DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

WORKING PAPER

A DISCRIMINANT ANALYSIS OF FACTORS AFFECTING PRODUCTIVITY AND PROFITABILITY OF SMALLHOLDER HOUSEHOLDS

BY

Petronella Jeche
Reneth Mano
And
Joseph Rusike

WORKING PAPER AEE 6/200

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DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION, FACULTY OF AGRICULTURE, UNIVERSITY OFZIMBABWE, P O BOX MP167, MOUNT PLEASANT HARARE, ZIMBABWE

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Department of Agricultural Economics and Extension
Faculty of Agriculture
University of Zimbabwe
P O Box MP167
Mount Pleasant
Harare
ZIMBABWE

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Petronella Jeche is an MSc graduate in the Department of Agricultural Economics and Extension.

Reneth Mano is a Lecturer in the Department of Agricultural Economics and Extension, University of Zimbabwe.

Joseph Rusike is a Lecturer in the Department of Agricultural Economics and Extension, University of Zimbabwe

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ABSTRACT

In neoclassical economics institutions are considered to be givens or mere constants in agricultural production and development. There is now a new field of economics that argues that institutions are not givens in agricultural production but have a role to play in determining the agricultural performance of households. This study develops a framework for analysing the relationship between institutions, agricultural performance, household characteristics and other neo-classical variables. The study investigates the factors that affect the productivity and profitability of households using data collected from dryland and irrigation areas. Discriminant analysis was used to identify the institutional and non-institutional factors that have an impact on the profitability and productivity of households. It emerged from this study that the agriculture performance of households is determined by a wide variety of factors that include household characteristics, institutional factors, resource endowment factors and crop production factors. The results of this study are consistent with the emerging literature that institutions are not constants in production. The study also contributes to the growing body of evidence that institutions do have an impact on agricultural production of households.

BACKGROUND AND LITERATURE REVIEW

Institutions play a central role in agricultural and economic development. In recent years substantial resources have been invested in smallholder agriculture supporting the delivery of such services as extension, credit and marketing, but most of these investments went to waste and failed to stimulate smallholder agriculture. Many development specialists have now concluded that external influence of grants to African agriculture has failed to deliver results because of inhibitions of the existing lethargic institutions. Getting institutions right is now widely accepted as a prerequisite for stimulating agricultural development in Africa. Since the late 1980s World Bank ideology on African agriculture has shifted towards institutional transformation. Efforts to develop smallholder agriculture are now spearheaded towards transformation of institutions servicing the smallholder farmer. These efforts of trying to solve Africa's agricultural problems through institutional transformation have come about as a result of the recognition that institutions are not merely a constant in the production equation as previously assumed in neo-classical economics (Eicher, 1999).

Although many development experts no longer consider institutions a mere constant in production and 'givens' in agricultural development, very little applied research has been conducted in Africa to identify key institutions and institutional configurations that matter the most in stimulating agriculture development. This study looks at the institutional environment and identifies key institutional factors affecting agricultural production performance in the smallholder agricultural sector. This paper contributes to the literature by generating information on how productivity and profitability in agriculture are affected by institutional arrangements. This information will be useful in formulating policies in the economic restructuring exercise that the government of Zimbabwe is carrying out, and in enhancing the increased contribution of smallholder agriculture to promote growth.

Smallholders have poor access to agricultural inputs and farm output markets, research extension, credit and irrigation services. Smallholder areas are characterised by high levels of unemployment, crushing poverty, hunger and malnutrition, and illhealth. The Zimbabwean Government is placing high emphasis on improving incomes in communal areas by promoting commercialization of agriculture and reducing the proportion of the population engaged in subsistence agriculture.

Various stakeholders are trying to restructure agricultural institutions to increase access by smallholders to agricultural input and output markets, credit, research, extension and irrigation services. There is general consensus that increasing smallholder agricultural productivity and incomes requires a social and political transformation and building up economic institutions of capitalism (Alderman, 1999: Rukuni, 1999). A study of comparative patterns of economic development patterns by Morris and Alderman (1988) shows that institutional and policy malleability are key to sustained economic development. Economic institutions, economic policies, and major factors of government must be altered as development proceeds and agriculture must be able to perform the Lewis functions of providing capital for industrial development.

Rukuni (1998; 1999) has argued that the major challenges facing African governments are weak and dysfunctional institutions, inadequate educational and other skills, and poor governance, managerial leadership. Institutions are dysfunctional and disconnected between different economic and social groups, rural and urban areas and between races. North (1998) also contends that the major challenge facing poor nations in Africa, Asia and Eastern Europe

is to develop efficient, responsive and cost effective institutions which are essential for the transition to market economies. Rukuni (1998) has suggested that there is a need for transformative leadership in Africa to bring about social and economic transformation and overcome dysfunctional institutions at four levels of society: individual and family, community and local government, organisations and institutions and public policy, politics and government. Five basic prime movers have been identified through gap analysis of present state and recommended as prerequisites that have to be developed and co-ordinated to achieve sustainable agriculture development. This requires public investments in institutions including land tenure, research, extension, agricultural input supply, credit, irrigation, farm output marketing and rural small scale primary industries.

Development experience over the past 40 years in Africa has shown that wholesale import of institutional solutions from outside is unsuccessful and that countries need to build their own institutions (Eicher, 1999; Rukuni, 1999). This requires co-ordination of economic institutions and traditional institutions. There is lack of information on how commercial and traditional institutions relate to each other.

From new institutional economics improvement in the performance of service delivery institutions of marketing, credit, research, extension and policy is expected to lead to greater agricultural performance especially in the underdeveloped rural economies. For development specialists in the field, the fundamental question is which of the multitude of possible institutions really matter and contribute most significantly to smallholder agricultural development. Some have argued whether money put towards development institutions earns higher returns than a dollar put in bank.

RESEARCH OBJECTIVES

The general objective of this study is to determine the institutional factors that have an impact on agricultural performance of smallholder households. The specific objectives of the study are as follows:

1. Carry out a quantitative analysis to determine the institutional factors that impact on the productivity and profitability of households in the irrigation areas.
2. Carry out a quantitative analysis to determine the institutional factors that impact on the productivity and profitability of households in the irrigation areas
3. Draw implications for institutional and agricultural policies and recommend the best way rural institutions can be crafted to improve smallholder agriculture.

RESEARCH QUESTIONS

To achieve the above objectives the study explores the following related research questions:

1. What institutional factors are most important in determining productivity and profitability at the household level in the irrigation area?
2. What institutional factors are most important in determining productivity and profitability at the household level in the dryland area?

CONCEPTUAL FRAMEWORK

The study uses a farm household model with market failures developed by Sadoulet and de Janvry (1985) to analyse the impact of alternative institutional arrangements on productivity and profitability of growing crops. The model of household decision making with market failure can be specified as:

Maximise the household's utility of consumption with respect to:

- production decision variables (products, variable factors, household characteristics)
- consumption choices (leisure and commodities)

Subject to the following constraints:

1. Technological and institutional constraints (production function relating output to variable and fixed factors draught animals, equipment, land, public infrastructure, credit, and extension services).
2. Time Constraint (total time available equal to work and leisure)
3. Cash income constraint
4. Effective farm prices of goods and services traded in the market.
5. Production equal to consumption equilibrium condition for household supplied goods and factors.

The production factors relating outputs to variable and fixed factors of production can be written following North (1994) as:

$$Q=f(L_f, K_f, D_f, IS_f, L_a, K_a, D_a, IS_a, E, I, T)$$

Where the subscripts f and a denote inputs devoted to the transformation and transaction factors

Q is output
L is Labour
K is Capital
D is land
IS is intermediate inputs
E is entrepreneurial input
T is technique: and
I is institutions

Techniques include the physical limitations on possible combinations of inputs within the state of existing knowledge. Institutions include the political, legal and contractual structure, norms of behaviour regarding contract fulfillment, honesty and effort.

Transaction costs are the sum of costs of the land, labour capital, intermediate goods, and entrepreneurial skill required to perform the transaction function (L_a, K_a, D_a and IG_a). A profit maximizing firm or individual will incur transactions costs only when the expected benefits of

doing so exceed the expected costs. Since the rational firm or individual will treat transactions costs like any other costs, the economics of transactions costs is just the same as the economics of any costs.

The household wants to minimize the sum total of transactions and neoclassical production costs (transformation costs) of providing and selling a given level of output with a given set of characteristics. Because changes in transaction cost leads to changes in transformation costs and vice versa, transaction and transformation costs are interchangeable in the production process. Therefore the household will utilize each input up to the point where the usual marginal conditions are satisfied for all inputs.

Hypotheses

Applying the framework to the problem of institutions and institutional change in smallholder agriculture in Zimbabwe generates two hypotheses about the relationship between technical institutional change, productivity and profitability. The first hypothesis is that if institutions are important in determining productivity and profitability of households then an analysis of the factors affecting the performance of indicators will reveal that institutional variables play a part in distinguishing between low performing households and high performing households in irrigation areas.

The second hypothesis is that if institutions are important in determining productivity and profitability of households then an analysis of the factors affecting the agricultural performance of households will reveal that institutional variables play a part in distinguishing between low performing households and high performing households in dryland areas.

ANALYTICAL METHODS

The above hypotheses are tested using survey data from the irrigation and dryland areas. Households in each farming category are divided into two classes: low performing and high performing households based on their total gross margins and their productivity levels. Discriminant analysis is then used to determine the factors that have the most impact in determining the agricultural performance of households.

Discriminant Analysis

Discriminant analysis aims to explain and predict the group membership of things on the basis of measurements on explanatory variables. Analysis concerns estimation of the coefficients $(a_I, I=1, 2, \ldots, k)$ in the discriminant functions for an appropriate set of variables $(Xi, I=1,2,\ldots k)$ which best discriminate between groups

$$D=a1x1 + a2x2 + \ldots\ldots akxk$$

The estimated model provides for the relative importance and direction of influence of the explanatory variables on the basis of magnitude and sign.

Discriminant analysis as an analytical technique has two research objectives, namely classification and analysis. The analysis aspects of this technique provide several tools for the interpretation of data. Among these are statistical tests for measuring the success with which the discriminating variables actually discriminate when combined into the discriminant functions. The weighting coefficients obtained from the statistical tests serve to identify the variables that contribute the most to differentiation along the respective function or within the

dependent variable. In this study the discriminant analysis was used as an analytical tool to identify variables that explain the differences in the dependent variables specified e.g. low and high productivity.

One of the statistics that can be derived from discriminant analysis is the canonical correlation. The canonical correlation is a measure of association between the single discriminant function and the set of dummy variables which define the group memberships, in this case there are two group memberships for profitability for example, low and high profitability. It tells us how closely the function and the 'group variable' are related. The standardised discriminant canonical coefficients are of great analytical importance in and of themselves. When the sign is ignored, each coefficient represents the relative contribution of its associated variable to that function. The standardized coefficients are adjusted for measurement scales that is why they represent relative contributions, unlike the unstandardized contributions which do not. The standardized canonical correlation will be used to determine the factors that matter the most in determining the dependent variables in this study.

There are two performance indicators that were used in this study to differentiate between farmers in the study areas. The performance indicators are profitability and productivity.

Gross margin analysis

These are the returns to farming after all the costs have been deducted. In its simplest way profit is obtained by subtracting total cost of production (Fixed costs and variable costs) for an enterprise from its gross output. Gross output refers to gross revenue and is obtained by multiplying total volume of output by its price. A commonly used indicator for profit is the gross margin and it should always be positive and greater than total overheads in the long run and to make investment worthwhile.

While gross margin is different from profit in that profit is gross margin less fixed costs, in this study the term profitability is used loosely referring to gross margins. The reason for this is that smallholder farmers are likely to face approximately the same level of fixed costs across households and across different crops. Thus the gross margin in this context is a step in calculating profit and using gross margins as profitability is unlikely to change the relative agriculture performance of households

Productivity is the rate at which an output flows through the use of a given set of factors of production such as land, labor and capital (Rukuni, 1994). There is a limit to the productivity of a piece of land, or a household and this limit is set by physical and non-physical factors. The physical factors are usually rainfall and soil quality whilst the non-physical factors are many and varied. Institutions constitute these latter factors and they affect a household's agricultural productivity in various ways. Productivity is usually expressed as a ratio to a selected input e.g. tonnes/ha, tonnes/kg fertilizer etc. In the first instance land productivity is the ratio of crop output in tonnes per hectare of land planted, whilst in the second instance output is expressed per fertilizer kilograms used.

DATA SOURCES

The study used mainly primary data collected through household surveys. Primary data were collected from Nyanyadzi and Mutambara in Manicaland. Nyanyadzi is an irrigation area, whilst Mutambara is a dryland cropping communal area in Chimanimani. Sampling frames were obtained from the Agritex officers and complemented with information from

kraaalheads. Cluster sampling was used to sample villages to be interviewed to allow easy travelling between villages, whilst for households random sampling was used. A total of 60 households were sampled from the dryland area and the same number from the irrigation area. After sampling, enumerators were then dispatched into the study area where they located and interviewed sampled households. It took an average of one hour for an enumerator to conduct an interview and fill out the questionnaire.

RESULTS

The agricultural performance of households in the irrigation area was analysed, and the households were then grouped into two classes with respect to each performance indicator. First, the households were grouped into two classes of low-income households and high-income households based on the mean performance of all the households. The two classes of income were used as the dependent variables in the discriminant analysis of factors affecting household income. whilst the two classes of household productivity were used in the discriminant analysis of factors affecting household productivity.

In the irrigation area there are two cropping seasons. Some of the crops grown in the two cropping seasons are the same, although their yields differ. Tables 1 below show the yields of the crops grown in the irrigation area.

Table 1 Mean Yields in irrigation

Crop	Mean yield
Maize	1.201 ton/acre
Beans	0,6 ton/acre (0.95)*
Tomato	1,360 ton/acre (1.8)*
Okra	28kg/acre

Source: Survey Data
*Yields in second irrigation cropping

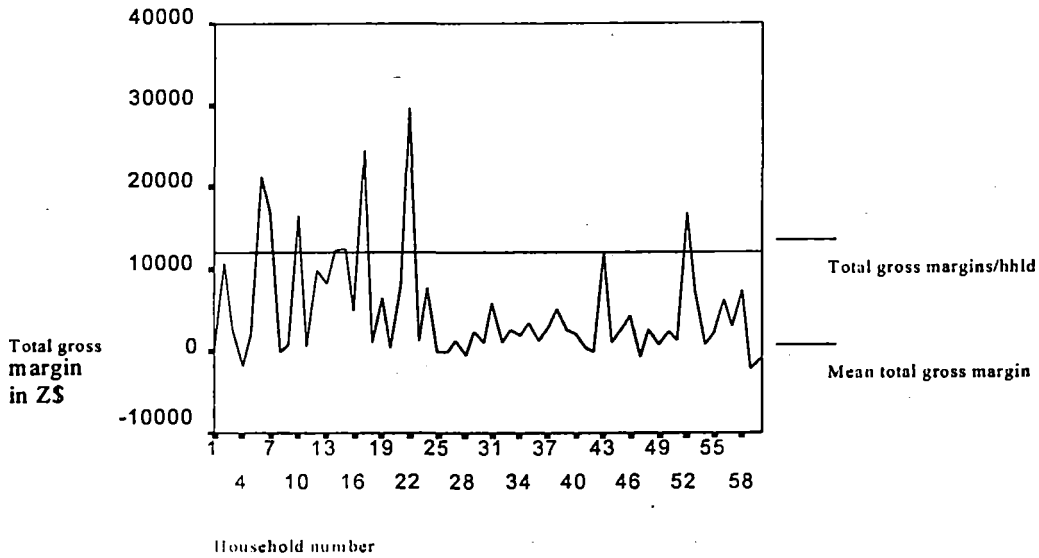
To obtain the total gross margins for the various enterprises carried out by the household the total gross margins for the different enterprises were summed and the distribution of household incomes obtained are as shown in Table 2 below.

Table 2 Total income from crop production in irrigation areas

	Irrigation area N=60
Mean total gross margin in $	11 989.58
Maximum total gross margin $	29 600.00
Minimum total gross margin in $	-2 376.25
No. of farmers with income above the mean	24
No. of farmers with income below the mean	36

The farmers were divided into two and classified as low profitability and high profitability, with the mean total gross margin being used as a criteria for dividing the farmers into the above two groups i.e. farmers with total gross margins below the mean and total gross margins above the mean. Figure 1 below shows the distribution of crop incomes within the sample and the mean total gross margin.

Figure 6.1 Distribution of total gross margins in the irrigation



The straight line in the figure above shows the means total gross margin for all the households. The households whose total gross margin is above this mean line are the ones classified as high income households whilst the households with total gross margins falling below this line are classified as low income households for the purpose of the discriminant analysis.

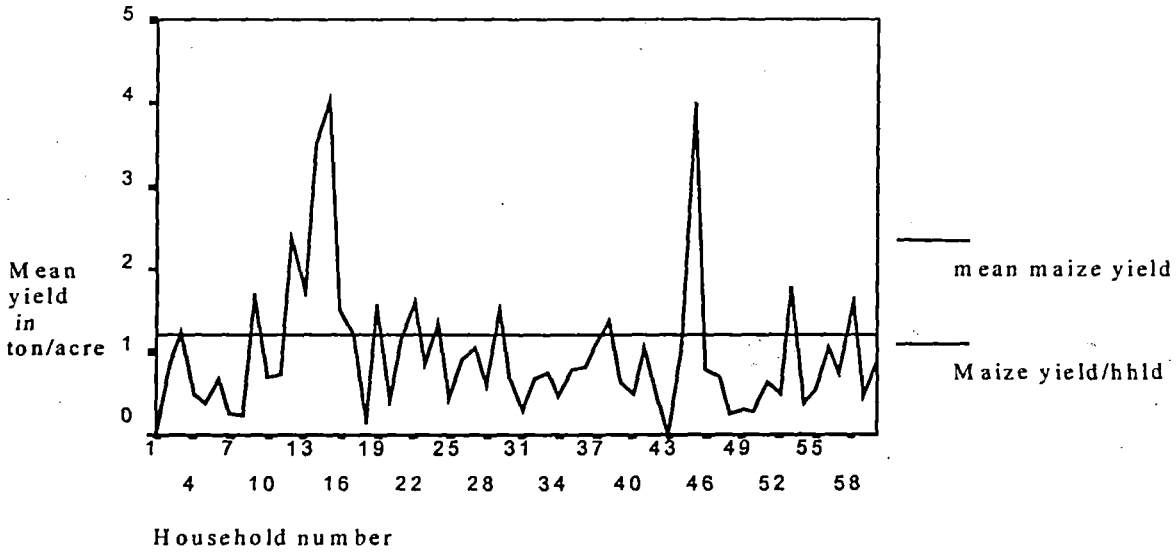
The same grouping of farmers was done for productivity levels with maize yields being used as an indicator for productivity. Table 3 below shows the mean, maximum and minimum maize yields in the irrigation area. The number of households with yields above and below the mean is also shown.

Table 3 Maize yields in irrigation areas

	Irrigation area N=59
Mean yields in ton/acre	1.20
Maximum yield ton/acre	4.02
Minimum yield ton/acre	0
No. of farmers with yield above the mean	22
No. of farmers with yield above the mean	37

From the above table two groups of farmers were obtained i.e. farmers with low productivity and farmers with high productivity based on the mean yields. Figure 2 below shows the distribution of productivity levels within the study sample and the mean.

Figure 2 Distribution of maize yields per household in irrigation areas



The analysis of agricultural performance of households outlined above yielded two classes of households for the gross margin income indicator, and two classes of households for the productivity indicator. These groups were then used in the discriminant analysis that is presented next.

Discriminant Analysis of factors affecting profitability in irrigation schemes

The key question that this analysis seeks to answer is are there significant differences in access to institutions between the high and low performing households. The dependent variable in the first section of this analysis is profitability whilst the second section of the analysis has yield (productivity) as the dependent variable.

A lot of factors contribute to the profitability levels or a household's total crop income in this case. These variables include crop prices, input costs, crop yields, marketing costs, information on prices, a household's resource endowments and other household and non household specific characteristics. A variety of such variables that are likely to have an impact on the gross margins derived from crop enterprises, and thus important in determining a household's income level were selected and a multiple discriminant analysis was performed on these variables. The dependent variable in the analysis was profitability and the households had been categorised into low profitability households and high profitability households as explained earlier on.

This procedure yielded one discriminant function, which was statistically significant at the 0.01 probability level and is used in this analysis. A total of sixteen variables were selected in the discriminant analysis performed. The table 4 below shows the standardised discriminant coefficients obtained from the analysis. All the factors in the table are statistically significant

at the 1% level, although their importance in explaining differences in the dependent variable differs.

Table 4 Standardised Canonical Discriminant Function Coefficients for profitability in irrigation areas

Factor	Coefficient
Institutional factors	
Type of marketing problems faced	**-3.172**
Membership to farm organisations (Yes, No)	**2.96**
Type of farmers group household belongs to	**3.900**
No. of times extension worker is seen (Once a week, month, Year)	**3.852**
Type of input purchase arrangement (Credit, Cash)	2.745
Do you see the extension worker often enough (Yes, No)	1.653
Type of extension agencies that gave the farmer advice last season	2.130
Household Characteristics	
Education level of household head	1.762
Age of household head (Years)	-2.136
Resource Endowment	
Size of adult cattle herd	**3.054**
Amount of labour a household hires out (hours)	**-5.890**
Type of problems faced in obtaining draft power	1.812
Daily wage rate for weeding in $	-0.763
No. of plows household possesses	0.564
Crop production	
Yield of tomatoes in kg/acre	2.117
Amount of beans sold in kilograms	**4.607**

Source: Analysis of Survey data

From the table above it can be observed that there is a wide range of factors affecting a household's profitability in the irrigation area. These factors are household characteristics such as the education level of a household head, age of the household age, a household's resource endowments such as the number of plows possessed, the size of a cattle herd and other variables relating to labour and draft power. It is interesting to note that the marketing problems a household faces, input purchasing arrangements and output marketing institutions also affect a household's profitability status. With regards to other institutions extension and farmer groups also matter. Amongst the variables selected in the discriminant analysis are the number of times a household sees an extension agent, and whether or not the extension worker is seen often enough. Membership to a farmers' organisation and the type of farmer organisation a household belongs to also have an impact on the profitability grouping of the household.

The most relevant of these factors are those whose absolute value is greater than half of the largest and are related to the institutions of input and output marketing, farmer organisations and extension. The greater the coefficient of a factor the more the factor influences profitability in the household. From the results of the discriminant analysis we can conclude that the most important institutions that determine whether a household has high or low

profitability are related to access to input and output markets, extension and farmer organisations.

Discriminant Analysis of factors affecting productivity in irrigation areas
Households were grouped into two classes based on their productivity levels. The discriminant analysis that was run produced the following results with a total of eleven variables being selected for the analysis:

Table 5 Standardised Canonical Discriminant Coefficients for productivity in irrigation areas

Factor	Coefficient
Institutional Factors	
No. of times extension worker is seen	**1.717**
Adequacy of extension service (Yes, No)	**1.767**
Whether household has taken a loan or not	**0.948**
Type of input purchase arrangement household has	-0.555
Membership to farmers' organisation (Yes, No)	-0.360
Amount of ammonium nitrate used in maize	0.545
Amount of compound D used in maize	-0.507
Resource Endowment	
Time of the year extra labour is hired	0.817
No. of plows a household has	**-1.020**
No. of days household labour is hired out	-0.564
Household Characteristics	
Household Ward	-0.494

Each of the factors in the table above is significant at the 1% level in determining a household's productivity status. The factors that contribute the most to productivity are those whose absolute value is greater than half of the largest. The greater the coefficient the more the factor determines productivity levels. The table shows that the institutions that matter the most in determining yields are input institutions, extension, farmer organisations and credit. The most important of these institutions is however credit. This is probably because access to credit allows a household to purchase fertilizers and other inputs and use of recommended levels of input results in higher yields.

From this analysis one can conclude that there are various factors that affect the productivity status of a household. The institutional factors that matter the most in determining productivity are related to extension, farmer organisations, input and output markets and credit institutions.

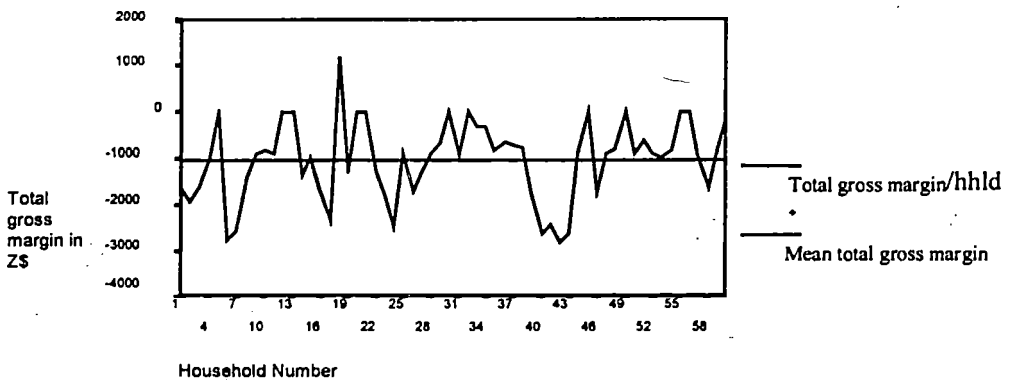
Analysis of agricultural performance of households in the dryland area
Profitability in dryland areas was also measured by total gross margins. Total gross margins were calculated based on gross margins for maize, groundnut and nyimo and the distribution of these results as shown in the table below.

Table 6 Total gross margins from crop production in the dryland areas

	Dryland area N=60
Mean total gross margin in $	- 1032.07
Maximum total gross margin $	1 189.80
Minimum total gross margin in $	-2830.45
No. of farmers with income above the mean	22
No. of farmers with income below the mean	38

Figure 3 below shows the distribution of total gross margins within the sample and the mean total gross margin. Those households with total gross margins below the mean line are the low income (profitability) households and those with total gross margins above the mean are the high income households.

Figure 3 Distribution of total gross margins by households in dryland area



The second indicator for household performance is productivity and this is given by maize yields. Table 7 shows the mean yields of the different crops that are grown in the dryland area, and the statistics for maize yields.

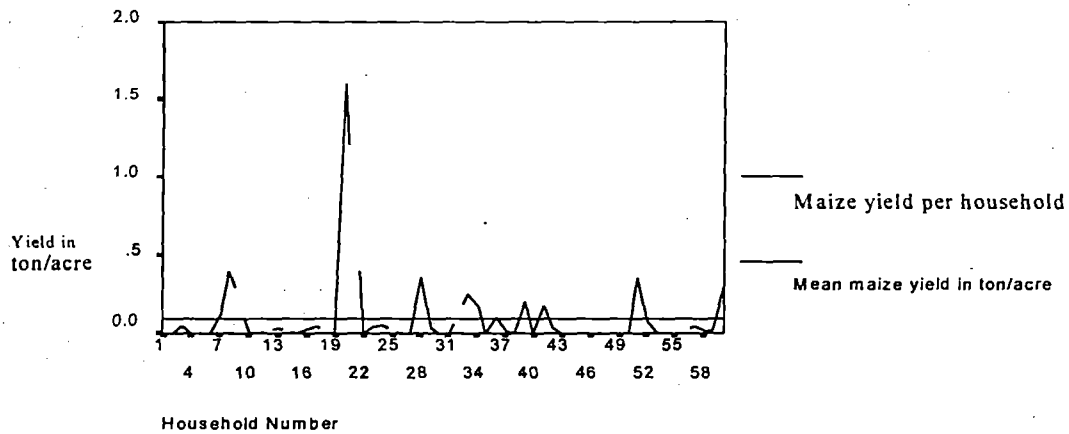
Table 7 Mean Yields in dryland areas

Crop	Mean yield In ton/acre	Maximum yield	Minimum yield
Groundnut	0.221	1.080	0
Maize	0.096	1.600	0
Mhunga	0.074	0.63	0
Nyimo	0.244	0.3	0
Sorghum	0.113	0.8	0

Source: Survey Data

The distribution of maize yields and the mean is shown in Figure 4 below.

Figure 4 Distribution of maize yields by households in the dryland area



Those households with maize yield below the mean line are low productivity households and those with maize yields above the mean line are high productivity households. The two classes of households for each of the performance indicators were used as the dependent variables for running the discriminant analysis, which will be discussed next.

Discriminant Analysis of factors affecting profitability/income levels in the dryland area
Table 8 gives the results of the discriminant analysis to determine those factors that determine gross margins in the dryland area.

Table 8 Standardised Canonical Discriminant Function Coefficients for profitability in dryland areas

Factor	Coefficient
Institutional Factors	
Type of inputs supplied by nearest trader	**-0.585**
Source of information on livestock prices	**-0.629**
Source of information on input suppliers and prices	**0.909**
Crop production	
Groundnut Income	0.441
Household Characteristics	
Marital Status of household head	**0.528**
Resource Endowments	
No. of plows a household possesses	0.416

The discriminant analysis performed on the data from the dryland areas yielded a total of only six variables that have an impact on a household's profitability status. In this case profitability was the dependent variable and all the other variables were independent variables assumed to

determine profitability.

From the above table of results it can be observed that the coefficients are rather low and thus do not strongly account for the profitability or income status of a household, but they do explain the differences in households' profitability levels as compared to the other variables. All the variables are significant at the 1% level. Looking at coefficients whose absolute values are greater than half of the largest, the most important institutions are those relating to input supply and output marketing since it has emerged that information on these institutions matters in determining the dependent variable. Other institutions such as credit, extension and farmer organisations do not seem to have an impact in explaining the differences in gross margins between the households, unlike in the irrigation area where all these institutions matter. The reason the other institutions such as extension, credit and farmer organisations have not come out as having an impact profitability in the dryland area, maybe that farmers are almost homogenous in lacking access to these institutions. The other reason could be that even farmers that have access to these institutions are not benefiting from them, such that at the end of the day the farmers are just the same as those with no access to these institutions. The difference in productivity levels is rather accounted to other factors, not institutional factors. The next section presents the results of the discriminant analysis to determine factors affecting the productivity of households.

Table 9 Standardised Canonical discriminant function coefficient for productivity in dryland areas

Factor	Coefficient
Institutional factors	
Suggestion on how extension services can be improved	0.359
Type of farmer's organisation the household belongs to	-0.815
Household Characteristics	
Family size	-0.449
Crop Production issues	
Income from maize	1.409
Factors considered in choosing what to grow	0.448

The standardised coefficients for the factors that were selected in this analysis are not very high but the factors do explain to some degree the maize yield levels. The above table shows that the most important institutions determining yield levels is the farmer organisation a household belongs to and extension service also plays a part. All the variables are significant at the 1% level. The most significant are those whose absolute values are greater than half the largest coefficient, and they relate to farmer organisations

Summary of results

The farm household model that is used in this study specified household performance as being dependent on variable and fixed factors of production as:

$$Q= f(L_f, K_f, D_f, IS_f, L_a, K_a, D_a, IS_a, E, I, T)$$

This model incorporates the impact of institutions unlike other production functions in

neoclassical economics. In irrigation areas the factors that emerge as determining the agricultural performance of households included household characteristics e.g. education level of household members, resource endowment e.g. labour, livestock, crop production factors such as the amount of output sold and institutional factors. These institutional factors included variables such as the type of marketing problems a household faces. This may mean that households that are different performance classes face different marketing problems. Maybe the households that are low performers reported that they do not face any problems at all implying that they do not market anything.

In the dryland areas the factors that determine the agriculture performance of households included institutional factors, resource endowments factors, household characteristics and crop production related factors. The institutional factors included variables such as the type of farmer organisation a household belonged to, and source of information on crop prices. The main point to note from all this is that there is more to production than the traditional neo classical economic variables.

Policy implications

Several policy implications can be drawn from the results of the study. The implications apply to farmer organisations, farmers, extension organisations, credit institutions and policy makers. The results have shown that there are some institutions that are critical in determining the performance of smallholder agriculture. There is a need to focus on developing these institutions so that they do not constrain smallholder agriculture. An important point to note is that there are some institutions such as land tenure that have been identified as constraining smallholder agriculture. From this study land was not identified as impacting on the agriculture performance of farmers, and the reason for this maybe because farmers have adapted to the type of tenure they are under such that land tenure has ceased to be a constraint. For academics perhaps the most important lesson is that institutions are not constants in production functions, but their state also has an impact on the output of farmers.

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