Impact of Agricultural Development on Nutrition: A Perspective Study in Jodhpur and Jaipur Districts

A.K. Dixit, S.K. Agarwal[1] and Padam Singh[2]
Desert Medicine Research Centre, Jodhpur - 342005
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SUMMARY

The impact of agricultural development on malnutrition (Calorie inadequacy) in desert is studied. For this purpose, the distributions of calorie-consumption per consumer unit (C.U.) in the two districts of Rajasthan namely Jodhpur (with inadequate agricultural development) and Jaipur (with adequate agricultural development) are analysed. Attempts are also made to see the intra and inter variations in calorie intake among the income classes of the agricultural community. The agricultural developmental strategies are also examined in the light of the standard of its appraisal. It has been noted that despite of satisfactory agricultural development in case of Jaipur, the malnutritional situation in the district goes parallel to that of Jodhpur.

Key words: Malnutrition, Measure of malnutrition, Measure of agricultural development, Log normal and normal distributions, Analysis of variance.

1. Introduction

Agricultural development affects the malnutrition in a given community. It provides the subsistence production (Agricultural produce that is not sold but directly consumed) and income through the sale of agricultural produce. The nutritional status of an individual is not only affected by the availability of food in the region but also to the ability of an individual to obtain the available food. However, its appraisal rests upon the induced changes in food consumption by various categories of farmers.

In the past, to take care of the nutritional situation in an area, the strategies have been to enhance the mean level production. However, the studies conducted by Food and Agricultural Organization (F.A.O. [2]), clearly depict that the impact of agricultural development on the nutritional situation of a region can

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1   University of Kuwait, Kuwait
2   Institute of Research in Medical Statistics, New Delhi

be seen only if it reaches to every section of the people of that area i.e. the benefits should be distributed evenly in the entire population. The intra and inter variations in calorie intake among different income classes should be minimum.

In order to assess the impact of agricultural development in the desert, a cross sectional study is carried out in Jodhpur and Jaipur districts of Rajasthan. The district Jodhpur represents the desert conditions leading to inadequate agricultural development while Jaipur represents agricultural development. The distribution of calorie intake per cosumer unit (C.U.) in the two districts is studied in the light of agricultural development. Intra and inter variations in calorie intake among various categories of farmers are also analysed.

2. *Sampling Methodology*

To study the distribution of calorie consumption per C.U., a dietary survey was undertaken in two districts during the year 1991. The following sampling plan was used.

The villages in each district were divided into 4 strata, based on village population size. From each stratum 4 villages were selected by SRSWOR. A list of household (H/H) was prepared and stratified as per the categories of farmers viz. Marginal, Small, Medium and Large in each district. Farmers having less than 1 ha land were classified as marginal, between 1 to 4 ha, small; between 4 to 10 ha of land as medium and above it as large farmers. A sample of 30 H/H from each category was selected at random and the calorie intake per C.U. was computed using oral questionnaire and following 24 hours recall technique of dietary survey. In this technique, a member of the H/H involved in preparation of food is asked to tell about what she/he has prepared during 24 hours. The raw ingredients in each preparation are noted. The amount of each raw ingredient in terms of its actual weight is recorded with the help of standard dietary cups. Given conversion factors are used to convert the weight of each item consumed in terms of calories.

3. *Measure of Malnutrition*

Sukhatme [5] defined a measure of malnutrition in the community as

$$\begin{matrix} \text{Calorie intake} \\ \text{of a H/H per} \\ \text{C.U.} \end{matrix} = \frac{\text{Total calorie intake in a H/H}}{\text{Total calorie requirement of H/H}} \times 2800 \qquad (3.1)$$

where calorie requirement is determined on the basis of age, sex and physiological status of an individual and 2800 is the assumed calorie intake of a 'reference man' in India.

Sukhatme also studied the distribution of calorie intake per C.U. in different populations and proposed that for a well fed population, the distribution of aforesaid statistic (3.1) would follow normal laws. He further suggested that any skewness in the distribution of calorie intake per C.U. at H/H level, indicates the presence of malnutrition which deals basically with calorie deficiency.

The distribution of calorie intake per C.U. obtained in the two districts is given in Table 1, as per the chosen class interval of 250 calories.

Table 1 : Distribution of calorie intake per C.U. in the two districts

Calorie intake of a H/H per C.U.	Number of H/H	
	Jodhpur	Jaipur
< 550	1	–
550 - 800	4	–
800 - 1050	7	11
1050 - 1300	16	9
1300 - 1550	29	20
1550 - 1800	19	16
1800 - 2050	12	11
2050 - 2300	11	17
2300 - 2550	6	9
2550 - 2800	4	10
2800 - 3050	3	12
3050 - 3300	2	2
3300 - above	6	3
Total	120	120

4. Measures of Agricultural Development

Agricultural development implies maximum economic utilization of land. The planned utilization of land will affect the nutritional status of the community. Therefore, cropping pattern, cropping intensity, yield per hectare and productivity in terms of standard nutrition unit (SNU) are chosen as the indices of agricultural development in the study.

The crops occupying 80% of total cropped area constituted the cropping pattern of a district. Table 2 gives land use, cropping pattern and production

in the two districts as per Statistical Abstract of Rajasthan [4]. The cropping intensity (C.I.) is defined as

$$\text{C.I.} = \frac{\text{Total cropped area}}{\text{Net sown area}} \times 100 \qquad\qquad (4.1)$$

Its value is 128 for Jaipur and 102 for Jodhpur.

Table 2 : Land utilization, cropping pattern and production in the two districts

Land utilization	Jodhpur	Jaipur
Net sown area (in ha)	1119516	765119
Area sown more than once (in ha)	22547	213597
Total cropped area (in ha)	1142063	978716

Cropping pattern and production

	Jodhpur			Jaipur		
Crops Cereals	Area under the crop (in ha)	% Area under the crop	Produc- tion (Tonnes)	Area under the crop (in ha)	% Area under the crop	Produc- tion (Tonnes)
Bajra	643500	56	30888	313626	32	179080
Jowar	12157	1	*	42764	4	10434
Maize	89	**	59	23808	2	13620
Wheat	27980	3	36262	18885	19	279199
Barley	570	**	829	43172	4	104234
Rice	*	**	*	16	**	14
Millet	1	**	1	38	**	7
Gram	37	**	32	87778	9	59162
Kharif- pulses	169365	15	2536	69419	7	1669
Commercial Crops						
Tur	*	**	*	291	**	145
Sesamum	24188	3	34	1191	**	169
Mustard	13695	1.2	11408	46174	5	29274
Linseed	*	**	*	225	**	74
Groundnut	166	**	75	21748	2.2	10722
Sugarcane	*	**	*	349	**	14368
Chillies	10858	1	14601	1598	**	1056
Tobacco	17	**	34	496	**	421

Source: Statistical Abstract of Rajasthan [4]

* Negligible
** Less than 1%

The agricultural development for the present study is considered in the light of improved calorie intake. Therefore, a measure of productivity in terms of calorie due to Shafi [3] is computed. This gives per hectare calorie production as compared to the same with the national standard. Thus the index becomes unit free and is used as a pure number for comparison. The following formula is used for computation.

$$\text{Productivity Index (P.I.)} = \frac{\sum_i P_i C_i}{\sum_i A_i \times 800000} \qquad (4.2)$$

where P_i, A_i, C_i are respectively the production, area and calorie per 100 gms for the ith crop. Summation extends over i crops, constituting the cropping pattern. The standard classification of the productivity index is as follows :

< 1.04	Low productivity
1.04 – 1.55	Medium productivity
1.55 – 2.59	High productivity
2.59 – above	Very high productivity

The value of P.I. for Jaipur is found to be 0.40 while for Jodhpur it is 0.039.

5. Statistical Analysis

The percentage distribution of land holding in the two districts is studied. The average calorie intake per C.U. is compared with respect to different groups of farmers and also farmers as a community between the districts. The results are given in Table 3. The test significance is performed on log transformation of the observe values because the observed distribution followed log normal distribution.

In order to understand malnutrition in a community, the distribution of calorie intake per C.U. is more important than the mean level comparisons. Therefore, appropriate distributions for the data of calorie intake per C.U. both for population as a whole and the different categories of farmers viz. marginal, small and medium are fitted. These size class of farmers become the target groups. The food demand of these masses of inadequately feds must be satisfied by any expansion of agricultural growth in order to check malnutrition in the community. The distributions are listed in Table 4. Further, to study the variation within the districts and also between the districts, the analysis of variance is carried out. Table 5 gives inter and intra variation of calorie intake per C.U. in the two districts.

Table 3 : Comparison of mean calorie intake per C.U. and its significance

Category of farmers	n	Statistic	Jodhpur	Jaipur	t-value
Marginal	30	Mean	1604.1	1980.3	
		S.D.	527.6	653.9	2.25*
		C.V.	33%	33%	
Small	30	Mean	1901.9	2012.5	
		S.D.	644.7	607.7	0.79
		C.V.	34%	30%	
Medium	30	Mean	1878.1	1912.4	
		S.D.	676.7	560.7	0.30
		C.V.	36%	29%	
Combined	120	Mean	1820.1	1958.8	
		S.D.	658.0	616.0	1.58
		C.V.	36%	31%	

* Significant
(i) t-value is calculated after log transformation
(ii) Large farmers not compared separately for not being the target group

Table 4 : Calorie intake per C.U. distribution among various categories of farmers in the two districts

Categories of farmers	Jodhpur			Jaipur		
	Fitting of distribution	Parameters (μ, λ)	χ^2	Fitting of distribution	Parameters (μ, λ)	χ^2
Marginal	Log normal	(1586,448)	1.28	Normal	(1958,615)	0.1
Small	Log normal	(1880,566)	1.26	Log normal	(2016,568)	0.2
Medium	Log normal	(1860,619)	0.96	Log normal	(1918,542)	0.81
Combined	Log normal	(1805,596)	11.52	Log normal	(1956,583)	1.55

$p > 0.05$ in each case, distributon fits well

Table 5 : ANOVA for intra and inter variations in calorie intake per C.U. in two districts

Source of variation	D.F.	S.S. (Adjusted)	M.S.S.	F_{cal}
Categories of farmers	2	0.240	0.120	3.84*
Between districts	1	0.361	0.361	
Error	140	13.700	0.098	

* Not significant

Gains in calorie intake per C.U. by each size class of farmers are not significant in Jaipur as compared to Jodhpur; inspite of adequate agricultural development.

6. Discussion

It is observed that the percentage of large holding in case of Jodhpur (of size $\geq$ 4 ha) was much more (61.43) as compared to that in Jaipur (20.49). However, this percentage for small and medium holdings (of size < 1 and 1-4 ha) was higher in Jaipur (36.88, 21.55) as compared to Jodhpur (10.22, 10.57). On an average, the size of land holding is bigger in case of Jodhpur but in terms of productivity it is only 1/10th to Jaipur. Moreover, the cropping intensity is also higher by 20% for Jaipur. This reflects appropriate irrigation and other facilities of adequate agricultural development for Jaipur.

The distribution of calorie intake per C.U. for both the districts is found to be log normal, indicates the existence of malnutrition in both districts [Sukhatme [5] found the distribution of calorie intake per C.U. to be normal for a well fed population. Any type of skewness indicates presence of malnutrition]. The only exception, is marginal farmers of Jaipur where the distribution follows normal laws. The log normal distribution of calorie intake per C.U. in case of Jaipur (with adequate agricultural development) clearly indicates that the problem of malnutrition in the community will remain unless every class of people is benefited with the agricultural development in their calorie intake. It has not been so as gains in calorie intake per C.U. by size class of farmers are not significant (Table 5). The high value of coefficient of variation (Table 3) also reflects the existence of malnutrition. It means malnutrition in both the districts remains parallel inspite of agricultural development in the case of Jaipur.

The strategies of agricultural development have been to enhance the production of more costlier cereals and/or to introduce cash crops (Table 2). It appears the various classes of farmers have not been benefited with this strategy of agricultural development. Thus the impact of agricultural development could not yield any significant effect as far as the problem of malnutrition is concerned.

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