INTERRELATIONSHIPS AMONGST FARM LABOUR MANAGEMENT VARIABLES AND FACTORS AFFECTING FARM LABOUR REMUNERATION

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Abstract

The purpose of this paper is to conduct an exploratory analysis of certain observable measures associated with farm labour management and to examine factors affecting farm labour remuneration. Data were collected in the Lions River, Lower Tugela and Elliot magisterial districts during January 1987. A principal components analysis extracted a factor common to measures of positive farmer attitude, called a "progressive labour management index", which implied that farmers who use labour training facilities also provide incentive schemes, give generous leave allowances and would consider employing an African farm manager. A regression analysis is used to determine factors affecting remuneration levels. A principal component which extracts 67.4% of variation in remuneration is used as the dependent variable. Variables tested included labourer training, years work experience, farmer's attitude and farm type. Training and years work experience were significant in all three areas and positively correlated with remuneration.

Uittreksel
Interafhanklikheid tussen arbeidsbestuur en faktore wat arbeidsvergoeding beïnvloed

Die doel van hierdie studie is om 'n verkenningsontleding uit te voer van sekere waarneembare maatstawwe geassosieër met arbeidbestuur en om faktore wat arbeidsvergoeding bepaal, te ontleed. Gedurende Januarie 1987 is data ingesamel vir die magistraatsdistrikte van Lions Rivier, Laer Tugela en Elliot. 'n Hoofkomponente-ontleding het 'n positiewe benadering tot arbeidbestuur as 'n gemeenskaplike faktor geïdentifiseer ('n "progressiewe arbeidbestuur indeks"). Dit dui daarop dat boere wat arbeideropleidingfasiliteite gebruik ook ander bestuurspraktyke volg soos vergoedingaansporing, ruim verlof en die indiensneming van Swart bestuurders. 'n Regressie-ontleding is gedoen om faktore wat vergoeding bepaal te ontleed. 'n Hoofkomponent wat 67,4% van die variasie in vergoedingsmaatstawwe verklaar is gebruik as afhanklike veranderlike. Veranderlikes gebruik sluit in arbeideropleiding, jare werkservaring, houding van boer en plaasgrootte. Opleiding en werkservaring was betekenisvol in al drie areas en positief gekorreleerd met vergoeding.

1. Introduction

There exists in South Africa a diversity of farm labour employment and living conditions, remuneration levels and farmers' attitudes towards labour, both inter-regionally and between individual farms. The occurrence of such disparities suggests that there may be farmer and labourer characteristics which significantly affect farm labour relations and remuneration levels. A knowledge of these attributes could be of use to policy makers in developing measures to reduce discrepancies and increase farm labour productivity and welfare. A better understanding of interrelationships of attributes could lead to better farm labour management.

In this study a two stage cluster sampling technique (Barnett, 1981) was employed to collect data pertaining to farm labour remuneration, education, working and living conditions, attitudes and demography in the Lions River, Lower Tugela and Elliot magisterial districts. Ninety-one farmers and 221 labourers were interviewed using structured questionnaires. A principal component analysis was used to examine interrelationships among certain farm labour variables across three strata (magisterial districts). Factors affecting labour remuneration levels were analysed by regression procedure.

Principal component analysis (PCA) can be used to establish commonalities amongst factors associated with farm management. In Nieuwoudt's (1977) principal component analysis of certain physical efficiency measures, the first component implied that a farmer achieving a high score in one efficiency criterion also achieves high scores in other efficiency criteria. This "performance index" showed a common association with financial success in farming and could be used to provide information concerning management performance.

In this study, a principal component analysis was conducted on observable measures such as farm wages, leave allowances, farm worker skills, training, education, farmer attitudes and incentive schemes. The purpose was to establish "common denominators" of remuneration patterns and management attitudes and to examine interrelationships among factors, which could be of importance for future policy and farm labour management. A progressive farmer index was extracted to determine whether farmers who use labour training facilities also provide incentive schemes and other good labour management practices.

2. Principal component analysis (PCA)

Principal component analysis is a variable reduction scheme that is used to economise in the number of variables and to indicate how the variables cluster together (Stevens, 1986:337; Nieuwoudt, 1977:77; Fuller, 1987). PCA partitions total variance of the set of variables by forming linear combinations of variables which account for the maximum amount of variance: $Y_1 = a_{11}x_1 + a_{12}x_2 \ldots a_{1j}x_j$

Where $x_1, x_2 \ldots x_j$ are the j labour management variables under study and Y_1 is called the first component. The procedure finds further independent linear combinations uncorrelated with each other such that each successive component accounts for the next largest amount of variance. The coefficients ... a_{ij} indicate the relative importance of each variable in the component. Principal component analysis can be viewed as a mathematical maximisation procedure, where each successive component accounts for the maximum amount of variance that is left (Stevens, 1986:339).

Table 1 : Matrix of correlation coefficients between labour management variables from 221 farm labour cases, Lions River, Lower Tugela and Elliot magisterial districts, 1987.

	HS	CW	TV	IS	LS	CAM	A	E	RT	UTF
HS	1.00									
CW	0.83*	1.00								
TV	0.85*	0.37*	1.00							
IS	0.00	0.19*	0.04	1.00						
LS	-0.04	0.04	-0.03	0.88*	1.00					
CAM	0.07	0.20*	0.11	0.66*	0.59*	1.00				
A	0.25*	0.14	0.11	0.03	0.04	0.00	1.00			
E	-0.00	-0.07	0.17	0.08	-0.03	0.00	-0.39*	1.00		
RT	0.09	0.18	0.15	-0.05	0.07	0.01	0.16	-0.02	1.00	
UTF	-0.02	0.05	0.05	0.83*	0.73*	0.55*	-0.01	-0.02	-0.16	1.00

Note: *Significant at 1% level

Legend: HS - Housing Standard (Measured on an index from 1 to 6). CW - Cash Wage (Rands). TV - Television (yes = 1, No = 0). IS - Make use of Incentive Schemes (Yes = 1, No = 0). LS - Leave Structure (Days leave p.a.). CAM - Whether or not the farmer would consider employing an African Manager. A - Age of labourer (years). E - Education of labourer (Years). RT - Labourer received formal training (Yes = 1, No = 0). UTF - Farmer's use of Formal Training Facilities (Yes = 1, No = 0).

In this study, a set of correlated variables is transformed into a set of six much smaller uncorrelated or linear combinations of these variables, and economic meaning may probably be attached to each component. The variables studied have widely differing measures (for example wages and rations are measured in rands, farm size in hectares and variables relating to incentive schemes and training facilities are dichotomous, with scores of 1 or 0). Therefore, linear transformations would have little meaning and standardised variates and the correlation matrix are used, as opposed to the covariance matrix, which is preferable when scales are commensurable (Morrison, 1978:268).

3. Results of interrelationships of labour management variables.

In this section the principal components will be extracted from the correlation matrix of labour management variables.

3.1 Correlation matrix

According to Table 1, labourers with good housing facilities (HS) earn relatively high cash wages (CW) and are more likely to have access to television facilities (TV). Farmers who make use of incentive schemes (IS) tend to give more generous leave allowances (LS), use formal training facilities (UTF) and are more likely to employ an African manager (CAM) on their farm. A high incidence of formal training is associated with a high cash wage percentage of gross farm expenditure. The negative association between age and education indicates that older farm workers tend to have received less school education than their younger counterparts.

3.2 Principal Component Analysis

Kaiser's criterion is used whereby only those components whose eigenvalues are greater than 1.0 are retained in the PCA (Stevens, 1986:341). Johnston (1980:190) explains that the value 1.0 represents the variance of the original variables. Therefore, a component with an eigenvalue of less than 1.0 accounts for less of the total variance than did any of the original variables. This criterion is particularly accurate when the number of variables are small (10 to 15) (Stevens, 1986:341), and was thus employed in this study. Five components were retained, accounting for 70.4% of the variance in the original set of variables. Results of the principal components analysis derived from the correlation matrix of 14 original variables (four more variables are added which were deleted from Table 1 in the interest of space) are presented in Table 2. The components are interpreted using the component - variable correlations (or factor loadings) which are largest in absolute magnitude. For example the first component has a high positive loading on variables IS, LS, UTF and CAM. The component procedure has empirically clustered the four variables.

Table 2: Principal components analysis of labour management variables, Lions River, Lower Tugela and Elliott, 1987.

Variable	Component Number 1	2	3	4	5
IS	0.96	0.01	0.03	0.05	0.05
LS	0.91	-0.01	-0.06	-0.04	0.18
UTF	0.87	-0.12	0.04	0.01	0.04
CAM	0.78	0.07	0.10	-0.05	0.07
RT	-0.05	0.96	0.07	-0.07	0.01
S	-0.05	0.96	0.08	0.05	0.04
HS	-0.04	0.03	0.76	-0.11	0.06
W	0.04	0.20	0.68	0.25	0.23
TV	0.14	0.19	0.60	0.08	0.21
R	-0.02	-0.12	0.57	0.08	0.27
E	-0.05	0.01	0.12	0.85	0.05
A	-0.01	0.13	0.33	-0.75	0.02
SF	0.09	-0.02	-0.13	0.05	0.80
NC	-0.02	0.01	0.03	0.01	0.70
Eigenvalue	3.20	2.41	1.57	1.40	1.25
% Variation per component	22.9	17.2	11.2	10.0	9.0
Cum. %	22.9	40.2	51.4	61.4	70.4

Legend:S - Skill level of labourers (skilled = 1, unskilled = 0); R - Value of rations in rands; SF - Farm size (ha); NC - Number of cattle owned by labourer. Identification of remaining variables given in Table 1.

The dominant factor loadings for each component are underlined in Table 2. The research procedure is to attach an economic meaning to components (Stevens, 1986:339). Table 2 shows that the data cannot be summarised in one or two components, showing the complexity of variables measured. Not a single component contributed a large percentage to the total variance. All the five components were thus seen as important and will be discussed.

Component 1 in Table 2 accounts for 22.9% of total variance of the sixteen labour management variables. It shows that farmers who provide incentive schemes for labourers tend to provide generous leave allowances (which includes an allowance for absenteeism), make use of off-farm training

facilities and are more likely to consider employing an African manager on their farm. This component can be described as the factor common to measures of positive farmer attitude, and is refered to as a "progressive labour management index".

The second component, which explains 17.2% of total variance, associates high levels of farm labour skills (S) with a high incident of off-farm training (RT).

Component 3, which extracts 11.2% of total variance, is called the "remuneration index". It shows that farmers who provide good quality housing for labourers (HS) tend to pay higher cash wages (CW), give more generous ration packages (R) and are more likely to provide television for labourers (TV). This remuneration index indicates that in kind payments to farm workers are positively correlated to cash payments. De Klerk (1983), Ardington (1985) and Antrobus (1984) each testified to the difficulty of quantifying farm labour remuneration levels due to the problem of attributing financial values to in kind payments. In this analysis the four remuneration variables have been empirically clustered and are clearly distinguishable from the rest by their high factor loadings as reported in equation 1.

$$Y = 0.76\,HS + 0.68\,CW + 0.60\,TV + 0.57\,R \qquad (1)$$

This component can be seen as an informative index of farm labour remuneration levels.

In component 4 a bipolar factor exists: a mixture of high positive and negative loadings on a particular component (Stevens, 1986:339). It describes the negative relationship between farm workers' age (A) and education (E). This relationship is to be expected because while rural school facilities for blacks remain severely inadequate, far less emphasis was placed on education twenty years ago than is the case now, and school facilities for farm workers were practically non-existent (Ardington, 1985).

Component 5, which explains 9% of total variance shows that the larger the farm size (SF), the more likely a farmer is to allow labourers to keep their own cattle on the farm (NC). In Elliot, where the average farm size is 813 ha, it is common practice for labourers to graze their own cattle on farms, whereas in Lower Tugela, which has an average farm size of 239 ha, almost no labourers are allowed to keep cattle.

4. Results of factors affecting farm labour remuneration and living conditions.

Estimating remuneration levels of farm labourers was problematic as a large proportion of income was non-wage or in kind remuneration. A regression analysis was used to determine factors affecting remuneration levels. In order to obtain a composite index of remuneration, a principal components analysis was conducted on four variables: quality of housing, presence of television, financial value of rations and cash wage. Two variables, housing and television were excluded to arrive at a component comprising cash wages and rations, which explained 67,4% of variation in remuneration. This component was used as a dependent variable in the regression.

Explanatory variables such as training levels, attitudes and farm size differ between areas. Therefore, a separate analysis was conducted in each region. Dummy variables were not used to account for regional differences, because they would capture part of the variance of explanatory variables.

Using the principal component of wages and rations as the dependent variable, the following variables were included as independent variables; years work experience, farmer's attitude towards labour, labour training and farm size. Results of linear regressions are shown in Table 3. The significance of t- statistics of variables fitted is seen as more important than the R^2. The relatively low R^2 is partly attributed to the cross sectional nature of the data.

Table 3 : A linear regression function testing wage determinants of farm labourers (n=221), Lions River, Lower Tugela and Elliot, 1987.

Dependent variable = Principal component comprising wages and Rations

Explanatory Variables	Lions River	Lower Tugela	Elliot
Years work experience	0.03554**	0.02470*	0.01696*
Farmer's attitude towards labour	0.69491*	0.47710*	0.04012
Labourer's Training	0.4864**	1.1009**	0.30241*
Farm Size	0.00178	0.01020*	0.00049
(R^2)	37.4	38.1	29.4

** Significant at 1% level of probability
* Significant at 5% level of probability

4.1 Variables explaining remuneration levels

(i) Years Work Experience: Van Kooten and Arthur (1985) measured work experience by subtracting years of school education plus six from each labourer's age. This assumes firstly that schooling starts at six years old and secondly that labourers start work directly after school. If a labourer had no formal education then 16 was subtracted from the labourer's age. It can be seen from Table 3 that in all three study areas, years work experience is significant and positively correlated with remuneration.

(ii) Farmers' attitude towards labour: An attitudinal index, measuring farmers' attitudes towards farm labour was obtained using Moll's (1984) questions for assessment of attitude type. It was expected that farmers with high scores on the attitudinal index would have more progressive views regarding farm labour remuneration, provision of housing facilities and farm labour training. In Lions River and Lower Tugela, the estimated coefficients are significant and positive, indicating that farmers' attitudes do have a positive effect on labour remuneration. In Elliot, farmers' attitudes do not significantly affect remuneration. This is possibly because in Elliot, which is an isolated farming district, attitudes are not as diverse (small variation in attitude variable) as in Lions River and Lower Tugela.

(iii) Labourers' training: It is assumed that farm labourers with higher education levels are more likely to be chosen for training for semi-skilled or skilled work than labourers with little or no education. In fact labour education and training are positively correlated, with a Pearson correlation coefficient of 0.32, significant at the 1% level. Due to this correlation, the labourers' training coefficients are expected to indicate the effects of education as well as training on remuneration, and education was excluded as an explanatory variable. Farm labour training generally consists of on-farm training administered by the farmer, or the attendance of a course, designed to teach a specific skill at a labour training institution. These courses tend to be short, not more than a few weeks long, and the training variables measured whether or not a labourer had received training, rather than length of training

period. In all three districts, farm labour training was positively correlated with remuneration, and highly significant. However, only 8% of interviewees had received training at an institution, yet 32% of interviewees were working in skilled or semi-skilled occupations. Furthermore, 39% of interviewees had received no school education. There is only one farm labour training institution for 8340 farm employees in Lions River, one centre for 21243 employees in Stanger and no training facilities in Elliot (Bureau of Census and Statistics, 1981).

Assuming that labour is paid in accordance with the value of its marginal product, then better trained labour makes a greater contribution to net farm income.

(iv) Farm size: In Lower Tugela, where almost all farmers had sugar-cane production as their only enterprise, farm size is likely to be positively associated with ability to pay farm labourers. From Table 3 it can be seen that farm size is significant and positively correlated with remuneration in Lower Tugela. In Elliot and Lions River, where farming activities are diverse, farm size is not necessarily an indication of farmers' ability to remunerate labour and regression coefficients for these regions are not significant.

Other variables could have been considered in explaining remuneration, for instance 'responsibility in decision making' of the labourer. It is, however, reasonable to assume that the better trained labourer with more experience will have more responsibility in decision making. Including management decision making as a variable, makes it impossible to capture the partial affect of training on remuneration.

5. Discussion and conclusion

Interrelationships amongst farm labour management variables were summarised in six orthogonal components with the aid of a principal components analysis. In the first component, farmers who achieved a high score in one labour management criterion also achieved high scores in other criteria. This indicates that farmers who use training facilities are likely to delegate authority by employing an African manager and use incentive schemes to increase productivity. A progressive labour management index could be used to provide farmers with comparative information concerning their labour management practices. The remuneration index described a positive relationship between certain remuneration factors. These factors were used in a separate PCA, to arrive at a remuneration index explaining 67.4% of variation in remuneration. Because farm labour income consists of more than cash wages, a remuneration index is a useful concept for income comparisons and to test for determinants of remuneration.

In a regression analysis of factors affecting farm labour remuneration, labourer training had a positive and significant effect on remuneration. Approximately one third of interviewees were working in skilled or semi-skilled occupations, and yet only 8% had received formal training. Given the strong positive correlation between education levels and labourers chosen for training, and between training and remuneration; and considering that greater skills are needed for more technologically advanced farm production, it would seem to be imperative that funds be devoted to establishment of farm labour training facilities and schools for children of black farm workers.

The policy implications are that (a) more should be spent on rural education and (b) that agricultural unions should promote a spirit of a progressive farmer. Social upliftment in rural areas should be high on the policy agenda.

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