PRINT: ISSN 0970-9274 ONLINE: ISSN 2456-6608
J Hum Ecol, 34(1): 23-28 (2011)
DOI: 10.31901/24566608.2011/34.01.04

Factors Affecting Rural Household Farm Labour Supply in Farming Communities of South Africa

Francis D.K. Anim

University of South Africa (UNISA), Department of Agriculture and Animal Health, College of Agriculture and Environmental Sciences, Florida Campus, P.O. Box 392, Pretoria, 0003, South Africa
Telephone: + 27 (0) 11 471 3231, FAX: + 27 (0) 11 471 2260, E-mail: animfdk@unisa.ac.za

KEYWORDS Farm Labour Supply. Resource-Poor. Elasticity. OLS Regression. South Africa

ABSTRACT This study investigated the socio-economic factors affecting the supply of labour for resource-poor rural household farmers of South Africa. Results indicate that rural household level variables that contribute positively to farm labour supply are farm operators' years of farming experience, gender of farm operator, farming type, cultivated land size, organizational structure of the farm, stock of farm machinery, extension services, and availability of farm inputs. Other household level variables that have significant but negative effects on the supply of farm labour are educational levels of households, whether the farm operator was raised on the farm or not, number of household members working off-farm, number of elderly people in the household, real wage rate, attitude towards technology, distance of the farm from the nearest town, and the location of the farm. It was recommended that further studies would be necessary to identify other macro as well as micro conditions such as national unemployment rates, land tenure issues, agro-ecological zones as well as the existence of micro climates for specific crops that need intensive labour during the peak seasons in some farming areas.

INTRODUCTION

Farm labour is a major source of employment opportunity for the rural labour force in South Africa. Data evince that there has been a steady decline of 25.1 percent in farm labour supply in South Africa since 1996 (Statistics South Africa 2000). A case study conducted by the Department of Agriculture in 1999 showed a reduction of 7.6 percent of regular farm labour supply in the agricultural sector from 1994/95 to 1998/99, an almost 2 percent decline per year over the period (Statistics South Africa 2000). Declining farm labour supply is compounded by the fact that the agricultural sector, with a few exceptions, has the worst poverty conditions (Ruben and van der Berg 2001). Studies indicate that shortage in farm labour supply results in low farm productivity which eventually culminates in poverty among rural farming communities. This situation has been considered a major problem especially in developing countries like South Africa (Gebremedhin and Switon 2001). Strategies suggested to dealing with this problem inter alia include, the development of capital intensive agricultural technology and its diffusion through extension services to increase productivity and profitability of resources employed in farm management activities. Despite the implied increase in the welfare of farmers, this strategy has been criticized because it benefits mostly large-scale farmers more than their small-scale counterparts, resulting in what has been termed "the rich becomes richer and the poor poorer". The main reasons advanced for the difference were that limited landholdings and access to capital resources and production services prevent efficient use of the new technology by small-scale farmers.

An alternative suggestion was to introduce labour intensive technology that required an increase in farm labour supply. It was envisaged that some of the labour intensive technologies introduced would require more labour; especially as some cash crops create peak labour demands at planting and harvesting. Other labour intensive technologies create peaked labour demands by increasing regularity of operations. The cost of purchased inputs in capital intensive technology could be replaced by family labour by providing farmers with the potential for more profit while at the same time protecting the environment (Tegegne et al. 2001). On the other hand, lack of adequate farm labour supply could be a barrier to the adoption of a more sustainable farming system, especially given the aging farm operators' deteriorating health through diseases such as HIV and AIDS and the seasonal nature of farming. The latter poses a problem when obtaining casual labour during peak seasons and also when keeping

farm workers busy during the waiting period in between crop production. The strategy of labour intensive farming system was to offer the potential to increase productivity and farm incomes through the employment of intensive farm labour, yet it has been generally overlooked and overshadowed instead by myriads of research on off-farm labour (Tegegne et al. 2001).

Many studies on off-farm labour have been documented in developed and less developed countries compared with studies on farm labour supply (De Janvry and Sadoulet 2001). However, few studies have recommended policies designed to encourage people to stay on the farm in rural areas compared with studies that have recommended part-time off-farm labour (Kwon et al. 2006). To respond to the general decline in farm labour supply in South Africa and elsewhere, this study investigated the socio-economic factors that affect farm labour supply using farm level cross-sectional data.

Objective and Hypothesis

The specific objective of the study was to investigate the impact of socio-economic variables on household farm labour supply in three farming communities of South Africa. It was hypothesized that farm labour supply is correlated with individual farmer characteristics, including family and farm characteristics, adoption and local/regional characteristics. Acceptance of the hypothesis may provide insights into farm labour use among rural farming communities.

MATERIAL AND METHODS

Methodology and Data Collection

De Janvry and Sadoulet (2001) in their study of income strategies among rural households in Mexico defined a farming household as an economic unit consisting of a group of persons who live in the same dwelling and dine together for at least 3 of the 12 months in a year. This definition perceives farm household only as a unit of consumption. Anderson (2002) also defined a farming household as an economic unit consisting of either a single person or a group of persons who live together, depend on common income and within the limits of that income, exercise choices in meeting specific objectives. This study adopted the latter definition, defining a farming household.

The following rural communities in the Limpopo province were selected as study areas namely, Capricorn, Sekhukhune and Mopani. The sampling method used was a systematic cluster random sampling in which weighting was conducted using the probability proportional size (PPS) technique. Each selected farming community was the primary sampling unit (PSU). This means that in each farming community, all households had the same chance of being selected for the study. The survey was anonymous as no personal identifiers (names, identity document number, address, etc.) were asked for in the schedule.

An anonymous, unlinked, cross-sectional survey was conducted among 396 household heads evenly distributed in three farming districts. The survey ran concurrently across the selected areas during the month of October 2007. The appropriateness of the month of October was adopted based on experience from October Household Surveys undertaken annually by the Statistics South Africa (SSA). According to SSA (2000), during this period, the population in rural communities tends to be stable with low mobility of household members.

To explain the impact of socio-economic variables on farm labour supply the following Ordinary Least Square (OLS) linear equation was specified.

$$Y_i = b_0 + \Sigma\, b_i X_i + u_i$$

where, X_i is a (1x n) vector of explanatory variables, b_0 the intercept, b_i a vector of parameters and u_i the error terms. The impact of a unit change in X_i is given as: $\partial Y/\partial X = b_i$ and elasticity (e), percentage change in Y for a percentage change in X_i as: $e = \partial Y/\partial X$ (X/Y) = b(X/Y). The complete estimated OLS linear equation was specified as follows.

$$Lab = b_0 + b_1 Exp + b_2 Gen + b_3 Edu + b_4 Rrd + b_5 Ofm + b_6 + Eld + b_7 Rwr + b_8 Ftp + b_9 Fsz + b_{10} Fst + b_{11} Stk + b_{12} Att + b_{13} Ext + b_{14} Inp + b_{15} Dis + b_{16} Loc + u.$$

RESULTS

The description and computation of variables used in the model are presented in Table 1 and the results of the OLS regression are presented in Table 2. The specified model gave a good fit to the data with *F*-value of 13.982, which was significant at all levels of significance, and R^2 of

0.38. The analysis depicted no multicollinearity problem as indicated by high *t*-values and low standard errors of the coefficients. The independent variables represented a set of individual as well as family and farm characteristics. The adoption and location characteristics were included in the model to capture the effects of exogenous variables on farm labour supply. On individual characteristics, the coefficients of experience (*Exp)* had positive sign and significant at the 5 percent level. The result suggested that high number of years of farming experience was associated with high farm labour supply. However, the supply elasticity of farm labour supply with respect to experience at the mean of the observation was small, which implies that a change of 10 percent in the ration of experience to farm labour causes a small change of about 0.09 percent in farm labour supply.

The effect of gender *(Gen)* on farm labour supply was positive and highly elastic. This suggested that gender variable had a great influence on farm labour supply in rural areas. The results showed that a change in farm labour supply per unit change in gender was about 22.4 percent. In addition, the elasticity of labour supply with respect to the gender variable suggests that a unit increase in the average number of females in the household was associated with a more that 10 percent increase in the supply of farm labour. On the other hand, households with high members of years of education *(Edu)*, and those not raised on the farm (*Rrd*) with high members of off-farm employment (*Ofm*) of family members in the household contributed less to labour on the farm. The number of household members working off-farm and high wage rate of households negatively affected labour supply. The results suggested that households who considered the real wage rate of off farm labour to be high over the past five years appeared to have less farm labour.

The selection of the type of farming most common in the study area had a significant negative effect on farm labour, whereas the cultivated land size, farm structure and the stock of farm machinery per hectare had significant positive effects on farm labour. On adoption, a negative attitude of the household head towards adoption of high yielding variety seeds after their introduction seemed to be a contributory factor towards the availability of farm labour supply. The OLS regression showed that a change in labour supply per unit change in attitude of household head resulted in a decrease of 11.8 percent in farm labour supply. The elasticity (e), percentage change in labour supply for a percentage change in attitude was elastic. The results pre-

Table 1: Description and computation of variables used in the model

Dimension/variable	*Detailed description and computation*
Independent Variable	
Labour *(Lab)*	Adults > 18 years in family working full-time on farm per season.
Individual Characteristics	
Experience *(Exp)*	Farm operator's years of farming experience.
Gender *(Gen)*	Gender: 1 if the operator is a female, and 0 if male.
Education *(Edu)*	Total number of year of schooling.
Farm raised *(Rrd)*	Dummy: 1 if farm operator was raised on a farm; 0 otherwise.
Off-farm work *(Ofm)*	Number of persons working off-farm in the household.
Family Characteristics	
Elderly *(Eld)*	Dummy: 1 elderly persons > 60 years of age 0 otherwise.
Real wage rate *(Rwr)*	Dummy: 1 off farm wage rate was considered as high 0 otherwise.
Farm Characteristics	
Farm type *(Ftp)*	Dummy: 1 if maize, 2 if sorghum, and 3 if cowpeas planted.
Farm size *(Fsz)*	Farm size actually cultivated (hectares).
Farm structure *(Fst)*	Dummy: 1 if the operator belongs to group and 0 otherwise.
Stock *(Stk)*	Stock of farm machinery per hectare in Rand.
Adoption Characteristics	
Attitude after adoption *(Att)*	Attitude dummy: 1 for yes and 0 otherwise.
Extension visits *(Ext)*	Extension visits: 1 for yes and 0 otherwise.
Inputs *(Inp)*	Availability of farm inputs: 1 for yes and 0 otherwise.
Local and Regional Characteristics	
Distance(DisLocation *(Loc)*	Average distance from farm to nearest town in Kilometers. Dummy variable: 1 if farm in Capricorn, 2 if Sekhukhune and 3 if in Mopani district.

Table 2: Estimated OLS regression model

Independent variable *Labour (Lab)* *Dependent variable/Predictor*	*Coefficient*	*Std. Error*	*t-value*	*P-value*	*Elasticity at mean value*
Individual Characteristics					
Experience *(Exp)*	0.111 **	0.055	2.011	0.045	0.09
Gender *(Gen)*	0.224 ***	0.025	8.832	0.000	0.93
Education *(Edu)*	- 0.189 **	0.078	-2.417	0.016	0.06
Farm raised *(Rrd)*	- 0.281 ***	0.083	-3.375	0.001	0.08
Off-farm work *(Ofm)*	-0.254 ***	0.031	-8.302	0.000	0.55
Family Characteristics					
Elderly *(Eld)*	-0.209 ***	0.030	-6.959	0.000	0.65
Real wage rate *(Rwr)*	-0.137 ***	0.048	-2.835	0.005	0.08
Farm Characteristics					
Farm type *(Ftp)*	-0.076 **	0.370	-2.044	0.042	0.12
Farm size *(Fsz)*	0.136 ***	0.033	4.151	0.000	0.21
Farm structure *(Fst)*	0.200 ***	0.044	4.576	0.000	0.11
Stock *(Stk)*	0.110 ***	0.029	3.780	0.000	0.43
Adoption Characteristics					
Attitude after adoption *(Att)*	-0.118 *	0.066	-1.785	0.075	0.35
Extension visits *(Ext)*	0.084 ***	0.026	3.252	0.001	0.29
Inputs *(Inp)*	0.052 **	0.026	1.995	0.047	0.20
Local and Regional Characteristics					
Distance *(Dis)*	-0.091 ***	0.032	-2.875	0.004	0.33
Location *(Loc)*	-0.068 ***	0.230	-2.916	0.004	0.39
(Constant)	0.174	0.139	1.245	0.214	

R^2=0.380; Durbin Watson = 1.974; F= 13.982; ***; Df = 16; *** P<0.01; **P<0.05; *P<0.10; Cases = 396

sented also indicate that extension visits to reinforce technology adoption and the availability of farm inputs for recommended technology appeared to have positive effects on farm labour supply in farming communities of South Africa. Local and regional characteristics, average distance of the farm from nearest town and the location of farm had negative effects on farm labour supply.

DISCUSSION

The present study examined the determinants of farm labour supply of limited resource farmers. It contributed to the body of knowledge directed at understanding the labour supply of rural farming communities with additional focus on limited resource farmers, which was a group of farmers that had not received a substantial amount of attention from researchers. According to expectations, farm operators' years of farming experience (*Exp*) was positively correlated with labour supply. This observation was consistent with other studies. It was expected that old and experienced farmers would prefer to work on-farm rather than seek off-farm employment. The result also suggested that experienced farmers would increase their expected supply of labour by 11.1 percent for every unit change of farm labour supply. Gender of farm operator (*Gen*) was included in the model to reflect potential discrimination against females, which may be more pronounced among rural farming communities (Lim-Applegate et al. 2002).

The results indicated a positive and significant relationship between gender and farm labour supply. The regression coefficient of gender was positive and highly significant at the 1 percent level. Again the variable was highly elastic with respect to farm labour supply. Percentage change in farm labour supply for a percentage change in the gender variable was 93 percent which was relatively high. In the study area where women contribute more to farm labour than men, it is an indication that a high percentage of rural women would result in a high supply of farm labour. Farm type (*Ftp*) and the organizational structure of the farm (*Fst*) reflected the strength of the institutional factors affecting the supply of farm labour. Types of crops produced and the organizational structure of the farm proxy the complexity of the farm and the more complex it is, the higher will be the demand and supply of farm labour. Farm labour supply was elastic with respect to the availability of farm inputs (*Inp*) and farm size actually cultivated (*Fsz)* and both increased farm

labour supply. Similar observations were made by Mc Nally (2002) and Babikir and Babiker (2007). According to Gould and Saupe (1989), households' labour supply is affected by the amount and quality of inputs and natural resources under the control of the household. In rural areas of South Africa and elsewhere, land and farm inputs are important resources available to the household and the presence of these resources is likely to increase activities on the farm and consequently require more farm labour supply.

Farm labour supply was elastic (0.43) with respect to the stock of farm machinery (*Stk*) per hectare. This meant that a 10 percent increase in machinery investment on the farm increases farm labour supply by 43 percent. Because capital intensive technology reduces farm labour supply, it was expected that in the long run resource poor farmers are likely to find higher returns to their excess labour on off-farm work as opposed to intensifying their farming operations on the limited available land resource. The extension services (*Ext*) variable had a positive significant impact on farm labour supply. This implied that the lack of extension services to resource poor farmers who had adopted improved varieties of recommended seeds would lead to discontinuance of the technology. Oni et al. (2002) assert that extension services to farmers help to reinforce the message and enhance the accuracy of recommended implementation of technologies. The provision of feedback on adopted technology is also important since farmers tend to withdraw from the recommended technology when there is no follow-up to acknowledge and congratulate adopters.

Educational levels of households (*Edu*) appeared to have a negative effect on labour supply. According to Kanwar (1998), education has an unclear effect on farm labour supply. The reason given is that the educated in the household normally tend to downgrade farm labour (Naidoo 1997). High education may, therefore, not translate into high supply of farm labour especially when it is not possible for educated households to work off-farm due to lack of opportunities and quality of education obtained (Kanwar 1998). A study of labour supply in the Gezira irrigation scheme in Sudan by Babikr and Babiker (2007) found similar relationship between educational levels of farmers and male labour supply. Whether the farm operator was raised on the farm or not (*Rrd*) and the negative attitude towards technology (*Att)* adoption, both had negative effects on farm labour supply. According to Ahearn et al. (2006), such family characteristics have significant negative effects for operators of small farms compared to the average operator; individual households who have moved recently into the farming community are more likely to be involved in off-farm work rather than on-farm work. They are also slow in adopting any recommended technology in the area which may also be due to the accompanied risks. This is because the movement may have been associated with the need for immediate off-farm employment to temporarily sustain the household but it might also indicate lower adjustment costs relative to an individual who has remained in the same location. The change in location may also expose the household to an entirely new technology which may not be familiar and difficult to accept.

The number of prime age persons working off-farm (Ofm) in the household had a negative significant affect the total labour supply. The implication was that the larger the size of households working off-farm, the less would be the total supply to do farm work (Kanwar 1998). According to Anderson (2002), the decision to work on or off-farm by a prime age household member depends on the household composition and behavioral participation pattern of other family members in the neighborhood. Babikir and Babiler (2007) explained that the result is the differential income effects resulting from the households' joint budget constraints and the time and money costs imposed by household members.

The study indicated that high number of elderly people in the household (*Eld*) had significantly negative effect on labour supply. This result reflected the fact that the analysis did not distinguish between two types of elderly people that existed in the household, that is, healthy to contribute to labour supply and too weak to contribute to labour (El-Osta and Ahearn 2004). The real wage rate had a negative and significant effect on farm labour supply. The results indicated low farm employment at higher wage rates. Household members real wage rate (*Rwr*) measured the wage rate if working off-farm was selected as an alternative option. It was expected that higher wages would be negatively correlated with the farm labour supply.

Similar results have been reported by Goodwin and Mishra (2004) and Kanwar (1998) with data from rural communities of Java and India. Again farm labour supply was elastic with respect to real wage rate (0.08). The extent to which rural households seek off-farm and not on-farm employment was therefore dependent upon non-farm wage.

The average distance of farm from nearest urban town (*Dis*) was entered as a proxy to capture the effects of availability of off-farm employment. It turned out to be negative and significant in relation to farm labour supply. Similar findings have been reported by McNally (2002), Holthausen (2002), Goodwin and Mishra (2004). Off-farm employment of farm household members is an important phenomenon throughout the world and it seems to alter on-farm labour supply (Anderson 2002). In rural areas of the Limpopo province of South Africa, it has been observed that men migrate to urban centers and cities in search of job opportunities. Similar observations have been made in rural areas of Sudan (Babikir and Babiler 2007). The location of the farm (*Loc*) variable was included in the model to capture the effect of the proximity of extension services to the farm. The three selected rural communities in the Limpopo province, namely, Capricorn, Sekhukhune and Mopani had variable distances from the farms to where agricultural extension officers were stationed. This variable turned out to be negative indicating that proximity and availability of extension services did not necessarily attract the households to stay and work on the farm. This demonstrates that men and women migrate to urban centers in search of better job opportunities so long as they regard off-farm wage rate to be higher than the wage rate in cash and kind offered on the farm.

Although the present study examined several factors that were hypothesised to affect farm labour supply, further studies will be necessary to identify other factors. For instance, personal and off-farm employment characteristics that may also affect farm labour supply. Macro as well as micro conditions such as national unemployment rates, land tenure issues, agro-ecological zones as well as the existence of micro climates for specific crops that need intensive labour during the peak seasons in some farming areas also need to be examined.

REFERENCES

Ahearn M, El-Osta, H, Dewbre J 2006. The impact of coupled and decoupled government subsidies on the off-farm labour supply participation of US farm operators. *American Journal of Agricultural Economics*, 88: 393–408.

Anderson A 2002. The effect of cash cropping, credit, and household compositionon household food security in Southern Malawi. *African Studies Quarterly*, 6: 1–2.

Babikir OM, Babiker BI 2007. *The Determinants of Labour Supply and Demand in Irrigated Agriculture: A Case Study of the Gezira Scheme in Sudan.* USA: Blackwell Publishing Ltd.

De Janvry A, Sadoulet E 2001. Income strategies among rural households in Mexico: The role of off-farm activities. *World Development*, 29(3): 467–480.

El-Osta H, Mishra A, Ahearn M 2004. Labour supply by farm operators under 'decoupled' farm program payments. *Review of Economics of the Households*, 2: 367–385.

Gebremedhin B, Swinton S 2001. Reconciling food-for-work project feasibility with food aid targeting in Tigray, Ethiopia. *Food Policy*, 26: 85–95.

Goodwin B, Mishra A 2004. Farming efficiency and the determinants of multiple job holding by farm operators. *American Journal of Agricultural Economics*, 86(3): 722–729.

Gould B, Saupe W 1989. Off-farm labour market entry and exit. *American Journal of Agricultural Economics*, 71(4): 960–969.

Kanwar S 1998. Wage responsiveness of labour supply and demand in non-clearing ruralmarkets: The case of Indian agriculture. *Economics Letters*, 61: 395-402.

Kwon C, Orazem P, Otto D 2006. Off-farm labour supply responses to permanent and transitory farm income. *Journal of Agricultural Economics*, 67: 1095–1100.

Lim-Applegate H, Rodriquez G, Olfert R 2002. Determinants of non-farm labour participation rates among farmers in Australia. *Australian Journal of Agricultural and Resource Economics*, 46(1): 85–98.

Mc Nally S 2002. Are other gainful activities on farms good for the environment? *Journal of Environmental Management*, 66: 57–65.

Holthausen D 2002. Effect of farm income and off-farm wage variability on off-farm labour supply. *Agricultural and Resources Economics Review*, 31(2): 187–199.

Naidoo L 1997. A place in the sun. Women farm workers organize. *South African Labour Bulletin*, 19(3): 20-26.

Oni SA, Obi CL, Okorie A, Jordan DA 2002. The economic impact of extension education on rural households in Limpopo province. *The South African Journal of Economics*, 70: 7-28.

Ruben R, van der Berg M 2001. Non-farm employment and poverty alleviation of rural farm households in Honduras. *World Development*, 29(3): 549–560.

Statistics South Africa 2000. *Employment Trends in Agriculture in South Africa. Pretoria*. Pretoria: Statistics South Africa.

Tegegne F, Sigh SP, Ekanem E, Muhammad S 2001. Labour use by small-scale conventional and sustainable farmers in Tennessee. *Southern Rural Sociology*, 17: 66-80.