Tropentag 2013, Stuttgart, Germany
September 17-19, 2013

Conference on International Research on Food Security, Natural Resource Management and Rural Development organised by the University of Hohenheim

Measurement of Farm and Non-Farm Employment Linkages: Empirical Insights from Three Villages in Bangladesh

Ranjit Sarkar[1], Sattar Mandal[2], Matthias Kleinke[3]

[1]Ministry of Local Government and Rural Development, Local Govt. Div., Bangladesh: ranjits1966@yahoo.com
[2]Bangladesh Agricultural University, Agricultural Economics, Bangladesh: asmandal11@gmail.com
[3]Rhine-Waal University of Applied Sciences, Life Sciences, Germany: Matthias.kleinke@hochschule-rehein-waal.de

Introduction

There is a growing evidence of non-farm activities in the income-generating portfolio of rural households across developing countries (Lanjouw and Stern, 1993; Estudillo and Otsuka, 1998). There are also positive linkages between farm and non-farm activities, which contribute to generation of additional employment in farm and non-farm sectors. In Bangladesh, agriculture is transforming from subsistence to commercialization, leading to various forms of backward and forward linkages between farm and rural non-farm sectors. The rapid expansion of modern rice technologies demands various services i.e. irrigation pumps, power tillers, rice transplanting and thresher machines, transportation and marketing services in a dynamic setting (Mandal, 2003).

Although there is a general agreement on the potential links between farm and non-farm sectors in the process of economic growth, it is important to understand the magnitude of such linkages between sectors (Haggblade, Hammer and Hazel, 1991). Several studies attempted to estimate the strength of farm and non-farm linkages from different perspectives i.e. production linkage, interrelationship amongst agricultural growth, industrial output and national income and backward and forward linkages incorporating rural non-farm sector (Rangarajan, 1982; Hazell & Haggblade, 1991). It is apparent that the past studies measured farm and non-farm linkages mainly using output and income variables, giving little or no consideration to labour time engaged in farm and non-farm activities. It is important to know how much employment of labour is generated in the non-farm activities if one unit of additional employment is created in the farming sector. The main objective of the present paper is to present the magnitudes of farm and non-farm employment linkages measured using farm survey data from Bangladesh.

Data and Methods of Estimation

The present study is based on the year-round primary data collected from 20 sample households in a cluster of three villages - peri-urban fringe, near rural town and near rural market - during the year 2007-08. The villages were selected following a stepwise approach giving emphasis on poverty incidence, intensity of farm related non-farm enterprises, and rural biasness. Data were collected for two high yielding varieties of rice - irrigated *Boro* rice grown in dry season (January to June) and rain- fed *Aman* rice grown in wet season (July- December).

Rural farm to non-farm backward employment linkage was measured as a ratio of direct and indirect non-farm employment to total farm employment created for the inter-cultural operation or input supplies for rice production. Rural farm to non-farm forward employment linkage effect was measured as a ratio of direct and indirect non-farm employment for rice post- harvest activities i.e. storing, processing and marketing to total employment in producing that amount of output with a specific land size and time period. Employment linkages were measured using the following formula:

Farm to Non-Farm Backward Employment Linkage

$$BEL_t = \frac{\sum_{i=1}^{n} Y_i + \sum_{i=1}^{n} Z_i}{\sum_{i=1}^{n} X_i}$$

Where, BEL_t is the backward employment linkage, X stands for the amount of labour (mandays) required for farm activities in producing rice, Y stands for the amount of labour or employment (mandays) required for direct backward non-farm activities in producing rice, Z stands for the amount of labour or employment (mandays) required for indirect backward non-farm activities in producing rice, i stands for number of activities ranges from 1 to n and t stands for time period (time generally considered as a crop season).

Farm to Non-Farm Forward Employment Linkage

$$FEL_t = \frac{\sum_{i=1}^{n} Y_i + \sum_{i=1}^{n} Z_i}{\sum_{i=1}^{n} X_i}$$

Where, FEL_t is the forward employment linkage, X stands for the amount of labour or employment (mandays) required for farm activities in producing rice, Y stands for the amount of

labour or employment (mandays) required for direct forward non-farm activities in producing rice, Z stands for the amount of labour or employment (mandays) required for indirect forward non-farm activities in producing rice, i stands for number of activities ranges from 1 to n, and t stands for time period (time generally considered as a crop season).

Total Employment Linkage = Backward Linkage + Forward Linkage

Discussion of Results

The estimated backward, forward and total linkages were 0.18, 0.43 and 0.61 for *Boro* rice and 0.14, 0.39 and 0.53 for *Aman* rice. For these two crops together, farm to non-farm total employment linkage coefficient was 0.58. This means that 100 man days of farm employment in rice production activities generated additional 58 man days of non-farm employment in various support services, processing and marketing activities (Table-1). As *Boro* rice, compared to *Aman* rice, required higher application of improved technology, and also gave higher yields, the employment linkages were found stronger for *Boro* rice than *Aman* rice.

The farm and non-farm employment linkages in rice production were strengthened through increased work time required for ploughing and land preparation, irrigation, transplanting, weeding, applications of manure, fertilizers and pesticides, harvesting and threshing, and carrying harvested rice home. Direct backward non-farm employment included farmers' time spent for collecting and applying inputs i.e. seeds, fertilizers, pesticides, diesel, irrigation, and tractor services for land preparation. Indirect backward non-farm employment was due to time spent by the input traders, irrigation pump and tractor operators, and input/output transporters. Direct forward non-farm employment was the time spent by the farmers for post- harvest activities i.e. threshing, cleaning, weighing and storing, carrying products to market. Indirect forward non-farm employment was for other's time spent for carrying paddy to husking mills, parboiling and drying paddy, milling, packing and marketing of cleaned rice.

Conclusions

The main conclusion is that the modern technology driven rice production system led to employment generation in various farm and non-farm activities in Bangladesh. The strong coefficients of employment linkages imply that more investment in intensification of rice-based farming system would not only improve food security at the farm level but it would also significantly increase productive non-farm employment opportunities. From national policy perspective, more research and development efforts should go into accelerating potential rural growth and non-farm sector development i.e. input delivery, marketing, farm mechanization, rural transport, and value chain development. This also requires special policy support so that farming sector development goes hand in hand with non-farm sector development.

Table 1. Farm to non-farm employment linkages for *Aman* and *Boro* rice and both rice crops

Mandays

Employment Status	***Aman***	***Boro***	**Total**
Employment in Farm sector	**112.31**	**144.32**	**256.63**
Direct Backward Employment	3.26	16.91	20.17
Indirect Backward Employment	12.83	8.95	21.78
Backward Employment	**16.09**	**25.86**	**41.95**
Farm to Non-Farm Backward Linkages	**0.14**	**0.18**	**0.16**
Direct Forward Employment	40.01	54.46	94.47
Indirect Forward Employment	3.42	7.95	11.37
Forward Employment	**43.43**	**62.41**	**105.84**
Farm to Non-Farm Forward Linkages	**0.39**	**0.43**	**0.41**
Direct Backward and Forward Employment	43.27	71.37	114.64
Indirect Backward and Forward Employment	6.25	16.9	33.15
Backward and Forward Employment	**59.52**	**88.27**	**147.79**
Farm to Non-Farm Total Linkages	**0.53**	**0.61**	**0.58**

Source: Field survey, 2007-08

References

Estudillo, J.P. and Otsuka, K. 1999. Green revolution, human capital and off-farm employment: changing sources of income among farm households in central Luzon, 1966-1994. *Economic Development and Cultural Change*, 47(3): 497-523.

Haggblade, S., J. Hammer, and P.B.R., Hazell, 1991. Modeling Agricultural Growth Multipliers, *American Journal of Agricultural Economics*, 73 (May): 36-374.

Hazell, P. and Haggblade, S.1991. Rural-urban growth linkages in India. Indian Journal of Agricultural Economics 46(4):515-529.

Lanjouw, P. and Stern, N. 1993. Markets, opportunities and changes in inequality in Palanpur, 1957-1984. *In:* A. Braverman, K. Hoff & J. Stigliz, eds., *The economics of rural organization: theory, practice and policy*. New York, USA, OUP.

M.A.S.Mandal, 2003. "Rural non-farm activities: diversity and implications for rural labour market in Bangladesh". *Employment and Labour market Dynamics*- A Review *of Bangladesh Development-2002*, Centre for Policy Dialogue, Dhaka, pp. 229-249.

Rangarajan, C., 1982. Agricultural Growth and Industrial Performance in India. Research Report 33, Washington D.C.: International Food Policy Research Institute.