessing food by manifolds.

7.5. Food Utilization Index

Overall, Rajasthan falls in the moderately insecure category on food utilization index, based on the state's average, ranging between 45.21 and 96.2 (figure 100). Nine districts are identified as secure or moderately secure. Barmer secures the top position while Pratapgarh is at the bottom most position. Though the districts perform well in food utilisation compared to food availability and food accessibility, yet the difference in scores between the best and worst performing district is two-folds, still depicting wide heterogeneity across districts in terms of food utilisation. Districts on eastern side seem to form a cluster of poor performing regions, while the districts on the western side form a cluster of better performing regions, bringing out the effect of space and neighbourhood on utilisation of food. In both the top ten and bottom ten districts based on the food utilization index, the average access to an improved drinking water source is universal. In the bottom ten districts, on average, eight out of ten individuals have a household member covered by a health insurance scheme, whereas in the top ten districts, nine out of ten individuals have a household member covered by some health insurance scheme. With respect to access to improved sanitation facilities, on average, only six out of ten individuals in the bottom ten districts have access, whereas seven out of ten individuals in the top ten districts have access to improved sanitation facility.

7.6. Food Stability Index

Food stability index is a composite of female literacy, age dependency, migrant workers and proportion affected by any natural calamities. Rajasthan, based on state's average, falls under moderately secure category on food stability index (figure 101). Nearly 40 percent districts fall under the secure or moderately secure category. Two districts – Jaisalmer and Pratapgarh are identified as extremely insecure while five districts – Banswara, Jhalawar, Baran, Dungarpur and Bundi fall under severely insecure category in terms of food stability. The food stability index ranges from 12.17 to 83.64, with Jhunjhunu securing the top position followed by Sikar, while Jaisalmer followed by Pratapgarh remain at the bottom, in that order. Districts falling under insecure category on food stability index are found at the periphery on the Rajasthan map spanning from western to south-eastern side, forming a cluster, except Sri Ganganagar that is positioned on the top-north of Rajasthan. The secure districts too form a cluster and span from central to north-eastern side.

7.7. Food and Nutrition Security Index

The Food and Nutrition Security Index (FNSI) is a composite of four food security pillars: Availability, Accessibility, Utilisation and Stability. Based on state's average, Rajasthan falls under moderately secure category, based on FNSI (figure 102). The FNSI for districts ranges from 22.5 to 58.55. Fifteen districts fall under secure or moderately secure category while remaining 18 districts in Rajasthan are food insecure by varying degree. Two districts - Jaisalmer followed by Banswara are extremely insecure district, while seven districts- Hanumangarh, Jhunjhunu, Jaipur, Sikar, Ganganagar, Alwar and Bharatpur fall under secure category. Districts like Barmer despite performing better on Food Utilisation Index, has been penalised on

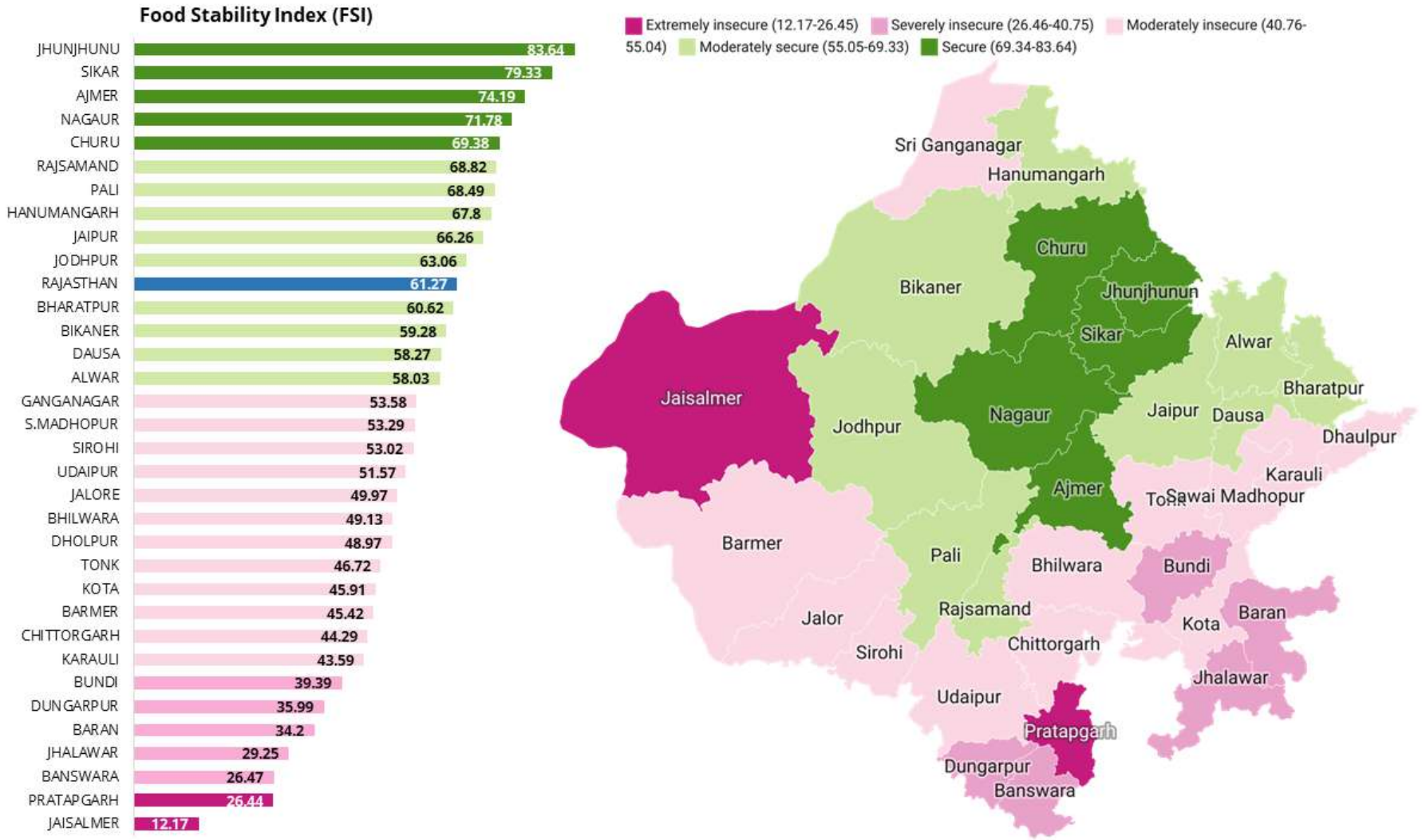


Figure 100: Performance of Rajasthan's districts in Food Stability Index (FSI).

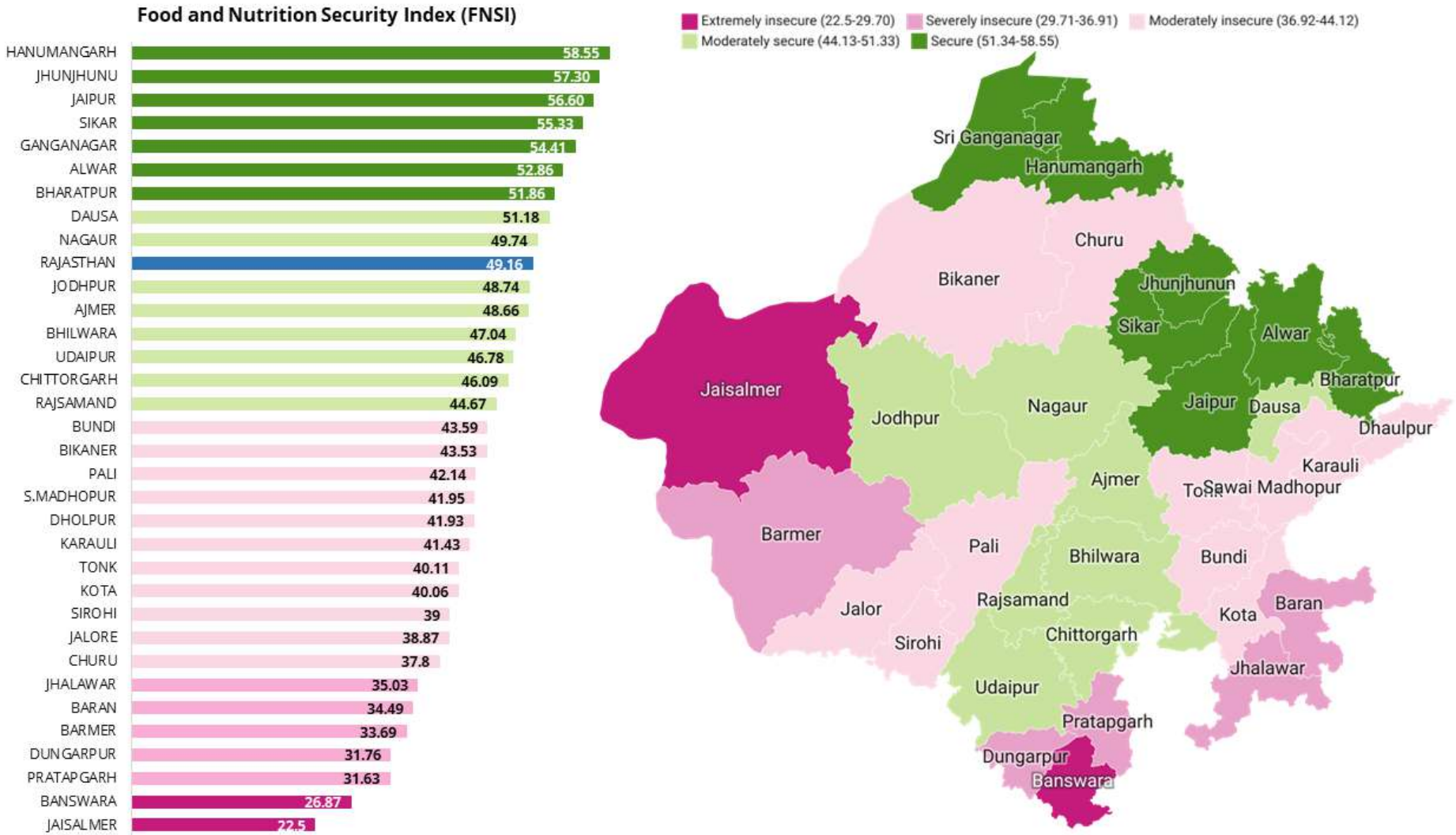


Figure101: Performance of Rajasthan's districts in Food and Nutrition Security Index (FNSI).

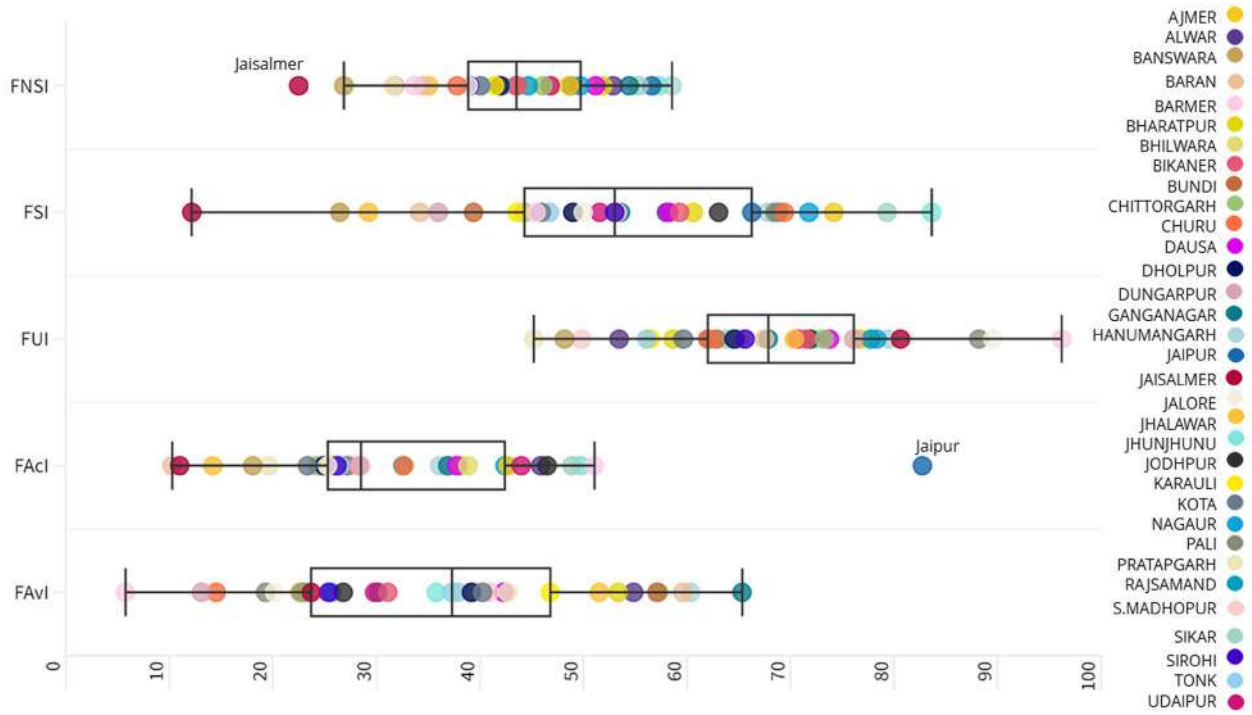


Figure 102: Box plot of FNS Indices.

account of poor performance across the other three dimensions and more specifically on food availability. Similarly, Jalore district has been penalised on account of poor performance across three dimensions - food availability, accessibility and food stability, despite better food utilisation.

The box plot (figure 103) of FNSI scores and individual four indices reveal variations, and asymmetry in performance across districts in Rajasthan. The spread seems condensed in FNSI Index compared to spread in individual four indices. Maximum dispersion is observed in Food stability index, followed by food availability index. Jaipur, the best performing district in Food Accessibility Index and Jaisalmer, the poorest performing district on Food and Nutrition Security Index, emerge as outlier, depicting huge variation in performance with respect to remaining districts.

7.8. FNSI and NITI Aayog's Multidimensional Poverty Index

The FNSI shows a significant negative correlation of 0.7 with Rajasthan's Multi-dimensional Poverty Index (MPI) released by NITI Aayog in 2021, indicating that lower MPI values correspond to higher FNSI scores. While FNSI considers four broad dimensions under food and nutrition security, the MPI is an aggregate measure that estimates poverty as the deprivation of health, education, and living standards and ranks districts and states in India[84]. As per performance in Food and Nutrition

84 Aayog, N.I.T.I., 2021. National multidimensional poverty index: Baseline report. *NITI Aayog*.

Figure103: Common districts among bottom ten and top ten in both Food and Nutrition Security Index (FNSI) and NITI Aayog's Multidimensional Poverty Index (MPI) 2021.

Note: The size of the bubble represents the proporton of Scheduled Caste and Scheduled Tribe population across districts in Rajasthan based on Census 2011, ranging from 18.5 percent in Sirohi (SR) to 80.8 percent in Banswara (BW). The colour of the bubble represents the performance of districts on FNSI, better performing districts represented by shades of blue, and poor performing district represented by shaded of orange.

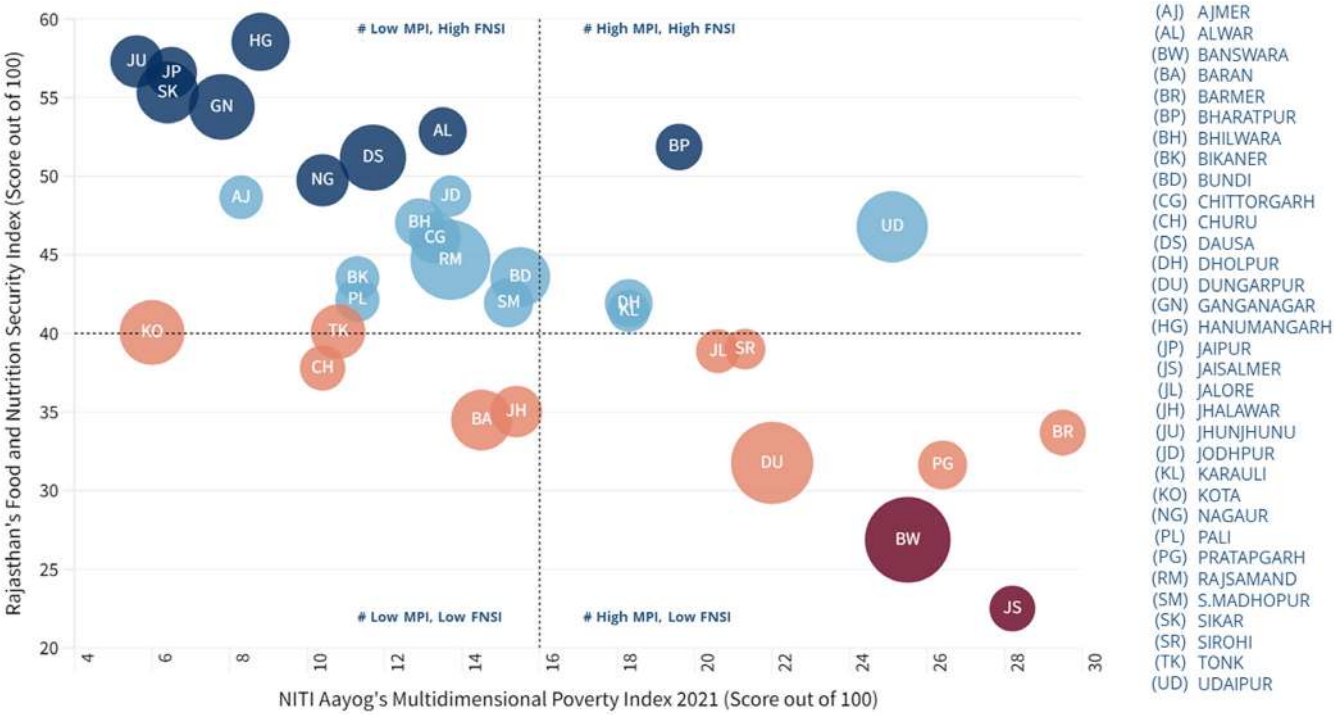


Figure 104: Scatter Plot depicting correlation between NITI Aayog's Multidimensional Poverty Index and Rajasthan's Food and Nutrition Security Index

Security Index (FNSI) and Rajasthan's Multi-dimensional Poverty Index (MPI), seven districts of Rajasthan, i.e., Jaisalmer, Banswara, Pratapgarh, Dungarpur, Barmer, Jalore, and Sirohi are common in their bottom ten districts that should be accorded priority while designing interventions in Rajasthan. Whereas six districts – Hanumangarh, Jhunjhunu, Jaipur, Sikar, Ganganagar and Nagaur appear common in the list of top ten performing districts in Rajasthan. However, districts such as Kota, Churu and Tonk are an exception, despite lower MPI, they do not perform well on FNSI, hence require specific attention.

7.9. Priority Districts in Rajasthan

Based on FNSI scores, bottom 10 districts have been identified as priority districts in Rajasthan. Table 5 presents the status of these districts in the four food security dimensions and overall FNSI. It appears except Jalore and Sirohi, rest eight priority districts are extremely food insecure in one or more food and nutrition security dimensions. Except Churu, that lies in the north-eastern part of Rajasthan, remaining all identified priority districts flank between the western and south-eastern periphery, almost forming a continuous cluster. Banswara falls among the bottom ten across all the four dimensions and is found to be extremely insecure in terms of food accessibility and utilisation, and severely insecure in terms of food availability and stability, needs the utmost attention, followed by Jaisalmer.

7.10. Summary of Findings: Food and Nutrition Security Index

- Food and Nutrition Security indices were developed using a suite of indicators influencing food availability, accessibility, utilisation, and stability. The indices help to rank districts in Rajasthan to monitor the status of food and nutrition security and identify the vulnerable districts that require special attention to achieve 'Zero Hunger' in the State.
- Based on the scores of food availability index, Rajasthan falls under the moderately insecure category. Out of the total districts in the state, two-thirds of the districts are placed in the moderate to extremely insecure range on the food availability index, with three districts - Barmer, Dungarpur, and Churu, categorized as extremely insecure. Only six districts including Ganganagar, Hanumangarh, Baran, Chittorgarh, Bundi, and Alwar are considered secure.
- The scores of food accessibility index reveal a very dull situation, with Rajasthan categorised under severely

Table 5: Ten priority districts in Rajasthan based on Food and Nutrition Security Index (FNSI)

Priority Districts	Food Availability Index (FAvI)	Food Accessibility Index (FAcI)	Food Utilization Index (FUI)	Food Stability Index (FSI)	Food and Nutrition Security Index (FNSI)
JAISALMER	Severely Insecure	Extremely Insecure	Moderately Secure	Extremely Insecure	Extremely Insecure
BANSWARA	Severely Insecure	Extremely Insecure	Extremely Insecure	Severely Insecure	Extremely Insecure
PRATAPGARH	Moderately Secure	Extremely Insecure	Extremely Insecure	Extremely Insecure	Severely Insecure
DUNGARPUR	Extremely Insecure	Severely Insecure	Moderately Secure	Severely Insecure	Severely Insecure
BARMER	Extremely Insecure	Moderately Insecure	Secure	Moderately Insecure	Severely Insecure
BARAN	Secure	Extremely Insecure	Moderately Insecure	Severely Insecure	Severely Insecure
JHALAWAR	Moderately Secure	Extremely Insecure	Moderately Insecure	Severely Insecure	Severely Insecure
CHURU	Extremely Insecure	Severely Insecure	Severely Insecure	Secure	Moderately Insecure
JALORE	Severely Insecure	Severely Insecure	Secure	Moderately Insecure	Moderately Insecure
SIROHI	Severely Insecure	Severely Insecure	Moderately Insecure	Moderately Insecure	Moderately Insecure

insecure. Among districts, except Jaipur that is found to be secure, rest are categorised as moderately to extremely food insecure. Seven districts- Jaisalmer in the west and Baran, Jhalawar, Banswara, Pratapgarh, Kota and Chittorgarh, forming a continuous cluster in the south-eastern part fall under extremely insecure category.

- Rajasthan falls into the moderately insecure category in terms of food utilization. Out of the total districts, nine are categorised as secure or moderately secure, Barmer being the top performer and Pratapgarh at the bottom. Eastern districts demonstrate lower performance in comparison to the better-performing western districts. Despite districts performing relatively better in food utilization compared to availability and accessibility, there remains a significant two-fold difference in scores between the best and worst districts, indicating substantial variations in food utilization across the region.
- Rajasthan is categorized as moderately secure on the food stability index, with Jhunjhunu and Sikar ranking highest, and Jaisalmer and Pratapgarh at the lowest positions. Around 40% of the districts are considered secure or moderately secure, clustered together spanning from the central to the north-eastern side of Rajasthan. Jaisalmer and Pratapgarh are identified as extremely insecure, while Banswara, Jhalawar, Baran, Dungarpur, and Bundi fall into the severely insecure category. The insecure districts form a cluster from the western to the south-eastern side of Rajasthan, except for Sri Ganganagar in the top-north region.
- Overall, on Food and Nutrition Security Index, Rajasthan is categorised as moderately secure. Out of total districts, 15 districts are identified as secure or moderately secure, with Hanumangarh occupying the top position. Jaisalmer followed by Banswara is found to be the extremely insecure district that require utmost attention. Out of the ten bottom districts, identified as 'priority district', except Churu, that lies in the north-eastern part of Rajasthan, remaining between the western and south-eastern periphery, almost forming a continuous cluster.
- The Food and Nutrition Security Index (FNSI) and Rajasthan's Multi-dimensional Poverty Index (MPI) demonstrate a significant negative correlation, indicating that lower MPI values correspond to higher FNSI scores. As per performance in Food and Nutrition Security Index (FNSI) and Rajasthan's Multi-dimensional Poverty Index (MPI), seven districts of Rajasthan, i.e., Jaisalmer, Banswara, Pratapgarh, Dungarpur, Barmer, Jalore, and Sirohi are common in their bottom ten districts. The bottom ten districts on Rajasthan's Food and Nutrition Security Index (FNSI) require specific attention and targeted interventions.

8. Conclusion and Recommendations

8. Conclusion and Recommendations

8.1. Background

Concluding the analysis, this chapter provides a summary of the key findings and policy recommendations aimed at accomplishing the goals and targets of Sustainable Development Goal 2 in Rajasthan. The key findings of the analysis pertaining to various dimensions of food and nutrition security are presented first, followed by the presentation of policy recommendations.

8.2. Status of Food Availability

- Both India and Rajasthan have witnessed a consistent increase in food grain production over the years. From 2004-05 to 2021-22, national production rose from 198 to 316 million metric tonnes, while Rajasthan's production nearly doubled from 12 to 21 million metric tonnes. Based on the fourth advance estimates of 2021-22, Rajasthan ranks fourth among Indian states in food grain production, contributing 21.05 million metric tonnes. Rajasthan's share of total food grain production in India has grown from 6.1 percent in 2004-05 to 6.7 percent in 2021-22. During the period of 2008-11 to 2016-19, there has been an improvement in overall food grain production in many districts of Rajasthan. However, districts in the western region continue to face lower food grain production due to the arid agroclimatic conditions influenced by the Thar desert. **Alwar, Ganganagar, Jaipur and Hanumangarh** consistently **hold the highest share** of total food grain production in Rajasthan. Conversely, **Jaisalmer and Sirohi have the**

lowest share of total food grain production in the state in 2008-11 and 2016-19. Notably, Pali and Jaisalmer have displayed significant progress, with their total food grain production nearly doubling from 2008-11 to 2016-19. However, Barmer witnessed a decline of 34 percent in total food grain production during the same period.

- Between **2006-07 and 2018-19**, there has been a **44 percent increase** in the production of **total cereals**. During the same period, the **production of pulses** has **grown significantly, reaching up to 2.5 times,** from 1.5 to 3.8 million metric tonnes. There has been a heightened emphasis on increasing pulse production since 2016-17, which has resulted in an improved ratio of total pulse production to total cereal production in Rajasthan. Among districts, the production of total cereals remains highest in Alwar, Jaipur, Hanumangarh, and Ganganagar while Nagaur and Bikaner record high production of pulses between 2008-11 and 2016-19. Notably, Rajsamand experienced a two-fold increase in cereal production, while districts like Baran and Kota witnessed an eighteen-fold and twelve-fold increase respectively in pulse production. On the other hand, Jaisalmer saw a 50 percent reduction in cereal production, and Bharatpur, Barmer, and Dholpur observed a decline in pulse production in 2016-19 compared to 2008-11.
- Among the cereals cultivated in Rajasthan, **wheat holds the highest position in terms of production, followed by pearl millet (bajra) and maize**. The production of wheat has witnessed significant expansion over the years, increasing from 7.8 million metric tonnes in 2006-07 to 12 million metric tonnes in 2018-19. Hanumangarh, Ganganagar, Alwar, and Bharatpur remained dominant in wheat production between 2008-11 and 2016-19. Most districts showed an improvement in average wheat production, except Nagaur and Jaisalmer, which experienced 19 percent and 39 percent reduction respectively between 2008-11 and 2016-19. Districts like Pali, Udaipur, Bhilwara, Dungarpur, and Jhalawar doubled or more than doubled their wheat production on average. **Majority of wheat production is concentrated in the eastern districts of the state, from north to south**.
- Overall, the growth in production of other cereals, except for wheat and rice, witness a very slight improvement, over the years. Rice production has steadily risen from 0.2 million metric tonnes to 0.5 million metric tonnes between 2006-07 and 2018-19. **While Rajasthan stands as the largest producer of pearl millet (bajra) in India, its production constitutes around one-third of the total wheat production in the state. Bajra production is concentrated in the central part of Rajasthan, from northeast to southwest, with southern districts contributing the least to its production.** A worrisome trend is observed with about **22 districts showing a decline in average production from 2008-11 to 2016-19.** Hanumangarh had the highest reduction (75 percent), followed by Dungarpur and Baran (71 percent reduction). However, Chittorgarh witnessed significant growth in bajra production (approximately six times higher), followed by Jhalawar with a 2.5 times higher production from 2008-11 to 2016-19. Alwar, Jaipur, Nagaur and Jhunjhunu consistently had the highest share in bajra production across districts in Rajasthan.
- In the 2018-19 period, Gram, grown during the Rabi season, holds the top position among pulses in terms of production, reaching 1.8 million metric tonnes. This is followed by Moong (Green Gram), cultivated in the Kharif season, with a production of 1.2 million metric tonnes. In general, **a higher share of pulse production in Rajasthan is concentrated in districts in the central-northern region**.

Bikaner, Ganganagar, and Jhunjhunu continue to be among the top five districts contributing the most to gram production in Rajasthan. Comparing to the production levels in 2006-07, **gram production has nearly doubled, while the production of green gram (moong) has increased almost five-fold** during the same period in Rajasthan. Jodhpur, Jalore, and Baran have experienced remarkable growth, with gram production increasing by ten to fifteen times between 2016-19 compared to 2008-11. Conversely, districts like Dholpur have witnessed an 80 percent decline in gram production, while Churu, Bharatpur, and Karauli have seen declines ranging from 40 to 55 percent over the two time periods.

- Overall, **moong production is concentrated in the central, northern, and western districts of Rajasthan,** excluding Barmer. Moong production in eleven districts of Rajasthan has more than doubled in 2016-19 compared to 2008-11, with Bikaner showing the highest improvement, reaching about fourteen times higher production. **Nagaur, Jodhpur, Pali, Ajmer and Jaipur remain the top producers** of moong in both periods. However, Pratapgarh, Alwar, Dausa, and Bharatpur experienced the maximum decline in moong production.
- The productivity of food grains in Rajasthan exhibits an interesting pattern. **Districts located on the eastern periphery, from north to south, have the highest productivity, while a clear decline is observed as one moves from east to west, coinciding with the transition from humid to arid agroclimatic zones. The western districts, characterized by desert land, have the lowest**

> **"Between 2006-07 and 2018-19, there has been a 44 percent increase in the production of total cereals. the production of pulses, on the other hand, has grown 2.5 times during the same period."**

productivity, except for Churu that lies in the north and has surprisingly low productivity despite being surrounded by districts with higher productivity. In Rajasthan, where rainfall is crucial for agriculture, the extent of irrigation plays a vital role in cultivating food crops and determining overall productivity. Higher irrigation coverage in cultivated areas is associated with greater food grain productivity.

- The availability of foodgrains depends on factors such as the area for crop cultivation, crop composition, agroclimatic conditions, government policies, and crop demand. In Rajasthan, changes in crop cultivation have been observed between 2006-09 and 2016-2019. Among cereals, **Bajra (Pearl millets) has seen a significant 10% decrease in its cultivation area (from 38% to 28%), while Moong (Green gram) has experienced an 8% increase (from 7% to 15%).** Urad and wheat production areas have also increased by 3.6% and 1.9% respectively over the ten-year period. The cultivation areas for

Maize, Jowar, Barley, Arhar, Moth, and Chaula have slightly declined, while rice cultivation among cereals and gram and masoor cultivation among pulses have seen marginal increases. **The drop in Bajra production can be attributed to two factors - Inadequate Minimum Support Price and shift towards pulse due to its shorter cultivation time and higher economic returns.**

- **Rajasthan is the largest contributor in milk production across India (15.05 % of total milk production). From 13.5 million metric tonnes in 2011-12 to 33.27 million metric tonnes in 2022, the state's milk output has increased by a net 146.44 percent.** Among the districts in Rajasthan, Jaipur boasts the highest average milk production at 1.88 million metric tonnes, while Dungarpur records the lowest at 0.2 million metric tonnes between 2016-17 and 2018-19. In contrast to other states, **Rajasthan's population does not heavily depend on egg and meat production for consumption, resulting in relatively lower overall production.** However, between 2011-12 and 2018-19, both egg and meat production in the state have nearly doubled. The production of eggs increased from 797 million to 1662 million, while meat production rose from 104 thousand metric tonnes to 181 metric tonnes.

8.3. Policy Recommendations for Improving Food Availability in Rajasthan

Augment Irrigation

- There is considerable scope for additional methods of water availability for agriculture like - drainage line treatment, soil and moisture conservation, rainwater nursery raising, afforestation, horticulture, pasture development etc.
- Temporary retention of runoff water and its reuse for preserving crops during brief periods of drought.

Improve Agriculture Inputs

- Cropping high yield variety seeds and drought and disease resistant varieties of seeds
- Extensive implementation of Integrated farming system (IFS) can be used as an efficient measure for increasing productivity of several crops including Millets and pulses.
- Rajasthan being the largest producer of pearl millets (Bajra) should invest more in promoting research and development of high yielding varieties and better shelf life of different types of millets in the state agriculture universities and should emerge as a champion for promoting millets in the country.

Diversify the Production

- The state government should diversify the production basket and focus more to incentivise the

production of pulses, millets, dairy, poultry, animal husbandry, and horticulture to tackle the challenges of agriculture-nutrition disconnect.

- Diversification of farm activities to include animal husbandry/ poultry rearing as a measure to moderate the shocks and stresses to farming households.

8.4. Status of Food Accessibility in Rajasthan

- According to the 68th NSS household consumption expenditure survey (2011-12), **food expenditure in Rajasthan is similar to the national average.** In rural areas of Rajasthan, 48.1 percent of expenditure is on food, while the national rural average is 48.6 percent. In urban areas of Rajasthan, 39.8 percent of expenditure is on food, compared to the national urban average of 38.5 percent. Generally, rural populations across India, including Rajasthan, spend a higher proportion of their income on food compared to urban populations. The most economically vulnerable group in India, **the bottom 25 percent based on monthly per capita expenditure, spends over half of their income on food, regardless of the state**. However, **rural Rajasthan's bottom 25 percent fares better than their rural counterparts in most other states**, except for Goa. Interestingly, **Rajasthan is one of the three states in India where urban populations in the bottom 25 percent spend slightly more on food than their rural counterparts**. The other two states are Kerala and Jammu & Kashmir.
- **Food expenditure accounts for half or more of the total expenses in 70 percent of the total districts in Rajasthan. Jhalawar has the highest proportion of food expenses, while Jaipur has the lowest among all districts**. Inequality between rural and urban areas is prominent when analysing at the district level. In rural areas, the share of expenses on food ranges from 45.9 to 57.8 percent, with 80 percent of districts spending half or more of their total expenses on food. In urban areas, the share of expenses ranges from 40.4 to 53.8 percent, with more than 60 percent of districts spending less than half of their total expenses on food. **Interestingly, the disparity in food expense share is higher among urban counterparts compared to rural counterparts, as rural areas show a more consistent spending pattern.** In rural Rajasthan, districts like Bikaner (57.8 percent) and Jhalawar (57.6 percent) have the highest share of food expenses, while Udaipur (45.9 percent) has the lowest. In urban Rajasthan, Churu and Sawai Madhopur have the highest share (53.8 percent), while Kota (40.4 percent) has the lowest share of food expenditure to total expenditure. Even within districts, the pattern of food expenditure share to total expenditure varies significantly. With the exception of Nagaur, Churu, and Hanumangarh, rural counterparts in most districts have a higher share of food expenses compared to urban counterparts. Kota, followed by Chittaurgarh and Bikaner, exhibit the largest differences (10-12 percent) between rural and urban counterparts in terms of the percentage share of food expenditure to total expenditure, with rural areas contributing more to food expenses.

- Food price inflation directly impacts access to food, particularly for vulnerable households already spending a significant portion of their income on food. **In Rajasthan, Consumer Price Indices (CPI) show an increase in food inflation, aligning with general inflation trends since 2012.** Between September 2019 and October 2020, food inflation surpassed general inflation, peaking during the COVID-19 pandemic from November 2019 to January 2020. Although there was a 4.6 percent decrease in

food and beverage inflation from November 2020 to March 2021, it rose again by 6.8 percent by December 2021. The CPI for cereals and cereal products experienced a notable rise of nearly 19% from January 2018 to February 2020. Notably, **strategic measures implemented in response to COVID-19 led to a significant decline of up to 7.7% in the CPI for cereals and cereal products from August 2020 to March 2021.** Furthermore, the CPI for key sources of protein and fat, such as pulses, milk, and oil, has been consistently increasing over the years, with the highest inflation observed in oil and oil products. It's worth mentioning that**, except for cereals and cereal products, where urban prices have slightly exceeded rural prices, particularly after August 2020, the prices of all other food commodities, including pulses, oils, milk, and their products, are significantly higher in rural areas compared to their urban counterparts in Rajasthan.**

- Rajasthan consistently surpasses the national average and the recommended norms set by the Rangarajan Expert Group on Poverty Measurement, 2014. While energy and protein intake has declined in Rajasthan and India between 1999-2000 and 2011-12, fat intake remains double the recommended norms. Specifically, there has been a notable increase in fat consumption between 2004-05 and 2011-12 in rural (6.8 percent) and urban (5.2 percent) areas, which aligns with the national trend. However, for **the bottom 25 percent of the population based on monthly per capita expenditure (MPCE) fractile, energy intake remains below the recommended norms in both rural and urban areas of Rajasthan,** despite an average improvement of around 150 calories from 1990 to 2012. Protein and fat consumption among the bottom 25 percent slightly exceeds the recommended norms in both rural and urban areas of Rajasthan in 2011-12. It is noteworthy that the **energy, protein, and fat intake among the bottom 25 percent population in Rajasthan exceeds that of the bottom 25 percent at the national level**.
- Examining different subgroups reveals that individuals in the **bottom 20 percent consume roughly a thousand calories less than those in the top 20 percent**, both in rural and urban areas. In rural areas, the average daily calorie intake is 291 calories lower, while in urban areas, it is 367 calories lower compared to the recommended energy

intake. Social group also influences nutrient intake, with **individuals belonging to scheduled tribes or scheduled castes consuming fewer calories, protein, and fat per day compared to their counterparts.** In the southern agroclimatic zone, individuals have lower average daily energy, protein, and fat intake compared to other agroclimatic zones. Notably, the **average energy intake per day among people living in the southern zone of rural Rajasthan is slightly below the recommended level.** Among different livelihood groups, individuals employed as casual laborers in non-agricultural sectors in rural areas, as well as casual laborers in urban areas, face the highest levels of per capita energy, protein, and fat deprivation on a daily basis. These findings highlight the vulnerability of these populations and the need for targeted measures to address their nutritional requirements.

- District-level trends in Rajasthan reveal significant disparities in per capita daily energy, protein, and fat intake, both among the urban and rural population, according to the 68th NSS consumption expenditure survey. **In rural areas, Jodhpur exhibits the highest daily per capita energy intake, while Udaipur**

has the lowest, with an average difference of approximately 1000 calories less consumed per person in Udaipur compared to Jodhpur. In urban areas, Tonk has the poorest average daily per capita energy intake, while Baran has the highest, with a difference of approximately 500 calories. Moreover, there are significant disparities in energy intake between rural and urban populations within the same district. For instance, Jodhpur, which leads in rural energy intake across districts, has the largest difference between rural and urban areas, with urban residents consuming approximately 600 calories less per day on average than rural residents. Regarding protein and intake, all districts exhibit adequate consumption above the recommended intake per person per day with significant variations within and across districts. Sri Ganganagar displays the largest difference in average daily protein intake per capita between rural and urban counterparts, with rural residents consuming 19 grams less protein on average than their urban counterparts per day. In terms of fat consumption, the districts in the southern region (Dungarpur, Banswara, Chittaurgarh, Sirohi, and Udaipur) show the greatest difference in fat consumption per capita per day, with urban areas consuming 18 grams or more fat than rural areas.

- In both rural and urban areas of Rajasthan, **cereals are the primary source of energy and protein intake during the periods of 2004-05 and 2011-12, followed by milk and milk products,** based on NSS consumption expenditure surveys. However, it is noteworthy that the **proportion of calorie intake from cereals has decreased in both rural and urban areas, while there has been a proportional increase in calorie intake from oils and oil products, as well as from miscellaneous sources**, indicating a shift in food preferences towards less nutritious food groups. On the other hand, **consumption of high-quality animal protein from eggs, fish, and meat remains low** at one percent in both rural and urban regions, reflecting the prevalence of vegetarianism among the population. The **contribution of plant-based protein from pulses remains unchanged at six percent between 2004-05 and 2011-12** in Rajasthan. It is worth noting that cereals lack essential dietary amino acids like lysine, which are crucial for improving muscle mass and preventing muscle loss. As a result, they offer a poor substitute for high-quality protein. Therefore, **despite meeting the recommended daily protein**

intake per capita in Rajasthan, there are concerns about the quality of protein consumed.

- Enhanced food accessibility, particularly for vulnerable households, relies on various factors such as occupational structure, agricultural earnings, and access to well-maintained roads. According to the 2011 Census, Rajasthan has a work participation rate of 43.6 percent, slightly higher than the national average of 39.8 percent. Around 16.5 percent of employed individuals in Rajasthan work as agricultural laborers, with the proportion of female agricultural laborers being twice that of males. **Districts in the southern and south-eastern regions of Rajasthan, except for Sri Ganganagar and Bharatpur, have the highest proportion of agricultural laborers, while Churu, Sikar, Jhunjhunu, and Jaipur have the lowest proportion.**
- Although the average daily wage rates for both male and female field laborers in Rajasthan have increased over time and are higher than the national average, it is still behind other major states like Kerala, Haryana, Punjab, and Uttarakhand as of 2019-20 figures. There are **significant wage disparities between male and female laborers across districts in Rajasthan, with female workers generally receiving lower pay than their male counterparts.**
- For vulnerable households in remote areas, access to paved roads and improved rural connectivity are crucial for ensuring consistent physical access to food. Rajasthan's road density, as of March 2022, stands at 81.47 km per 100 square km, which is considerably lower than the national average of 165.23 km per 100 square km. According to village connectivity data until March 2021, **over half of Rajasthan's villages with a population of under 250 still lack proper connectivity.** This indicates that residents in smaller and sparsely populated areas face significant challenges in accessing essential services.

8.5. Policy Recommendations for Improving Food Accessibility in Rajasthan

Strengthen Food Safety Nets to Leave No One Behind

- Strengthening the food safety net programme like TPDS, ICDS and MDM to include the excluded vulnerable population.
- Covering the left out vulnerable population through

state food security schemes will help in improving the overall food and nutrition security in the state.

- Strengthen and expand the provisions in the food safety net baskets' for improving the protein intake amongst its vulnerable population.

Manage Food Inflation

- Food inflation and rising prices can be tackled by facilitating timely distribution of pulses, other grains, edible oil through the TPDS by the state government.
- Increase investments in market information system for accurate and timely estimating the price spike among major food commodities.
- State government should be proactive in availing the Central government support on price stabilization fund and schemes to extend its benefits to its population.

Augment the livelihood promotion programme

- The state/national government needs to focus on increasing employment especially in rural areas through various employment generation programme and livelihood promotion programme.

Investing in Physical Infrastructure

- Boost investments for improving physical infrastructure such as roads, modern warehouses, cold storage etc. needs to be improved to ensure physical access to food to the last mile.

8.6. Food Utilization in Rajasthan

- Between 2015-16 and 2019-21, **Rajasthan has shown significant improvement in various indicators related to child undernutrition and mortality, particularly among the Empowered Action Group (EAG) states.** In terms of mortality rates, Rajasthan's rank has improved in Neonatal Mortality Rate (NMR), Infant Mortality Rate (IMR), and Under-5 Mortality Rate (U5MR), moving from 29th to 21st, 29th to 21st and 29th to 23rd positions respectively, among the 35 states/union territories with comparable data (Chandigarh not included due to unavailability of data).
- **Rajasthan has witnessed improvements in its rank in stunting, wasting, and underweight categories**, moving from 31st to 20th, 28th to 16th and 30th to 22nd respectively, between 2015 and 2021. Rajasthan has recorded the **highest decline in prevalence of stunting**, of about 7.3 percentage points in child stunting, from 39.1 percent in NFHS-4 to 31.8 percent in NFHS-5. The prevalence of stunting in the state is below the national average of 35.5 percent in 2019-21. Similarly, Rajasthan has achieved the **second-highest reduction of 9.1 percentage points in the prevalence of underweight children** in India, decreasing from 36.7 percent in 2015-16 to 27.6 percent in 2019-21, which is lower than the national average of 32.1 percent. Rajasthan has also made progress in reducing wasting in children, with a decline of 6.2 percentage points over the past five years, from 23.0 percent in NFHS-4 to 16.8 percent in NFHS-5.
- **In rural areas, a higher proportion of children under five years old are observed to be stunted and underweight compared to urban areas**. However, urban areas have slightly higher rates of wasting and overweight/obesity among children. Among children under five, **boys have slightly higher incidences of stunting, wasting, and underweight compared to girls**. The prevalence of stunting and underweight increases significantly after 6 to 8 months of age until two years of age.
- Among different social groups, the **highest prevalence of child undernutrition is found among the Scheduled Tribe population**, with 35.9 percent stunting, 18.6 percent wasting, and 32 percent underweight among children under five. The nutritional status of mothers also greatly affects the nutritional status of children**. Children born to mothers with a low Body Mass Index (<18.5) have higher rates of stunting, wasting, and underweight** compared to children of mothers with a normal BMI.
- District-level analysis reveals a wide range of stunting, wasting, and underweight prevalence across districts in Rajasthan. Baran district has the highest burden, while Jhunjhunu district has the lowest. Most districts in Rajasthan have shown a reduction in stunting between 2015-16 and 2019-21, except for Tonk, Barmer, Dausa, and Baran, which have seen an increase. In terms of wasting, Jhalawar district has the highest burden and Udaipur has the

lowest. Dungarpur, Udaipur and Sirohi districts have shown the highest reduction in wasting, while several districts have experienced an increase. Jhalawar has the highest burden of severely acute malnourished (SAM) children and Udaipur the lowest. Disparities in underweight prevalence among districts are also evident, with Sikar performing the best and Baran performing the worst. Over the past 15 years, there has been a growing concern about the increasing proportion of overweight/obese children under the age of five in Rajasthan. Jhunjhunu district reports the highest prevalence of overweight/obese children, while Pali district has the lowest.

- Rajasthan has achieved the **second highest reduction in the proportion of adults with a low Body Mass Index (BMI) compared to other states/UTs**. Between the NFHS-4 and NFHS-5 surveys, the percentage of women and men with low BMI decreased by 7.4 and 8.7 percentage points, respectively. **Rajasthan is among the five states/UTs in India that have shown a decline in the percentage of overweight women, with a decrease from 14.1 percent in 2015-16 to 12.9 percent in 2019-21**. However, the proportion of obese men increased from 13.2 percent to 15 percent during the same period. Nonetheless, the prevalence of overweight/obese women in Rajasthan is nearly 50 percent lower than the national average of 24 percent, as per the NFHS-5 findings. Nutrition outcomes in adults are also influenced by age and social groups. The prevalence of low BMI decreases with increasing age in both men and women, while the chance of being overweight/obese increases with age. Among adolescents, 40.1 percent of girls and 34.7 percent of boys have low BMI. On the other hand, 23.7 percent of women and 26 percent of men aged 40-49 years are obese or overweight. **Scheduled tribes have the highest proportion of women with a low BMI (24.8 percent), followed by those belonging to scheduled castes (22.8 percent). Districts spanning from eastern to south-eastern periphery have a higher proportion of women with low BMI compared to other districts.** All districts, except Jhunjhunu, have shown a reduction in the proportion of women with a low BMI. The maximum reduction is observed in Udaipur, while the least reduction is observed in Alwar district. Ajmer has the lowest prevalence of women with low BMI, while Bundi has the highest.

- **Rajasthan stands at the bottom sixth position with respect to prevalence of anaemia among children between 6 to 59 months of age** next to states like Madhya Pradesh and Gujarat. The **prevalence of anaemia has increased across all age groups** in Rajasthan between 2015-16 and 2019-21, moving from 25th to 31st position in terms of rank**. Women aged 15-49 years experienced an increase from 46.8 percent to 54.4 percent, while adolescent girls saw an increase of 10.3 percentage points from 49.1 percent to 59.4 percent during the same period.** The burden of anaemia also increased in adolescent boys (15-19 years) and men (15-49 years) by 11.9 percentage points and 6 percentage points, respectively. Anaemia status in children and adults is influenced by various social, household, and maternal characteristics. **Rural areas have a higher proportion of anaemic children compared to urban areas. Children belonging to scheduled tribes have the highest prevalence of anaemia at 77 percent.** Maternal anaemia greatly affects the anaemia status of children, with the **highest proportion of anaemic children having mothers who are severely or moderately anaemic.** Breastfeeding mothers are more anaemic compared to pregnant women. At the district level, the prevalence of child anaemia in Rajasthan ranges from 58.6 percent to 84.3 percent, with **Jaisalmer having the lowest prevalence and Rajsamand the highest**. **Districts in the northern part and two longitudinal belts of districts running from east to central and moving towards the south have the highest proportion of anaemic children.** The burden of child anaemia increased significantly in districts like Churu, Hanumangarh, Sri Ganganagar, Dhaulpur, and Bikaner. Dungarpur has the highest proportion of anaemic adolescent girls and women.

- **Rajasthan has made steady improvements in Infant and Young Child Feeding (IYCF) indicators between 2015-16 and 2019-21.** The rates of early initiation of breastfeeding, exclusive breastfeeding for children under six months, timely introduction of complementary feeding, and adequate diet for breastfeeding children aged 6-23 months have all increased. However, the progress is still far from optimal, and the state government needs to strengthen its implementation plan. The proportion of children between six months and below two years receiving an adequate diet in the

complementary feeding age group has improved in all districts except Tonk and Sirohi. **However, even with the improvement, Jodhpur has the highest proportion of children receiving an adequate diet at 12.5 percent, while Sirohi, Dungarpur, and Jalore have the lowest proportions.** All districts in Rajasthan have shown improvement in Vitamin A supplementation among children aged 6 to 59 months between 2015-16 and 2019-21.

- Rajasthan has shown improvement in key nutrition-sensitive indicators. The percentage of women receiving at least 4 antenatal check-ups (ANC) during pregnancy has increased from 38.5 percent in NFHS-4 to 55.3 percent in NFHS-5, a rise of 16.8 percentage points. **Rajasthan is among a few states, including Uttarakhand, Madhya Pradesh, Odisha, Uttar Pradesh, and Haryana, to have witnessed such significant increments in 4+ ANC visits. The consumption of 100+ iron and folic acid (IFA) tablets by pregnant women has also nearly doubled, from 17.3 percent in NFHS-4 to 33.9 percent in NFHS-5.** Regarding antenatal care, most districts in Rajasthan, except Bhilwara, Dausa, Jaipur, and Pratapgarh, have shown an increase in the consumption of IFA tablets for 100 days or more during pregnancy, although the improvement varies disproportionately. Rajsamand displayed the highest improvement of 37.7 percentage points, while Karauli had the least improvement. Ganganagar district had the highest consumption of IFA tablets, while Bharatpur district had the lowest. There is significant variation across districts in terms of the proportion of women who had at least 4 ANC visits during pregnancy. Kota had the highest performance (81.3 percent), while Alwar had the lowest (30 percent). Chittaurgarh showed the most improvement in 4+ ANC visits, followed by Barmer with an increase of nearly 50 percentage points since 2015-16.
- However, the **NFHS-5 survey in Rajasthan revealed poor micronutrient intake among children under five years old. Less than five percent of children between 6 and 23 months consumed iron-rich foods. Only a quarter of children were given iron supplements, and five percent received micronutrient powder within one week of the survey. Additionally, only 22.4 percent of children were given a deworming tablet in the six months prior to the survey.** Despite government interventions and a large-scale Vitamin A supplementation program, **around 35 percent of children were not provided Vitamin A doses in the six months prior to the survey.** The proportion of fully immunized children aged 12 to 23 months has significantly increased in most districts, with a few exceptions. Barmer had the highest proportion of fully immunized children at 92.9 percent and displayed a three-fold improvement in full immunization between 2015-16 and 2019-21. Only Alwar and Sawai Madhopur had less than 60 percent of children in the 12 to 23-month age group who were fully immunized according to NFHS 2019-21.
- Access to safe drinking water and improved sanitation facilities are crucial for improving food absorption and addressing the underlying causes of malnutrition among vulnerable populations. In Rajasthan, the proportion of households with access to improved drinking water sources has increased from 93.7 percent in 2015-16 to 96.5 percent in 2019-21. Urban areas have higher access (99.1 percent) compared to rural areas (95.6 percent). **All districts in Rajasthan have nearly 90 percent or more households with improved drinking water sources**. Districts like Jaipur, Barmer, Kota, Sikar, and Dausa have nearly all households (>99 percent) with access to improved drinking water sources.
- There has been significant improvement in access to improved sanitation facilities, with 71.1 percent of households having such facilities in 2019-21, compared to 46.1 percent in 2015-16. **The difference between rural and urban areas is 21.1 percent, with urban areas (87.2 percent) having better access than rural areas (66.1 percent).** Among districts, Barmer stands out with a four-fold increase in the proportion of households with improved sanitation facilities. **Hanumangarh (83.8 percent) and Barmer (83.6 percent) have the highest proportions of households with improved sanitation facilities, while Banswara has the lowest (40.8 percent). Poor performing districts form a continuous cluster in the eastern and south-eastern periphery of Rajasthan.**
- There has been a **significant increase (nearly five-fold increase on an average) in the proportion of households covered under health insurance or financing schemes across Rajasthan** between NFHS-4 (2015-16) and NFHS-5 (2019-21). This can be attributed to **the successful implementation of the 'Mukhya Mantri Chiranjeevi Swasthya Bima**

Yojana' in Rajasthan, launched in 2021 to provide **universal healthcare** to all citizens. Barmer has the highest proportion of households with health coverage, increasing from 8.9 percent in 2015-16 to 97.8 percent in 2019-21. Sawai Madhopur has the lowest proportion of households covered under health schemes compared to other districts in Rajasthan, despite an increase from 31.6 percent in 2015-16 to 80.5 percent in 2019-21.

- According to the classification by Composite Indicator for Anthropometric Failure (CIAF), NFHS-5 (2019-21) analysis shows that **half of the children under the age of five in Rajasthan experience one or more anthropometric failures**. Baran and Karauli have the highest proportions of children with at least one anthropometric failure, while Sikar and Jaipur have the lowest proportions. **The triple burden and double burden of undernutrition have significantly decreased in Rajasthan between NFHS-4 and NFHS-5.** The proportion of children suffering from **all three forms of undernutrition simultaneously** (stunting, wasting, and underweight) has reduced **by almost 50 percent**, from 7.2 percent in 2015-16 to 3.5 percent in 2019-21. Most districts have reduced the prevalence of the triple burden of undernutrition, with some districts achieving a reduction of 10 percentage points or more. **Karauli, Dausa, Jhalawar, Baran, and Banswara have the highest proportions of children suffering from all three forms of undernutrition simultaneously, while Sikar has the lowest.**
- **Household wealth** significantly affects the risk of a child experiencing different forms of undernutrition or overweight/obesity. **Children from the poorest households have significantly higher chances of single, double, or triple undernutrition** compared to the poorest households. **Scheduled tribes** have the highest prevalence of double and triple undernutrition, followed by scheduled castes and other backward castes. **Rural areas have a higher risk of double undernutrition, and male children have a higher risk of double and triple undernutrition.** Geographic location also plays a role. **Kota and Bharatpur divisions have the highest proportion of children with both triple and single undernutrition.** Jaipur and Jodhpur divisions have the lowest proportion of children with triple and double undernutrition.

8.7. Policy Recommendations for Improving Food Utilization in Rajasthan

Fortify the Food Safety Nets

- State government should fortify all dry ration as well as hot cooked meals with iron and vitamins distributed through TPDS, PM-POSHAN and ICDSS. Fortification of staple cereals could be a positive step in this direction.
- State government should ensure the successful implementation of all micro-nutrient supplementation programmes.

Generate Mass Awareness

- State government should launch major social

behaviour change communication among the masses to generate awareness about nutrition specific and nutrition sensitive initiatives in place and promote its uptake.

- State government should also generate awareness about diversifying the consumption of locally available iron rich foods such as millets, pulses, and green leafy vegetables.

Strengthen the IYCF Programme Implementation

- The 6-24 months age is the most critical window as maximum growth faltering occurs at this age in children. However, the IYCF indicators fares poorly in Rajasthan, even when compared to national average. State government should strengthen the implementation of IYCF related programme in the state particularly in the most vulnerable population and geography.
- State government should augment the Take Home Ration with desired nutrients and launch SBCC campaigns for its uptake.
- State government should make provision to provide milk to children at Anganwadis under the Integrated Child Development Scheme and effectively monitor its implementation.

Target and treat SAM and MAM Children

- State government should ensure and facilitate the targeting and compulsory free treatment of all severely and moderately acute malnutrition children.
- Provision of increased THR quantity, ready-to-eat snacks, enriched THR with extra protein, fat, and eggs, and ready-to-eat therapeutic meals to be provided to all MAM/SAM children and promote its consumption through SBCC.

8.8. Status of Food Stability in Rajasthan

- **Rajasthan, with its arid climate, receives less rainfall compared to the rest of the country.** The average annual rainfall in Rajasthan is 549 mm. From 2006-07 to 2021-22, the highest recorded rainfall was in 2013-14, 137.6 percent above the normal annual rainfall, while the lowest was in 2009-10, 23% below normal. Since 2013-14, Rajasthan has experienced higher peak rainfall every two years, specifically in 2016-17 and 2019-20. The **average annual rainfall between 2012-13 and 2021-22 is 31.5 percent higher than the normal annual rainfall.**

- District analysis in Rajasthan reveals **two distinct clusters** based on rainfall patterns: **one with higher rainfall in the eastern to south-eastern periphery, and another with lower rainfall in the northern to southwestern belt.** Between 2008-11 and 2016-19, the clusters remained similar overall, but with some exceptions. In terms of intensity, districts in the extreme south and southeast received more rainfall in 2008-11, while the northern and western belt experienced even less rainfall in 2016-19. This divergence resulted in increased food grain production, specifically cereals, in districts with higher rainfall, while millet and pulse production thrived in areas with lower rainfall.
- Rainfall is crucial for groundwater recharge in Rajasthan, but the state is facing overexploitation. The 2022 assessment shows **groundwater extraction levels at 151.07 percent, an 8 percent increase from 2017. Except for a few districts, all of Rajasthan is extracting groundwater beyond its replenishable quantity.** Some districts have extraction levels exceeding 200 percent. This worsening trend affects food production as 85 percent of the extracted water is used for irrigation.
- **Rajasthan suffers from frequent natural disasters such as droughts, hailstorms, floods, and locust attacks.** Due to low rainfall and unpredictable monsoons, the state is highly vulnerable to droughts. Between 2017-18 and 2022-23, **droughts during the Kharif season affected around 4.2 million people on average, causing crop losses of approximately 2.6 billion USD (INR 208 billion). Western districts like Barmer, Jaisalmer, Bikaner, Jodhpur, and Pali were severely impacted by the drought. In recent years, floods too have become more common in Rajasthan, particularly in eastern and southeastern districts such as Baran, Bundi, Dhaulpur, Jhalawar, Kota, Sawai Madhopur and Tonk.** During the Kharif season from 2017-18 and 2022-23, floods affected an average of 8.3 million people annually, resulting in crop losses exceeding 3.1 billion USD (INR 248 billion). Hailstorms are frequent, and Rajasthan has also experienced locust attacks. In 2019-20, hailstorms and locust attacks affected about 2.9 million people across the state, causing crop damage worth 2.27 billion USD (INR 181.6 billion).
- Between 2016 and 2019, **acute respiratory infections and influenza-like illnesses were the most prevalent diseases in Rajasthan**, affecting an average of 8.5 million people annually. Other common diseases included fever, diarrheal disorders, and malaria, according to the Integrated Disease Surveillance Programme (IDSP).
- Approximately one in three people in Rajasthan are multidimensionally poor, with **rural areas experiencing three times higher poverty rates compared to urban areas (35.22 percent and 11.52 percent respectively). Rajasthan ranks among the ten states/UTs in India with the highest poverty headcount ratio, according to the NITI Aayog's Multi-Dimensional Poverty Index for 2021**.
- Rajasthan ranks in the **bottom third for female literacy, with a literacy rate of 64.7 percent** according to NFHS-5 (2019-21), placing it below Bihar and Jharkhand. There is a significant gender gap in literacy, with women falling behind men by 24.2 percentage points (88.9% for men). **Rural areas have a 20.2 percentage point lower female literacy rate compared to urban areas**, while the gap between male literacy rates in rural and urban areas is only 3.4%.
- Unemployment rates in Rajasthan have declined steadily since 2018-19, but in 2020-21, the unemployment rate in the state remained slightly higher than the national average. **Urban areas have significantly higher unemployment rates compared to rural areas**, and female unemployment is more prevalent in urban areas compared to rural areas.

8.9. Policy Recommendations for Improving Food Stability in Rajasthan

Conserve and preserve rainfall water

- Given the arid climate and scanty rainfall, the state should adopt all water preservation and conservation methods such as check dams, watersheds, and other techniques recommended under the 'food availability' section.
- State government should promote crops such as millets and pulses which require less extraction of ground water for irrigation purposes. Besides,

modern techniques of ground water recharge such as check dams and watersheds should be promoted throughout the state, and particularly in the vulnerable districts.

Augment investments and strengthen early warning systems

- State government should boost investments in early warning systems to predict droughts, famine, and floods in the state well in time to prepare for disaster management response. Social protection systems should be strengthened to mitigate the effects of the crisis.
- State disaster response policy should be updated to include the food and nutrition security responses during crisis.

Augment local healthcare systems

- State government should invest in providing universal healthcare by strengthening local healthcare systems such as PHC, and CHC to cater to the needs of the vulnerable population and mitigate morbidities such as ARI, influenza, malaria, and diarrheal disorders.

Achieve universal female literacy and gender parity in employment

- State government should invest and work to achieve universal female literacy and ensure minimum 10 years of education for all women of the state.
- State government should promote female employment in both formal and informal sectors and rural and urban areas, to bring parity in the employment scenario.

8.10. Status of Districts in the Food and Nutrition Security Index

- A comprehensive set of **17 indicators** was used to develop **Food and Nutrition Security indices**, which encompass aspects such as food availability, accessibility, utilization, and stability. These indices play a **crucial role in assessing the status of food and nutrition security in districts across Rajasthan** and identifying vulnerable areas that need special attention to achieve 'zero hunger' in the state.
- Rajasthan is classified as **'moderately insecure'** in terms of **food availability**, with two-thirds of the districts falling within the moderate to extremely insecure range. Specifically, **three districts** - **Barmer, Dungarpur, and Churu** - are categorized as **extremely insecure**, while only **six districts**, including **Ganganagar, Hanumangarh, Baran, Chittorgarh, Bundi, and Alwar, are considered secure**.
- The **food accessibility index** reveals a concerning situation in Rajasthan, with the state being classified as **'severely insecure'**. **Apart from Jaipur, which is deemed secure, the remaining districts are categorized as moderately to extremely food insecure**. Notably, **seven districts** - Jaisalmer in the west and Baran, Jhalawar, Banswara, Pratapgarh, Kota, and Chittorgarh **in the south-eastern region - fall under the extremely insecure category, forming a contiguous cluster**.
- In terms of **food utilization**, **Rajasthan** falls into the **'moderately insecure'** category. Out of all the districts, **nine are classified as secure or moderately secure, with Barmer performing the best and Pratapgarh ranking the lowest**. **Eastern districts exhibit lower performance compared to the better-performing western districts.** Although districts fare relatively better in food utilization than availability and accessibility, there is a significant two-fold difference in scores between the highest and lowest performing districts, indicating substantial variations in food utilization across the region.
- **Rajasthan is 'moderately secure' according to the food stability index**, with Jhunjhunu and Sikar ranking the highest, while Jaisalmer and Pratapgarh are positioned at the lowest. **Around 40% of the districts are considered secure or moderately secure, clustered in the central to north-eastern part of Rajasthan. Jaisalmer and Pratapgarh are identified as extremely insecure,** while Banswara, Jhalawar, Baran, Dungarpur, and Bundi fall into the severely insecure category**.** The **insecure districts form a cluster spanning from the western to the south-eastern side of Rajasthan**, except Sri Ganganagar in the northern region.
- **Overall, Rajasthan** is classified as **'moderately secure'** based on the **Food and Nutrition Security Index.** Out of all the districts, **15 are identified as secure or moderately secure, with Hanumangarh occupying the top position. Jaisalmer, followed by**

Banswara, is found to be extremely insecure and requires utmost attention. Among the ten bottom districts, identified as **'priority districts,' except for Churu in the north-eastern part, the rest are located between the western and south-eastern peripheries, forming an almost continuous cluster.**

- The Food and Nutrition Security Index (FNSI) and Rajasthan's Multi-dimensional Poverty Index (MPI) demonstrate a significant negative correlation, indicating that lower MPI values correspond to higher FNSI scores. As per performance in Food and Nutrition Security Index (FNSI) and Rajasthan's Multi-dimensional Poverty Index (MPI), seven districts of Rajasthan, i.e., Jaisalmer, Banswara, Pratapgarh, Dungarpur, Barmer, Jalore, and Sirohi are common in their bottom ten districts. The bottom ten position on Rajasthan's Food and Nutrition Security Index (FNSI) require specific attention and targeted interventions.

8.11. Policy Recommendations for Improving FNS in Vulnerable Geographies

Focused attention on Vulnerable FNS Region of the State

- The state government should make special provisions on diversifying the food basket and launching the SBCC campaign through the food safety nets in the identified priority districts ranging from western to southern periphery; particularly the bottom five districts.

> Hanumangarh has been identified as the most food secure district where as jaisalmer and Banswara has ranked at bottom requiring polices support to improve their fns status.

Annexures

Annexure-1: Distribution of children under the age of five as per the CIAF categories in 2015-16 and 2019-21, in percentage.

State/District	Atleast one anthropometric failure		Undernutrition												Overweight/Obesity			
			Only Stunted		Only Wasted		Only Underweight		Stunted and Underweight		Wasted and Underweight		Stunted, Wasted and Underweight		Only Overweight/ Obese		Stunted and Overweight/ Obese	
	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)	NFHS-4 (2015-16)	NFHS-5 (2019-21)
Ajmer	58.9	44.5	10.4	10.7	6.6	7.0	1.4	0.4	13.3	7.2	16.4	9.9	8.6	1.9	1.1	1.3	1.2	1.4
Alwar	58.1	52.2	14.8	17.2	4.8	6.0	1.7	1.0	20.2	11.8	9.2	7.0	4.5	2.1	0.7	2.2	2.2	1.8
Banswara	70.9	61.2	13.0	14.6	6.5	6.0	2.5	2.9	23.8	21.5	11.8	5.2	12.5	5.7	0.2	0.0	0.4	1.3
Baran	61.7	65.9	12.1	13.8	7.7	7.4	2.2	3.1	18.1	22.3	11.7	7.0	9.2	5.9	0.0	0.2	0.8	2.4
Barmer	59.0	52.0	10.0	13.8	8.3	3.9	4.7	1.3	17.1	19.7	9.1	4.7	8.6	2.6	0.4	0.3	0.8	1.5
Bharatpur	59.6	54.0	19.8	14.4	6.1	3.7	0.9	2.7	21.5	16.3	4.8	3.1	3.7	4.6	0.2	1.7	2.6	2.9
Bhilwara	62.1	41.7	6.9	10.5	11.0	4.0	2.5	2.0	17.3	6.8	12.9	10.4	10.0	2.6	0.3	0.7	1.3	1.0
Bikaner	56.0	51.8	12.6	7.7	8.0	11.3	2.1	1.3	14.4	10.4	11.3	10.2	5.2	2.9	0.8	1.6	1.4	1.2
Bundi	61.3	50.5	11.0	12.1	6.4	7.4	3.2	1.6	18.9	12.0	12.8	6.7	8.5	4.1	0.5	0.0	0.0	0.7
Chittaurgarh	58.5	45.1	8.9	12.8	6.9	4.7	5.7	0.9	19.3	13.2	8.5	5.8	8.4	3.8	0.0	0.0	0.8	1.0
Churu	51.6	46.2	12.6	10.6	8.8	6.9	2.1	1.1	12.1	10.4	8.0	5.5	4.9	3.1	1.6	2.5	1.5	1.0
Dausa	47.9	55.5	13.2	13.0	4.8	6.0	1.7	1.8	15.8	14.9	6.8	7.0	3.7	6.7	0.8	0.3	1.0	1.3
Dhaulpur	65.6	61.0	21.7	19.6	2.9	4.1	1.9	1.1	25.1	17.8	6.5	5.8	6.4	3.3	0.0	1.1	1.2	3.7
Dungarpur	70.9	46.3	7.8	13.1	7.7	4.5	1.7	1.5	21.4	12.8	14.5	7.7	15.3	3.3	0.2	0.5	1.9	1.7
Ganganagar	50.3	52.9	11.3	11.0	7.7	10.7	1.9	0.9	14.2	7.4	10.2	9.7	2.7	3.3	1.3	2.6	0.6	1.1
Hanumangarh	53.0	47.2	16.6	11.0	10.6	9.9	1.6	2.7	11.6	6.4	5.8	4.8	4.4	4.0	0.0	2.0	2.4	1.8
Jaipur	47.2	40.3	15.1	11.0	4.9	6.7	1.4	2.1	15.9	9.1	4.8	4.3	3.2	3.4	0.5	0.9	1.5	1.1
Jaisalmer	56.0	53.3	11.4	8.0	6.5	10.6	1.7	1.8	20.1	11.0	10.1	9.1	5.3	3.9	0.4	0.8	0.4	1.2
Jalor	65.9	56.5	14.6	13.0	6.5	4.1	2.5	2.1	19.3	24.5	11.3	3.4	9.4	4.0	0.6	1.2	1.6	1.1
Jhalawar	63.0	61.2	9.6	12.2	5.5	7.2	2.9	2.3	18.0	12.6	16.6	12.8	9.8	6.5	0.0	0.2	0.8	1.1
Jhunjhunun	44.4	41.4	15.9	9.5	3.9	5.5	0.3	1.7	9.5	6.6	6.1	5.8	3.6	1.8	1.6	3.0	3.5	1.8
Jodhpur	58.9	49.5	11.9	13.3	6.3	5.8	2.0	1.7	19.1	12.7	9.7	4.8	7.8	2.2	0.6	1.3	1.5	3.0
Karauli	61.6	63.2	18.0	14.5	6.4	8.1	3.4	2.5	19.8	13.8	6.2	10.2	6.3	7.3	0.2	1.2	1.4	1.1
Kota	54.6	51.2	6.6	12.4	7.1	8.1	3.8	3.3	15.2	8.9	11.4	7.0	9.3	4.6	0.3	0.3	0.9	1.7
Nagaur	53.0	49.6	14.6	11.3	4.7	7.2	2.2	1.9	15.3	13.5	6.3	3.8	7.4	4.4	0.8	1.9	1.6	1.6
Pali	60.0	53.5	11.9	12.6	5.3	3.9	3.3	1.4	21.6	17.8	7.1	9.8	9.4	3.9	0.0	0.0	1.6	0.0
Pratapgarh	72.9	55.6	8.9	11.5	8.0	8.6	3.6	2.2	20.6	10.7	14.7	10.3	15.4	4.8	0.2	1.1	1.1	1.7
Rajsamand	61.5	49.7	11.2	15.6	8.8	6.3	2.8	1.2	15.9	8.2	10.5	5.9	9.5	3.4	0.7	0.9	1.9	2.2
Sawai Madhopur	53.2	49.5	13.3	10.6	5.0	9.7	2.4	0.6	20.0	9.2	6.4	7.4	5.1	3.9	0.0	0.8	0.6	1.8
Sikar	42.8	39.4	12.1	11.8	6.0	4.5	3.1	1.0	11.6	7.0	3.6	6.3	2.0	1.2	1.8	1.2	2.5	2.3
Sirohi	70.3	49.1	8.3	11.1	10.7	4.0	2.8	2.1	21.7	14.3	14.3	9.0	11.7	3.0	0.3	0.8	0.7	1.6
Tonk	50.2	54.3	8.0	13.9	4.2	7.3	2.5	0.6	15.3	11.2	11.3	5.1	8.2	4.4	0.2	1.4	0.5	2.3
Udaipur	68.4	44.9	9.3	14.8	6.0	1.3	3.2	2.7	24.6	15.4	11.7	4.9	12.2	2.0	0.0	0.5	1.1	1.0
Rajasthan	**57.7**	**50.2**	**12.6**	**12.6**	**6.5**	**6.2**	**2.3**	**1.8**	**17.8**	**12.9**	**9.3**	**6.4**	**7.2**	**3.5**	**0.5**	**1.1**	**1.4**	**1.6**

Annexure-2: Methodology for Food and Nutrition Security Index

The indices have been computed following the five steps: i) selection of indicators, ii) normalisation, iii) weighting; iv) computation of index v) ranking and categorisation of districts. The methodology is presented in detail in the Annexure.

Selection of indicators

The framework for selection of indicators is largely based on a suite of food security indicators presented in the State of Food Insecurity in the World (SOFI) report in 2013 which has also kept evolving over the years[85]. We have explicitly refrained from including any outcome indicators, in order to avoid mixing inputs/causes with outcomes[86]. The variables included are not only relevant for food security; they are also characterized by wide cross-sectional and longitudinal availability. The selected indicators cover all the 33 districts in Rajasthan and contribute either positively or negatively to food security.

Normalisation

To make data comparable across indicators, values for individual district and the state of Rajasthan were rescaled for each of the selected indicators from its raw form into a score form ranging from 0-100, where 0 denoted the lowest value and 100 denoted the highest value. This was done using the Range Equalisation Method (REM), also known as max-min approach, being adopted by UNDP for computation of Human Development Index. The maximum and minimum values were set for each of the seventeen indicators based on the lowest and highest values observed for the same year and or previous five years where the data was available and rounded off to the nearest decimal. This was done to avoid the normalised value for a given indicator to be 0 for a poor performing district. The maximum and minimum values set for each selected indicator is provided in table 7.2. The normalised scores were tabulated using the following formula:

$$Normalised\ Value = \frac{X_i - Min}{Max - Min} * 100$$

Where X_i denotes the values for district for the selected indicator for a particular year, *Max* denotes the maximum set value and *Min* denotes the minimum set value.

---

85 FAO, IFAD and WFP. 2013. The State of Food Insecurity in the World 2013. The multiple dimensions of food security. Rome, FAO.

86 Coates, J., 2013. Build it back better: Deconstructing food security for improved measurement and action. Global Food Security, 2(3), pp.188-194.

Maximum and Minimum Values set for normalisation of the selected indicators

S.No.	Food Security Pillars	Indicators	Unit	Minimum Value	Maximum Value
1	Availability	Food Grain Productivity	Kg/hectare	130	3510
2	Availability	Irrigation extent	Percentage	0.1	1
3	Availability	Per capita production of cereals, pulses (3 yearly average)	Kg per person	50	830
4	Availability	Per capita value of agriculture output	Rupees per person	14290	75600
5	Availability	Milk Production	Thousand tons	90	2160
6	Accessibility	Share of Food in Total Expenditure in population under bottom 30%	Percentage	45	56
7	Accessibility	Proportion of agriculture worker to total worker by districts	Percentage	5	34
8	Accessibility	Road density (only PWD roads)	km of road per 100 sq. km of land area	13	116
9	Accessibility	Gross District Domestic Product (GDDP) in rupees at real price by districts	Rupee	517360	9022370
10	Accessibility	Agricultural casual wage rate	Rupee	220	510
11	Utilisation	Access to safe drinking water	Percentage	75	100
12	Utilisation	Access to improved sanitation facility	Percentage	15	85
13	Utilisation	Households with any usual member covered under a health insurance/financing scheme	Percentage	75	100
14	Stability	Women who are literate	Percentage	50	80
15	Stability	Age dependency ratio	Ratio	0.5	0.9
16	Stability	Proportion of migrant workers	Percentage	0	95
17	Stability	Proportion of population affected by any natural disaster	Percentage	0.4	4

Weightage

The four pillars have the same importance in the food security definition, so they are weighted equally (0.25 or one-fourth)[87]. The weighting of each indicator under each pillar varies according to the number of variables selected in each dimension. For example, there are five indicators under Food Accessibility, so each of the indicators have equal weightage of 0.20 (or one-fifth), similarly the four indicators under the food stability have equal weight of 0.25 (or one-fourth).

Computation of Index

Composite indices for each of the four security pillars – Food Availability (FAI), Food Accessibility (FAcI), Food Utilisation (FUI), Food Stability Index (FSI) and overall Food and Nutrition Security (FNSI) is computed for all 33 districts in Rajasthan. The method adopted for aggregation is Geometric Mean method, also used in computing Human Development Index since 2010. Geometric Mean method was chosen as data aggregation method over the widely used linear averaging method on account of limitations of the latter. A problematic feature of linear averaging method is the masking effect due to the full substitutability among its components; higher values of some components can compensate for lower values of other components[88,89]. It was noted, for instance, that a weaker state of health in a particular country could get masked in the aggregation by, say, improved income levels. Appropriateness of the linear aggregation method was debated and critiqued by several researchers, and from 2010 onwards, computation of HDI shifted to the Geometric Mean approach[90].

Even the Sustainable Development Solutions Network's (SDSN) Global SDG Index methodological paper, on which the NITI Aayog's SDG Index is based, acknowledges the limitation of linear averaging method for its perfect substitutability, yet recommends it mainly on account of two broad reasons – one, its ease in interpretation among public and policy makers and second, the SDG indicators are not completely heterogenous and complement one other[91]. However, in the present case of computing Food and Nutrition Security Index (FNSI), the globally adopted FAO definition for food security[92], strongly emphasises that all the four pillars – availability, accessibility, utilisation, and stability are equally important to achieving food security and thus none can be given greater priority than the others. Therefore, geometric mean method for computing the composite is a better suited method, since the four dimensions are heterogenous and non-complimentary. Moreover, any aggregation measure chosen must follow the concept of 'development with equity'[93].The geometric mean method considers the unbalanced development across dimensions and provides low scores (penalty) to the given district if the development across its dimension is non-uniform.

The indices have been computed using geometric mean method using the following equation:

$$Index_k = [\sqrt[n]{m_1 * m_2 * m_3 \dots m_n}] * 100$$

87 Caccavale, O.M. and Giuffrida, V., 2020. The Proteus composite index: Towards a better metric for global food security. *World Development*, *126*, p.104709.

88 Santeramo, F.G., 2015. Food security composite indices: implications for policy and practice. *Development in Practice*, *25*(4), pp.594-600.

89 Mazziotta, M. and Pareto, A., 2016. On a generalized non-compensatory composite index for measuring socio-economic phenomena. *Social indicators research*, *127*(3), pp.983-1003.

90 Klugman, J., 2010. Human development report 2010–20th Anniversary edition. The real wealth of nations: Pathways to human development.

91 Lafortune, G., Fuller, G., Moreno, J., Schmidt-Traub, G. and Kroll, C., 2018. SDG index and dashboards detailed methodological paper. *Sustainable Development Solutions Network*.

92 Food Summit, F.A.O., 2009. Declaration of the world summit on food security. *World Food Summit*, pp.16-18.

93 Sagar, A.D. and Najam, A., 1998. The human development index: a critical review. *Ecological economics*, *25*(3), pp.249-264.

Where:

$m = y_{ij}$ for positive indicator and $m_{ij} = 100\text{-}y_{ij}$ for negative indicator.

y represents normalised score for the given indicator, *i*.

j represents a given district or state (Rajasthan)

n represents number of indicators used for calculating the given index.

k represents the index for which the data is aggregated (FAI, FAcI, FUI, FSI or FNSI)

Ranking and Categorisation of Districts

The scores obtained for each of the index ranges between 0 and 100. The higher the score, better is the performance of district on the respective index. The districts were ranked in descending order of the scores. The districts were further categorised into five categories: extremely insecure, severely insecure, moderately insecure, moderately secure, secure. The cut-offs were set by dividing the range of the respective indexes into five equal parts; thus, the cut-offs were different for each of the five indexes. This method was adopted since the objective was to compare the districts performance relative to the performance of other districts in Rajasthan for a particular index. The district having the scores in lowest cut-off band was categorised as extremely insecure, while the district with scores in the highest cut-off band was categorised as secure.

The cut-offs and categories for each of the five indices in presented in table below.

Cut-offs for categorising districts in respective food security indices

Categories	Indices Cut-offs				
	Food Availability Index (FAI)	Food Accessibility Index (FAcI)	Food Utilisation Index (FUI)	Food Stability Index (FSI)	Food and Nutrition Security Index (FNSI)
Extremely Insecure	5.77-17.67	10.29-24.77	45.21-55.4	12.17-26.45	22.5-29.7
Severely Insecure	17.68-29.59	24.78-39.25	55.41-65.6	26.46-40.75	29.71-36.91
Moderately Insecure	29.6-41.5	39.26-53.74	65.61-75.8	40.76-55.04	36.92-44.12
Moderately Secure	41.51-53.41	53.75-68.23	75.81-86	55.05-69.33	44.13-51.33
Secure	53.42-65.33	68.24-82.73	86.01-96.2	69.34-83.64	51.34-58.55

Annexure-3: Food Availability Index

District	Food grain Productivity (kg/hectare), 2018-19		Irrigation Extent, 2018-19		Per capita production of food grains (cereals+pulses) (in kg per person), 2016-19		Per capita value of agriculture output (In rupees per person), 2020-21		Milk Production (000 tons), 2018-19		Food Availability Index	
	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Score	Rank
GANGANAGAR	2936	83.01	0.83	81.33	645	76.32	57091	69.81	775	33.09	65.33	1
HANUMANGARH	2981	84.33	0.54	49.18	681	80.95	58855	72.69	770	32.87	60.37	2
BARAN	2898	81.89	0.95	94.75	665	78.90	59705	74.07	434	16.60	59.61	3
CHITTORGARH	3282	93.24	0.75	72.23	566	66.16	46763	52.96	629	26.04	57.24	4
BUNDI	2487	69.73	0.91	90.28	794	95.37	50552	59.15	444	17.09	57.10	5
ALWAR	2974	84.13	0.92	90.57	372	41.28	30414	26.30	1331	59.95	54.84	6
BHARATPUR	2915	82.39	0.90	89.28	329	35.71	33922	32.02	1155	51.45	53.37	7
JHALAWAR	2488	69.76	0.91	89.74	412	46.44	48532	55.85	553	22.37	51.53	8
KARAULI	2807	79.19	0.77	74.71	374	41.52	39277	40.76	554	22.43	46.80	9
PRATAPGARH	2806	79.16	0.72	69.28	385	42.90	45347	50.66	336	11.87	42.67	10
DAUSA	2588	72.73	0.66	61.97	367	40.64	31160	27.52	646	26.84	42.29	11
S.MADHOPUR	2102	58.34	0.89	87.81	327	35.54	38201	39.00	424	16.14	40.91	12
KOTA	2826	79.76	0.97	96.36	357	39.35	28934	23.88	393	14.64	40.26	13
BHILWARA	2060	57.10	0.45	38.58	350	38.42	31086	27.39	938	40.95	39.40	14
DHOLPUR	3098	87.82	0.85	83.12	348	38.18	27420	21.42	410	15.48	39.18	15
SIKAR	1475	39.78	0.43	36.53	263	27.37	32052	28.97	1491	67.67	37.88	16
TONK	1184	31.18	0.67	63.32	319	34.51	43013	46.85	558	22.60	37.29	17
JHUNJHUNU	1784	48.94	0.57	51.85	329	35.83	29365	24.59	633	26.24	35.78	18
RAJASTHAN	**1544**	**41.84**	**0.47**	**40.66**	**295**	**31.42**	**33948**	**32.06**	**717**	**30.30**	**34.92**	
BIKANER	812	20.17	0.35	27.49	272	28.46	45687	51.21	835	35.98	31.10	19

District	Food grain Productivity (kg/hectare), 2018-19		Irrigation Extent, 2018-19		Per capita production of food grains (cereals+pulses) (in kg per person), 2016-19		Per capita value of agriculture output (In rupees per person), 2020-21		Milk Production (000 tons), 2018-19		Food Availability Index	
	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Score	Rank
JAIPUR	1859	51.15	0.44	37.75	183	17.03	19923	9.19	1801	82.68	30.17	20
UDAIPUR	2133	59.25	0.40	33.84	153	13.26	27628	21.75	937	40.91	29.84	21
JODHPUR	696	16.75	0.36	29.15	177	16.27	34866	33.56	1161	51.74	26.79	22
NAGAUR	842	21.06	0.22	13.85	248	25.38	32788	30.17	1123	49.89	25.67	23
SIROHI	1798	49.34	0.58	53.12	106	7.16	38525	39.53	384	14.18	25.38	24
JAISALMER	634	14.92	0.25	16.93	255	26.32	75593	99.99	323	11.27	23.71	25
AJMER	1162	30.52	0.22	13.34	204	19.76	26930	20.62	900	39.14	23.04	26
RAJSAMAND	2288	63.85	0.36	28.50	201	19.36	21952	12.50	383	14.14	22.85	27
BANSWARA	1824	50.11	0.53	48.09	222	21.99	21329	11.48	293	9.80	22.65	28
JALORE	362	6.86	0.54	49.27	121	9.07	34477	32.93	775	33.11	20.17	29
PALI	844	21.12	0.22	12.97	215	21.13	27392	21.37	538	21.66	19.30	30
CHURU	443	9.25	0.16	6.26	188	17.67	30534	26.49	584	23.85	14.53	31
DUNGARPUR	1541	41.76	0.36	29.27	150	12.84	17037	4.48	204	5.50	13.11	32
BARMER	139	0.26	0.18	8.74	70	2.62	30349	26.19	954	41.74	5.77	33

Annexure-4: Food Accessibility Index

District	Share of Food in Total Expenditure in population under bottom 30% (%) 2011-12			Proportion of agriculture worker to total worker by districts (%) 2011			Road density (only PWD roads) (per 100 square km of land area) 2021-22		Gross District Domestic Product (GDDP) in rupees at constant price by districts 2020-21		Agricultural casual wage rate (in Rs.) 2019-20		Food Accessibility Index	
	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Score	Rank
JAIPUR	46	7.06	92.94	5.3	1.16	98.84	69	54.30	8278450	91.25	467	85.11	82.73	1
BARMER	50	41.92	58.08	11.0	20.81	79.19	44	30.11	3774352	38.29	410	65.44	51.06	2
JHUNJHUNU	52	62.17	37.83	7.7	9.31	90.69	91	75.98	1520275	11.79	507	99.06	49.74	3
SIKAR	52	63.57	36.43	8.7	12.87	87.13	74	59.66	2051845	18.04	457	81.83	48.90	4
JODHPUR	51	55.04	44.96	16.2	38.78	61.22	49	35.21	3187373	31.39	427	71.49	46.50	5
ALWAR	52	68.17	31.83	12.7	26.51	73.49	84	69.35	4781159	50.13	293	25.03	45.89	6
UDAIPUR	46	4.66	95.34	22.2	59.25	40.75	77	62.55	2696361	25.62	297	26.48	44.00	7
AJMER	51	54.78	45.22	13.8	30.38	69.62	61	46.19	2679298	25.42	332	38.57	42.74	8
NAGAUR	51	52.63	47.37	18.5	46.46	53.54	60	45.74	2348971	21.54	380	55.02	42.42	9
BHILWARA	51	57.43	42.57	14.2	31.73	68.27	61	46.30	2856179	27.50	289	23.94	38.86	10
RAJASTHAN	**51**	**50.25**	**49.75**	**16.5**	**39.75**	**60.25**	**51**	**36.53**	**1949157**	**16.83**	**355**	**46.61**	**38.62**	
BHARATPUR	52	61.91	38.09	22.3	59.66	40.34	79	64.06	1791082	14.98	378	54.47	38.10	11
DAUSA	50	44.44	55.56	11.1	21.18	78.82	111	95.54	1083664	6.66	300	27.59	37.77	12
GANGANAGAR	48	25.81	74.19	25.2	69.82	30.18	48	34.04	2445065	22.67	335	39.59	36.90	13
HANUMANGARH	52	66.76	33.24	20.0	51.63	48.37	40	25.79	1979784	17.19	470	86.33	36.13	14
CHURU	53	74.46	25.54	9.7	16.36	83.64	36	22.59	1324874	9.49	455	81.03	32.65	15
RAJSAMAND	49	38.26	61.74	19.4	49.48	50.52	90	75.19	1093056	6.77	287	23.05	32.56	16
S.MADHOPUR	54	79.32	20.68	15.4	35.73	64.27	62	47.32	1040035	6.15	362	48.85	28.52	17
DUNGARPUR	48	29.60	70.40	28.7	81.84	18.16	116	99.75	689845	2.03	424	70.42	28.32	18
BIKANER	55	90.90	9.10	10.5	19.06	80.94	25	11.84	2364166	21.71	450	79.29	27.25	19
PALI	54	79.81	20.19	28.2	79.90	20.10	46	31.72	1764449	14.66	442	76.50	27.03	20

District	Share of Food in Total Expenditure in population under bottom 30% (%) 2011-12			Proportion of agriculture worker to total worker by districts (%) 2011			Road density (only PWD roads) (per 100 square km of land area) 2021-22		Gross District Domestic Product (GDDP) in rupees at constant price by districts 2020-21		Agricultural casual wage rate (in Rs.) 2019-20		Food Accessibility Index	
	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Score	Rank
TONK	55	88.14	11.86	17.5	43.01	56.99	49	34.90	1158963	7.54	431	72.92	26.46	21
SIROHI	49	35.48	64.52	23.3	63.11	36.89	45	30.75	983152	5.48	309	30.82	26.20	22
KARAULI	54	78.03	21.97	18.3	46.03	53.97	50	36.28	991590	5.58	353	45.69	25.58	23
BUNDI	51	57.35	42.65	21.2	55.77	44.23	47	32.59	1027770	6.00	306	29.54	25.56	24
JALORE	54	80.42	19.58	17.6	43.53	56.47	50	36.14	1161627	7.58	319	34.28	25.30	25
DHOLPUR	50	47.34	52.66	14.2	31.75	68.25	75	60.47	749735	2.73	267	16.27	24.95	26
CHITTORGARH	55	93.73	6.27	15.4	35.80	64.20	51	37.35	1580800	12.50	351	45.10	24.30	27
KOTA	46	8.28	91.72	18.0	44.92	55.08	54	39.35	2039880	17.90	226	1.95	23.35	28
PRATAPGARH	46	4.66	95.34	20.1	52.12	47.88	60	45.61	620658	1.21	253	11.49	19.62	29
BANSWARA	50	42.94	57.06	21.8	57.76	42.24	100	84.58	1075069	6.56	224	1.44	18.06	30
JHALAWAR	55	87.45	12.55	30.6	88.21	11.79	67	52.07	1277604	8.94	244	8.38	14.20	31
JAISALMER	55	90.49	9.51	15.2	35.12	64.88	15	1.53	750923	2.75	401	62.34	11.01	32
BARAN	54	85.34	14.66	33.5	98.23	1.77	45	31.24	1154126	7.49	275	18.97	10.29	33

Annexure-5: Food Utilization Index

District	Population living in households with an improved drinking-water source (%), 2019-21		Population living in households that use an improved sanitation facility (%), 2019-21		Households with any usual member covered under a health insurance/financing scheme (%) 2019-21		Food Utilisation Index	
	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Score	Rank
BARMER	99.90	99.60	83.60	98.00	97.80	91.20	96.20	1
JALORE	98.30	93.20	77.40	89.14	96.60	86.40	89.54	2
PALI	96.20	84.80	81.80	95.43	96.20	84.80	88.20	3
JAISALMER	95.20	80.80	75.70	86.71	93.70	74.80	80.62	4
HANUMANGARH	97.80	91.20	83.80	98.29	89.00	56.00	79.47	5
NAGAUR	96.90	87.60	79.00	91.43	90.00	60.00	78.33	6
RAJSAMAND	94.80	79.20	72.10	81.57	93.20	72.80	77.77	7
AJMER	98.10	92.40	77.50	89.29	88.70	54.80	76.75	8
DUNGARPUR	94.10	76.40	59.90	64.14	97.50	90.00	76.12	9
DAUSA	99.40	97.60	59.40	63.43	91.20	64.80	73.75	10
CHITTORGARH	97.60	90.40	63.80	69.71	90.60	62.40	73.26	11
JHUNJHUNU	98.40	93.60	79.00	91.43	86.10	44.40	72.43	12
JODHPUR	96.50	86.00	75.40	86.29	87.50	50.00	71.86	13
BIKANER	94.90	79.60	79.80	92.57	87.40	49.60	71.50	14
UDAIPUR	92.70	70.80	60.30	64.71	94.30	77.20	70.72	15
RAJASTHAN	**96.5**	**86.00**	**71.1**	**80.14**	**87.8**	**51.20**	**70.67**	
JHALAWAR	92.40	69.60	62.10	67.29	93.60	74.40	70.37	16
GANGANAGAR	94.40	77.60	83.40	97.71	85.30	41.20	67.85	17
BARAN	96.10	84.40	59.00	62.86	89.50	58.00	67.51	18
SIROHI	93.60	74.40	54.10	55.86	92.00	68.00	65.62	19

District	Population living in households with an improved drinking-water source (%), 2019-21		Population living in households that use an improved sanitation facility (%), 2019-21		Households with any usual member covered under a health insurance/financing scheme (%) 2019-21		Food Utilisation Index	
	Raw Value	Normalised Value	Raw Value	Normalised Value	Raw Value	Normalised Value	Score	Rank
BHILWARA	93.10	72.40	62.30	67.57	89.10	56.40	65.10	20
DHOLPUR	94.80	79.20	57.50	60.71	89.00	56.00	64.58	21
SIKAR	99.40	97.60	77.90	89.86	82.40	29.60	63.79	22
BUNDI	95.70	82.80	56.30	59.00	87.70	50.80	62.84	23
JAIPUR	99.90	99.60	79.60	92.29	81.50	26.00	62.06	24
CHURU	98.20	92.80	80.20	93.14	81.90	27.60	62.02	25
KOTA	99.60	98.40	79.00	91.43	80.90	23.60	59.66	26
BHARATPUR	93.90	75.60	62.70	68.14	84.80	39.20	58.67	27
KARAULI	94.80	79.20	49.90	49.86	86.40	45.60	56.47	28
TONK	90.90	63.60	66.20	73.14	84.50	38.00	56.12	29
ALWAR	97.60	90.40	66.00	72.86	80.80	23.20	53.46	30
S.MADHOPUR	92.50	70.00	71.20	80.29	80.50	22.00	49.82	31
BANSWARA	95.60	82.40	40.80	36.86	84.20	36.80	48.17	32
PRATAPGARH	88.60	54.40	46.30	44.71	84.50	38.00	45.21	33

Annexure-6: Food Stability Index

District	Women who are literate (%) 2019-21		Age Dependency Ratio 2011			Proportion of Migrant worker (%) 2011			Proportion of population affected by any natural disaster (%) 2019-20			Food Stability Index	
	Raw Value	Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Score	Rank
JHUNJHUNU	74.4	81.33	0.61	26.89	73.11	1.0	17.70	82.30	0.0	0.00	100.00	83.64	1
SIKAR	71.8	72.67	0.63	32.81	67.19	1.1	18.40	81.60	0.5	0.57	99.43	79.33	2
AJMER	68.4	61.33	0.60	24.57	75.43	1.4	27.98	72.02	8.6	9.08	90.92	74.19	3
NAGAUR	67.2	57.33	0.67	42.83	57.17	0.8	12.21	87.79	7.4	7.75	92.25	71.78	4
CHURU	63.9	46.33	0.69	47.80	52.20	0.6	4.18	95.82	0.0	0.00	100.00	69.38	5
RAJSAMAND	67.7	59.00	0.67	41.37	58.63	1.7	35.15	64.85	0.0	0.00	100.00	68.82	6
PALI	74.4	81.33	0.69	47.43	52.57	1.8	38.81	61.19	15.1	15.92	84.08	68.49	7
HANUMANGARH	68.2	60.67	0.58	20.32	79.68	2.1	46.54	53.46	17.3	18.23	81.77	67.80	8
JAIPUR	72.4	74.67	0.58	19.03	80.97	2.8	67.78	32.22	1.0	1.07	98.93	66.26	9
JODHPUR	67.4	58.00	0.70	48.85	51.15	1.9	41.16	58.84	8.9	9.42	90.58	63.06	10
RAJASTHAN	**64.7**	**49.00**	**0.66**	**40.83**	**59.17**	**1.7**	**36.39**	**63.61**	**22.4**	**23.56**	**76.44**	**61.27**	
BHARATPUR	61.1	37.00	0.74	58.77	41.23	0.8	11.49	88.51	0.0	0.00	100.00	60.62	11
BIKANER	62.5	41.67	0.72	55.97	44.03	1.5	30.94	69.06	2.4	2.55	97.45	59.28	12
DAUSA	60.3	34.33	0.71	53.23	46.77	1.2	23.11	76.89	6.3	6.66	93.34	58.27	13
ALWAR	63.2	44.00	0.67	43.04	56.96	1.6	32.81	67.19	31.0	32.65	67.35	58.03	14
GANGANAGAR	69.3	64.33	0.56	15.09	84.91	3.5	84.83	15.17	0.5	0.55	99.45	53.58	15
S.MADHOPUR	55.7	19.00	0.65	38.01	61.99	1.3	23.84	76.16	9.6	10.12	89.88	53.29	16
SIROHI	60.6	35.33	0.69	47.49	52.51	2.5	57.39	42.61	0.0	0.00	100.00	53.02	17
UDAIPUR	62.0	40.00	0.68	43.98	56.02	1.3	25.73	74.27	54.6	57.51	42.49	51.57	18
JALORE	60.4	34.67	0.79	72.13	27.87	1.3	24.86	75.14	13.4	14.11	85.89	49.97	19
BHILWARA	56.4	21.33	0.63	32.45	67.55	2.1	46.33	53.67	23.4	24.65	75.35	49.13	20
DHOLPUR	57.7	25.67	0.79	71.28	28.72	1.1	19.41	80.59	3.0	3.21	96.79	48.97	21

District	Women who are literate (%) 2019-21		Age Dependency Ratio 2011			Proportion of Migrant worker (%) 2011			Proportion of population affected by any natural disaster (%) 2019-20			Food Stability Index	
	Raw Value	Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Raw Value	Normalised Value	100-Normalised Value	Score	Rank
TONK	55.2	17.33	0.62	29.50	70.50	1.3	25.61	74.39	45.2	47.61	52.39	46.72	22
KOTA	76.5	88.33	0.52	4.62	95.38	3.6	88.29	11.71	52.2	54.99	45.01	45.91	23
BARMER	66.3	54.33	0.86	89.11	10.89	0.9	12.93	87.07	16.5	17.37	82.63	45.42	24
CHITTORGARH	56.1	20.33	0.58	20.88	79.12	1.5	31.45	68.55	61.8	65.10	34.90	44.29	25
KARAULI	53.3	11.00	0.74	59.93	40.07	1.0	16.24	83.76	2.1	2.23	97.77	43.59	26
BUNDI	56.9	23.00	0.60	24.82	75.18	2.7	62.76	37.24	59.5	62.62	37.38	39.39	27
DUNGARPUR	66.0	53.33	0.77	66.68	33.32	0.6	4.68	95.32	85.6	90.10	9.90	35.99	28
BARAN	57.9	26.33	0.65	36.42	63.58	2.3	53.99	46.01	78.1	82.25	17.75	34.20	29
JHALAWAR	54.3	14.33	0.64	33.83	66.17	1.6	32.88	67.12	84.1	88.51	11.49	29.25	30
BANSWARA	53.1	10.33	0.77	67.97	32.03	0.5	1.42	98.58	80.7	84.95	15.05	26.47	31
PRATAPGARH	53.5	11.67	0.71	52.25	47.75	0.9	13.10	86.90	85.4	89.90	10.10	26.44	32
JAISALMER	62.2	40.67	0.82	80.51	19.49	3.0	72.75	27.25	94.0	98.98	1.02	12.17	33

Annexure-7: Food and Nutrition Security Index (FNSI)

District	Food Availability Index (Score)	Food Accessibility Index (Score)	Food Utilization Index (Score)	Food Stability Index (Score)	Food and Nutrition Security Index (Score)	Food and Nutrition Security Index (Rank)
HANUMANGARH	60.37	36.13	79.47	67.80	58.55	1
JHUNJHUNU	35.78	49.74	72.43	83.64	57.30	2
JAIPUR	30.17	82.73	62.06	66.26	56.60	3
SIKAR	37.88	48.90	63.79	79.33	55.33	4
GANGANAGAR	65.33	36.90	67.85	53.58	54.41	5
ALWAR	54.84	45.89	53.46	58.03	52.86	6
BHARATPUR	53.37	38.10	58.67	60.62	51.86	7
DAUSA	42.29	37.77	73.75	58.27	51.18	8
NAGAUR	25.67	42.42	78.33	71.78	49.74	9
RAJASTHAN	**34.92**	**38.62**	**70.67**	**61.27**	**49.16**	
JODHPUR	26.79	46.50	71.86	63.06	48.74	10
AJMER	23.04	42.74	76.75	74.19	48.66	11
BHILWARA	39.40	38.86	65.10	49.13	47.04	12
UDAIPUR	29.84	44.00	70.72	51.57	46.78	13
CHITTORGARH	57.24	24.30	73.26	44.29	46.09	14
RAJSAMAND	22.85	32.56	77.77	68.82	44.67	15
BUNDI	57.10	25.56	62.84	39.39	43.59	16
BIKANER	31.10	27.25	71.50	59.28	43.53	17
PALI	19.30	27.03	88.20	68.49	42.14	18
S.MADHOPUR	40.91	28.52	49.82	53.29	41.95	19
DHOLPUR	39.18	24.95	64.58	48.97	41.93	20
KARAULI	46.80	25.58	56.47	43.59	41.43	21

District	Food Availability Index (Score)	Food Accessibility Index (Score)	Food Utilization Index (Score)	Food Stability Index (Score)	Food and Nutrition Security Index (Score)	Food and Nutrition Security Index (Rank)
TONK	37.29	26.46	56.12	46.72	40.11	22
KOTA	40.26	23.35	59.66	45.91	40.06	23
SIROHI	25.38	26.20	65.62	53.02	39.00	24
JALORE	20.17	25.30	89.54	49.97	38.87	25
CHURU	14.53	32.65	62.02	69.38	37.80	26
JHALAWAR	51.53	14.20	70.37	29.25	35.03	27
BARAN	59.61	10.29	67.51	34.20	34.49	28
BARMER	5.77	51.06	96.20	45.42	33.69	29
DUNGARPUR	13.11	28.32	76.12	35.99	31.76	30
PRATAPGARH	42.67	19.62	45.21	26.44	31.63	31
BANSWARA	22.65	18.06	48.17	26.47	26.87	32
JAISALMER	23.71	11.01	80.62	12.17	22.50	33

Annexure-8: Recommendations for Rajasthan Government

S. No.	Recommendations	FNS Dimension	Lead Responsibility/ Department	Other department/ entities
1	• Huge scope for additional methods of water availability for agriculture like- drainage line treatment, soil and moisture conservation, rainwater nursery raising, afforestation, horticulture, pasture development etc. • Temporary storage of run-off water and its recycling for crop-life saving during short drought periods	Availability	Irrigation Department- Govt. of Rajasthan	Water Resources Department- GOI,
2	• Cropping high yielding variety seeds and drought and disease resistant varieties of seeds	Availability	Department of Agriculture, Govt. of Rajasthan	Ministry of Agriculture, GoI
3	• The state government should diversify the production basket and focus more to incentivise the production of pulses, millets, dairy, poultry, animal husbandry, and horticulture. • Extensive implementation of Integrated farming system (IFS) can be used as an efficient measure for increasing productivity of several crops including Millets and pulse as the primary goals of IFS are maximization of yield of each component. • Rajasthan being the largest producer of Pearl Millets (Bajra) should increase investment in promoting research and development of high yielding varieties and better shelf life of different types of millets in the state agriculture universities and should emerge as a champion for promoting millets in the country.	Availability	Department of Agriculture, Govt. of Rajasthan	Ministry of Agriculture, GoI
4	• Diversification of farm activities to include animal husbandry/ poultry rearing as a measure to moderate the shocks and stresses to farming households.	Availability	Department of Agriculture, Govt. of Rajasthan	Rajeevika
5	• Strengthening the food safety net programme like TPDS, ICDS and MDM to include the excluded vulnerable population and to cover the left out vulnerable population through other State food security schemes will help in improving the overall food and nutrition security in the state.	Accessibility	Food and Civil supplies Department, Govt of Rajasthan	DFPD, GoI
6	• Food inflation and rising prices can be tackled by facilitating timely distribution of pulses, other grains, edible oil through the TPDS. • Government should invest in a market information system for accurate and timely estimating the price spike among major food commodities. • State government should be proactive in utilizing the Central government support on price stabilization fund and schemes to extend its benefits to its population.	Accessibility	Food and Civil supplies Department, Govt of Rajasthan	Ministry of Agriculture, GoI

S. No.	Recommendations	FNS Dimension	Lead Responsibility/ Department	Other department/ entities
7	• Rajasthan government should make provisions of distributing pulses through the TPDS, MDM, and ICDS for improving the protein intake among its vulnerable population.	Accessibility	Food and Civil supplies Department, Govt of Rajasthan	Ministry of Agriculture, GoI
8	• The state government needs to focus on increasing employment especially in rural areas through various employment generation programme and livelihood promotion programme	Accessibility	Rural Development and Panchayati Raj Department, Govt of Rajasthan	Rajeevika
9	• Investments in improving physical infrastructure such as roads, modern warehouses, cold storage etc. needs to be improved to ensure physical access to food to the last mile.	Accessibility	Public Works Department, Govt of Rajasthan	Rajasthan Sate Warehouse Corporation
10	• State government should fortify all dry ration as well as hot cooked meals with iron and vitamins distributed through TPDS, PM-POSHAN and ICDSS. Rice fortification is a right step in the direction. • State government should ensure the successful implementation of all micro-nutrient supplementation programme. State government should launch major social behaviour change communication among the masses to generate awareness about nutrition specific and nutrition sensitive initiatives in place and promote its uptake. • State government should also generate awareness about diversifying the consumption of locally available iron rich foods such as millets, pulses, and green leafy vegetables.	Food Utilization	WCD Department, Govt of Rajasthan	Food and Civil supplies Department, Department of Education, Department of Health, Govt of Rajasthan
11	• The 6-24 months age is the most critical window as maximum growth faltering occurs at this age in children. However, the IYCF indicators fares poorly in Rajasthan, even when compared to national average. State government should strengthen the implementation of IYCF related programme in the state particularly in the most vulnerable population and geography. State government should augment the Take Home Ration with desired nutrients and launch SBCC campaigns for its uptake. • State government should ensure and facilitate the compulsory free treatment of all severely and moderately acute malnutrition children. Besides, provision of increased THR quantity, ready-to-eat snacks, enriched THR with extra protein, fat, and eggs, and ready-to-eat therapeutic meals to be provided to all MAM/SAM children and promote its consumption.	Food Utilization	WCD Department, Govt of Rajasthan	Department of Health, Govt. of Rajasthan

S. No.	Recommendations	FNS Dimension	Lead Responsibility/ Department	Other department/ entities
12	• Given the arid climate and scanty rainfall, the state should adopt all water preservation and conservation methods such as check dams, watersheds, and other techniques recommended under the 'food availability' section.	Stability	Irrigation Department, Govt. of Rajasthan	Water Resources Department-GOI,
13	• State government should promote crops such as millets and pulses which require less extraction of ground water for irrigation purposes. Besides, modern techniques of ground water recharge such as check dams and watersheds should be promoted throughout the state, and particularly in the vulnerable districts.	Stability	Department of Agriculture, Govt. of Rajasthan	Ministry of Agriculture, GoI; Irrigation Department, Govt of Rajasthan
14	• State government should invest in early warning systems to predict droughts, famine, and floods in the state. Social protection systems should be strengthened to mitigate the effects of the crisis. • State disaster response policy should be updated to include the food and nutrition security responses during crisis.	Stability	Disaster Management and Relief Department, Govt. of Rajasthan	National Disaster Management Authority, GoI
15	• State government should invest in providing universal healthcare by strengthening local healthcare systems such as PHC, and CHC to cater to the needs of the vulnerable population and mitigate morbidities such as ARI, influenza, malaria, and diarrheal disorders.	Stability	Department of Health, Govt. of Rajasthan	Ministry of Health and Family Welfare, GoI
16	• State government should invest and work to achieve universal female literacy and ensure minimum 10 years of education for all women of the state.	Stability	Department of Education, Govt. of Rajasthan	Ministry of Education, GoI
17	• State government should promote female employment in both formal and informal sectors and rural and urban areas, to bring parity in the employment scenario.	Stability	Rural Development and Panchayati Raj Department, Govt of Rajasthan	Rajeevika
18	• The state government should make special provisions on diversifying the food basket distributed through the food safety nets in the identified U-shaped region ranging from western periphery moving towards south to eastern periphery particularly in the districts of Banswara, Jalore, Barmer and Tonk.	Food Security	Planning Department, Govt of Rajasthan	Food and Civil supplies Department, Department of Education, Department of Health, WCD Department (Govt of Rajasthan)

Planning Department
Directorate of Economics and Statistics
Center for SDGs Implementation
Yojana Bhawan, Tilak Marg, C-Scheme
Jaipur-302005, Rajasthan
Email: ddsdg.des@rajasthan.gov.in

2, Poorvi Marg, Vasant Vihar
New Delhi - 110057
Tel: +91-46554000
E-mail: wfp.newdelhi@wfp.org