A Sustainable Diet for a Sustainable Life: An Indian city, Ajmer as a Case Study

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Abstract

An integral part of sustainable development is to reduce the throughput of natural resources in relation to human demands and services. Ecological footprint relates various throughputs of resources to the respective fertile areas required which offer a chance of auditing sustainable development. Ecological footprint is a measure of the mark that is left behind upon the natural environment. The footprint is expressed in terms of the land area that is required to feed, provide resources, produce energy, assimilate waste, and to re-absorb its CO2 generated from combustion of fossil fuels. Food which we eat and how it is produced and manufactured has a significant impact on the environment and ecological footprint. This study employed the compound methodology to estimate the food carbon footprint of Ajmer city. The results have been calculated for different food and land categories, which are summed up to a total food footprint of Ajmer city which equals to 0.05729785ha/capita. The conclusion drawn from the study reveals thatby making simple choices about the foods we eat, we can contribute to reducing our Ecological Footprint.

Keywords: Ecological footprint, food footprint, sustainable consumption, compound methodology, global hectares.

Introduction

In today's world, human population is increasing and viable agricultural lands are decreasing rapidly. This scenario will lead to global food scarcity.

Ecological Footprint is a sustainability index that calculates the environmental burden of human population in spatial terms. Footprint measures land and sea area which is required to provide resources to human population and for absorbing its emissions[1]. Ecofootprint (EF) is an accounting method which focuses on land appropriation which provides a way to measure and communicate environmental impacts induced by humanson Earth[2]. What we choose to eat, where it comes from, and how it's grown and produced has an impact on the earth. By making simple choices about the foods we eat, we can contribute to reducing our Ecological Footprint[3].

Factors influencing food choice include[4]: i. Biological factors (hunger, palatability of food, taste, sensory aspects), ii. Economic issues (cost, income), iii. Physical measures (ease of access to food, education, specific skills, time constraints), iv. Social ideas (culture, family, peer-group pressures, meal patterns), v. Psychological factors (mood, stress, guilt), vi. Individual's beliefs, attitudes and knowledge about food.

21st century consumers have become aware of their impact on environment and their own health through food choices they make for themselves.

Food footprint is estimated as the total amount of land needed for crop cultivation, pastures and fisheries in addition to land and ocean area needed to absorb the carbon emissions related to production, processing, and transportation of food[5].

Land area in footprint calculations is expressed in global hectares, which is required to produce the food and fiber, absorb wastes, generate energy and provide space for roads, buildings and other infrastructural developments[6].

Methodology

For this study of food footprint for Ajmer, calculations were based on Compound method in which average national consumption data were used as proxies for Ajmer data. The Food Footprint of Ajmer has been calculated for the years 2008-10 using national data. The estimate of the national Ecological Footprint of food per capita was the starting point for assessing Ajmer's Footprint of food. In order to calculate the Food Footprint of Ajmer, the population of Ajmer was multiplied by the national per capita Ecological Footprint of food. The data for world yield of each crop was obtained from FAO's statistical database on the Internet. The city area of Ajmer was studied for estimating footprint of food.

Calculations of Food Footprint for Ajmer city: For food footprint calculations, the data used was based on the average consumption of an Indian citizen; Ecological Footprint of a resident of city was then constructed using the average footprint size for an Indian citizen. The per capita Ecological Footprint

for each product was calculated by dividing the consumption per capita of a product by the product's associated productivity. The total consumption footprint (CF$_p$) of Ajmer was then calculated by multiplying the average per capita Indian Ecological Footprint by the total population of Ajmer.
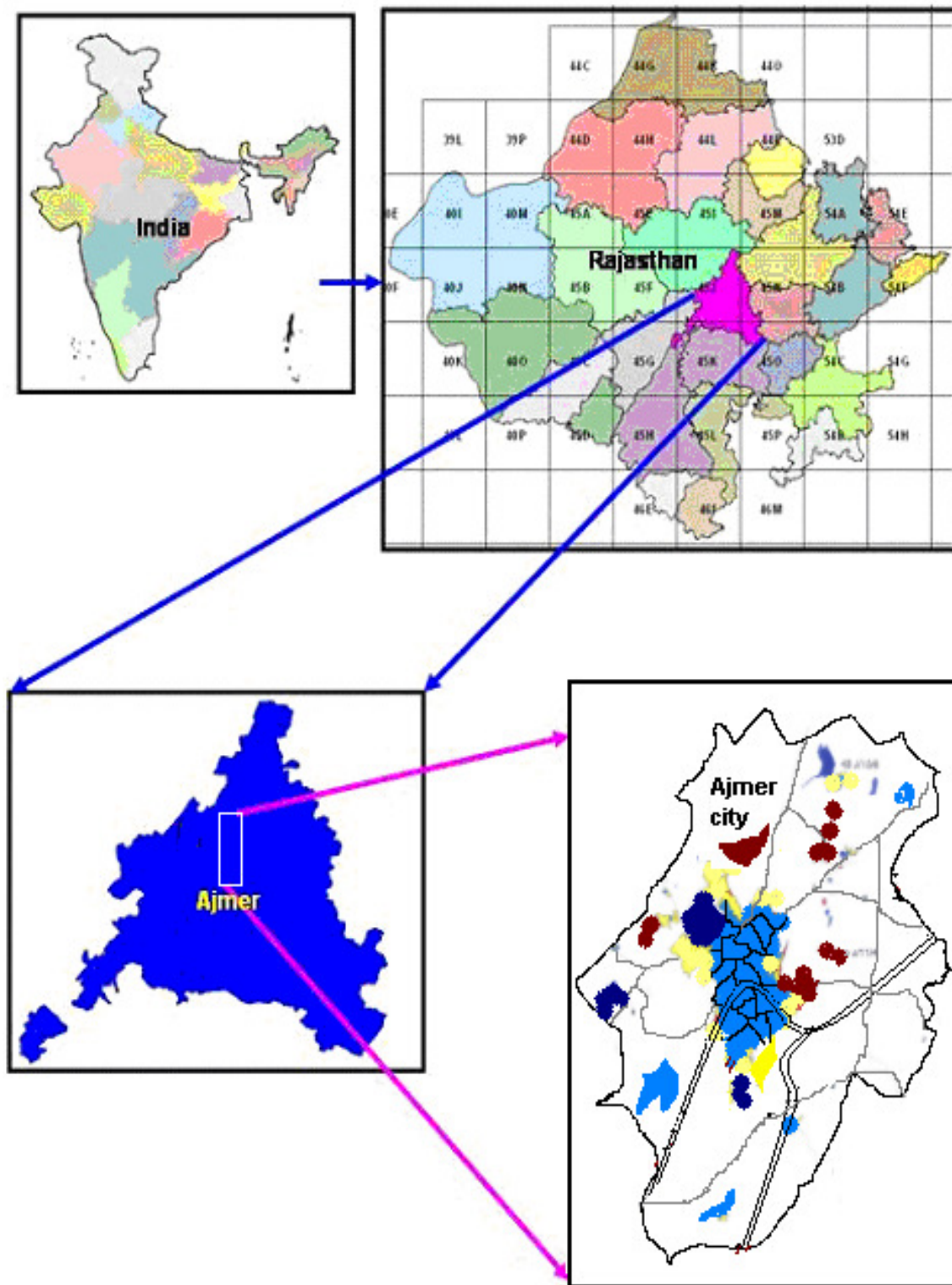
Map-1
Study area- Ajmer City

The study includes six food categories (max. consumption) for analysis of food footprint of Ajmer city, namely i. Cereals, ii. Dairy, iii. Fruits, iv. Vegetables, v. Beverages, vi. Other crops.

The calculation of Indian Ecological Footprint per capita was completed by the use of an Excel spreadsheet model developed by Mathis Wackernagel. The rows of the spreadsheet represent resource types, while the columns contain the productivity, production, import, export and consumption of these resources. The total consumption is calculated by subtracting total exports of a resource type from the sum of its production and imports. The final column represents the Ecological Footprint per capita.

The per capita Ecological Footprint for each product was found by dividing the consumption per capita of a product by the product's associated productivity.

The Ecological Footprint per capita would be:

(Production + Imports – Exports)/ Population of India = Ecological footprint
        Yield   per capita

The numerator represents the consumption per capita, while the denominator represents the average global yield. [7]

Table-1
Calculation of food footprint

S. No	Food Category	Yield (kg/ha)	Production (t)	Import (1000$)	Import (t)	Export (1000$)	Export (t)	Consumption (t)	Footprint (ha/cap)	Land Category
	Cereals									
1	Wheat	2704	75800000	643916	1793209	58	237	77592972	.000000027	Arable
2	Rice	33029	144570000	0	0	8908	54885	144515115	.000000042	Arable
3	Maize	24401	18960000	2031	4273	592045	2722715	16236558	.000000006	Arable
	Dairy									
4	Chicken	37050	2240000	28	23	819	576	2239447	0	Pasture
5	Cow milk	11286	42890000	0	0	3791	7089	42882911	.000000036	Pasture
6	Hen Egg	117491	2670000	532	294	66095	67259	2603035	0	Pasture
	Fruits									
7	Bananas	349829	21766400	0	0	6319	16662	21749738	0	Arable
8	Mangoes	63000	13501000	80	104	163622	240858	13260246	.000000002	Arable
9	Apples	76506	2001400	51636	58401	8070	32655	2027146	0	Arable
	Beverages									
10	Tea	17011	949200	30658	19586	469274	193459	775347	0	Arable
11	Coffee	8396	288000	40928	26476	327897	152610	161866	0	Arable
12	Coca Beans	3355	10180	17469	8331	33	13	18498	0	Arable
	Other Crops									
13	Pulses	7522	820000	187953	351230	1446	2002	1169228	.000000001	Arable
14	Groundnut	14326	9183000	0	0	27183	29583	9153147	.000000006	Arable
15	Oil seeds	2997	119000	27854	44859	23570	23574	140285	0	Arable
16	Jute	22772	1840000	36915	136389	8397	38664	1937725	0	Arable
17	Natural rubber	18200	819000	337	125	33317	13069	806056	0	Arable
18	Sugarcane	725551	355520000	0	0	0	0	355520000	.000000004	Arable
19	Tobacco	14054	520000	5234	928	347166	173345	347583	0	Arable
	Vegetables									
20	Potatoes	149256	22090000	30	120	11021	81627	22008493	.000000001	Arable
21	Pumpkin	97222	3500000	0	0	9430	5087	3494913	0	Arable
22	Tomatoes	179169	8585800	26	33	37050	134845	8450988	0	Arable

Results and Discussion

The spreadsheet of the Ecological Footprint calculations for Ajmer gives the total Ecological Footprint of food, based on national data is 0.05729785ha/capita.

Different food categories have varying footprint, Cereals with maximum footprint and Beverages with the lowest footprint for Ajmer city.

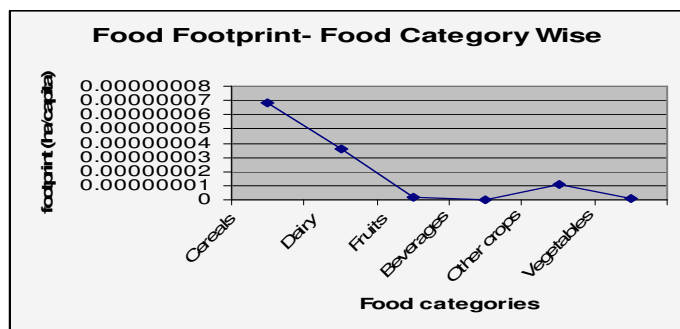Food footprint can also be broadly categorized into arable and pasture land areas.

Figure-1
Graph showing food footprint of varying food categories

Table-2
Footprint categorized into land types

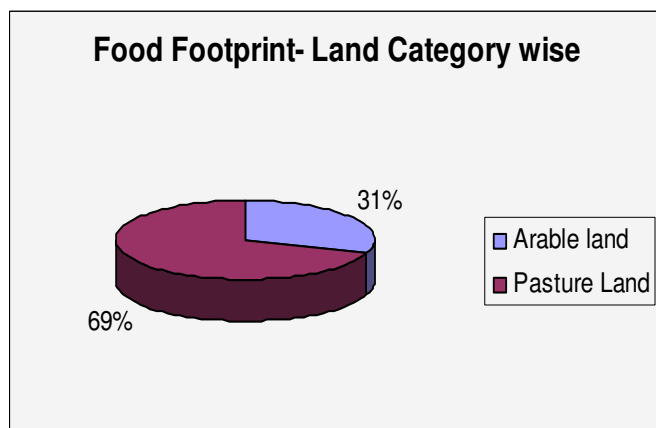| Land Category	Total ha/cap	Footprint of Ajmer (ha/cap)
Arable Land	0.000000082	0.0174807
Pasture Land	0.000000036	0.03981715

Figure-2
Graph showing food footprint into land types

Analyzing the results: The calculated value of Food footprint comes to be 0.572gha which is 31.5% of the total ecological footprint of Ajmer city being the second largest component of per capita ecological footprint. Similarly, the research work by Chambers et al, 2004 presents food footprint for Scotland to be 1.55 gha or 29% of Scotland's total ecological footprint. According to findings of the research,largest component in the food carbon footprint was cereals, while in the case of London, the meat consumed occupies largest part of food footprint[8].

Conclusion

It could be drawn from the results that for a step towards sustainable consumption, strong effort is required to develop an agenda of research which links agriculture, environment, society and health concerns together and apply it to daily consumption patterns.

As city residents, we can make sustainable food choices which can help our city grow sustainably with a smaller footprint. By making simple choices about the foods we eat, we can contribute to reducing our Ecological Footprint. This will ensure a great quality of life today and for future generations.

Recommendation- Eating Green: i. Eat less of non-vegetarian diet, ii. Rare visit to restaurants, iii. Less consumption of dairy products., iv. Less consumption of soft drinks. v. Prefer eating seasonal and local fruits and vegetables. vi. Avoid consumption of packaged snacks and junk food. vii. Use of an energy efficient refrigerator. viii. Less consumption of bottled water.

References

1. Frey S. and Barrett J., The Footprint of Scotland's Diet. The environmental burden of what we eat, A report for Scotland's Global Footprint Project **(2006)**

2. Athira R. and Subha V., Ecological Footprint Analysis- An overview *AJER* 12-19 **(2013)**

3. Bond S., Ecological footprints- A guide for local authorities published by WWF- UK, Panda House, Wayside park, Godalming **(2002)**

4. European Commission Food consumer science. Lessons learnt from FP projects in the field of food and consumer science, Brussels, **(2007b)**

5. Tunza Developing sustainability.together **3(2)** 12 **(2005)**

6. FAQ- Ecological footprint quiz by Center for sustainable economy **(2002)**

7. Wackernagel, M. The Ecological Footprint of Santiago de Chile. *Local Environment* **3**(1) 7-25 **(1998)**

8. City limits A resource flow and ecological footprint analysis of Greater London. Commissioned by IWM (EB) Chartered Institution of Waste Management Environmental Body, Prepared by Best Foot Forward **(2002)**