

RURAL HOUSEHOLD'S PARTICIPATION IN NON-FARM ECONOMIC ACTIVITIES IN INDIA USING BINARY LOGISTIC REGRESSION MODEL

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Abstract:

Non-farm sectors have gradually evolved to play a major role in Indian economy. Its expansion arose from the structural transformation of the economy from agrarian to industrial, and then to a service-dominated environment, with occupational distribution changing in lockstep. Though, slightly different in Indian scenario where services preceded industries. The present work focused on the understanding the determinants of growth of rural non-farm sector employment in India taking the case of Bihar using 442 sample households. Binary Logistic Regression Model has been used to study the role of age, education, landholding, and source of income in motivating the household to take up non-farm employment. The results indicate, land holding and source of income to be significant while age and education are insignificant variables.

Keywords: Employment, Non-farm Sector, Rural, Structural Transformation

JEL Code: E24, P25, R11

1. Introduction

Non-farm sectors have gradually evolved to play a major role in Indian Economy. In the period after 1970's attentions had started to be diverted to the non-farm sector and there occurred a shift in employment away from agriculture towards secondary and tertiary sector. The rural non-farm sector growth emerged out of economic transformation from an agricultural to industrial and finally a service dominant environment and the occupational distribution corresponding this change in similar way [Fisher (1939), Clark (1940)]. This however did not hold true to many developing nations. In terms of rural sector, rural population of developing countries of Latin America, Asia and Africa have heavily depended on incomes from non-farm sector. 35% of rural household incomes in Africa, and 50% in Asia and Latin America resulted from rural non-farm employment in mid 2000s (Reardon, Stamoulis, and Pingali, 2007). Apparently, the transformation had been slow for Asian countries while the pace was faster for African countries (Headey, Bezemer and Hazell, 2010).

In India large-scale urban manufacturing sector was unable to absorb the surplus labour force resulting in much attention getting diverted to rural non-farm sector particularly to generate income and employment (Chakrabarti and Kundu, 2009). Overall, aggravated unemployment and underemployment problem in rural area, minimal support from Indian industrial sector along with ever increasing labour-force, paved the way for

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generating new employment avenues and hence rural non-farm sector came in focus (Sardana, Manocha and Gangwar, 1995). Behera (2015) emphasized on the need to focus particularly on rural non-farm generation to match the pace at which the surplus labour is moving out of agriculture because major population in India are residing in rural areas and would eventually reduce the cost of migration. Further, generation of more non-farm employment is needed to facilitate in achieving the goal of inclusive growth (Mehrotra, Parida, Sinha and Gandhi, 2014). Thus, employment diversification became the long-term strategy to create non-farm avenues of income and employment for rural poor (Chadda, 1993).

At present, according to the latest Periodic Labour Force Survey (PLFS) Report (2019-20), around 39 percent of rural workforce are engaged in non-farm sector. Evidently, agriculture continues to be an important economic activity with a large population indulged in agriculture and allied activities, it has no longer been the only dependence as a primary source of livelihood for a large majority of rural population. The paper is divided into five sections where the first section is the introduction. The introduction is followed by the review of past literatures and the data source and methodology used for the study. The last two sections elaborate on results of the regression analysis and the conclusion.

2. Review of literature

The non-farm sector is heterogenous in nature and includes all economic activities i.e. mining and quarrying along with other secondary and tertiary sector activities other than agriculture, livestock, fishing and hunting (Lanjouw and Lanjouw, 2001). This would eliminate crop production as well as allied agriculture activities from the non-farm sector. Non-farm sector has been more comprehensively explained by Jha (2005) to include “mining and quarrying, household and non-household manufacturing, processing, repair, construction, trade and commerce, transport and other services in villages and rural towns undertaken by enterprises varying in size from household own-account enterprises to factories.”

Overall, this section reviews the existing literature on different aspects of RNFE. A descriptive review of literature on RNFE has been undertaken in two broad sub-headings that begins with the theoretical background followed by describing different factors affecting growth of rural non-farm employment.

Revisiting the Theories

In order to get the theoretical understanding about employment and related issues, the need is to review several development and growth models. The earlier theories emphasized on employment, but it was during 1950s to early 1970s, theorists focused on structural change in describing the development process. They focused on reallocation of labour from the agricultural sector to the industrial sector as the key source for economic growth. W. Arthur Lewis (1954) and Fei-Ranis (1964) have put forward the dual economy model. These models are concerned with economic growth through transfer of surplus labour from the traditional sector to the modern sector which is determined by the rate of capital accumulation. The process continues till the surplus labour in the traditional sector is exhausted and the two sectors start competing for labour.

Jorgenson's Neo-Classical Model of Dual Economy (1961) deals with labour mobility from traditional sector (agricultural) to modern sector (manufacturing) as a result of agriculture surplus. This surplus makes labour free from the land for employment in the manufacturing sector resulting in the growth of labour force at a rate equal to the growth rate of agriculture surplus. As this surplus begins to diminish, the labour force declines in manufacturing sector and returns to agriculture sector. Manufacturing sector output drops to zero and the process of capital accumulation comes to a halt.

Ragner Nurkse (1953) postulated that disguised unemployment in an underdeveloped country can be a source of capital formation. According to him, hands would move from the village to the new construction sites; with the hand would also move mouths; and with less mouths to feed in the village, the possibility would be created for food to move out of the village to supply the needs of other workers. Thus, a process of economic development is generated using disguised unemployment.

Harris and Todaro (1970) put forward the H-T Model of Migration and Unemployment. The Todaro Paradox observes the link between urban unemployment and migration flows. In the HT model, migration is a disequilibrium phenomenon. Equilibrium is sub-optimal one which is characterised by unemployment. These models show how a labour abundant country can bring about rapid economic development using its labour resources. Given this background, the present study would focus on different dynamics of non-farm employment sector in Bihar.

Factors Determining Non-farm Employment

A number of Indian studies suggested growth of agriculture is likely to stimulate growth and development of the RNFE. An important contribution in this regard is Mellor's (1976) growth linkage theory that found agriculture growth to be the driver behind the growth of RNFS.

Parthasarathy, Shameem and Reddy (1998) pointed out that the growth of rural non-farm employment has been increasingly attributed to the production and consumption linkages that agricultural growth created under the impetus of green revolution.

Similarly, Hazell and Haggblade (1991) also stressed on the importance of both consumption and production linkages between farm and non-farm growth. Their study investigated that the growth of RNFE resulted primarily due to agriculture growth which led to rise income levels of the farmers and daily wages of agriculture labourers, resulting in an increased demand for non-farm goods and services.

Lanjouw and Shariff (2002) have also found that growth of certain non-farm sub-sectors is strongly associated with higher agricultural wage rates. Dev (1990) and Papola (1994) established that growth of RNFE is dependent on agricultural productivity. Commercialisation and technological advancement in agriculture have also provided a pull to the RNFE (Rajashekar and Biradar, 1998).

Apart from the agriculture lead growth, gender, caste and age, landholding, education, urbanisation, rural infrastructure, income, rural credit facility and accessibility, population densities, liberalization and globalization, connectivity with urban centers, government expenditures are some other factors contributing to the growth of RNFE

[Lanjouw and Shariff, (2002); Hazell and Haggblade (1991); Chandrasekhar, (1993); Unni (1991); Mecharla (2002); Srivastav and Dubey (2002); Ranjan (2009); Jatav and Sen (2013)].

The understanding from the existing literature, makes the need to investigate the factors leading the households to undertake non-farm employment. Here we have concentrated on four individual and household level variables to serve our purpose. Thus, the main objective of the present study is to examine the impact of age, education, landholding, and household's source of Income in the decision of household's participation in rural non-farm employment.

Hence, the study considered Bihar as the case study firstly because it is one of the fastest growing states of India having double digit growth (in terms of GDP growth) but remained stuck in the grim of backwardness and secondly its agricultural workforce has significantly decreased which pushed the labour force to migrate to urban centers.

3. Impact of Non-Farm Development on Farm Employment in India

Guisan(2021) presents an international comparison of development, employment and productivity in India, in comparison with China and several OECD countries, for the period 1950-2020. She finds that the evolution of the period 2002-2019 has confirmed the results of the model estimated by Guisan(2002) regarding the diminution of Farm Employment. The article by Guisan(2021) also analyzes the impact of the educational level of population and the advancements in life expectancy and other indicators of quality of life in India.

That econometric model, estimated with a pool of India and China for the period 1965-2002, in order to diminish multicollinearity showed homogeneity of coefficients and a high goodness of fit, with a significant negative effect of the increases of Non-Farm Employment and Non.Farm Real Income on Farm Employment.

After a maximum of 238 million workers of Indian Agriculture in year 2005, the figure diminished to 200 million, in this sector, in year 2019 and 184 in year 2. The increase of industrialization and development of Services has implied an increase of real income and employment in Non Agricultural activities, evolving from 187 million in year 2005 to 270 in year 2019 and 254 in year 2020. The diminution of year 2020 has been caused by the problems of the pandemic Covid-19, and it is expected that Non Farm Employment will increase in the next years and that increase will have positive impacts on productivity per worker both in Farm and Non-Farm activities.

Behera(2015) present the evolution of the share of employment and income by sector in India for the period 1972-2010, with a diminution of the share of Agriculture from 74.58% to 51.76% in Employment and from 41.01% to 14.5% in Income.

Guisan and Exposito (2006) analyzed employment by sector and regional development in India and China. They found great differences in real income per capita among Indian regions. These results suggest the convenience of increase sustainable development in industry and services also at regional level.

4. Binary Logistic Regression Model of Bihar

4.1. Data Source and Methodology

The present study makes use of household-level data through primary survey to understand the state of rural non-farm sector in one of the developing State, Bihar. The primary data has been collected from the study area, that is Bihar. At the first stage whole state was divided into four agro-climatic zones i.e. Northern West zone, Northern East zone, Southern East zone and Southern West zone. At the second stage one district each was purposively selected from the four zones based on the level of rural population. At the subsequent stage one block from each district and then one village from each block was selected. A total of 442 samples were collected from the selected villages. The detailed description is presented in the table below:

Table 2: Description of the Sample Taken

Zone	District*	Block**	Village***	Sample Size
I	Muzaffarpur	Kurhani	Madhopur Susta	164
II	Purnia	Dagarua	Mathaur	156
III	Bhagalpur	Colgong	Makaspur	57
IV	Gaya	Mohanpur	Kenari	65

* One district each selected from the four broad agro-climatic zones on the basis of higher non-farm employment ratio.

** one block from each district selected based on their proximity to various industrial sites, educational institutions, growing infrastructure which directly or indirectly influenced people to be engaged in non-farm sector.

*** one village each selected based on distance criterion from the urban center which directly or indirectly influenced people to be engaged in non-farm sector.

Methodology

The data from the sample households were collected using a well-structured pre-tested questionnaire. The collected data was coded and entered into Statistical Package for Social Science (SPSS ver. 21) for analysis. The model specification is stated under:

$$\frac{\hat{Y}}{1 - \hat{Y}} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \cdots \cdots + \beta_i X_i + u$$

Here the dependent variable (Y) presents the sector of employment of the Household Head (HHH) and where $\hat{Y}$ is the probability that the HHH would be engaged in non-farm sector. the the dependent variable is a binary variable taking the value 0 if the HHH is engaged in farm sector and 1 otherwise.

β_i are the coefficients and the independent variables (X_i) are the determinants that affects the heads decision to take farm or non-farm employment.

For the purpose of the study, we have taken age, education, landholding and household's source of Income as independent variables. Here u_i represents the error term capturing all the exogenous variables that may influence the model.

Table 3 gives the detailed description of the dependent and the independent variables.

Table 3: Description of Variable used in the Binary Logistic Regression Model

Variable	Code Description
Dependent Variable (Y)	
HHH Employed in Non-farm Sector	if the HHH is engaged in farm activity = 0 if the HHH is engaged in non-farm activity = 1
Independent Variables (X_i)	
Age of the HHH (X ₂)	Below 35yrs=1, 35yrs-49yrs=2, 50yrs and above=3
Size of operational landholdings of the HH (X ₄)	Landless=1, With Land=2
Level of Education of the HHH (X ₅)	Below Primary=1, Primary and Above=2
Source of Income (X ₈)	Income from Farm=1, Income from Non-Farm=2, Income from both Farm and Non-Farm=3

4.2. Results and Discussion

The results of the regression analysis have been presented in Table 4 and Table 5. The results shows that our model correctly predicts more than 85 per cent of the cases. Based on the model summary and the Hosmer-Lemeshow goodness-of-fit statistic our model adequately describes the data. Thus, the model that we have used in the study is a good fit.

Table 4: Classification Table^a

	Observed		Predicted		
			HHH Employed in Farm or Non-farm Sector		Percentage Correct
			Farm	Non-Farm	
Step 1	HHH Employed in Farm or Non-farm Sector	Farm	123	22	84.8
		Non-Farm	42	255	85.9
	Overall Percentage				85.5
a. The cut value is .500					

Understanding the binary logistic regression results presented in Table 5, out of the four independent variable two variable turned significant while the other two were not significant. Age and education are insignificant while landholding and source of income are significant variables.

We have hypothesised that young labour force is more likely to participate in the more remunerative non-farm sector. More educated labour enters more productive and remunerative non-farm employment. In terms of land holding, we have hypothesised a negative relation with the possibility of the head of the household to take up non-farm employment opportunities. The last variable that is source of income whether from farm, non-farm or mixed sources determine the likelihood of the head to join the non-farm sector.

Table 5: Binary Logistic Regression Result (N=442)

Variables in the Equation	B	S.E.	Wald	Df	Sig.	Exp(B)
Age of the HHH (Reference= Below 35yrs)	-	-	1.526	2	.466	-
Age of the HHH (35yrs to 49yrs)	-0.549	0.456	1.451	1	.228	0.577
Age of the HHH (50yrs and above)	-0.487	0.463	1.107	1	.293	0.614
Level of Education (Reference = Up to Primary)	0.138	0.328	0.176	1	.675	1.148
Operational Land Holding (Reference = Landless)	-1.258	0.358	12.327	1	.000	0.284
Source of Income (Reference= Income from Farm)	-	-	53.894	2	.000	-
Source of Income (1)	7.620	1.175	42.054	1	.000	2037.712
Source of Income (2)	3.795	1.031	13.560	1	.000	44.469
Constant	-2.750	1.073	6.563	1	.010	0.064
Model Summary						
-2 Log Likelihood	Cox and Snell R ²		Nagelkerke R ²		Hosmer and Lemeshow Test χ^2	
250.232 ^a	0.503		0.701		6.367	
a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.						

Based on the data in the result table we partially accept the hypothesis at 5 per cent level of significance. Out of the significant variables, land holding by the household shows a negative relation with the employment in the rural non-farm sector while source of income has positive relation.

A negative relation between household's operational land holding and the possibility of the head entering the rural non-farm sector imply that those with higher level of land asset have less possibility of joining non-farm employment. Kumar, Kumar, Singh & Shivjee (2011) also established a negative relation between size of land and probability of getting involved in non-farm sector at the India level. The odd ratio too suggests that those with some amounts of land are less likely to enter non-farm employment. Similarly, households with either mixed income source or single non-farm earnings,

their heads are more likely to get engaged in rural non-farm employment than those with only farm income.

Though insignificant, the odd ratio of the age variable shows that labour at higher age groups is less likely to participate in the non-farm sector compared to those belonging to less than 35 years age group. For Abraham (2011), age is an important determinant of employment in the non-farm sector. Similarly divulging in the odd ratios for education suggests that the head with education above primary level are more likely to participate in the rural non-farm employment. In fact, individuals or labour with better education and possess required skills enable them to get involved in the non-farm sector employment (Ranjan, 2009).

5. Conclusion

Overall, the study is an attempt to understand the role of demographic factors like age and education and economic factors like land holding and income on the rural households leading them to non-farm employment. The present study is an empirical analysis based on primary survey of selected villages in Bihar. The binary logistic regression results present age and education as insignificant variables while land holding and income as significant variable. Thus, partially accepting our hypothesis. Land holding and income are important determinant in rural household in deciding to undertake farm or non-farm employment.

Based on our results, mostly landless labours are joining the non-farm sector that can be due to distress that they are taking non-farm employment. There is a need to make non-farm sector a more vibrant sector for rural employment options in Bihar. With stagnating and low technology driven agriculture, a more inclusive growth in the state can only be achieved by developing the rural non-farm opportunities. Getting involved in low paid, less productive non-farm sector would only lead to further casualization of labour market. Further better education infrastructure and vocational training would increase the possibility of the rural labour to enter regular wage and salary employment.

Public expenditure and government policy initiative is core to the development of rural non-farm employment. The policy measures should be based on the local conditions of the state and provide equal opportunities to all. MGNREGA is one such program aimed to provide gainful employment opportunities in rural areas, but the need is better quality employment opportunities for all.

References

- Abraham, V. (2011). *Agrarian Distress and Rural Non-Farm Sector Employment in India*. MPRA Paper No. 35275.
- Behera, D. K. (2015). Sectoral Occupational Transformation in India: Old Concerns and New Directions. *Applied Econometrics and International Development*, Euro-American Association of Economic Development, 15(2), 197-212.
- Chadda G. K. (1993). Non-Farm Employment for Rural Households in India: Evidence and Prognosis. *The Indian Journal of Labour Economics*, 36(3), 296-327.

Chakrabarti, S. & Kundu, A. (2009). Rural Non-Farm Economy: A Note on the Impact of Crop-Diversification and Land Conversion in India. *Economic & Political Weekly*, 44(12), 69-75.

Chandrasekhar, C. P. (1993). Agrarian Change and Occupational Diversification: Non-agricultural Employment and Rural Development in West Bengal. *The Journal of Peasant Studies*, 20(2), 205-270.

Clark, C. (1940). *The Conditions of Economic Progress* London: Macmillan and Co., Limited.

Dev, S. M. (1990). Non-Agricultural Employment in Rural India: Evidence at a Disaggregate Level. *Economic & Political Weekly*, 25(28), 1526-1536.

Fei, C.H. John and Gustav Ranis (1964): Development of the Labor Surplus Economy: Theory and Policy, The Economic Growth Centre, Yale University, USA

Fisher, A.G.B. (1939). Production: Primary, Secondary and Tertiary. *The Economic Journal*, 15(1), 24-38.

Guisan, M.C. (2004). Employment and Real Income of Agriculture in India, China and OECD Countries: Econometric Models and Evolution 1950-2020. *The IUP Journal of Applied Economics*, IUP Publications, Vol. 5, pages 7-17, Hyderabad, India.

Guisan, M.C. (2021). Employment by Sector and Development in India for 1950-2020 and International Comparisons with China and OECD Countries. *Applied Econometrics and International Development* Vol. 21-1.

Guisan, M.C, Exposito, P., 2006. "Production by sector in China, India and OECD Countries, 1985-2005," *Regional and Sectoral Economic Studies*, Vol. 6(2).

Harris R. and Todaro, Michael P. (1970). Migration, Unemployment and Development: A Two-Sector Analysis. *The American Economic Review*, 60(1), pp. 126-142.

Hazell, P., & Haggblade, S. (1991). Rural-urban growth linkages in India. *Indian Journal of Agricultural Economics*, 46 (4), 512–529.

Headey, D., Bezemer, D., & Hazell, Peter B. (2010). Agricultural Employment Trends in Asia and Africa: Too Fast or Too Slow?. *The World Bank Research Observer*, 25(1), 57-89.

Jatav, M., & Sen, S. (2013). Drivers of Non-Farm Employment in Rural India: Evidence from the 2009-10 NSSO Round. *Economic & Political Weekly*, 48(26), 14 – 21.

Jha, B. (2005). Rural Non-Farm Employment in India: A Co-ordinated Study. Agricultural Economics Research Unit, Institute of Economic Growth: Delhi.

Jorgenson, D. W. (1961), " The Development of a Dual Economy ", *Economic Journal*, 71, 309-334.

Kumar, A., Kumar, S., Singh, D.K. and Shivjee. 2011. Rural employment diversification in India: Trends, determinants and implications on poverty. *Agricultural Economics Research Review* 24(2):361-372.

Lanjouw Jean O., & Lanjouw, P. (2001). The rural non-farm sector: issues and evidence from developing countries. *Agricultural Economics*, 26(1), 1–23.

Lanjouw, P., & Sheriff, A. (2002). Rural Nonfarm Employment in India: Access, Income and Poverty Impact. National Council of Applied Economic Research Working Paper Series No. 81, 1 – 56.

Lewis, W. A., (1954). “Economic Development with Unlimited Supplies of Labour”, The Manchester School, Vol. 22, No. 2, pp. 242-258.

Mecharla, P. (2002). Determinants of Inter-District Variations in Rural Non-Farm Employment in Andhra Pradesh: A District Level Data Analysis. PRUS Working Papers 13, Poverty Research Unit at Sussex, University of Sussex.

Mehrotra, S., Parida, J., Sinha, S. & Gandhi, A. (2014). Explaining Employment Trends in the Indian Economy: 1993–94 to 2011–12. *Economic & Political Weekly*, 49(32), 49–57.

Mellor, John W. (1976). The New Economics of Growth: A Strategy for India and the Developing World. Cornell University Press, Ithaca.

NSSO. (2021). Annual Report, PLFS 2019–20. New Delhi: Ministry of Statistics & Program Implementation, Government of India.

Nurkse, Ragnar. 1953. Problems of Capital Formation in Underdeveloped Countries. Oxford: Oxford University Press.

Papola, T. S. (1994). Structural Adjustment, Labour Market Flexibility and Employment. *Indian Journal of Labour Economics*, 37(1), 3-16.

Parthasarathy, G., Shameem & Reddy, B. S. (1998). Determinants of Rural Non Agricultural Employment: The Indian Case. *Indian Journal of Agricultural Economics*, 53(2), 139-154.

Rajasekhar, D., & Biradar, R. R. (1998). Rural Non-Farm Activities in Karnataka. Bangalore: Institute for Social and Economic Change (Mimeo).

Ranjan, S. (2009). Growth of Rural Non-Farm Employment in Uttar Pradesh: Reflections from Recent Data. *Economic and Political Weekly*, 44(4), 63-70.

Reardon, T., Stamoulis, K., & Pingali, P. (2007). Rural Nonfarm Employment in Developing Countries in an Era of Globalization. *Agricultural Economics*, 37, 173-183.

Sardana P. K., Manocha V., & Gangwar, A. C. (1995). Nature and Pattern of Changes in Rural Non-Farm Employment in Haryana. *Indian Journal of Agriculture Economics*. 50, 417-421.

Srivastav, N., & Dubey, A. (2002). Rural Non-farm Employment in India: Spatial Variations and Temporal Change. *Indian Journal of Labour Economics*, 45(1), 745-758.

Unni J. (1991). Regional Variations in Rural Non-Farm Agricultural Employment: An Exploratory Analysis. *Economic & Political Weekly*, 26(3), 109-122.

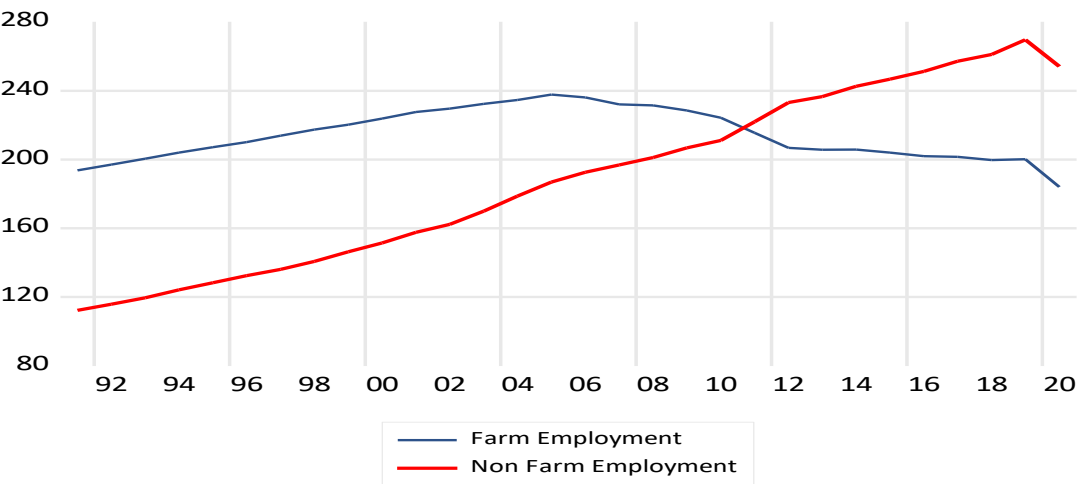
Annex:

Table A1. some indicators of Agricultural production in India. 1961-2011

Production of crop for various years (in Thousands of hectare)^[77]						
Crop	1961	1971	1981	1991	2001	2011
Rice	34694	34694	40708.4	42648.7	44900	44010
Wheat	12927	18240.5	22278.8	24167.1	25730.6	29068.6
Pulses	3592	2582.8	2388	2123.1	1650	1700
Oil seeds	486	453.3	557.5	557.5	716.7	1471
Sugar cane	2413	2615	2666.6	3686	4315.7	4944.39
Tea	331.229	358.675	384.242	421	504	600
Cotton	7719	7800	8057.4	7661.4	9100	12178

Source: FAO. <https://www.fao.org/faostat/en/#data/QC>

Table A2. Evolution of Farm and Non-Farm Employment in India



Source: Reproduced, with permission, from Guisan(2021). Elaboration from World Bank statistics.