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Effect of farm power on farm household livelihood in Makurdi local government area of Benue state

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Abstract

This study investigates on the effect of farm power on household livelihood in Makurdi Local Government Area of Benue state. A random and purposive sampling were used to select farmers from different council wards and a total 100 respondents were selected as sample size for the study. Factor analysis, and multiple regression were used to determine the factors affecting the use of farm power, examine the effect of tractor power on area cultivated of food crops, analyze the effect of tractor power on farm productivity and assess the effect of tractor power on poverty level of farmers in the study area. The study revealed that an increase in tractor power used will lead to increase in area cultivated of food crops by 2.24 hectares; a unit increase in tractor power use will lead to increase in farm productivity by 361.05 tonnes per ha; a unit increase in tractor power used will lead to decrease in poverty level of farmers by 0.77 units. The study therefore recommends that, Agricultural policy makers should place more emphasis on the development of small-scale farmers particularly in the use of appropriate and affordable farm power options, credit acquisition amongst others.

Keywords: Farm Power; Farm household; Livelihood; Productivity

1 Introduction

Agriculture is the lifeblood of the economy of most rural communities in developing countries with more than half of its population depending on small or micro-scale farming as their primary source of livelihood (FAO, 2006). While this number includes pastoralists and the landless, the great majority of these are small holder farmers with about 80% farming less than two hectares of land (FAO, 2006).

The composition of households plays an important role in agricultural production through the means of different farm power sources, which has been categorized into three main groups namely human, draught animal and tractor (DAP) farm power (FAO, 2005). At the household level, farm power is closely related or associated with household's asset-based wealth and may play a determining role in livelihood strategies and outcomes.

A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term (Chambers and Conway, 1992). The livelihood framework thus encompasses household asset (i.e. human, natural, physical, financial and social) and their use in farming, non-farming activities and other strategies used by a household to make a living.

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Farm power for various agricultural operations can be broadly classified as:

- Tractive work; such as seed preparation, cultivation, harvesting and transportation
- Stationary work; such as silage cutting, feed grinding, threshing, winnowing and lifting of irrigation water.

According to FAO (2006), these operations are done by different sources of farm powers namely; human power, animal power, oil engines, tractors, power tillers, electricity and renewable energy (biogas, solar and wind).

Farm power has a direct correlation with farm household livelihoods such that households with smallest asset base tend to rely on family labour as their source of farm power. Their weakest assets are their financial and physical assets while their human resource base is also weak. Their relative strength lies in their social assets. Indeed, these assets has the smallest difference between the family labour group and tractor owners (UNDP, 2002).

Governments and donor agencies have revised their earlier assumptions about pathways out of poverty in rural areas and biases against agriculture. This revision is in line with research showing that recent declines in poverty rate in developing countries have been due mainly to falling rural poverty (IMF, 2006). More than 80% of the decline in rural poverty has been attributed to improved farm power sources and better conditions in rural areas, rather than the out-migration of the poor. Furthermore, evidences have consistently shown that better farm power sources which stimulates agricultural growth is highly effective in reducing rural poverty (Diao, 2006).

Apart from the initial reduction in drudgery associated with land preparation, the partial adoption of animal farm power and tractors usually results in an increased in the area cultivated, creating additional demand for labour for planting, weeding and harvesting. Labour availability, affordability, and productivity for subsequent operations becomes crucial to increasing productivity.

FAO (2006) report reconfirmed that the farm power situation is deficient almost everywhere, and that urgent measures are needed to correct it if the widely promoted goals of raising the productivity of the sector, reducing poverty, and achieving food security are to be achieved. The ability to cultivate land rather than access to land is a major constraint on production. Loss of access to a source of farm power such as tractor hire services or animals invariably results in a reduction in the area cultivated (FAO *et al.,* 2014).

In the past, many studies concerned with mechanization, draught animal power, hand-tool technology, etc. tended to be rather mono-topical, dealing with only one aspect of the subject. Farm power and mechanization also tended to be separated from the actual processes of crop production and processing; it was a topic created by engineers and was dealt with by engineers. As a result, there is a widespread lack of understanding of the subject, and there are many widely held misconceptions with regard to the essential contribution of farm power and mechanization to small farmers' productivity and livelihoods.

In recent years, the Farm Power and Mechanization Group in FAO has broken away from this rather narrow approach and has put the different sources of farm power, mechanization, machinery, equipment and tools into a much broader context (FAO, 2006).

There are quite a number of literatures on farm power FAO carried out a study in seven SSA countries in late 2001 and early 2002 examined the crucial role of farm power in increasing production and improving livelihoods. In these countries, despite attempts to increase the use of DAP and tractors, human muscle still constituted the most important power source – with some 65 percent of agricultural land prepared and weeded by hand in the seven countries (FAO, 2003). The study found that with the omnipresent threat to the ability of families to provide sufficient labour, the cultivated area declines, nutrition suffers, and the spectra of increased hunger and poverty looms over the homestead.

Similarly, Lyimo and Semgalawe (2002) worked in the United Republic of Tanzania in 2003 and 2004 and observed that, although increasing the supply of farm power to labour-deficient families would be one way to alleviate the stress and poverty level; another way would be to reduce the requirement for labour in agricultural production which could be by substituting manual labour for tractor power.

Peng J *et al*., (2022) analysed the influence of agricultural mechanization level on agricultural production and income by utilizing a sample-modified endogenous merging model and a threshold effect model. He found out that the level of mechanization has a significant positive impact on the cost, output value, income and return rate of all types of crops.

Daun. *et al.,*2020, explores perceived agronomic, environmental, and socioeconomic effects together, thereby revealing linkages and trade-offs, some of which have been hitherto unknown. Data were collected using a novel data collection method called "participatory impact diagrams" in four countries: Benin, Kenya, Nigeria, and Mali. In 129 gendered focus group discussions, 1330 respondents from 87 villages shared their perceptions on the positive and negative effects of agricultural mechanization and developed causal impact chains. The results suggest that mechanization is likely to have more far-reaching agronomic, environmental, and socioeconomic consequences than commonly assumed. Most perceived effects were positive, suggesting that mechanization can help to reduce poverty and enhance food security.

Miah *et al*., 2005 assessed the socio-economic impact of farm mechanism of creating employment opportunities and changing the livelihood of rural laborers. The rural laborers experienced a considerable increase in their annual income (98-503%)

MdAkter F.F *et al*.,2019 reviewed on farm mechanization in Bangladesh. The study concludes -there is no doubt that the application of farm power to appropriate tools, implements and machines "farm mechanization" is an essential agricultural input in Bangladesh with the potential to transform the lives and economies of millions of rural families.

From the above reviewed literature, it is obvious that there are few literatures on farm power globally and much work has not been done in Nigeria especially as it affects livelihood in Makurdi LGA of Benue State. It is against this backdrops that this study explored the impacts of farm on farmers livelihood and to test these hypotheses;

- H_{01}: Tractor farm power sources used have no significant effect on area cultivated of food crops by farm household in the study area.
- H_{02}: Tractor farm power have no significant effect on farm productivity in the study area.
- H_{03}: Tractor farm power have no significant effect on poverty level of farmers in the study area.

1.1 Analytical Framework

In order to facilitate the estimation of the data generated for the study, the ordinary least square method for multiple regressions shall be employed. This method of analysis is employed because it is unbiased, it is fairly simple to understand when compared with some other econometric technique for analyzing data. The least square has been used in a wide range of economic relationship with fairly satisfactory result, and despite the improvement of computational equipment and of statistical information which facilitated the use of other more elaborate econometric techniques, OLS is still one of the most commonly used method in estimating relationships in econometric models. OLS is an essential component of most other econometric technique, (Koutsoyiannis, 1977).

The OLS estimator is consistent when the regressors are exogenous, and optimal in the class of linear unbiased estimators when the errors are homoscedastic and serially uncorrelated. Under these conditions, the method of OLS provides minimum-variance mean-unbiased estimation when the errors have finite variances. Under the additional assumption that the errors be normally distributed, OLS is the maximum likelihood estimator.

Suppose a data consists of n observations $(y_i, x_i)^n{}_{i=1}$

Each observation includes a scalar response y_i and a vector of p predictors (or regressors) x_i. In a linear regression model, the response variable is a linear function of the regressors:

$$y_i = \alpha + x_i \beta + \varepsilon_i \quad \ldots\ldots (1)$$

Where β is a vector of unknown parameters; ε_i's are unobserved scalar random variables (errors) which account for the discrepancy between the actually observed responses y_i and the "predicted outcomes" $x_i\beta$;

As a rule, the constant term is always included in the set of regressors X, say, by taking $x_{i1} = 1$ for all $i = 1, \ldots, n$. The coefficient β_1 corresponding to this regressor is called the *intercept*.

There may be some relationship between the regressors. For instance, the third regressor may be the square of the second regressor. In this case (assuming that the first regressor is constant) we have a quadratic model in the second regressor. But this is still considered a linear model because it is linear in the βs.

2 Methodology

The study area was Makurdi Local Government in Benue state

Source: BENUE.COM.NG

Figure 1 Map of Benue State showing the study area

2.1 Population and Sampling Procedure

The population of the study consists of all farming households in Makurdi Local Government Area of Benue State. A simple random and purposive sampling were used to select farmers from different council wards in the study area. Based on participation in farming activities and tractor usage in the study area, the following (5) council wards were selected: Bar ward, Mbalagh ward, Wadata ward and Wailomayo ward and North bank II ward.

From the selected wards, twenty (20) farmers were then selected at random from villages in the selected council wards to make a total of 100 farmers. Therefore, the sample for this study consists of 100 farmers selected from different wards in the Local Government.

2.2 Measurement of Variables

- Sex: was measured by asking respondents to indicate whether male (1) or female (0).
- Age: was measured by asking respondents to indicate their actual age in years.
- Marital status: was measured by indicating (1) for married and (0) for single.
- Household size: was measured by asking the respondents to indicate the number of persons residing in the household during the study.
- Level of education: was measured by indicating number of years spent in acquiring formal education.
- Farm size: was measured by asking the respondent to indicate the area of land cultivated (hectares).
- Farming experience: was measured by asking the respondent to indicate the number of years of farming.
- Annual income: was measured by asking the respondent to indicate amount received as annual income (Naira).
- On-farm Income: was measured by asking the respondent to indicate amount accrued from farming activities (Naira).

- Off-farm income: was measured by asking the respondent to indicate amount accrued from non-farming activities (Naira).
- Asset: Basic assets were listed and respondents will be asked to indicate available assets in the household.
    - Farm power source was measured by asking the respondents to indicate the farm power source(s) used on the farm. Hence for the purpose of the regression analysis, a dummy equal 1 will be assigned to farmers who adopt a particular power source and zero otherwise.
    - Poverty was measured as household consumption expenditure per person in naira.
    - Membership of farmer group, 1 if member, 0 otherwise.
    - Extension contact: 1 if visited by extension agents, zero otherwise.
    - Credit: 1 if received credit, 0 otherwise.
    - Productivity: will be measured by asking respondents to indicate the quantity produced per ha for given farm enterprises.

2.3 Method of Data Analysis

Both descriptive and inferential statistics were used to analyze data for this study. Objectives (i) and (ii) were analyzed using descriptive statistics such as frequencies, percentages and mean. Objective (iii) was analyzed using factor analysis. Objective (iv), (v), (vi), and (vii) was analyzed using ordinary least squares (OLS) regression. Hypotheses 1 to 4 were tested using t-test.

2.4 Model Specification

The model specifies that farm household livelihood (Y) is dependent on tractor farm power used by farmers.

$$Y= f(T, S) \quad \ldots\ldots (2)$$

$$Y= \beta_0+ \beta_1T+ \beta_2S+U \quad \ldots\ldots (3)$$

where:

Y= Farm household livelihood (area cultivated of food crops or productivity or poverty level)
β_0 =The intercept of regression equation
β's =The slopes of the regression equation
T=Tractor power
S = Vector of socioeconomic characteristics of farmers (age, gender, education, family size, off-farm income, membership of farmer group, extension contact, credit)
U=Stochastic error term

The presence of error term (U) takes care of other variables that have influence on farm household livelihood but not specified in the model.

3 Results and discussion

3.1 Socio-economic Characteristics of Farmers

The result of the socio-economic characteristics the respondents is shown in table 1.

The result on gender distribution showed that majority of the respondents are males (54%) while 46% of the respondents are females in the study area. This agrees with Odogola and Olaulah (2002) who observed that men are the main users of draught animals, human power, the sole users of tractors and the sole owners of both.

The result also showed that the age distribution in the study area had the majority (48%) within the age bracket of 43-53years. Age range between 32-42years represents 20% of the respondents, while age bracket of 21-31years represent 15% of the respondents. The mean age is 42.74. This shows that majority of the respondents are within the active working age and involved in farming activities in the study area.

Marital status distribution showed that singles in the study area represent 13% of respondents, married represent 85% of the respondents while others represent 2% of the respondents. This shows that majority of the respondents are

married. This agrees with the findings of FAO (2006) who asserts that men, in their role as head of the household, usually make decisions regarding the purchase of new tools.

Educational qualification of the respondents showed that 20% of them had primary education. Majority (58%) of the respondents had secondary education, 18% had tertiary education while 5% had no formal education. This shows that majority of the farmers had various levels of education. This is consistent with the observations of Lyimo and Semgalawe (2002) that many farmers have attended secondary school, some have tertiary education, and others have skills in non-farm professions that they gained prior to working in agriculture.

This result of analysis on farm size revealed that majority (52%) of the respondents had less than five hectares of farm land while 47% had farm size between 6 and 16 hectares. The mean farm size is 8.88 hectares. This may be attributed to the fact majority of the respondents were commercial and therefore cultivated a large area of land. This result agrees with FAO and UNIDO (2008) who reported in a joint study tractor hirer cultivate about 8% hectares of land while tractor owners cultivate more than 20 hectares.

The result also showed that the mean household size of the respondents is 8.74. 73% of the respondents had a household size within the range of 2-6, 21% of respondents had a household size within the range of 10-16 while 6% of respondents had a household size within the range of 17-23. This is in line with Twum and Drafor (2002) who stipulated that a large household (achieved through polygamy or the extended family) is a livelihood strategy that is adopted to ensure that sufficient labour is available to cover peak workloads.

The distribution of respondent according to farming experience shows that majority (40.0%) of the respondents had farming experience between 17-27 years while (32.0%) of the respondents had farming experience between 28-38 years. The mean farm size is 25.51. This implies that most of farmers in the area have been involved in farming for a long time to determine a given farm power source that is most profitable to use.

The result on farm type further revealed that majority (63%) of the respondents' practice commercial farming while (37%) are involved in subsistence farming. This is attributed to the fact that most farmers that use tractor power are commercial farmers.

The analysis on respondents' access to credit showed that majority (67%) of the respondents had no access to credit while 33% had access to credit.

The result further revealed that accessibility to credit by farmers in the study area is very little (67%) and very few of the respondents (27%) had high access to credit.

Result also revealed that majority (59%) of the respondents had other source of income while 41% had no other source of income. This implies that majority of the respondents were not into full time farming. This is consistent with FAO study (2013) that tractor ownership is generally unattainable from farmers' own resources and even where they have the financial capacity, they usually prefer to diversify into non-farm activities in order to spread their livelihood risks.

Also, from the result, it was revealed that majority (90%) of the respondents had no extension visits while 4% of the respondents had extension visits of 2 and 3 times in a year respectively. This shows that farmers in the study area had little or no access to extension services.

The distribution of respondents according to membership of farming organization from the result showed that majority (54%) of the respondents belong to a farming organization while 46% of the respondents do not belong to any farming organization.

The result on household consumption per person revealed that majority (70%) of the respondents spent less that ₦20, 000 on household consumption, 27% of the respondents spent between ₦20, 001 and ₦60, 000, 1% spent a range of ₦100, 000 – ₦140, 000 on household consumption while 2% of the respondents spent above ₦180, 000 on household consumption.

The result also revealed that majority (67%) of the respondents had productivity greater than 550,000, 11% of the respondents had productivity in the range of 50,001 – 150,000 while 10% of the respondents had productivity in the range 450,001 – 550,000. This shows that farmers in the area are highly productive.

Table 1 Socio - economic Characteristics of Respondents

Socio - economic characteristics	Frequency (f)	Percentage (%)	Mean (x)
Sex			
Female	46	46.0	
Male	54	54.0	
Total	100	100	
Age (years)			
<20	4	4.0	
21-31	15	15.0	
32-42	20	20.0	42.74
43-53	48	48.0	
54-64	13	13.0	
Total	100	100	
Marital status			
Single	13	13.0	
Married	83	83.0	
Others	2	2.0	
Total	100	100	
Household size (No. of persons)			
2-9	73	73.0	8.74
10-16	21	21.0	
17-23	6	6.0	
Total	100	100	
Level of education (years)			
No formal education	4	4.0	
Primary	20	20.0	
Secondary	58	58	2.04
Tertiary	18	18	
Total	100	100	
Farm size (hectares)			
≤ 5	52	52.0	
6-16	47	47.0	8.88
39 – 49	1	1.0	
Total	100	100	
Farming experience (years)			
≤ 5	4	4.04	
6 – 16	12	12.12	

17 – 27	40	40.04	25.51
28-38	32	32.32	
> 38	11	11.11	
Total	100	100	
Number of extension visit (years)			
No visit	90	90.0	0.3
2 times	4	4.0	
3 times	4	4.0	
5 times	2	2.0	
Total	100	100	
Membership of farming organization			
No	44	44,0	0.56
Yes	56	56.0	
Total	100	100	
Type of farming			
Subsistence	37	37.0	
Commercial	63	63.0	
Total	100	100	
Access to Credit			
Yes	67	67.0	
No	33	33.0	
Total	100	100	
Level of Accessibility			
Very high	1	1.0	
High	27	27.0	
Little	3	3.0	
Very little	69	69.0	
Total	100	100	
Other income source			
Yes	59	59.0	
No	41	41.0	
Total	100	100	
Household consumption per person			
<20,000	70	70.0	
20,001-60,000	27	27.0	
100,001-140,000	1	1.0	
>180,000	2	2.0	
Total	100	100	

Productivity			
<50,000	4	4.0	
50,001-150,000	11	11.0	
150,001-250,000	5	5.0	
250,001-350,000	2	2.0	
350,001-450,000	1	1.0	
450,001-550,000	10	10.0	
>550,001	67	67.0	
Total	100	100	

3.2 Farm Power Sources use by Farmers

The result on farm power sources used by farmers is presented in table 2. The result showed that majority (64%) of the respondents use tractor power source while 36% did not use tractor power sources in the study area. The result further revealed that, majority (67%) of the respondents use human power for farm activities in the study area while 33% of the respondents do not use human power. The result also revealed that, animal power sources (0%) and wind power sources (0%) are not used by farmers in the study area.

Table 2 Farm power sources use by farmers

Farm power source	**Yes**	**No**
Tractor	64	36
Human	67	33
Animal	0	0
Wind	0	0

3.3 Factors Affecting the Use of Farm Power

Table 3 is factors analysis of constraints to the use of farm sources among farmers in the study area. Various factors were analyzed and the results were categorized into 2 levels of factors (high and low). A mean score less than 2 shows a high constraint factor while a mean score greater than 2 shows no constraint factor. The result shows that labour (1.26), land (1.34), finance (1.36), affordability (1.48), skills (1.91), weather (1.56), soil type (1.45), topography (1.46), accessibility (1.47) and maintenance (1.38) all constituted factors that affect the use of farm power sources in the study area. This agrees with the FAO (2006) who listed that skills and education, land availability, labour availability, affordability, financial assets, social assets, physical assets amongst others as constraints militating against the choice and use of farm power sources in sub-Saharan Africa. The study however found out that compatibility (3.41) is not a constraint factor in the choice and use of farm power sources in the study area.

Table 3 Factors affecting the use of farm power

Factors	**Mean**
Labour	1.26
Land	1.34
Finance	1.36
Affordability	1.48
Compatibility	3.41
Skills	1.91
Weather	1.56

Soil type	1.45
Topography	1.46
Accessibility	1.47
Maintenance	1.38

3.4 Impact of Tractor Power on Area Cultivated of Food Crops

The result of the impact of tractor power on area cultivated of food crops is presented in table 4. The result showed that the coefficient of determination (R^2) is 0.64. This implies that 64% of the total variation in area cultivated of food crops is explained by tractor power, the remaining 36% left unaccounted for by the model is attributed to the error term. The result also showed that the F-statistics (41.06) was positive and significant at 1% indicating the overall significance of the model. The result further stated that the coefficient of tractor power (2.24) is positive and significant indicating that a unit increase in tractor power used will lead to increase in area cultivated of food crops by 2.24 hectares. Therefore, the null hypothesis that stipulated that tractor farm power sources used have no significant effect on area cultivated of food crops by farm household is rejected. This is attributed to the fact tractor that power reduces drudgery and is faster compared to other farm power sources therefore, farmers using tractor are likely to cultivate more hectares of land than those who do not. This agrees with the findings of Kienzle and Sims (2015) who asserted that, apart from the initial reduction in drudgery associated with land preparation, the partial adoption of animal farm power and tractors usually results in an increase in the area cultivated, creating additional demand for labour for planting, weeding and harvesting.

Table 4 Impact of tractor power on area cultivated of food crops

Crop size	**Coefficients**	**t-stat**
Constant	2.57	0.89
Tractor	2.24**	1.96
Income	1.51e-06***	11.40
Farm exp	0.26**	2.34
Age	-0.15	-1.45
R^2	0 .64	
F	41.06***	

** and *** indicate significant at 5% and 1% respectively

3.5 Impact of Tractor Power on Farm Productivity

Table 5 Impact of tractor power on farm productivity

Output	**Coefficients**	**t-stat**
Constant	237.09	0.61
Tractor	361.05***	2.96
Education	66.84	0.76
Farm exp	-17.18*	-1.75
Age	-4.85	-0.55
Farm size	95.21***	15.80
Household size	-1.45	-0.10
R^2	0.77	
F	49.27***	

* and *** indicate significant at 10% and 1% respectively

The result of the impact of tractor power on farm productivity is presented in table 5. The result showed that the coefficient of determination (R^2) is 0.77. This implies that 77% of the total variation in farm productivity is explained by tractor power, the remaining 23% left unaccounted for by the model is attributed to the error term. The result also showed that the F-statistics (49.27) was positive and significant at 1% indicating the overall significance of the model. The result further stated that the coefficient of tractor power (361.05) is positive and significant indicating that a unit increase in tractor power used will lead to increase in farm productivity by 361.05tonnes per ha. Therefore, the null hypothesis that stipulated that tractor farm power have no significant effect on farm productivity in the study area by farm household is rejected. This agrees with the findings of a study by FAO (2014) who posited that, food security improves as households' switch power sources with tractor and animal sources owners of tractor hirers generally being more food secured.

3.6 Impact of Tractor Power on Poverty Level of Farmers

The result of the impact of tractor power on poverty level of farmers is presented in table 6. The result showed that the coefficient of determination (R^2) is 0.43. The result also showed that the F-statistics (11.38) was significant and positive indicating the overall significance of the model.

Table 6 Impact of tractor power on poverty level of farmers

Income	**Coefficients**	**t-stat**
Constant	11.489	22.87
Tractor	-0.77***	3.58
Age	0.02	1.28
Sex	0.25	1.13
Farm size	0.04***	5.31
Farm experience	0.00	0.24
Household size	-0.01	-0.02
R^2	0.43	
F	11.38	

*** indicate significant 1%

The result further stated that the coefficient of tractor power (-0.77) was negative and significant at 1% indicating that a unit increase in tractor power used will lead to decrease in poverty level of farmers by 0.77 units. This agrees with the findings of Lyimo and Semgalawe (2002) who observed that, although increasing the supply of farm power to labour-deficient families would be one way to alleviate the stress and poverty level; another way would be to reduce the requirement for labour in agricultural production. On the contrary, Ajibola and Sinkaiye (2002) observed that in the past – and sadly sometimes today – the application of tractors and heavy mechanization in unsuitable situations has led to heavy financial losses, lower agricultural production, and environmental degradation. In these circumstances, tractor mechanization can easily become a burden to national economies, and to individuals, rather than being an essential input with the potential to increase productivity.

4 Conclusion

The study espoused that smallholder farmers need farm power and mechanization to raise the productivity of their land and labour, area of food crop cultivated and to see improvements in farm family livelihoods. This essential input is not only needed for agricultural production, but along the value chain for farm produce. Mechanization is needed to alleviate drudgery and to alleviate the load on women, children and the elderly, all of which may lead to an increase in labour productivity.

Bearing in mind that farm power must be an essential ingredient of agricultural productivity and livelihoods strategies, two approaches to satisfying the need can be considered: on the one hand, increasing the supply of farm power, and on the other, reducing the need for it.

Improving smallholders' access to farm power and machinery inputs is crucial as machinery purchase is often beyond the means of a large proportion of the sector. Group ownership is a possibility and can be supported by public sector incentives. Private sector custom mechanization services are probably the most appropriate vehicle and should be supported by public sector incentives and training.

Recommendation

The study therefore recommends that, Agricultural policy makers should place more emphasis on the development of small-scale farmers particularly in the use of appropriate and affordable farm power options, credit acquisition amongst others.

Compliance with ethical standards

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Disclosure of conflict of interest

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