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## Role of pulses in the food and nutritional security in India

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### ABSTRACT

In spite of impressive growth of Indian agriculture, ensuring household food and nutritional security is still a challenge due to imbalanced growth in agriculture biased towards wheat and rice. Though production of pulses in the recent decade has increased but is not in pace with the increase in population. Pulses for being a major source of protein in Indian diet and for being resource conserving and environmental friendly, the increase in pulse production will act as a panacea for problems like nutritional security. Hence, an attempt has been made in this paper to analyze the significance of pulses in food consumption and nutritional security vis-à-vis other food items. The analysis is based on the 55<sup>th</sup> and 66<sup>th</sup> rounds of National Sample Survey pertaining to years 1999-2000 and 2009-10, respectively, using simple descriptive statistics. The dietary pattern has shifted away from cereals and pulses toward fruits, vegetables, processed food and food items of animal origin. The decline in the consumption of pulses has lead to increase in malnutrition and decline in protein intake. Need of the hour is to increase production and availability of pulses by adopting various innovative measures like institutional and policy support, development and wider adoption of HYV and low cost technologies, proper extension services for production and marketing of pulses, development of value chain, etc.

**Key words:** Consumption Pattern, Expenditure Pattern, Elasticity, Food and Nutritional Security, Production and Pulses

Food and nutritional security is said to be achieved when adequate food (quality, quantity, safety, socio-economic acceptability) is available and accessible for and satisfactorily used and utilized by all individuals at all time to live a healthy and active life (UNICEF, 2008). The impressive growth of Indian agriculture no doubt has helped the country in achieving self-sufficiency with respect to availability of foodgrains at national level. The estimates suggest that India is likely to be the most populous country on the planet by 2020 with a population of 1.39 billion. India is house for 445 million poor i.e. 35 percent of Indian are living on less than \$1.25 a day. Half of the pregnant women are anemic in India while in the case of children under the age of five years, 74 percent are reported to be anemic and 43 percent underweight (World Bank, 2012). Hence, ensuring household food and nutritional security is still a challenge for the country, particularly when a huge proportion of 1.2 billion population is poor and malnourished.

The growth of agriculture in India may help immensely in improving food and nutritional security as agriculture plays

a key role in increasing food availability and higher realization of income, support livelihoods of major proportion of population and contribute to the overall growth of the economy (World Bank, 2008). However, imbalanced growth of agriculture may also lead to continued malnutrition. The Green Revolution of mid 1960s, regarded for revolutionizing Indian agriculture, has been biased towards wheat and rice. Pulses and coarse grains, which are the source of staple food and protein requirements for poor, have not been given adequate attention (Adiguru and Ramasamy, 2003; Reddy 2009). Though the proportion of pulses have shown some sign of recovery during the last decade owing to various government policies, still much progress could not be made in terms of availability of pulses. Inefficient marketing and relatively higher prices of pulses further aggravates the problem of poor availability of pulses leading to malnutrition. Malnutrition is not the result of a single cause but is multi faceted problem acting singly or in combination with other complex factors like poverty, purchasing power, health care, ignorance and policies (Singh, 2009; Reddy, 2013).

Pulses for being a major source of protein in Indian diet and for its vital contribution in sustaining agricultural growth due to its resource conserving nature and being environmental friendly, the increase in pulse production will act as a panacea for problem like availability of food and nutritional security. Hence, an attempt has been made in this paper to analyze the significance of pulses in food consumption and nutritional security vis-à-vis other food items. The paper specifically attempts to study the change in consumption pattern of leading food items over time in rural and urban India and their impact on the nutrient intake in terms of energy, protein and fat; and to work out gap in consumption of different food items in comparison to the levels prescribed. An attempt has also been made to examine the composition of consumption expenditure and various other related aspects like availability, production growth, price movement and price elasticity of pulses vis-à-vis other food items so as to suggest appropriate policy measures to enhance the production and availability of pulses.

### METHODOLOGY

The study utilizes secondary information collected from various reports of National Sample Survey Organization on dietary pattern, consumer expenditure and nutrient intake, etc. for fulfilling different objectives of the paper. The analysis is

based on the 55<sup>th</sup> and 66<sup>th</sup> rounds of National Sample Survey pertaining to years 1999-2000 and 2009-10, respectively. The gap in nutrient intake was worked out as per the formula given below:

$$\text{Food Consumption Gap} = A_{Fi} - R_{Fi}$$

Where,  $A_{Fi}$  = Actual consumption level of  $i^{\text{th}}$  food item

$R_{Fi}$  = Recommended level of  $i^{\text{th}}$  food item

## RESULTS AND DISCUSSION

### Consumption Pattern of Leading Food Items

The change in consumption of different food items during 1999-2000 and 2009-10 is presented in the Table-1. The table reveals that per capita daily consumption of cereals declined substantially from 424 gms in 1999-2000 to 378 gms in 2009-10 in rural India i.e. a decrease of nearly 11 percent, whereas corresponding change in urban India was from 347 gms to 312 gms, a decline of about 10 percent. The other two commodities whose consumption has come down in both rural and urban India are pulses and sugar. However, consumption of pulses is a concern for nutritional security, as per capita daily consumption of pulses was 28 gms in rural India during 1999-2000 against a recommended level of 42 gms which further decreased to 23 gms during 2009-10. In urban areas, the per capita daily pulses consumption decreased from 33 to 27 gms during the same period. However, a considerable positive change is observed in the consumption of fruits and vegetables and edible oil. The consumption of fruits and vegetables registered an increase of about 73 percent and 31 percent, respectively in rural India while the increase was to the tune of 53 percent and 21 percent, respectively in urban India. Considerable change in the consumption of food items of animal origin has also been observed. The per capita daily consumption of meat, fish and eggs showed an increasing trend though still lower than recommended level. It increased from 14 gms to 20 gms in rural India and from 19 gms to 24 gms in Urban India during the reference period. The per capita consumption of milk has increased marginally from 127 ml to

138 ml in rural India and from 176 ml to 182 ml in urban India. Change has also been observed in favour of other food items which mainly consist of processed and packaged food items.

In all, the consumption is moving away from foodgrains and changing towards horticultural products like fruits and vegetables, food items of animal origin like milk, eggs, meat, fish, etc and processed products. This shift in consumption pattern may be attributed to relative prices of cereals and pulses, diversification towards high value food and change in income and taste and preferences of consumers (Mittal, 2007; Reddy, 2004; Reddy, 2009a and Kumar, *et al.* 2007). Unfavorable change in the consumption of pulses may be due to factors like relatively higher prices, complex marketing due to involvement of processing, slow growth in production and inclination of population towards consumption of animal protein.

### Change in Dietary Pattern and Nutrient Intake

The previous section reveals the transition in dietary pattern from foodgrains to horticultural crops, food items of animal origin and processed food. The impact of this transition in dietary pattern on the nutrition intake has been assessed in terms of change in calories, protein and fat intake. The details of calorie, protein and fat intake from different food items in rural and urban India during 1999-2000 and 2009-10 are presented in the Table-2 to Table-4.

Though, the contribution of cereals have come down in rural India by about 11 percent, still as much as 60 percent of calories intake has been contributed by cereals during 2009-10. Studies suggest that the decline in traditional staple consumption has been significant for coarse cereals like sorghum, pearl millet and Maize (Shalini, 2012; Reddy *et al.* 2013). The downfall in the contribution of cereals in calories intake has been effectively compensated by the increased

**Table 1. Change in food consumption in rural and urban areas of India, 1999-2000 and 2009-2010**

Food Items	Unit	Rural			Urban		
		1999-00	2009-10	Change (%)	1999-00	2009-10	Change (%)
Cereals	Grams	424	378	-10.77	347	312	-10.04
Pulses	Grams	28	23	-18.21	33	27	-18.70
Vegetables	Grams	180	235	30.84	198	239	20.64
Fruits	Grams	28	48	72.80	53	81	53.25
Milk	ml	127	138	8.56	176	182	3.38
Edible oil	Grams	17	21	27.20	24	27	12.05
Sugar	Grams	28	23	-16.19	33	27	-17.07
Egg Fish	Grams	14	20	39.39	19	24	24.65
Others	Grams	55	80	45.93	104	120	14.59

**Table 2. Nutrient intake by source in India: Energy (Kcal )**

Food Items	Rural			Urban		
	1999-00	2009-10	Change (%)	1999-00	2009-10	Change (%)
Cereal	1449 (68.00)	1296 (60.20)	-10.54	1184 (55.35)	1069 (49.86)	-9.66
Pulses	96 (4.50)	77 (3.58)	-19.85	115 (5.38)	92 (4.29)	-19.72
F&V	114 (5.35)	145 (6.73)	26.98	134 (6.26)	164 (7.65)	22.37
Milk	137 (6.43)	142 (6.60)	3.65	204 (9.54)	197 (9.19)	-3.50
Edible oil	150 (7.04)	191 (8.87)	27.20	219 (10.24)	245 (11.43)	12.05
Sugar	111 (5.21)	93 (4.32)	-15.85	131 (6.12)	109 (5.08)	-17.08
Egg Fish	17 (0.80)	23 (1.07)	39.85	24 (1.12)	30 (1.40)	24.58
Meat	58 (2.72)	185 (8.59)	220.91	129 (6.03)	238 (11.10)	84.78
Grand Total	2131 (100.00)	2153 (100.00)	1.00	2139 (100.00)	2144 (100.00)	0.22

**Table 3. Nutrient intake by source in India: Fat (Grams)**

Food Items	Rural			Urban		
	1999-00	2009-10	Change (%)	1999-00	2009-10	Change (%)
Cereal	5.1 (14.26)	4.3 (10.06)	-15.77	3.9 (7.78)	3.47 (6.35)	-10.99
Pulses	0.52 (1.45)	0.45 (1.05)	-13.7	0.63 (1.26)	0.54 (0.99)	-14.65
F&V	1.22 (3.41)	1.57 (3.67)	28.15	1.62 (3.23)	2.02 (3.69)	24.83
Milk	9.93 (27.76)	10.04 (23.50)	1.06	15.18 (30.28)	14.34 (26.23)	-5.53
Edible oil	16.67 (46.60)	21.2 (49.61)	27.2	24.33 (48.53)	27.27 (49.88)	12.05
Sugar	0.00 (0.00)	0.00 (0.00)	-69.29	0.00 (0.00)	0.00 (0.00)	-22.00
Egg Fish	0.56 (1.57)	0.77 (1.80)	37.79	0.9 (1.80)	1.07 (1.96)	19.15
Meat	1.76 (4.92)	4.4 (10.30)	149.87	3.57 (7.12)	5.96 (10.90)	66.81
Other	35.77 (100.00)	42.73 (100.00)	19.45	50.13 (100.00)	54.67 (100.00)	9.05
Grand Total						

intake of calories from other sources like edible oil, fruits and vegetables and milk (Reddy and Bantilan, 2012). Similar pattern has been observed in urban India also. The proportion of cereals in total calorie intake is lower in urban areas as compared to rural areas. All these observations clearly indicate that consumption of cereals has come down due to shift away from traditional staples. It has been observed that as income rises, households generally diversify their food consumption pattern by shifting towards high value and high quality food items (Kumar *et al.* 2007).

In the case of fat intake, the situation has improved both in urban and rural areas for period under consideration in all the food items except cereals, pulses and sugar. The same has been reflected by an increase in fat intake by nearly 30 percent in rural India and more than 9 percent in urban India. Only a small portion is being contribution by sugar and pulses.

**Table 4. Nutrient intake by source in India: Protein (Grams)**

Food Items	Rural			Urban		
	1999-00	2009-10	Change (%)	1999-00	2009-10	Change (%)
Cereal	39.88 (68.09)	35.67 (61.48)	-10.54	33.41 (57.16)	30.11 (52.15)	-9.86
Pulses	6.4 (10.93)	4.94 (8.51)	-22.78	7.65 (13.09)	5.98 (10.36)	-21.82
F&V	3.02 (5.16)	3.95 (6.81)	30.89	3.55 (6.07)	4.3 (7.45)	21.07
Milk	5.1 (8.71)	5.55 (9.57)	8.9	7.27 (12.44)	7.36 (12.75)	1.21
Sugar	0.04 (0.07)	0.03 (0.05)	-33.89	0.04 (0.07)	0.03 (0.05)	-17.54
Egg Fish	2.42 (4.13)	3.47 (5.98)	43.72	3.41 (5.83)	4.45 (7.71)	30.62
Meat	1.72 (2.94)	4.41 (7.60)	156.15	3.13 (5.36)	5.5 (9.53)	75.88
Other	58.57 (100.00)	58.02 (100.00)	-0.93	58.45 (100.00)	57.74 (100.00)	-1.22
Grand Total						

In the case of protein, though there is a marginal decline in the protein intake in both rural and urban areas, it has been in the range of recommended level of 60 gms per capita per day. Apart from providing calories, two third of total protein intake in rural areas and more than half of the total protein intake in urban areas is being contributed by cereals. Next major source of protein is pulses with 8.5 percent contribution in rural areas and 10.4 percent contribution in urban areas (2009-10). It is revealed that during the period under consideration, the proportion of protein from cereals and pulses has come down both in rural and urban areas. The decline in contribution from cereals is obvious due to shift in consumption from traditional items to fruits, vegetables and animal protein. The concern is the decline in the contribution made by pulses as a source of protein. Mainly in ensuring a balanced diet to the poor who may not have that easy access to high value protein alternatives of horticultural crops and animal origin, pulses could be better alternative. The poor mainly rely on cereals and pulses for their protein requirements. Under such circumstances, pulses can act as an important source of protein for poor in urban and rural India.

#### Gap in Consumption of different Food Items

The gap in the consumption of different food items in comparison to the level prescribed is presented in Table-5. The consumption of cereals in rural India in both the period under consideration is found to be above the recommended level. However, the consumption in urban India declined below recommended level during 2009-10 with a gap of 18 gms. Cereals are an import source of energy in Indian diet and their deficiency may lead to fall in energy intake and also utilization of other vital nutrients.

In addition to cereals, the consumption of all items except sugar and edible oils is found to be lower than the prescribed level in rural as well as urban India during both the

**Table-5: Gap in consumption and requirement of different food items in India**

Food Items	Unit	Rural			Urban		
		1999-00	2009-10	Change in Gap (%)	1999-00	2009-10	Change in Gap (%)
Cereals	Grams	94	48	--	17	-18	--
Pulses	Grams	-14	-19	-12.14	-9	-15	-14.84
Vegetables	Grams	-170	-115	15.84	-152	-111	11.68
Fruits	Grams	-72	-52	20.40	-47	-19	28.31
Milk	ml	-173	-162	3.63	-124	-118	1.98
Edible oil	Grams	0	4	--	7	10	--
Sugar	Grams	5	0	-19.71	10	4	--
Egg Fish Meat	Grams	-16	-10	18.62	-11	-6	15.98

(-) indicates gap in consumption

periods. However, this gap has come down in all the food items other than pulses during 2009-10. The gap in the per capita daily consumption of pulses has increased from 14 gms in 1999-2000 to 19 gms in 2009-10 in rural India and from 9 gms to 15 gms in Urban India during the same period.

### Composition of Consumption Expenditure

The figures presented in the Table-6 revealed that, the proportion of total expenditure on food items has come down over time in both rural and urban India. The expenditure on different commodities except cereals has, in general, either increased or remained same in terms of proportion of expenditure made on food items. In the case of pulses, even with the decline in quantity consumed, the proportion of expenditure towards pulses in the total household expenditure on food items has increased mainly on account of increase in prices of pulses in the recent past.

**Table 6. Trends in percent composition of consumer expenditure (MPCE)**

Food Items	Rural		Urban	
	1999-2000	2009-10	1999-2000	2009-10
Cereals	22.2 (37.4)	15.6 (29.1)	12.4 (25.8)	9.1 (22.4)
Gram	0.1 (0.2)	0.2 (0.4)	0.1 (0.2)	0.1 (0.2)
Cereals substitute	0.1 (0.2)	0.1 (0.2)	0.0 (0.0)	0.0 (0.0)
Pulse and pulse products	3.8 (6.4)	3.7 (6.9)	2.8 (5.8)	2.7 (6.6)
Milk and milk products	8.8 (14.8)	8.6 (16.0)	8.7 (18.1)	7.8 (19.2)
Edible oil	3.7 (6.2)	3.7 (6.9)	3.1 (6.4)	2.6 (6.4)
Egg, fish and meat	3.3 (5.6)	3.5 (6.5)	3.1 (6.4)	2.7 (6.6)
Vegetables	6.2 (10.4)	6.2 (11.6)	5.1 (10.6)	4.3 (10.6)
Fruits and nuts	1.7 (2.9)	1.6 (3.0)	2.4 (5.0)	2.1 (5.2)
Sugar	2.4 (4.0)	2.4 (4.5)	1.6 (3.3)	1.5 (3.7)
Others	7.1 (12.0)	8.0 (14.9)	8.8 (17.9)	7.8 (19.2)
<b>Total Food</b>	<b>59.4</b> <b>(100)</b>	<b>53.6</b> <b>(100)</b>	<b>48.1</b> <b>(100)</b>	<b>40.7</b> <b>(100)</b>
Total Non-food	40.6	46.4	51.9	59.3
Total Expenditure	100.0	100.0	100.0	100.0

Note: MRP estimates for 1999-2000, Figures in parentheses are proportion of expenditure made on food items

### Food Production and Availability

The foodgrains production has recorded impressive growth since independence. It has increased from about 50 million tones at the time of independence to over 240 million tones during 2010-11. The present level of foodgrains production seems to be adequate at national level, but the production of pulses being a vital source of protein for poor and vegetarian society, could not emulate the same growth

story. The probable reason for slow growth in production of pulses is that major proportion of area under pulses is cultivated under rainfed conditions (Savadatti, 2007). Some progress in pulses has been made during the last decade due to various policy initiatives of the Government, the positive change in pulse production does not seem to be enough to cater to the need of masses as has been reflected by the lower per capita availability of pulses at national level. Per capita availability of various food items like milk, sugar and edible oil is found to have increased over a period of time and are comparable to the prescribed level recommended by NIN, 2010 (Table-7). In addition to availability, the distribution of foods, both within the community and the family, may be unfavorable to some vulnerable groups due to low income and low purchasing power. In view of the high cost of milk, a large proportion of the Indian population subsists on diets consisting mostly of vegetarian foods with low nutrient bio-availability (NIN, 2010).

**Table 7. Availability of different food items in India**

Food Items	Unit	1990	2000	2005-06	2006-07	2007-08	2008-09	2009-10	NIN
Cereals	gm/day	432	423	413	407	394	407	407	330
Pulses	gm/day	41	32	33	36	42	37	32	42
Milk	ml/day	176	220	241	251	260	266	273	300
Vegetables	gm/day	212	243	--	210	--	--	--	350
Edible Oils	gm/day	18	26	29	30	31	35	36	17
Sugar	gm/day	34	43	45	46	49	52	51	23

The growth in the production of some of the leading crops is presented in Table-8. The performance of pulses was found to be poor in comparison to wheat and rice except for the last decade. During last decade, pulse production registered a growth of 3.47 percent, which does not seem to be sufficient to take care of the individual requirement as the per capita consumption has declined. This decline in consumption of pulses over years may possibly be attributed to factors like increase in population leading to supply gap, rise in price of pulses (as reflected in the Figure-1) and shift in consumption towards fruits, vegetables and animal protein, etc.

**Table 8. Growth in production of crops (Base TE1981-82=100)**

Crops	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2011-12
Rice	3.62 (17.06)	2.02 (13.31)	1.72 (5.30)
Wheat	3.57 (15.49)	3.57 (18.30)	2.37 (10.92)
Coarse Cereals	0.40 (2.05)	-0.02 (-2.29)	3.01 (6.97)
Pulses	1.52 (2.10)	0.59 (0.11)	3.47 (3.24)

Note: Figures in parentheses are the absolute change in production (million tonnes)

Source: Economic Survey, 2011-12, GOI



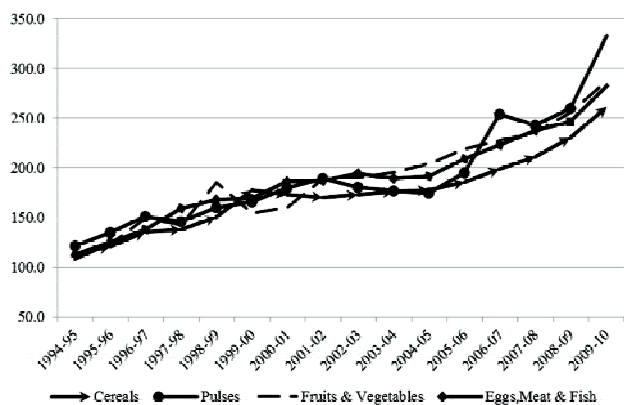


Figure 1. Wholesale Price Index of major consumption items (Base 1993-94)

Same has been reflected by the analysis of compensated own-price elasticities (Mittal, 2006). The own-price elasticity of all the commodities has the expected negative signs (Table-9). The price elasticity is lowest for cereals and milk and highest for products of meat origin. The price elasticity of pulses is comparatively higher than cereals and milk especially for very poor, poor and non-poor section of the population. Pulse consumption by very poor household in rural areas declines by 0.72 per cent when the price of pulse rises by 1 per cent and thus revealing that, pulse consumption is more sensitive to price changes than cereal and milk consumption. High value commodities are very sensitive to prices. Most Indian consumers have relatively low incomes, and tend to be very price-sensitive buyers of most items, including pulses. A breakthrough in pulses production technology is necessary to keep pace with rising demand for this commodity.

Table 9. Compensated Own-Price Elasticity of Pulses

Class	Pulses		Cereals		Milk		Fish, Meat and Chicken	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Very Poor	-0.72	-0.79	-0.40	-0.44	-0.84	-0.34	-3.11	-2.62
Poor	-0.74	-0.78	-0.43	-0.44	-0.01	-0.52	-2.78	-2.41
Non-Poor	-0.75	-0.77	-0.45	-0.44	-0.46	-0.64	-2.47	-2.24
Rich	-0.74	-0.74	-0.45	-0.41	-0.72	-0.78	-2.20	-2.01
All	-0.74	-0.75	-0.46	-0.43	-0.62	-0.74	-2.33	-2.09

In the recent past food consumption pattern has undergone considerable change owing to various factors like increase in income, urbanization, change in consumer taste and preferences, awareness about safe and healthy food, etc. As a result, the composition of diet and nutrition intake has changed considerably. It is evident from the fact that the dietary plan has shifted away from cereals and pulses toward fruits, vegetables, processed food and food items of animal origin. The consumption of pulses has come down for various possible reasons like poor availability, high prices and availability of cheaper alternatives of animal origin. The shift in consumption towards horticultural crops and food items of animal origin has no doubt contributed towards higher intake of calories, but the intake of protein at the same time has come

down mainly due to decline in the consumption of pulses which is a major source of quality protein compared to other food items. The concern is reduction in consumption of pulses for predominantly vegetarian society and poor due to high price and fluctuation in supply of pulses. Moreover, pulses may act as a low cost substitute during high prices of vegetables and food items of animal origin. Though, the production of pulses has registered an impressive growth in the recent decade but it is not in pace with the increase in the population. Thus, need of the hour is to increase production and availability of pulses by adopting various innovative measures. This will ensure food and nutritional security by bringing sustainability in agricultural production in the country. In order to increase the growth in production of pulses, institutional and policy support is required for enhancing area under pulses, development of HYVs, supply of quality inputs (Kumar *et al.* and Singh *et al.* 2012), intercropping (Sankaranarayanan *et al.* 2011), proper extension of production technologies (Tomar *et al.* 2009), development of value chain, etc. The supply of pulses can be increased by having orderly marketing of pulses. The availability of information being a vital component will make farmers to respond more effectively to the various initiatives of the Government. With the advent of technology, the information flow could reach to the lowest level of farming community. Popularizing low cost technology of production, promotion of high yielding varieties and marketing related issues will be more effective using ICT. The elasticity of the demand for high value commodities is highly price sensitive and hence, in the event in the rise in price of such commodities, pulses will act a substitute for cheaper protein. Also, considering the fact that, wide spread malnutrition prevailing among children and women in India, there is need to promote consumption of pulses by linking to programme like mid-day meal and rural health mission by incorporating either free distribution of pulses or by subsidizing the food.

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