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Research Paper

Role of Kitchen Gardening in Ensuring Food Security among Rural People of Jharkhand

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ABSTRACT

Based on primary and secondary data, an attemtpt has been made in this study to investigate the role of kitchen gardening in ensuring food security among rural people of Jharkhand. It has been found that Jharkhand with its diverse agro-climatic conditions is much suited for the development of horticulture based economy with ample scope of growth. It is evident from the study thatthe number of household members exhibits a strong negative correlation with the dependent variable, indicating that larger households tend to have lower values in the dependent variable. Female members and the number of children also display significant negative correlations suggesting that households with more female members and children tend to have lower values in calorie intake. Additionally, the number of children shows a significant negative correlation, indicating that households with a higher number of children tend to have lower values for the dependent variable. Conversely, variables such as income and land owned exhibit weak positive correlations, suggesting a minimal relationship with the dependent variable. On the other hand, variables such as income and land owned do not demonstrate significant correlations with the dependent variable, as their correlation coefficients are close to zero and their p-values are above the conventional threshold. The regression results suggest that factors such as the number of children, adult males, adult females, illiteracy, and levels of education within the family are significantly associated with the log of daily calorie intake. However, the presence of a kitchen garden does not exhibit a statistically significant relationship.

HIGHLIGHTS

- Jharkhand is much suited for horticulture based economy.
- More female members and children tend to have lower values in calorie intake.
- Presence of a kitchen garden does not exhibit a statistically significant relationship.

Keywords: Kitchen garden, vegetables, calorie intake, households, Jharkhand

Malnutrition is a serious public health problem in India. It retards child growth, increases the risk and duration of illness, reduces work output, and slows social and mental development. Malnutrition among women of reproductive age increases the risk of mortality during labour and delivery and puts their newborn children at risk of long-term deficiencies. Improving nutritional status, including micronutrient status, can lead to increased productivity, increased child survival and growth, and reduced maternal morbidity and mortality. Three types of interventions are commonly employed to improve micronutrient status viz. capsule/tablet supplementation, fortification of commonly consumed foods, and diet diversification. Diet diversification is arguably the most sustainable and affordable strategy to improve nutrition for

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the majority of the population, particularly the poor. For poor households, vegetables and fruits are often the only source of micronutrients in the family diet. Homestead production of fruits and vegetables provides the household with direct access to important nutrients that may not be readily available or within their economic reach. Therefore, home gardening would be a good means to improve household food security. Equally important, home gardening/community nursery has been shown to be a source of additional income, because the household can sell a portion of the garden's produce. Studies suggest that this additional income is generally utilized to purchase supplementary food items, further increasing the diversification of the family's diet. Home gardening is especially important in overcoming seasonal availability of foods and promoting household self-sufficiency. Kitchen garden is a supplementary food production system managed by household members. Although a portion of crop is sold in the market, most of them are used for household consumption. Kitchen garden or home gardening is the ancient food production techniques throughout the world, which is referred by different names in different places. Home gardening remains the most important method of food production in the developing countries.

However, there is dearth of studies in relation with status and scope of home gardening nurseries at the grass root levels. The present research would facilitate the identification of problems and the development of solutions based on the sharing the experiences of household members on their food habit and the practice of kitchen gardening. Indicators are dependent on the programme objectives and should include some that can be monitored locally. Continued integration of lessons learned from implementation and evaluation efforts is one of the key aspects to the successful scale up of any programme. In this background, an attemtpt has been made in this study to investigate the role of kitchen gardening in ensuring food security among rural people of Jharkhand.

Database and Methodology

The study was conducted in Jharkhand based on both primary and secondary data. According to the secondary information kitchen gardening is widespread in different rural panchayats in Gumla district of Jharkhand (Anonymous, 2017). Thus, Gumla distinct of Jharkhand was selected purposively for in-depth analysis of this study. In the next stage, the list of rural panchayats with concentration of kitchen garden was collected and categorised into two groups i.e. high and low concentration of kitchen garden. Then two panchayats i.e., one each from high and low concentration were selected randomly. In the next stage, the list of villages of the selected gram panchayats was collected. Then two villages from each panchayat were selected randomly. The list of households of the selected villages was collected and sub-divided into two groups i.e. having kitchen garden and without kitchen garden. Finally, 50 households (25 with kitchen garden and 25 without kitchen garden) from each village were selected randomly. Thus, 200 households were selected as the ultimate sample unit of the study.

Variable	**Description**
Calorie intake (Dependent variable)	Amount of daily calorie intake by the household members
Kitchen Garden	Household with kitchen garden; 1 = household with kitchen garden, 0 = household without kitchen garden
Age	Age of household members
Education	Years of schooling of household members
Primary	Up to 4 years of schooling.
Basic	5 to 9 years of schooling.
Secondary & above	10 and above years of schooling
Family size	Number of household members
Male members	Number of male members in a household
Female members	Number of female members in a household
Household with young kids	A household with younger aged children; 1 = The household has at least one child below the specified age. 0 = The household does not have any children below the specified age.
Household Income	Household income per month (in Rupees), derived from income of all members of the household.
Land holdings	Total amount of cultivable land
Kitchen garden area	The area of a kitchen garden within a household. It is the designated space within the household premises

Simple statistical tools such as Pearson's product moment correlation and student-test were used to analyse data. The present study estimates the equation of income expenditure by employing the ordinary least square (OLS) regression model, which can be specified as follows:

$$lnY_i = \alpha + \beta_i X_{ij} + \varepsilon_i$$

Where, lnY_{ij} represents the log of percapita daily calorie intake of i^{th} household. X_{ij} denotes a set of variables affecting daily calorie intake of household members which includes various household socio-economic and demographic characteristics. α is the constant term. β (β_0, β_1, β_2, ..., β_n) are the regression coefficients representing the impact of the independent variables on the dependent variable, ε represents the error term or residual, which accounts for the variation in the dependent variable that is not explained by the independent variables. The regression analysis aims to estimate the values of the regression coefficients (β_0, β_1, β_2, ..., β_n) by minimizing the sum of squared differences between the predicted values of the dependent variable and the actual observed values. This estimation process is typically carried out using statistical techniques such as least squares estimation.

The correlation coefficient is a statistical measure that quantifies the strength and direction of the linear relationship between two variables. The most commonly used correlation coefficient is the Pearson correlation coefficient. The mathematical procedure to calculate the Pearson correlation coefficient is as follows:

Calculate the mean (average) of each variable. Let's denote the means as $\bar{x}$ (for the first variable) and $\bar{y}$ (for the second variable). For each observation, subtract the mean of its respective variable from the value of that variable. These differences are called deviations. Denote the deviations for the first variable as $(x - \bar{x})$ and for the second variable as $(y - \bar{y})$. Multiply the deviations of the first variable $[(x - \bar{x})]$ with the deviations of the second variable $[(y - \bar{y})]$. Calculate this product for each observation and sum up all the products. Calculate the standard deviation for each variable. Denote the standard deviation for the first variable as σ_x and for the second variable as σ_y. Divide the sum of the products of deviations (calculated in step 4) by the product of the standard deviations ($\sigma_x \times \sigma_y$). This yields the Pearson correlation coefficient (r). Mathematically, the formula for calculating the Pearson correlation coefficient (r) is:

$$r = \Sigma\left[\left(x - \bar{x}\right) \times \left(y - \bar{y}\right)\right] / \left(n \times \sigma_x \times \sigma_y\right)$$

where $\sum$ denotes the sum of, $(x - \bar{x})$ represents the deviation of the first variable, $(y - \bar{y})$ represents the deviation of the second variable, n represents the number of observations, σ_x represents the standard deviation of the first variable, and σ_y represents the standard deviation of the second variable.

The resulting correlation coefficient (r) ranges between -1 and +1. A positive value indicates a positive linear relationship, a negative value indicates a negative linear relationship, and a value close to zero indicates a weak or no linear relationship between the variables. It is important to note that correlation does not imply causation, and it is always essential to consider other factors and conduct further analysis to establish the nature and significance of the relationship between the variables.

Regression analysis is a statistical technique used to model and investigate the relationship between a dependent variable and one or more independent variables. It allows researchers to examine how changes in the independent variables are associated with changes in the dependent variable, making it a valuable tool for prediction, explanation, and hypothesis testing. The general concept of regression analysis involves fitting a regression model to the data, which describes the functional relationship between the dependent variable and the independent variables. The goal is to estimate the coefficients of the regression model that best represent the relationship and provide insights into the impact of the independent variables on the dependent variable. There are various types of regression analysis, but the most commonly used is linear regression. Linear regression assumes a linear relationship between the independent variables and the dependent variable. The present study estimates the equation of education expenditure by employing the ordinary least square (OLS) regression model, which can be expressed as follows:

$$lny_i = \alpha + \beta_i X_{ij} + \varepsilon_i$$

where lnY_{ij} represents the log of percapita daily calorie intake of i^{th} household. The education expenditure comprised of different staple foods. X_{ij} denotes a set of variables affecting daily calorie intake of household members which includes various household socio-economic and demographic characteristics. α is the constant term. β (β_0, β_1, β_2, ..., β_n) are the regression coefficients representing the impact of the independent variables on the dependent variable. ε represents the error term or residual, which accounts for the variation in the dependent variable that is not explained by the independent variables. The regression analysis aims to estimate the values of the regression coefficients (β_0, β_1, β_2, ..., β_n) by minimizing the sum of squared differences between the predicted values of the dependent variable and the actual observed values. This estimation process is typically carried out using statistical techniques such as least squares estimation. The descripition of variables are furnished below:

Variable Name	Description
Calorie intake (Dependent variable)	Amount of daily calorie intake by the household members
Kitchen Garden	Household with kitchen garden; 1 = household with kitchen garden, 0 = household without kitchen garden
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Land holdings	Total amount of cultivable land
Kitchen garden area	The area of a kitchen garden within a household. It is the designated space within the household premises

RESULTS AND DISCUSSION

Table 1: Area, production and productivity of vegetables in Jharkhand

Year	Area (000 ha)	Production (000 tons)	Productivity (ton/ha)
2000-01	149.8	2109.5	14.00
2001-02	158.5	1736.3	10.95
2002-03	118.2	1300.1	11.00
2003-04	110.6	1197.2	10.82
2004-05	223.6	3394.9	15.18
2005-06	224.2	3401.3	15.17
2006-07	223.6	3394.9	15.18
2007-08	238.9	3639.7	15.24
2008-09	232.6	3698.5	15.94
2009-10	229.6	3727.0	16.23
2010-11	259.5	4112.4	15.80
2011-12	261.2	3902.6	14.90
2012-13	321.5	4325.4	13.50
2013-14	313.6	4238.1	13.51
2014-15	316.7	4279.3	13.51
2015-16	264.2	3373.0	12.77
2016-17	293.5	3370.0	11.48
2017-18	289.2	3475.2	12.02
2018-19	290.1	3508.3	12.09
2019-20	295.9	3595.0	12.14
2020-21	310.6	3792.2	12.21
2021-22	311.7	3965.1	12.72

Source: *(1) Jharkhand Economic Survey, Government of Jharkhand, (2) www.ceicdata.com, Department of Agriculture & Farmer's Welfare, Govt. of India.*

Jharkhand with its diverse agro-climatic conditions is much suited for the development of horticulture based economy with ample scope of growth. The state of Jharkhand may be divided into six horticultural sub zones as far as the ecological specialties and suitability of different horticultural crops is concerned. The wide product base, high volume of round the year production, strategic geographical location, abundant sunlight and high domestic demand inevitably vegetables can be one of the major thrust area of development. The horticultural produce including off-season vegetables from the state are being preferred in the neighbouring states for their quality and time of availability. In view of the dismal productivity of food crops and the geographical situation of the state, horticulture, is no more an option but has become a compulsion in the state. Jharkhand has

enormous potential for cultivation of a number of horticultural crops; however, the productivity is low. Area, production and productivity of vegetables in Jharkhand presented in Table 1 shows that vegetables are grown in an area of 311.7 thousand hectares with production of 3965.1 thousand tons in 2021-22. Major vegetables grown in Jharkhand are potato, onion, brinjal, tomato, cole crops, pea, okra, chilly and cucurbits. The productivity of vegetables in the state is 12.72 ton/ha. North Eastern Plateau region has maximum production as well as highest productivity of vegetables. The region also has the advantage of being an important sourcing hub for consumption markets like Patna, Kolkata and other parts of West Bengal. Ranchi has the largest production of vegetables in Western Plateau Region and has round the year cultivation of vegetables like cauliflower, french bean and brinjal.

The region ranks 2nd as a whole in terms of total production of vegetables in Jharkhand. South Eastern Region, being relatively smaller and fraught with soils with high iron content, overall does not record a high production. However, there are areas like Patamda and Chandil which are highly suitable for vegetable cultivation and contribute significantly to the region's total vegetable production. Most of the Vegetables grown in the State have good acceptability in fresh retail markets. Tomato and potato are produced in abundance in Jharkhand which often causes glut situation leading to distress sale and high wastage as the surplus produce cannot be converted in to value added products. Because of the geographical diversity, Potato is available with an almost year round supply. Thus, all the factors combine to give the State an envious potential in providing the necessary requirements for setting up of vegetable processing units. The unique location also provides a ready and serviceable market for the processed items.

Table 2: Relationships between socio economic variables and daily calorie intake

Variables	Correlation Coefficient	p-value
No. of below 15 age group members	-0.269*	0.000
No. of 16-35 age group members	-0.105*	0.035
No. of 36-55 age group members	0.119*	0.017
Above 55 age group members	-0.104*	0.037
Illiterate Family Members	0.029	0.563
Primary Education Family Members	-0.004	0.943
Basic Education Family Members	-0.123*	0.014
Secondary Education Family Members	-0.074	0.139
Illiterate Family Members	-0.056	0.269
Household member	-0.288	0.000
Male members	-0.018	0.714
Female members	-0.185*	0.000
No. of children	-0.272*	0.000
Income	0.015	0.895
Land owned	0.051	0.307

Results of correlation analysis presented in Table 2 reveal the relationship between various variables and the daily calorie intake. The "Correlation Coefficient" column represents the strength and direction of the correlation between each variable and the dependent variable. The "p-value" column indicates the statistical significance of the correlation coefficient. Among the demographic variables, the number of household members below 15 age group shows a significant negative correlation (-0.269*) with the dependent variable. Similarly, the number of members in the 16-35 age group and above 55 age group also exhibit weak negative correlations (-0.105* and -0.104* respectively), albeit with lower significance. Conversely, the number of members in the 36-55 age group demonstrates a weak positive correlation (0.119*), indicating a potential association with the dependent variable. These findings suggest that households with a higher proportion of younger or older members tend to have lower values for daily calorie intake.

Table 3: Regression results

Explanatory Variables	Coefficients	t-value
Kitchen garden	0.067*	1.927
No. of children	-0.082*	-2.531
No. of adult male	-0.048*	-2.030
No. of adult female	-0.079*	-2.970
No. of below 15 age group members	-0.058*	-1.900
No. of 16-35 age group members	-0.014	-0.495
No. of 36-55age group members	0.037*	1.985
Above 55 age group members	-0.025	-0.698
Illiterate Family Members	0.050*	2.632

Primary Education Family Members	0.061*	3.062
Basic Education Family Members	-0.009	-.291
Secondary Education Family Members	0.027**	1.652
Income	-0.054*	-2.206
Land holdings	0.009**	1.773
SC	-0.024	-0.247
ST	0.123**	1.808
Intercept	7.733*	122.897
Adjusted R^2	0.431	0.633

Note: ** Statistically significant at the 0.01 level; ** at the 0.05 level of significance*

Source: *Author's own calculations*

Regarding education levels, the presence of family members with basic education shows a significant negative correlation (-0.123*) with the dependent variable, suggesting that households with a higher number of individuals with basic education tend to have lower values in the dependent variable. Other educational categories, such as illiterate, primary education, and secondary education family members, do not demonstrate significant correlations with the dependent variable. Moreover, the number of household members overall exhibits a strong negative correlation (-0.288) with the dependent variable, indicating that larger households tend to have lower values in the dependent variable. Female members and the number of children also display significant negative correlations (-0.185* and -0.272* respectively), suggesting that households with more female members and children tend to have lower values in calorie intake.

Additionally, the number of children (-0.272*) shows a significant negative correlation, indicating that households with a higher number of children tend to have lower values for the dependent variable. Conversely, variables such as income (0.015) and land owned (0.051) exhibit weak positive correlations, suggesting a minimal relationship with the dependent variable. On the other hand, variables such as income and land owned do not demonstrate significant correlations with the dependent variable, as their correlation coefficients are close to zero and their p-values are above the conventional threshold.

The regression results presented in Table 3 indicate the relationships between the daily calorie intake and various explanatory variables in a semi-log regression model. The coefficients and t-values provide information on the magnitude and statistical significance of these relationships. Among the explanatory variables, having a kitchen garden has a coefficient of 0.067 with a t-value of 1.927. This indicates that having a kitchen garden may have a positive significant impact on daily calorie intake. The number of children in the household has a coefficient of -0.082 with a t-value of -2.531. This indicates that an increase in the number of children is associated with a decrease in the daily calorie intake, and the effect is statistically significant. Similarly, the number of adult males and adult females in the household also have negative coefficients (-0.048 and -0.079, respectively) with significant negative t-values, implying that an increase in the number of adult males or adult females is associated with a decrease in the log of daily calorie intake. The number of below 15 age group members has a coefficient of -0.058 with a t-value of -1.900, suggesting a negative but statistically significant relationship with the daily calorie intake. Age group of 36-55 exhibits positive effect on calorie intake. The number of individuals in the age group of 16-35 and above 55 does not exhibit statistically significant relationships with the daily calorie intake. Thus in below 15 years and 36-55 age group we can reject the null hypothesis and accept the alternative hypothesis.

Regarding education, households with illiterate family members have a coefficient of 0.050 with a t-value of 2.632, indicating that illiteracy in the family is associated with a higher daily calorie intake. Moreover, households with family members having primary education, secondary education, and above education also show positive coefficients with statistically significant t-values, suggesting that higher levels of education within the family are associated with daily calorie intake. Other variables, such as land holdings, SC (scheduled caste), and ST (scheduled tribe), show coefficients and t-values suggesting varying degrees of association with the log of daily calorie intake, but not all are statistically significant. The value of adjusted R^2 is 0.431 which indicates that the model explains approximately 43.1 per cent of the variation in the dependent variable, suggesting a moderate level of explanatory power.

CONCLUSION

It can be concluded from the foregoing discussion that Jharkhand with its diverse agro-climatic conditions is much suited for the development of horticulture based economy with ample scope of growth. The state of Jharkhand may be divided into six horticultural sub zones as far as the ecological specialties and suitability of different horticultural crops is concerned. It has been found that the number of household members overall exhibits a strong negative correlation with the dependent variable, indicating that larger households tend to have lower values in the dependent variable. Female members and the number of children also display significant negative correlations suggesting that households with more female members and children tend to have lower values in calorie intake. Additionally, the number of children shows a significant negative correlation, indicating that households with a higher number of children tend to have lower values for the dependent variable. Conversely, variables such as income and land owned exhibit weak positive correlations, suggesting a minimal relationship with the dependent variable. On the other hand, variables such as income and land owned do not demonstrate significant correlations with the dependent variable, as their correlation coefficients are close to zero and their p-values are above the conventional threshold. In summary, the regression results suggest that factors such as the number of children, adult males, adult females, illiteracy, and levels of education within the family are significantly associated with the log of daily calorie intake. However, the presence of a kitchen garden does not exhibit a statistically significant relationship. The coefficients and t-values provide insights into the direction and significance of these relationships, offering valuable information for understanding the determinants of daily calorie intake.

REFERENCES

Anonymous. 2015-16. National Family Health Survey-4, International Institute for Population Sciences (Deemed University). Mumbai.

Anonymous. 2017. Adapted from an article originally published on VillageSquare.in. Subscribe to VillageSquare's weekly update on the website *for more stories from rural India.*

Food and Agriculture Organization. 2005. Building on Gender, Agro-biodiversity and Local Knowledge. Rome: FAO.

Food and Agriculture Organization. 2010. Improving nutrition through home gardening. (FAO). Available from: http://www.fao.org/ag/agn/nutrition/household_gardens_en.stm.

Gaur, M. 2022. India's undernourished population drops to 224.3 million as per UN report, Current Affairs, 8th July.

Halder, P. and Pati, S. 2011. A need for paradigm shift to improve supply chain management of fruits & vegetables in India. *Asian J. Agric. Rural Dev.,* **1**: 1–20.

Landauer, K. and Brazil, M (eds.). 1985. Tropical Home Gardens. Selected papers form an international workshop at the Institute of Ecology, Padjadjaran University, Indonesia, United Nations University Press, Japan.

Marsh, R. 1996. Household Gardening and Food Security: A Critical Review of the Literature. Nutrition Programmes Service, Food and Nutrition Division, FAO, Rome.

Rehman, B., Faiza, M., Qaiser, T., Khan, M.A., Ali, A. and Rani, S. 2013. Social attitudes towards kitchen gardening. *J. Soc. Sci.,* **2**: 27–34.

Talukder, A.., Sapkota, G., Shrestha, S., De Pee, S. and Bloem, M.W. 2004. Homestead food production program in central and far-western Nepal increase food and nutrition security: An overview of program achievements, *In* R. Gautam, B. Sthapit, and P. Shrestha, eds., Home gardens in Nepal, proceedings of national workshop on "Enhancing the contribution of home garden to on-farm management of plant genetic resources and to improve livelihoods of Nepalese farmers: lessons learned and policy implications", Pokhara, Nepal.