

Production

Source: https://aps.dac.gov.in/APY/Public_Report1.aspx , <https://dof.gov.in/> , <https://dahd.nic.in/>

Data Aggregation

- The crop production data is available from 2000 to 2019.
- The production of all crops is reported at all India, state, and district levels. State level production is a cumulative of available district production data.
- For non-vegetarian foods production data is available only at state level.
- For each crop category, the total crop category production is the cumulative values of all crops in that crop category.
- All the production values are reported in multiple units (Quintal, Tonnes, Million tonnes).
One quintal = 100 kg, One Tonne = 1000 kg, One Million tonnes = 10⁹ kg

Crop Category Categorization

Crop Category	No. of Crops
Cereals & Millets	7
Egg	1
Fruits	37
Green Leafy Vegetables	4
Milk	5
Meat & Poultry	7
Nuts	4
Pulse	12
Roots & Tubers	8
Spices	7
Vegetable	20

Table 1.1

The foods considered under each food group matches with the food groups in consumption and market price tabs.

Crops under each crop category

Crop Category	Crop Type
Cereals & Millets	Bajra (Pearl millet), Barley, Jowar (Sorghum), Maize and Products, Ragi (Finger millet), Rice, Wheat
Egg	Egg (Mostly of Hen and Desi, Ducks, Fowls)
Fruits	Amla (Indian gooseberry), Apple, Apricot, Bael (Wood apple), Banana, Ber (Ziziphus), Cherry, Custard Apple, Dates(Fresh and Dried) , Dragon Fruit, Fig, Grapes, Guava, Jack Fruit, Jamun (Java plum/Indian blackberry), Kiwi, Lime, Lime-Lemon, Litchi, Mandarin Orange, Citrus(like Blood orange, Kaffir lime Etc), Mango, Mulberry, Musk Melon, Orange, Other Fruits, Papaya, Peach, Pear, Persimmon, Pineapple, Plum, Pomegranate, Sapota, Strawberry, Sweet Orange (Mosambi), Watermelon
Green Leafy Vegetables	Curry leaves, Leafy Veg., Methi (Fenugreek leaves), Spinach (Palak)
Milk	Crossbred Cow, Indigenous Cow, Total Buffalo, Total Cow
Non-Veg	Buffalo, Cattle, Fish, Goat, Pig, Poultry, Sheep
Nuts	Almond, Cashew Nut, Coconut, Groundnut
Pulse	Arhar / Tur (Red gram/Pigeon pea), Lobia (Cowpea), Horse Gram, Masoor (red lentil), Moong (Green Gram), Moth Bean, Other Kharif Pulses, Other Rabi Pulses, Other Summer Pulses, Peas dry, Black gram (Urad), Bengal Gram (Chickpea)
Roots & Tubers	Beetroot, Carrot, Elephant Yam, Potato, Radish, Sweet Potato, Tapioca, Yam
Spices	Black Pepper, Dry Chillies, Green Chillies, Garlic, Ginger, Turmeric
Vegetable	Ash gourd, Brinjal, Bitter Gourd, Beans, Bottle Gourd, Cucumber, Cauliflower, Capsicum, Cabbage, Drumstick, Green Peas, Ladies finger, Onion, Other Vegetables, Olive, Pointed gourd (parwal/kovakka), Pumpkin, Ridge Gourd, Snake gourd, Tomato, Turnip

Table 1.2

Consumption

Source: <http://microdata.gov.in/nada43/index.php/catalog/CEXP>

Data Aggregation

- The household food consumption data from the National Sample Survey Organization (NSSO), India is available from 2000 to 2012.
- This tab summarises the intake of **146** unique food items and aggregated values of **18** food group classifications from the various National Sample Surveys. As suggested by the NSSO, the consumption values are presented at district and state level for the thick rounds of survey (NSS66: 2009-2010, NSS68: 2011-2012) and at state level for the other rounds.

Intakes of food items

Both per capita and per consumer unit consumption (typically coefficients of energy requirement with adult male as reference) are presented. Per consumer unit is therefore, adult male equivalent

Summarising datasets for All India, State and District:

Per capita monthly intake (PCMI) :

- Total Household intake at the district or state level was derived by Horvitz Thomson (HT) estimator ($\hat{Y} = \sum_{i=1}^n w_i y_i$; w_i and y_i be the survey weight assigned by NSSO and monthly household intake for i^{th} household). If total district or state level population is estimated by $\hat{N} = \sum_{i=1}^n w_i n_i$; n_i be the household size for the i^{th} household; n be the number of households sampled and w_i be the survey weight assigned by NSSO, then

$$PCMI = \frac{\hat{Y}}{\hat{N}}$$

Distribution within the household: Assumed to be based on consumer units that are age and gender dependent.

Wastage before and after consumption: Not adjusted.

Consumer units table

Number of consumer units assigned for completed ages								
NVIF	<1	1-2	3-4	5-6	7-8	9-11	12-20	21+
Male	-	0.4	0.5	0.6	0.7	0.8	1	1
Female	-	0.4	0.5	0.6	0.7	0.8	1	0.8

Per consumer unit monthly Intake (PCUMI) :

- Total household intake at the district or state level was derived by Horvitz-Thompson (HT) estimator ($\hat{Y} = \sum_{i=1}^n w_i y_i$; w_i and y_i be the survey weight assigned by NSSO and monthly household intake for the i^{th} household; n is the number of households sampled). Then total populations in each population category mentioned above were derived by $\hat{N}_j = \sum_{i=1}^n w_i n_{ci}$; n_{ci} be the number of members of j^{th} population category at i^{th} household. If C_j is the consumer unit for the j^{th} population category,

$$PCUMI = \frac{\hat{Y}}{\sum_{j=1}^k \hat{N}_j C_j}$$

Per consumption unit monthly intake per population category (PCMIPPC):

- The total household intake (\hat{Y}) at the state/district level was first derived by the Horvitz-Thompson estimator. Then total populations in each of the population categories mentioned above were derived by $\hat{N}_j = \sum_{i=1}^n w_i n_{ci}$; n_{ci} be the number of members of j^{th} population category at i^{th} household. The proportion of total consumer units of the j^{th} category over total consumer units of the state/district was derived as $\hat{P}_j = \frac{\hat{N}_j C_j}{\sum_{j=1}^k \hat{N}_j C_j}$ where C_j is the consumer unit for the j^{th} category; $j=1, 2, \dots, k$. The total household intake by j^{th} category be then $\hat{Y} \times \hat{P}_j$.

Hence, $PCMIPPC = PCUMI \times C_j$, C_j be the consumer unit of the j^{th} population category.

Outlier Detection

Outlier households removed: Outlier households are identified as per the criterion of having per-capita Energy intake > 99.9 percentile.

NSSO Surveys and years

NSSO Rounds	Years
NSS56	2000-2001
NSS57	2001-2002
NSS58	2002-2003
NSS59	2003-2004
NSS60	2004-2005
NSS61*	2004-2005(July - June)
NSS62	2005-2006
NSS63	2006-2007
NSS64	2007-2008
NSS66*	2009-2010
NSS68*	2011-2012

*Thick rounds Table 1.3

Food Group Categorization

Food Group	No. of Foods
Beverages	8
Cereals & Millets	17
Egg	1
Fruits	21
Green Leafy Vegetables	1
Milk & Milk products	4
Meat & Poultry	6
Nuts	7
Oil	10
Processed foods	13
Pulse	13
Roots and Tubers	5
Salt	1
Served and processed	3
Spices	9
Sugar	5
Tobacco	3
Vegetables	19

Table 1.4

The foods considered under each food group matches with the food groups in production and market price tabs.

Flagging possible imprecise estimate

Due to limited intake of some regional food items, the aggregated estimate of those food items at district level may be imprecise or invalid due to 'zero' inflation, thereby impacting the state level estimates. To avoid misinterpretation of such estimates, these estimates are flagged in the table and hidden in the maps (gray color). Estimates with precision greater than 5% was considered as imprecise. Precision of the estimate was derived by following expression

$$\text{Precision} = \frac{2 \times (\text{SD of the household level per capita or per consumer unit intake})}{\sqrt{\text{No of surveyed households at the aggregation level}}}$$

Units

- The Intake quantity for Total in all the food groups has been reported in '00 grams per month.
- The Intake quantity for all the individual food items has been reported in grams per month.

Foods under each food group

Food Group	Food Name
Beverages	Fruit Juice And Shake, Other Beverages (Cocoa/Chocolate/Bournvita), Coffee: Cups, Coffee: Powder, Tea: Cups, Tea: Leaf, Cold Beverage (Bottled or Canned), Mineral Water
Cereals & Millets	Bajra and Products (Pearl millet), Barley and Products, Jowar and Products (Sorghum), Other Cereals, Other Rice Products, Other Wheat Products, Ragi and Products (Finger millet), Refined wheat flour, Rice - Other Sources, Rice - P.D.S., Rice flakes, Rice puffed, Small Millet and Products, Wheat, Wheat / Atta - Other Sources, Wheat / Atta - P.D.S., Cereal Substitutes (Tapioca/Jackfruit Seed Etc.)
Egg	Egg
Fruits	Apple, Banana, Berries, Dates, Grapes, Guava, Jackfruit, Katha, Leechi (Litchi), Lemon, Lime, Orange / Mausambi, Other Dry Fruits, Other Fresh Fruits, Papaya, Pears (Naspati), Pineapple, Raisin (Kishmish/Monacca Etc), Watermelon, Mango, Musk Melon
Green Leafy Vegetables	Palak / Other Leafy Vegetables
Milk Products	Curd, Milk Condensed/ Powder, Milk: Liquid, Other Milk Products (Ghee, Butter Etc)
Meat and Poultry	Beef / Buffalo Meat, Chicken, Fish / Prawn, Goat Meat / Mutton, Others (Birds/Crab/Oyster/Tortoise Etc), Pork
Nuts	Cashew Nut, Coconut Green, Coconut, Groundnut, Other Nuts, Singara (Water chestnut), Walnut
Oil	Butter, Edible Oil, Ghee, Groundnut – Oil, Refined Oil [Sunflower/Soyabean/Saffola/Etc], Rice Bran Oil, Vanaspati / Margarine, Oilseeds, Coconut oil, Mustard Oil
Processed foods	Biscuit, Bread (Bakery), Cornflakes, Ice-Cream, Other Packaged Processed Food, Papad / Bhujia / Namkeen / Mixture / Chanachur, Pickles, Prepared Sweets, Salted Refreshment, Sauce, Sewai / Noodles, Cake / Pastry
Pulse	Arhar /Tur (Red gram/Pigeon pea), Bengal Gram (Chickpea), Bengal gram flour, Bengal gram whole, Black gram, Gram Products, Khesari, Other Pulse Products, Other Pulses, Peas dry, Soyabean, Moong (Green Gram), Masoor (red lentil)
Roots and Tubers	Beet (Beetroot), Potato, Radish, Carrot, Sweet Potato
Salt	Salt
Served and processed	Cooked Meal as Assistance or Payment, Cooked Meals Purchased, Cooked Snacks Purchased
Spices	Black Pepper, Curry Powder, Dry Chillies, Garlic, Ginger, Other Spices, Chilli (Green), Tamarind, Turmeric
Sugar	Candy (Misri), Gur (Jaggery), Honey, Sugar - Other Sources, Sugar - P.D.S.
Tobacco	Country Liquor, Foreign Liquor or Refined Liquor, Toddy
Vegetables	Bitter Gourd, Brinjal, Cucumber, French Beans and Barbati (long green beans), Gourd (E.g. Bottle Gourd), Green Peas, Jhinga / Torai (Ridge Gourd), Lady's Finger, Onion, Other Vegetables, Parwal / Patal (Pointed gourd), Pumpkin, Snake Gourd, Cauliflower, Capsicum, Cabbage, Tomato, Turnip, Plantain (Green)

*PDS=Public distribution system

Table 1.5

Market price

Source: <https://agmarknet.gov.in/>

Data Aggregation

- The market price data is available from 2000 up to May 2022.
- Different Seasons of India based on the India Meteorological Department IMD <https://mausam.imd.gov.in/#>
 - Winter – December, January, and February
 - Summer – March, April, and May
 - Monsoon – June, July, August, and September
 - Autumn – October, and November
- All the seasonal price data are aggregated from daily data and displayed at the state level.
- The market price data is aggregated per year and displayed at the state and district level.
- The state market prices are the average value of district prices.
- All the market price values are reported as INR or USD /Quintal. One quintal is 100 kg

Data Pre-processing

- The market price data for Bihar has been removed after 2014 since the data is not updated.
- The following Data validation steps to validate the price of each food item at different time points to avoid unrealistic prices has been done.
 - The price of each food item has been verified using the percentile values. The percentile values (25th, 50th, 75th) of each food item has been calculated and compared with the real-time prices. If the 25th percentile price did not seem realistic for a food item, the 50th percentile was considered. If the 50th percentile also did not seem realistic, then we moved on to the 75th percentile.
 - If any of the percentile values is found to be realistic, then the corresponding percentile value is set as the minimum cut-off value for that food item and the prices observed below that cut-off will be removed.
 - If all the percentile values of the food item are not realistic then the food item has been removed from the food list.
 - As an example, the 25th, 50th, and 75th Percentile price of Egg per/Quintal is 325 INR, 550 INR, 1400 INR respectively. Since the prices doesn't seem realistic, we have removed the Egg from the food list

The flow chart given below explains the Data validation process

25th Percentile Price for a Food item
(INR/Quintal)
(E.g., 25th Percentile Price for Egg is
325 INR/Quintal)

25th Percentile Price is a Realistic price

Remove the price observed less than
the 25th Percentile values

25th Percentile Price is not a Realistic price
(0.325 INR for 2 eggs is **not a
realistic price**)

50th Percentile Price for a Food item
(INR/Quintal)
(50th Percentile Price for Egg is
550 INR/Quintal)

50th Percentile Price is a Realistic price

Remove the price observed less than
the 50th Percentile values

50th Percentile Price is not a Realistic price
(0.550 INR for 2 eggs is **not a
realistic price**)

75th Percentile Price for a Food item
(INR/Quintal)
(75th Percentile Price for Egg is
1400 INR/Quintal)

75th Percentile Price is a Realistic price

Remove the price observed less than
the 75th Percentile values

75th Percentile Price is not a Realistic price
(1.4 INR for 2 eggs is **not a
realistic price**)

Remove that food item from the food list
(**Egg has been removed from the
food list**)

Cut off percentile of Food items

Cut off	Food Group	Food Items
25th percentile	Cereals & Millets	Bajra, Barley, Jowar, Maize and Products, Ragi, Rice, Wheat flour atta, Wheat
	Fruits	Amla, Apple, Apricot, Banana, Ber, Cherry, Custard Apple, Grapes, Jack Fruit, Jamun, Lime-Lemon, Lime, Litchi, Mango, Orange, Papaya, Peach, Pineapple, Plum, Pomegranate, Sapota, Watermelon
	Green Leafy Vegetables	Green Coriander, Mint
	Meat and poultry	Beef Buffalo Meat, Fish Prawn
	Nuts	Almond, Groundnut, Cashew Nut, Walnut, Coconut
	Oil	Butter, Coconut Oil, Ghee, Mustard Oil, Groundnut - Oil
	Pulse	Arhar / Tur, Bengal gram dhal, Bengal gram flour, Bengal gram whole, Black gram
		Cowpea (Lobia), Horse Gram, Moong (Green Gram), Moth Bean, Peas dry, Soyabean, Masoor
	Roots and Tubers	Beetroot, Carrot, Elephant Yam, Potato, Sweet Potato, Tapioca, Yam
	Spices	Black Pepper, Dry Chillies, Garlic, Ginger, Green Chillies, Tamarind, Turmeric
	Sugar	Sugar, Gur (Jaggery)
	Vegetables	Ash gourd, Beans, Bitter gourd, Brinjal, Cauliflower, Capsicum, Cucumber, Drumstick, Green Peas, Mushroom, Onion, Pointed gourd, Ridge Gourd, Plantain (Green)
Snake guard, Tomato, French Beans and Barbati		
50th percentile	Fruits	Pear, Persimmon
	Green Leafy Vegetables	Methi (Fenugreek leaves), Spinach (Palak)
	Vegetables	Cabbage
75th percentile	Fruits	Karbuja (Musk melon), Guava
	Meat and poultry	Pork, Chicken
	Roots and Tubers	Radish
	Vegetables	Bottle Gourd, Pumpkin, Turnip

Table 1.6

Food Group Categorization

Food Group	No. of Foods
Cereals & Millets	8
Fruits	26
Green Leafy Vegetables	4
Meat and Poultry	4
Nuts	5
Oil	5
Pulse	12
Roots and Tubers	8
Spices	7
Sugar	2
Vegetables	21

Table 1.7

The foods considered under each food group matches with the food groups in production and consumption tabs.

Foods under each food group

Food Group	Food Name
Cereals & Millets	Bajra, Barley, Jowar, Maize and Products, Ragi, Rice, Wheat flour atta, Wheat
Fruits	Amla, Apple, Apricot, Banana, Ber (ziziphus), Cherry, Custard Apple, Grapes, Guava, Jack fruit, Jamun, Lime-Lemon, Lime, Litchi, Mango, Orange, Papaya, Peach, Pear, Persimmon, Pineapple, Plum, Pomegranate, Sapota, Water melon, Karbuja (Musk melon)
Green Leafy Vegetables	Green Coriander, Methi (Fenugreek leaves), Mint, Spinach (Palak)
Meat and Poultry	Beef Buffalo Meat, Chicken, Fish Prawn, Pork
Nuts	Almond, Groundnut, Cashew nut, Walnut, Coconut
Oil	Butter, Coconut Oil, Ghee, Mustard Oil, Groundnut - Oil
Pulse	Arhar / Tur, Bengal gram dhal, Bengal gram flour, Bengal gram whole, Black gram, Cowpea (Lobia), Horse Gram, Moong (Green Gram), Moth Bean, Peas dry, Soyabean, Masoor
Roots and Tubers	Beetroot, Carrot, Elephant Yam, Potato, Radish, Sweet Potato, Tapioca, Yam
Spices	Black Pepper, Dry Chillies, Garlic, Ginger, Green Chillies, Tamarind, Turmeric
Sugar	Sugar, Gur (Jaggery)
Vegetables	Ash gourd, Beans, Bitter gourd, Bottle gourd, Brinjal, Cabbage, Cauliflower, Capsicum, Cucumber, Drumstick, French Beans and Barbati, Green peas, Mushroom, Onion, Pointed gourd, Pumpkin, Ridge gourd, Snake gourd, Tomato, Turnip, Plantain (Green)

Table 1.8

Rainfall

Source: <https://datasource.kapsarc.org/explore/dataset/district-wise-rainfall-data-for-india-2014/information/>

Data Aggregation

- The rainfall data is available from 2008 to 2020.
- The rainfall data is reported at state level. State level rainfall data is an average of available district rainfall data.
- Different Seasons of India based on the India Meteorological Department IMD <https://mausam.imd.gov.in/#>
 - Winter – December, January, and February
 - Summer – March, April, and May
 - Monsoon – June, July, August, and September
 - Autumn – October, and November
- All the seasonal rainfall data are aggregated from monthly data and displayed at the state level. All the rainfall data are reported in millimetre (mm).