# The Relationship between Agricultural Production and Poverty in Malawi: A District Level Analysis

## Steven Henry Dunga

*School of Economics Science, North-West University, Vanderbijlpark, South Africa*
*Email: steve.dunga@nwu.ac.za*

*Abstract*

*The importance of agricultural production in reducing poverty, especially in developing countries is well established in the literature. Most of the households in sub-Saharan Africa have their livelihood dependent on subsistence agriculture. Improvements in agricultural practices that result in higher yields and hence more income are some of the best strategies in dealing with rural poverty. This study looked at the relationship between agricultural production and the poverty rate at district level in Malawi. The study used panel data from IHS2 and IHS3 with the district head count poverty rate as a dependent variable. Some of the variables used were district annual maize production, tonnage of agricultural subsidy received per district, and the proportion of people benefiting from agricultural subsidy. The results show that there is a link between agriculture production and poverty at district level. An increase in maize production was associated with a reduction in the district poverty rate.*

*Keywords: Agricultural production, poverty reduction, panel data, HIS*

## 1. Introduction

Agriculture, as a sector, has been a mainstay of most developing countries, contributing a substantial percentage to employment for most sub-Saharan countries (Agriculture, 2010; Aliber, Michael, Baiphethi, Mompati, Jacobs, 2007; ILO, 2000). The fact that agriculture is a very important sector is vindicated by the stand-offs in the World Trade Organisation (WTO) negotiation where even the developed countries are not willing to leave the sector unprotected (Hoda & Gulati, 2008; WTO, 2004). Issues of agriculture remain a bone of contention with the Cairns group leading in the fight (WTO, 2014). For developed countries agriculture is highly commercialised and mechanised, and its contribution to employment is minimal (World Bank, 2014). However, agriculture is crucial for developing counties. Even in the midst of increasing efforts to diversify their economies and focus on other areas such as manufacturing and mining, agriculture still stands as a pillar for national development in most developing countries.

The importance of agricultural production in reducing poverty, especially in developing countries, is well established in the literature (ILO, 2008; Chirwa, 2011; Dunga, 2014). Most of the households in sub-Saharan Africa have their livelihood dependent on subsistence agriculture. Improvements in agricultural practices that result in higher yields and hence more income are some of the best strategies in dealing with rural poverty. This paper looks at the relationship between agricultural production and poverty reduction in Malawi. With more than 80 percent of the employment attributed to agriculture, the study considers the link at district level in the country. The rest of the paper is organised as follows: section two looks at the literature on agriculture and poverty, section three presents the methodology and the model specification. Results are presented and discussed in section four and section five contains the conclusion of the paper.

## 2. Literature Review

Development theories take cognisance of the different stages a country goes through to attain a a higher standard of living for the citizens. Rostow's (1960) growth theory suggests a five staged trajectory from underdevelopment to development. The first and starting point is the traditional society, which is a precondition to take off into self-sustaining growth as a second stage (Todaro & Smith 2011). The traditional societies are characterised by agro-based economies, of which most developing countries fall under. Malawi's economy is still agro-based. In 2012, according to the Integrated Household Survey three (IHS 3) by NSO (2012), about 85 percent of households in Malawi were engaged in agricultural activities. The IHS 3 also revealed that, of these households, about 84 percent were engaged in crop production whilst 44

percent reared livestock. The survey also revealed that 43 percent of households engaged in agricultural activities were engaged in both livestock rearing and crop cultivation. Thus, a bulk of Malawi economic activity is based on agriculture. This is not unique to Malawi. The ILO (2008) pointed out that, historically, agriculture has been and continues to be an engine of economic development, providing the food, feed, fibre and fuel with which to create more diversified products and services in other sectors. In many countries, agriculture continues to be the mainstay of rural livelihoods, a major contributor to GDP and an important source of export earnings (ILO, 2008).

The trajectory of poverty reduction from agriculture may follow different paths in different circumstances. A study by Dunga (2014) found that agricultural production in Malawi is linked to poverty through maize production and also access to input subsidy. The framework below shows other sectors that are to be looked simultaneously with agriculture production.

**Figure 1:** The interconnection of the channels of poverty reduction
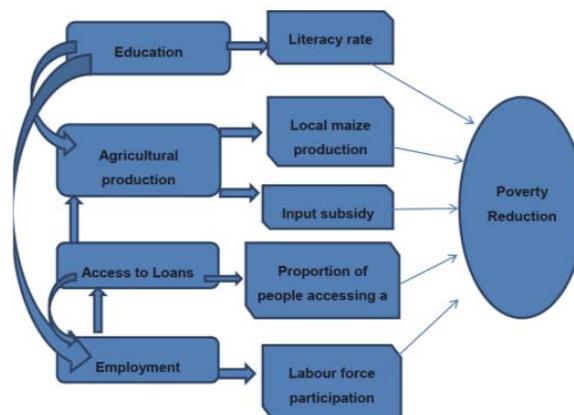


**Source:** Dunga, (2014)

This indicates that in order for poverty reduction to be effective in the country, it must factor in agriculture as a channel for its success. A number of studies have shown the existence of a direct link between agricultural production and poverty reduction. Coxhead and Warr (1995 cited by Hull, 2009) found that an increase in agricultural productivity reduces poverty especially for the rural masses. DFID (2005) noted that agriculture should be placed at the heart of efforts to reduce poverty. They pointed out that there is a mass of evidence that increasing agricultural productivity has benefitted millions through higher incomes, more plentiful and cheaper food, and by generating patterns of development that are employment intensive and benefit both rural and urban areas.

According to NEPAD (un), improvement in agricultural performance has the potential to increase rural incomes and purchasing power for large numbers of people. This means that more than any other sector agriculture can uplift people scale en masse, especially in developing countries like Malawi where the majority of people are in agriculture. NEPAD states that with an improvement in agriculture, a virtuous cycle of reduced hunger, increased productivity, increased incomes and sustainable poverty reduction can be started (NEPAD cited in ILO 2008:6). The World Bank (2003) concurred and argued that rural poverty is as diverse as the rural poor in their livelihood strategies, but in most of the poorest developing countries, agriculture is the main source of rural economic growth. That is why improved agricultural productivity and growth are central to the Bank's strategy. The US, through its AID organisation, also views agricultural production as central. They contended that for many developing countries overall economic growth, trade expansion and increased income-earning opportunities depend on the performance of the agricultural sector. Therefore, in these developing countries, increases in agricultural productivity must be accelerated to reduce current levels of food insecurity and meet the food, job creation and income needs of new populations and, hence, reduce the incidences of poverty (USAID, 2004). In their argument for agriculture the CGIAR (2005) stated that agricultural growth is critical to achieving the MDGs. As the vast majority of potential beneficiaries of the MDGs depend on agriculture for a living, higher agricultural productivity is a precondition for achieving the goal of eradicating extreme poverty and hunger in the poor

countries. It is therefore through agricultural production that smallholder famers have a chance of rising out of poverty. This is directly dependent on their ability to increase the productivity of their crop and livestock husbandry activities. Agricultural production growth in developing countries has strong direct and indirect effects on non-agricultural growth. Perhaps more importantly the positive impact of agricultural growth on poverty reduction is more than proportional to the relative importance of the sector in the economy, (FAO, 2005).

Understanding the importance of agriculture as a channel for poverty reduction requires accompanying policies to enhance its effect. As stated by the International Labour Organisation, in its 98th session, agriculture cannot play this dynamic, wealth-creating role without an enabling policy environment. Also, there is need for adequate institutions and sufficient, well-targeted public and private investment that needs to work hand-in-hand with the agricultural initiatives. ILO noted that in LDCs these support structures are in existent of where there exist, inefficient and disappointing.

*"The experience of recent decades has been disappointing in this regard in a number of countries, particularly the LDCs, where investment has declined, rural poverty remains widespread and a very large share of the labour force is engaged in low-return agricultural work. Cuts in health and education budgets and in other public services, as well as the dismantling of publicly funded agricultural extension services during the structural adjustment processes of the 1980s and 1990s, undermined the foundation for bottom-up development for a generation. The effects are being felt today with a large number of poorly educated rural youth with few skills and poor job prospects and a smallholder agricultural sector that cannot thrive due to lack of support in terms of policy, infrastructure, inputs and investment"* (ILO 2008).

The relationship between poverty and agricultural production in Malawi has been also reported in studies by Chirwa, (2004) and (2008) where he linked agricultural production to land holding and poverty. The findings, according to Chirwa (2004), were that access to land was one of the major hindrances to household production and, hence, poverty alleviation. Chirwa argued that agricultural policies in Malawi favoured large-scale (estate) production at the expense of smallholder farmers who accounted for more than 80 percent of households. Smallholder farmers faced several constraints including landlessness, small land holdings, and declining agricultural productivity.

## 3. Methodology and Data Collection

The study uses data from Intergrated Household Survey 2 and 3 collected by the National Statistics Office of Malawi. The survey collected data from households on a number of variables.This paper uses the district poverty rate for the two IHS rounds as a dependent variable and a number of agriculture related variables as dependent variables as specified in section 3.2. The model uses panel data and was run in STATA using random effects GLS regression.

### 3.1 Model specification

The paper uses the random effects model as opposed to fixed effects model. This is because there are a number of weaknesses with the fixed effects model (FEM), especially if applied in this model. Some of the weaknesses in the FEM is that degrees of freedom are lost by including too many dummy variables. In this model, there is already a limited number of data points and loosing degrees of freedom would render the model unfit. An easy way to compensate for this is to account for the differences in the intercepts by putting them in the error term. The random effects model takes that into account. It has a composite of the error term from the individual districts and from the model. Therefore, the intercept used is the mean of all the district intercepts and the individual errors are a representation of the diversion of the district intercept from the mean intercept.

The Breusch-Pagan (BP) test is used to test whether it is appropriate to use the random effect or fixed effects model. The null hypothesis under the BP test is that variance is equal to zero. This assumption, that variance is equal to zero, means that there are no random effects and hence it is not appropriate to use random effects. This test for the model rejects the null hypothesis. The results produced a chi square test of 11.31 and a pvalue of 0.0004, which means the null hypothesis of variance equal to zero, is rejected and concludes that there are random effects, and hence the use of the random effects model is appropriate. So the REM, also known as the ECM, is of the following form:

$$DPR_{it} = \beta_{1t} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it} \dots (1)$$

Instead of treating $\beta_{1i}$ as fixed, it is assumed that it is a random variable with a mean value of $\beta_1$ without the subscript i. The intercept value for an individual district can be expressed as:

$$\beta_{1i} = \beta_1 + \varepsilon_i \quad i = 1, 2\dots N \dots (2)$$

Where $\varepsilon_i$ is a random error term with a mean value of zero and variance of $\sigma^2_\varepsilon$. Equation (1) then becomes:

$$DPR_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon_i + u_{it} \dots (3)$$

$\varepsilon_i + u_{it} = w_{it}$ Therefore

$$DPR_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + w_{it} \ (4)$$

Where, $w_{it}$ is the composite error term. The composite error term $w_{it}$ consists of two components, namely $\varepsilon_i$, which is the cross-section, or individual districtspecific error component, and $u_{it}$, which is the combined time series and cross-section error component. The model estimated used the district poverty rate as a dependent variable and a number of agricultural production related aspects as independent variables. This is as follows:

$$DPR_{it} = \beta_{1it} + \beta_{2it} Maize\ pro_{it} + \beta_{3it} input\ Subsidy + \beta_{4it} people\ on\ subsidy_{it} + \beta_{5it} price\ of\ Maize_{it} + \beta_{6it} Literacy\ rate + \omega_{it} \ ... \ (5)$$

Where DPR is the District Poverty Rate, $\beta_{1it}$ is the random effects intercept term, $\beta_{2it...6it}$ are the coefficients for the independent variables. Maize pro is the annual maize production measured in tonnage per district, Input Subsidy is the amount of subsidy received annually per district, also measured in tonnes. Price of maize is the average annual maize price per district. Literacy rate is also included in the model as it has a positive relationship with agricultural production, and $\omega_{it}$ is the random effects composite error term.

## 4. Results and Discussion

Agricultural production in Malawi, especially at district level, is almost the only economic output. A study by Chirwa looked at the share of agriculture in the country from the 1970s, the trend of which is represented in Table 1.

**Table 1:** Trends in agricultural share of the economy

| Indicator | 1970-79 | 1980-84 | 1985-89 | 1990-94 | 1995-99 | 2000-05 |
|---|---|---|---|---|---|---|
| **Share of agricultural GDP** | 39.63 | 37.23 | 35.88 | 33.36 | 38.60 | 38.49 |
| **Share of total employment** | 39.84 | 48.79 | 45.88 | 49.96 | 69.17 | Above 70 |

**Source:** Chirwa et al. (2008:11)

It is therefore safe to associate or proxy economic activity to agricultural activities in this context. The section that follows discusses the variables that are considered important in linking poverty reduction to agricultural production.

**Table 2:** Descriptive statistics of the variables in the agricultural model

| Variable | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **Hectare** | 62 | 35762.48 | 42043.24 | 1437 | 210726 |
| **Local maize production** | 62 | 21722.50 | 25003.86 | 1295 | 132135 |
| **Input Subsidy** | 62 | 6285.172 | 4316.74 | 324.1 | 17712.75 |
| **Beneficiary** | 62 | 77698.93 | 54050.13 | 6554 | 265939 |
| **Maize price** | 62 | 26.51 | 5.243 | 39.75 | |
| **Literacy rate** | 62 | 66.94 | 14.02 | 34.1 | 93.1 |

Calculation in STATA using IHS 2 and 3 data

Table 2 presents the descriptive statistics of the variables in the agricultural sector that are crucial in determining the relationship with poverty reduction. These variables are chosen due to their association with agricultural production in Malawi.

### 4.1 A discussion of the variables under the agricultural production model

This section justifies the choice of the variables used in the analysis of the relationship between poverty reduction and agricultural production in Malawi. The variables to be discussed include land holding, the input subsidy program, and maize production as per the descriptive statistics in Table 2.

### 4.1.1 Land holding (hectares)

One of the most important factors associated with agricultural production is the availability of land. Therefore, land available for maize production is considered an important factor in the model. A study by Chirwa (2004) found the link

between poverty reduction and land holding to be crucial. The study revealed that agricultural policies had favoured large scale farmers at the peril of small holder farmers who accounted for 80 percent of the households in the country. Two of the main reasons or constraints that small holder farmers faced was landlessness and small land holding (Chirwa, 2004:1). Another study by Mukherjee and Benson (2003) reported that per capita consumption increased by 13–17 percent in response to increased cultivated area in Malawi (Mukherjee & Benson, 2003:352). According to the data, as reported in Table 2, on average, 35762.48 hectares are under maize cultivation per district in Malawi. There is also a clear indication that the distribution of land is varied in the districts. The maximum land under maize cultivation is 210726 hectares and the minimum is 1437, giving a range of 209289 hectares, which is an indication of very high disparities between the districts.

### 4.1.2 Local maize production

In Malawi food security for the nation is understood in the context of access to maize (Chirwa, 2008). Figure 2 shows the major food crops in Malawi.

**Figure 2:** Malawi's major food crops
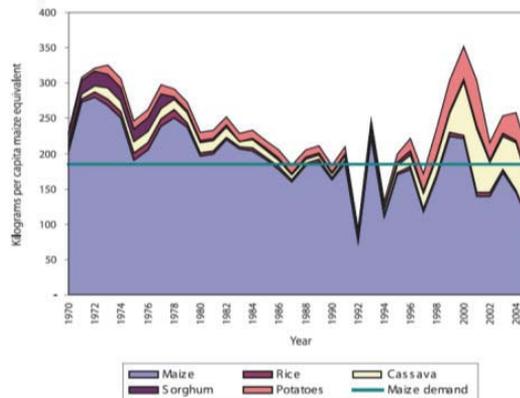


**Source:** Chirwa *et al.,* (2008)

There are a number of food crops grown in Malawi with the major one being maize, which is cultivated in all the districts of the country. Other crops include rice, which is only grown in a few districts that have the conditions necessary for rice production, namely Zomba in the south and Karonga in the northern region. Also, cassava, sorghum and potatoes are considered important food crops as depicted in Figure 2. Chirwa and Zakeyo (2003), in emphasising the importance of maize, stated that even if the total food production is above the minimum requirement for the country, should the production of maize be below the minimum, the nation considers itself to be food insecure for that year. The same sentiments about maize are echoed in the Ministry of Agriculture, where it is stated that the country is seen to be in a food crisis if the production and supply of maize falls below the minimum required levels. This can be so, despite the fact that other food crops also grown in the country, like rice and cassava, are alternatives to maize in some parts of the country. Maize remains the main staple food for Malawians (GoM, 2010:12). The importance of maize is even seen by the amount of land dedicated to maize cultivation by households across the regions in the country. Table 3 gives some indication of the importance of maize.

**Table 3:** Small holder agriculture in Malawi in 2004

| Item | Northern region | Central Region | Southern region | Nation |
|---|---|---|---|---|
| Landholdings less than 0.5 ha /household (%) | 12.1 | 15.4 | 25.4 | 19.9 |
| Less than 1.0 ha /household (%) | 31.4 | 40.6 | 54.1 | 46.2 |
| **Maize growers (%)** | **93** | **97** | **99** | **97** |
| Access to credit for food crop inputs (%) | 2.5 | 4.2 | 3.0 | 3.4 |
| Percentage of smallholder farmers purchasing fertilizer (%) | 37 | 44 | 39 | 41 |

**Source:** Dorward and Chirwa (2011)

### 4.1.3  Input subsidy

Although there is so much attention given to agriculture, productivity remains the centre of the connection between agriculture and poverty reduction (Dorward & Chirwa, 2011). Looking at the percentage of smallholders that purchase fertilizer in Table 3, it is clear that most farmers cannot afford this strategic input. In the 2004/2005 growing season, the government introduced a subsidy on fertilizer, which to a greater extent makes it possible for most poor households to use the input. The input subsidy is therefore important in explaining the changes that have happened in the agriculture sector since 2004. This is the reason that the input subsidy variable is included as an independent variable in the model. The variable is measured in terms of tonnes of fertilizer received per district. The descriptive statistics in Table 2 indicated that, on average, 6285.172 tonnes are received per district. Although it is clear that other districts benefit more as the maximum tonnage received per district is reported to be 17712.75 and the minimum is at 324.1 tonnes.

**Table 4:** Results of the agricultural production and poverty model

| Regression model with maize production as the only independent variable | | | Regression model with all the independent variables specified in equation 5 | |
|---|---|---|---|---|
| Variable | Coefficient | p-value | Coefficient | P –value |
| Constant | 58.881 | 0.000*** | 65.297 | 0.000*** |
| Local Maize production | -0.003134 | 0.001*** | -0.0001 | 0.497 |
| Hectors | | | -0.000072 | 0.39 |
| Input Subsidy | | | -0.0020 | 0.06* |
| Beneficiary of subsidy | | | .000 | |
| Maize price | | | -0.07412 | 0.769 |
| Wald chi 2 | 11.96 | 0.000*** | 16.48 | 0.0056*** |

Calculation using Integrated Household Survey data (significant at 1%** ,5%** 10%*)

The results of the simple regression model show that a one ton increase in local maize production reduces the district poverty rate by -0.003, and it is significant even at 1percent significance level with a p-value of 0.001. The fact that there is a negative relationship between the district poverty rate and maize production confirms the *a priori* expectation that improvements in agricultural production can help reduce incidences of poverty in the country.

However, to further investigate the relationship between the poverty rate and agricultural production, the study estimates the model specified in equation (5) with more independent variables that are expected to have a bearing on the relationship between agricultural production and the district poverty rate.

The outcome of the model is not impressive in terms of the significance of the coefficients. Only the input subsidy is significant at 10 percent significance level with a p-value of 0.06. This result leads to rejecting the null hypothesis that there is no relationship between input subsidy and poverty reduction. The conclusion drawn from this significant coefficient is that the inputs subsidy program significantly affects the poverty rate at district level. The input subsidy is measured in tonnes received per district, which means a one ton increase in the subsidy received per district reduces poverty at district level by 0.002. This significant result with regard to the subsidy is in agreement with a study by Dorward and Chirwa (2011), who also found that the fertilizer subsidy led to significant increases in national maize production and productivity, and consequently contributed to increased food availability, higher real wages and wider economic growth, and poverty reduction in the country (Dorward & Chirwa, 2011).

Although not significant in the model, the hectares under maize cultivation and the maize price have all indicated a negative relationship with the district poverty rate. This is in agreement with the *a priori* expectation that an increase in land cultivated should lead to a reduction in poverty. A study by Mukherjee and Benson (2003), found that an increase in cultivated land also increased per capita consumption in Malawi. It can however be argued that the result in this study is only representing the inelasticity of land over time. Increased land cultivation is only possible when there is land lying idle, or as the pareto principle would call it, inefficient use of land. In cases where all the land is being used, this increase may only constitute a change of usage.

Maize price also has a coefficient that is not significant as far as affecting the district poverty rate is concerned. However, the negative sign means that the higher the maize price the lower the district poverty rate. That the result is not significant may largely point to the fact that maize prices are higher during times of shortage, and that when there is a shortage, it is mostly the poor that suffer as they struggle to buy food. Therefore a significant relationship between maize price and poverty would have been worrisome in policy terms.

The Wald chi square test statistic is also significant, showing that the null hypothesis, that all the variables in the model are equal to zero, cannot be accepted. With a p-value of 0.0056 for the simple regression and 0.000 for the multiple regression, the models are significant at 1percent significance level. Hence, the model specification cannot be questioned.

## 5. Conclusion

The main conclusion drawn from the empirical analysis of the relationship between agricultural production and district poverty rate is that, increased agricultural production proxied by local maize production is crucial for poverty reduction in the country. This result is in agreement with a number of studies that also found a strong relationship between agriculture and poverty reduction. A study by Cervantes-Godoy and Dewbre (2010), found that growth in agricultural incomes were of special importance in a twenty five country. DFID (2004) also found that increased agriculture productivity is a key to poverty reduction.

The fact that 85 percent of the labour force in Malawi are in agriculture implies that, if incomes from agriculture increase, then 85 percent of the labour force will benefit. It is therefore clear from this result that government policies aimed at promotion of productivity would be more pro-poor. Productivity becomes the important aspect since with all the land under usage output can only be increased if there is advancement in productivity. Therefore, policies like the fertilizer subsidy, which have proven to increase productivity (Dorward & Chirwa, 2011), have to be encouraged. There is also a need to research better varieties of maize that would lead to higher output. Programs that would encourage farmers to venture into irrigation so as to avoid the effects of changing weather patterns would also work to the advantage of poor households.

## References

Agriculture, F. (2010). Estimate of the contribution of the agricultural sector to employment in the South African economy. Pretoria: Government Printer.
Aliber, M. Baiphethi, M. & Jacobs, P. (2007). scenarios, 132–163.
CGIAR. (2005). *Agricultural Research matters: Achieving the Millennium development Goals.* Washington DC.
Chilonda, P., Machethe, C., & Minde, I. (2007, May). Poverty, Food security and Agricultural trends in southern Africa. *Regional Strategic Analysis and Knowledge support System: Southern Africa.*
Chirwa, E.W. (2004). *Access to Land, Growth and Poverty Reduction in Malawi.* PLACE
Chirwa, E., Kumwenda, I., Jumbe, C., P.Chilonda, & Minde, I. (2008, October). Agricultural growth and Poverty reduction in Malawi: Past Performance and Recent trends. *ReSAKSS Working Paper No.8, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)*(policy Research Institute (IFPRI) and International Water Management Institute (IWMI).
Datt, G., Simler, K., Mukherjee, S., & Dava, G. (2002). Determinants of poverty in Mozambique: 1996-97 food consumption and nutrition division discussion paper No 78. *International Food Policy Research institute.* Washington DC.
DFID. (2005). *Growth and poverty reduction: the role of agriculture.* London: UK Department for International.
Dunga, S.H. (2014). The channels of poverty reduction in Malawi: a district level analysis. Unpublished thesis: North-West University (Vanderbijlpark).
FAO. (2005). *Beijing consensus on the future of global agriculture and rural areas - A blue print for action.* Rome.
Frees, E. W. (2004). *Longitudinal and panel data: Analysis and application in the social sciences.* New York: Cambridge University Press.
Gujarati, D. N. (2004). *Basic Econometrics.* NY: The McGraw Hill.
Hoda, A., & Gulati, A. (2008). WTO negotiations on agriculture and developing countries. Johns Hopkins University Press: Baltimore.
ILO. (2008). Promotion of rural employment for poverty reduction. *97th Session.* International Labour Office Geneva.
NEC, NSO, & IFPRI. (2001). *The Determinants of Poverty in Malawi 1998 An Analysis of the Malawi Integrated Household Survey.* Lilongwe.
NEPAD. (2003). *Comprehensive Africa Agriculture Development Programme; World Bank:.*
NSO. (1998). *Intergrated Household Survey.* Zomba: National statistics Office, Government Press.
NSO. (2005). *Intergrated Household Survey (IHS2).* Zomba: Governmet Press.
NSO. (2012). *Intergrated Household Survey 3 (IHS 3).* Zomba: National stistical office of Malawi (Government Press).
Todaro, M., & Smith, S. C. (2011). *Economic Development.* (11, ed.) London: Pearson.
UNDP. (2008). *Malawi Poverty Report.PLACE*
UNDP. (2011). *Human Development Report, sustainability and equity: a better future for all.* NY: Palgrave Macmillan.
USAID. (2004). *USAID agriculture strategy: Linking producers to markets .* Washington DC.
WTO. (2004). The issues , and where we are now, (December), 1–88.

WorldBank. (2007). Finance for all? Policies and pitfalls in expanding access. [Online] Available: http://www.worldbank.org/ INTFINFORALL/Resources/.../FFA_book.