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# Journal of African Studies and Development

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Review

## Resolving Nigeria's dependency on oil – The derivation model

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Since the discovery of oil in commercial quantity in Nigeria in 1956 and the oil boom of 1970s, oil has dominated the economy of the country. Oil accounts for more than 90 percent of the country's exports, 25 percent of the Gross Domestic Product (GDP), and 80 percent of government total revenues. As a result, the economy of the country has been substantially unstable, a consequence of the heavy dependence on oil revenue, and the volatility in prices. The oil boom of the 1970s led to the neglect of agriculture and other non-oil tax revenue sectors, expansion of the public sector, and deterioration in financial discipline and accountability. In turn, oil-dependence exposed Nigeria to the vagaries associated with oil price volatility which threw the country's public finance into disarray. Moreover, since oil revenue dominates Nigeria's Federation Account, the sharing of oil rents govern intergovernmental fiscal relations in the country with an on-going tension between agitations by oil producing states for greater share of resources and demands for redistribution from other regions, particularly relatively less endowed ones. In this paper, the authors argue for a rethink in the current revenue sharing formula in Nigeria in favor of derivation. This will reduce ongoing tensions in the distribution of proceeds from oil between the federal government and states on one hand and between the federal government and oil producing states in Nigeria on the other hand. The authors argued for a rollback to the era when states/regions were accorded 50% retention of any proceeds accruing from their areas. This will make every state/region in Nigeria to look inwards and explore other resources that abound in their areas and will also help to diversify the economy of Nigeria away from oil.

**Key words:** Oil dependency, economic diversification, derivation formula, economic development.

### INTRODUCTION

The volatility in crude oil production in Nigeria and fluctuations in international oil price has once again brought to the front burner anxieties about the future of the oil sector in the Nigerian economy. In the first quarter

of 2014, the contribution of the oil sector as a percentage of the nation's real Gross Domestic Product (GDP) was estimated at about 14.75 percent, compared to 15.80 percent (a decline of over 100 basis points) in the

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corresponding period in 2013, according to the National Bureau of Statistics (NBS, 2014). Also, average daily production of crude oil was 2.29 million barrels per day (mbpd) in the first quarter, as against 2.35 mbpd in the corresponding quarter in 2013, based on data from the Nigerian National Petroleum Corporation (NNPC, 2014). Current average daily crude oil production is less than the projected 2.53 mbpd on which the 2014 federal government budget estimates are based. In terms of growth, oil sector GDP (with associated gas components) grew at 0.74 in the first quarter of 2014. Conversely, the non-oil sector continued to be a major driver of the economy, recording 7.89 percent growth in real terms in the same period (NBS, 2014).

The oil sector in Nigeria has witnessed disruptions in recent times due to pipeline vandalization, incidents of illegal bunkering and theft of crude. These have resulted in incessant declarations of force majeure by some International Oil Companies (IOCs) such as Eni (Agip), Total and Royal Dutch Shell. Estimates of revenue loss due to oil theft and vandalization are about \$1.23 billion in the first quarter of 2013 alone (NNPC, 2014). The federal government has in several global fora sought global clampdown on illicit trade in stolen crude oil as an antidote to oil theft. Nigeria has consistently argued that stolen crude oil ought to be treated globally in the same manner as stolen diamonds because they both generate blood money, aids corruption and violence and can provoke war (Ahmad and Mottu, 2003; Collier and Hoeffler, 2005; Brough and Elliot, 2008; Sampson, 2013). As a result of these ugly developments, the Federation Accounts Allocation Committee (FAAC)<sup>1</sup> has had to resort to the Excess Crude Account (ECA)<sup>2</sup> to shore up monthly allocations to the three tiers of government. There is also apparent lethargy on the part of IOCs in embarking on new investments especially in deepwater explorations as a result of uncertainties and the delayed

enactment of the Petroleum Industry Bill (PIB)<sup>3</sup>. These somewhat gloomy scenarios together with the energy policies of the United States and China have reinforced concerns about the long term future of the oil sector in Nigeria and the country's near-total dependence on proceeds from oil (Uzor, 2013).

The near total dependence of Nigerian economy on oil has dire implications for the economy (Emmanuel, 2004; Gary and Karl, 2003; Karl, 1997, Sampson, 2013). To buttress this point, in 2013, the stock of the nation's external reserves and Excess Crude Account witnessed various degrees of decline as a result of fluctuations in the price and quantity of oil. The CBN report (2014) shows that the gross external reserves as at December 31, 2013 stood at US\$42.85 billion, representing a decrease of US\$0.98 billion or 2.23 percent compared with US\$43.83 billion at end-December, 2012. The excess crude account (ECA) also declined within the period. Earlier in the first quarter 2013, external reserves had climbed to its highest level in more than four years, hitting around US\$48.57 billion in May (CBN, 2014). The drop in both the stock of external reserves and the ECA are attributable to a number of factors. First was the slowdown in Portfolio and Direct Foreign Investments (FDIs) flows in the fourth quarter 2013, which prompted increased funding of the foreign exchange market by the CBN to stabilize the national currency. Secondly, there was a drop in oil revenue inflow owing to decline in oil output – due to oil theft and pipelines vandalism at various times in 2013 which resulted in the loss of about 300,000 – 400,000 barrels per day (NNPC, 2014). Thus, this 'quantity shock' led to depletion in both accounts – the external reserves and the ECA. While the ECA and external reserves were getting depleted, the nation's stock of public debt was on the increase all through 2013. Indeed, according to the Debt Management Office (DMO, 2014), Nigeria's total public debt stood at N10.04 trillion (US\$64.51 billion) as at end-December, 2013 – with the domestic debt standing at N8.67 trillion (US\$55.69 billion) – representing 86.32 percent of the total debt.

It should be further noted that the Nigerian economy has been largely unstable, a consequence of the heavy dependence on oil revenue, and the volatility in prices. The oil boom of the 1970s led to the neglect of agriculture and other non-oil sectors, expansion of the public sector, and deterioration in financial discipline and accountability. In turn, oil-dependence exposed Nigeria to oil price volatility which threw the country's public finance into disarray (Adebayo, 1993; Adesina, 1998; Ahmed and Singh, 2003). According to Sala-i-Martin and Subramanian (2013), waste and 'Dutch disease' manifesting in rapid capital accumulation and negative

<sup>1</sup> The Federation Accounts Allocation Committee (FAAC) is a commission set up by the 1999 constitution of Federal Republic of Nigeria in charge of revenue allocation or the statutory distribution of revenue from the Federation Account among the different levels of government.

<sup>2</sup> The Nigerian Sovereign Investment Authority Act, 2011 (NSIA Act 2011) which establishes the Excess Crude Account has the principal aim of building a savings base for Nigerian citizens, enhancing the development of Nigerian infrastructure and providing stabilization support in times of economic stress, among others. The NSIA as the governing authority is empowered to make regulations and policies as it may determine to be most effective to achieve the objective of the fund. It also has the power to invest in equity, debt, private equity, real estate, infrastructure, fixed income securities and all other asset classes at the international and domestic level. Thus, the portfolio scope of the fund is subject to the assessment criteria, policies and procedures developed from time to time by the NSIA on the advice of its external asset managers. The Act requires adherence with the Generally Accepted Principles and Practices developed by the International Working Group of Sovereign Wealth Funds, otherwise known as the Santiago principles. The Act reflects the legal propriety of the Nigerian Sovereign Wealth Fund and is aimed at ensuring management independence and accountability, corporate governance, and transparency in the fund's transactions (NSIA Act, 2011).

<sup>3</sup> The Petroleum Industry Bill 2012 is a bill before the 7<sup>th</sup> National Assembly. It is an act to provide for the establishment of a legal, fiscal and regulatory framework for the petroleum industry in Nigeria and for other related matters. It is awaiting passage into law by the National Assembly in Nigeria.

Total Factor Productivity (TFP) characterized Nigeria's 54 year post-independence development experience. While capacity utilization averaged about 77 percent in 1975, it had declined to about 50 in 1983 and until very recently has languished at about 35 percent since the mid 1980s till date. Moreover, since oil revenue dominates Nigeria's Federation Account, the sharing of oil rents govern intergovernmental fiscal relations in the country with an on-going tension between agitations by oil producing states for greater share of resources and demands for redistribution from other regions, particularly relatively less endowed ones. Also, the history of successive revenue allocation arrangements in Nigeria has been most unstable and accompanied by distrust, inadequate information flows, a lack of transparency, and uncertain accountability (Aliyu, 1977; Ashwe, 1986; Jinadu, 1985; Mobogunje, 2001; Ahmed and Singh, 2003; Obinna, 1985; Mbanefoh, 1989, Uche and Uche, 2004). Indeed the present intergovernmental fiscal arrangement prevailing in Nigeria generates a large vertical imbalance in favor of the centre while allocations to the states do not depict any clear pattern of redistribution between regions or any correlation with relative needs. While in theory the arrangement takes into account the effort of each state to mobilize internal revenue, in practice, an equal weight is given for this variable in allocations. Thus, apart from failing to create an incentive to increase states' efforts at revenue generation, the federation account transfer does not appear to have any significant equalization effect. Oil-availability has also fundamentally altered fiscal governance in Nigeria. Like most other oil-producing countries, Nigeria has suffered from poor institutional quality stemming from oil proceeds, a factor which according to Sala-i-Martin and Sambaramanian (2013) has contributed to lower long run annual growth of 5 percent.

It is obvious from the foregoing that Nigeria's dependence on oil can no longer be sustained in the long term and efforts must be intensified to diversify the economy away from oil. One way of achieving this is through a roll-back to the derivation model which was in vogue in Nigeria before the discovery of oil in commercial quantities. The derivation model in revenue sharing in Nigeria requires that all revenues which accrue from or are attributable to a particular state (region) should be allocated in part or in full to such a state (region), irrespective of the fiscal jurisdiction involved or the machinery for the collection. The principle is closely related to the benefit principle of taxation. Its main attraction is that it ensures that a state (region) of origin of any particular revenue would receive more than any other state (region) from the revenue accruing from within its geographical boundary or area of jurisdiction (Nwokedi, 2007). This model worked so well before the scheme of amalgamation in 1914 as it instills healthy competition among the regions to exploit and develop resources within their respective regions. Each of the regions in Nigeria were comparatively well off through exploitation

of resources where they have comparative advantage. There was then the groundnut pyramids in the Northern region, the flourishing Cocoa sector in the Western region and the Palm Oil Plantations in the Eastern region. These and many other resources were exploited, developed and exported and they provided the regions with ample revenues to run the regions successfully. The regions were fiscally independent and there was true fiscal federation in the country at the time. All these were to change with the discovery of oil in commercial quantity and near-total abandonment of agriculture over the years in Nigeria. We shall place analytical spotlight on these points later in the paper.

The major objective of this paper is to suggest a rollback to the use of derivation as a revenue sharing model as a way of resolving Nigeria's dependence on oil. To achieve this objective, the paper adopted the descriptive and historical analytical methodology. The rest of the paper proceeds as follows: following this introduction, section 2 reviews the oil sector and the Nigerian economy. In section 3, we reviewed some of the emerging threats to Nigeria's oil industry especially the ambitions US and Chinese energy policies to decouple their countries energy requirements from fossil fuel. In section 4, we provide a model for resolving Nigeria's decades-long dependence on oil. Discussions on the policy implication of a rollback to derivation model and possible benefits to the federation will be dealt with in section 5 while the paper is concluded in section 6.

### **The oil sector and the Nigerian economy**

That the Nigerian economy is intricately interlinked with the oil sector is obvious. Crude oil receipts account for about 80 percent of total government revenue accruable to the federation account<sup>4</sup>, 95 percent of foreign exchange earnings, about 15 percent to the country's GDP (14.85 percent in the first quarter of 2014), and 4 percent of total employment – thus making Nigeria one of the most oil-dependent economies in the world (Sampson, 2013). As such, any major shock in the international commodities market negatively affects the Nigerian economy as was evident during the global economic and financial crisis when crude oil prices plummeted from its record high of \$147.50 per barrel in July 2008 to less than \$40 per barrel in December 2008.

Indeed, but for the Excess Crude Account (ECA) that became handy as a fiscal buffer for the economy, the

<sup>4</sup> The 1999 constitution of the Federal Republic of Nigeria, Section 162(1) specifically provided that "the Federation shall maintain a special account to be called 'the federation account' into which shall be paid all revenues collected by the government of the federation, except the proceeds from the personal income tax of the personnel of the armed forces of the federation, the Nigerian Police force, the ministry or department of government charged with responsibility for foreign affairs and the residents of the Federal Capital Territory, Abuja" (FGN, 1999)



consequences of total dependence on oil earnings would have been catastrophic.

The upside of the oil sector notwithstanding, the focus of the sector at the expense of other sectors has been blamed for the abysmal performance and retarded growth of other sectors of the Nigerian economy notably manufacturing and agriculture (Obo, 1998; Fearon, 2005; Ehwareme, 1999; DFID, 1999, 2001). In the era preceding the discovery of crude oil in commercial quantity, agriculture was the major source of foreign exchange. The groundnut pyramids of the Northern region, cocoa farms of the Western region and palm plantations of Eastern Nigeria were the major sources of foreign exchange that sustained these respective regions (Taiwo, 1999; Vincent, 2001; Teriba, 1999; Sala-i-Martin and Subramanian, 2013). The story of Malaysian farmers learning the rudiments of palm cultivation in Nigeria but now exporting palm produce to Nigeria underscores the neglect that agriculture has suffered. Malaysia is the world's largest producer of oil palm and the commodity is currently the country's leading agricultural export. Nigeria is still a net importer of food, including staples, despite having about 75 percent arable land of which over 50 percent is not cultivated (World Bank, 2005, 2006).

The manufacturing sector has not fared better since Nigeria joined the 'elite league' of petro-dollar countries. The sector has been performing sub-optimally in spite of the preponderance of incentive packages and government policies. Several studies have established a relationship between the decline in manufacturing and the discovery of crude oil in the country since the late 1950s (Ekundare, 1973; Danjuma, 1994; Mbanefoh, 1997; Obi, 1998; Colier et al, 2003; Emmanuel, 2004; Ramey and Ramey, 2005). It has been argued that the manufacturing sector has been ensnared by the infamous resource curse or Dutch disease<sup>5</sup> with attendant under-capacity utilization (Gravin and Hausmann, 1998; Goodhand, 2003; DFID, 2001, 2003). The oil sector has not broadened the productive

base of the economy and has not alleviated the unemployment situation in the country because it is not a labour-intensive industry. Although Nigeria's export trade is still tilted in favor of crude oil, recent trade figures indicate improvement in non-oil exports. According to the data from the Nigeria Bureau of Statistics (2013), non-oil export rose by 25.5 percent between 2011 and 2012, while the contribution of oil to total trade declined from 71.7 percent in 2011 to 69.2 percent in 2012. Statistics from the Central Bank of Nigeria (2013) also shows that between 2009 and 2012, the non-oil export industry grew at an average rate of about 23 percent annually. The trend is a noticeable departure from the past when crude oil export accounted for over 90 percent of the country's total merchandise trade. These developments suggest that the strategic programmes and policies of the Ministry of Industry, Trade and Investment to promote the development of the non-oil export sector and diversify the export base of the economy are beginning to yield results. The high incidence of unrecorded exports is still a challenge to the non-oil sector and this has affected accurate reporting of the performance of the sector. The non-oil sector is however still dominated by raw commodities and few products with little value addition to the economy.

Amid Nigeria's internal challenges that have culminated in reduced crude oil production, major agencies have cut their forecast for crude oil demand for 2014 (Hitchens, 2013; IEA, 2013). The downgrade in oil demand in 2014 is symptomatic of continuous unease about the challenges to the world economic recovery and the fragility of the euro-zone economies. Despite some cherry developments, there is still pessimism over the global economic outlook, with downside risks continuing to be presented by the sovereign debt crisis in the euro-zone which could negatively impact demand for crude oil in 2014. The Organization of Petroleum Exporting Countries (OPEC) in April 2014 trimmed its forecast for global growth in oil demand in 2014 for the second time in two months. OPEC now expects that world oil demand will rise by 800,000 barrels per day (bpd) in 2014, a cut of 40,000 bpd from its previous estimate after disappointing consumption in industrialized countries in the first quarter of the year. The 12-member cartel cited on-going challenges to the world economic recovery, especially in Europe, as posing considerable uncertainties for product demand. In March 2014, OPEC, which produces more than one in three barrels of crude oil consumed each day worldwide, reduced its overall demand numbers for crude oil by 10,000 bpd. In similar developments, the International Energy Agency (IEA) and the US Energy Information Administration (EIA, 2013) have also reduced their forecasts for global oil demand in 2014. The International Energy Agency (IEA) reduced its forecasts for global oil demand in 2014 for a third consecutive month, predicting the weakest consumptions in Europe in almost three decades. The IEA cut its estimate by 45,000 bpd, predicting that world consumption will

<sup>5</sup> Three major lines of argument have been employed in the theoretical literature to explain the resource curse - the tendency of natural resource abundance/dependence to stultify growth and development. One line follows what has come to be known as the *Dutch disease*. The second focuses on the *volatility effect* of natural resource export-dependence (Gravin and Hausmann, 1998; Ramey and Ramey, 1995; Okoh and Egbon, 1999; and Caballero, 2000), while the third discusses the *rent-seeking effects*. The rent seeking views assert that resource-dependence (especially oil) often lead to a vicious development cycle whereby all actors (public and private, domestic and foreign) have overwhelming incentives to seek links with the state in order to share in the resource pie. This incentive for rent-seeking penalizes productive activities, distorts the entire economy and hinders economic growth. In a dynamic setting, this may produce a *voracity effect* (Lane and Tornell, 1999). The *Dutch disease* thesis asserts that an increase in resource-based revenues (due to a boom) leads to an appreciation in the local currency, increases the capacity of the country to import *tradables* and also enlarges the demand for other goods and services, including *non-tradables* which must be produced locally. This forces a structural adjustment in the domestic economy as resources are diverted out of the non-resource tradable sector (represented by manufacturing) into the production of *non-tradables*. Thus typically, resource booms lead to the contraction of the non-resource (manufacturing) sector (Hausmann and Rigobon, 2003).

increase by a subdued 795,000 barrels a day, or 0.9 percent, to 90.58 million barrels a day in 2014. On its part, the US Energy Information Administration (EIA) cuts its world oil demand forecast for 2014 by 50,000 bpd to 960,000 bpd.

The reduction in forecast for oil demand for 2014 is a worrisome development for Nigeria. Nigeria's crude oil production has declined consistently since December 2013 and was 1.940 mbpd in April 2013 according to OPEC data, less than 2.53 mbpd estimated in the 2014 federal government budget. Although crude oil price is still well above the \$79 per barrel budget benchmark, continuous weaker-than-expected crude oil demand could culminate in sharp decline in price. If this pessimistic scenario crystallizes, implementation of the 2014 budget will be in serious jeopardy with far reaching implications for the budget of the three tiers of government in Nigeria which depends largely on proceeds from the Federation Account.

It should be recalled that Nigeria has for long been the highest producer of crude oil on the African continent. However, there are threats to this decades-long dominance as some African countries are stepping up oil production and new discoveries of crude oil reserves in countries which hitherto were not members of the 'elite league' of oil producing countries. For instance, Ghana – West Africa's second largest economy is now an oil producing country and it expects production to more than double by 2021 as output rises at its Jubilee field and as other sites commences production (OPEC, 2013). The country also has new crude discoveries at different stages of appraisal and development. The return of normalcy in North Africa after the Arab Spring has also resulted in improved crude oil production in the region especially in Algeria and Libya until recent upheavals in Libya.

However, the most important threat to Nigeria's dominance is Angola. Angola has twice knocked off Nigeria from her decades-long perch as Africa's largest crude oil producer, first in April 2008 and secondly between May and October 2009. Although these periods coincided with decline in Nigeria's crude oil production due to agitations in the oil-rich Niger Delta region, the difference between Nigeria and Angola's production now stands at just 170,000 barrels per day. There is also noticeable preference for Angola as the choice destination for fresh investments by some International Oil Companies (IOCs). This development has elicited fears that Nigeria could permanently lose its position as the continent's top crude oil producer, a position held since the 1970s. Nigeria's proven crude oil reserves has remained at 37.2 billion barrels as at end 2011, representing 28.7 percent of Africa's total proven reserves of 128.578 billion barrels, according to the 2013 OPEC Annual Statistical Bulletin. Nigeria's proven crude oil reserves ranks as second largest in Africa after Libya's which stood at 48.01 billion barrels as at end 2012.

Algeria with 12.2 billion barrels occupies the third spot in proven crude oil reserves while Angola, Nigeria's main rival in terms of production in the continent, ranks fourth with 10.47 billion barrels. The OPEC Annual Statistical Bulletin (2013) also shows that Sudan holds the continent's fifth proven reserves with 6.7 billion barrels while Egypt has the sixth largest reserves with 4.5 billion barrels. Gabon occupies the seventh position with 2 billion barrels, while other African crude oil producers collectively have approximately 7.5 billion barrels of crude oil reserves. While some African countries have had accretion to their proven crude oil reserves, Nigeria's proven reserves have remained stagnant at 37.2 billion barrels since 2006, a development that is symptomatic of lack of new crude oil discoveries. This state of affairs may not be unconnected with somewhat opaque regulatory environment in the oil and gas industry in Nigeria over the years. The situation has been compounded by the non-passage of the Petroleum Industry Bill (PIB) which is intended to provide a level playing field for the operators in the oil and gas industry, the oil host communities, the government and other stakeholders in the industry. The much awaited Petroleum Industry Bill (PIB) is presently before the Seventh National Assembly for consideration and enactment into law. The PIB was first presented to the Sixth National Assembly in 2009 but it was not passed into law before the expiration of that assembly. The bill is adjudged to be one of the most profound legislations in the history of Nigeria and the oil sector due to the critical role of the sector in the economy. Although Nigeria's upstream oil sector ranks as one of the most developed in the continent, it is yet to attain its full potentials. The PIB is expected to herald a new fiscal regime for the sustainable development of the oil sector and improved revenue for the country. As expected, the PIB has elicited reactions from several stakeholders. Whilst it has received groundswell of support from some quarters, others contend that it is not an all-purpose elixir that will address all the challenges of the oil sector. For instance, the International Monetary Fund (IMF) has canvassed for the early passage of the PIB. The IMF reckons that the bill would boost investment, government revenue and fiscal transparency. International Oil Companies (IOCs) on the other hand have maintained that the proposed higher taxes in the PIB would make exploration of oil and gas uneconomical in the country. They contend that the bill will make Nigeria's Production Sharing Contract (PSC) regime among the harshest in the world. The IOCs consider the PIB as extremely punitive towards them and this have somewhat stalled new investments. It is estimated that about \$50 billion planned investment especially in deepwater explorations is on hold and could be imperiled if the controversies surrounding the bill are not quickly addressed and the bill passed into law (NNPC, 2013).

As the PIB debate rages, it is pertinent to note that the legislation is not all about higher taxes and royalties

payable by IOCs, and instituting a Petroleum Host Communities Fund (PHC-Fund). The bill also seeks to make some profound changes in the oil sector by restructuring and improving the management of Nigeria's oil resources. It provides for the dismantling of the state-owned oil corporation – the Nigeria National Petroleum Corporation (NNPC) into nine commercially oriented and profit driven agencies that do not rely on government subsidies. The nine agencies will comprise two regulatory agencies, three funds, three commercial companies and one technical and support bureau. The NNPC would be restructured in the mould of Saudi Arabia's Aramco, Malaysia's Petronas and Brazil's Petrobras with improved corporate governance. The PIB also provides for the delisting of the NNPC from the Public Enterprises Privatization and Commercialization Act. It also requires the government to divest up to thirty percent and forty nine percent of the authorized shares of the National Oil Company and the National Gas Company respectively to the public in a transparent manner on the Nigerian Stock Exchange. The bill seeks to optimize domestic gas supplies, particularly for power generation and industrial development, and encourage domestic refining of crude oil (PIB, 2012).

Furthermore, to reinforce our call for quick diversification of the Nigerian economy away from oil, it is important to review emerging threats arising from impending paradigm shifts in energy policies of two of the world largest economies – the United States and China. Indeed, development in energy policies of these two countries is of strategic interest to Nigeria. The United States was until recently the largest importer of the country's crude oil – a position that China has currently taken. Therefore, any major shift in energy consumption by any of these countries could have negative consequences for Nigeria and other oil producing countries.

### **Emerging threats to Nigeria's oil dependency – US and Chinese energy policies**

The United States is vigorously pursuing an energy policy which seeks to move the country towards attaining energy independence and away from Middle East and Africa energy sources. The United States is projected to become the world's largest producer of crude oil and other liquid fuels by 2020 and will be entirely self-sufficient by 2030, and a net exporter by 2035 according to some estimates (EIA, 2014). The International Energy Administration (IEA, 2013) believes that the United States will become the world's largest oil producer by 2017, overtaking current leaders Saudi Arabia and Russia. According to Powell (2013), by 2017 the US would no longer need to buy oil from any source but Canada. The quest for US energy independence has been bolstered by new drilling techniques and technology - horizontal drilling and hydraulic fracturing (Hitchens, 2013).

Another major development recently in the global

energy market is the move by China (the second largest oil-consuming nation) to commence production of shale oil (Powell, 2013). The imminent commencement of shale oil exploration in China has sent shock waves around the global energy market. China is estimated to have roughly 240 billion tons of accessible oil shale reserves. According to estimates by the Organization of Petroleum Exporting Countries (2013), about 10 million tons of oil can be produced from these reserves annually. In obvious panic, OPEC has constituted a committee to study the likely impacts of the shale oil exploration on the price of oil in the international commodities market and the likely economic impacts on oil producing countries. Although shale oil extraction is more costly than the production of conventional crude oil, it is nonetheless a substitute for conventional crude oil. There are also concerns about the environmental impact of shale oil production but this also is unlikely to deter China as the country is determined to embark on the project. For China, developing indigenous energy is a high priority. China's continuous reliance on oil imports somewhat ties its prosperity to political turmoil in the Middle East, and Africa. China also reckons that for strategic national interest, it is expedient to limit its energy needs from sources susceptible to interdiction and disruption.

Should these optimistic scenarios in the United States and China crystallize Nigeria and a host of other countries that export crude to the US and China would have to look for other markets. This could have grave consequences for the price of crude oil and it is feared that some oil producing countries could face the threat of becoming failed states (Herbst, 2013). The United States has been the largest importer of Nigeria's crude oil over the years but this is changing very fast. In the last decade, Nigeria accounted for between 9 and 11 percent of US total crude oil imports. However, Nigeria crude oil has recently dropped to below 5 percent share of total US crude imports. According to US Energy Information Administration (EIA, 2013) data, over the past five years the United States' reliance on Nigerian crude imports has dropped 63 percent, falling from a peak of 1.084 million barrels per day in 2007 to just 405,000 barrels per day in 2012.

This development underscores the need for the country to quickly decouple its revenue earnings exclusively from oil to other non-oil sectors. The needed diversification however, will be difficult to achieve if the country retains the current revenue sharing model which has encouraged rent seeking behaviour and over dependence on oil revenue by all the federating units in the country. It is therefore, imperative that the country tinkers with a new revenue sharing model that will encourage fiscal independence among the federating units.

### **Resolving Nigeria's oil dependency – The derivation model**

To resolve Nigeria's dependence on oil as major revenue

source, the authors propose a revisit and re-enthronement of the derivation model. This proposal is not made lightly as the authors acknowledge that it is fraught with controversies. Indeed, one of the most controversial debates in Nigerian political-economic discourse is the way government revenue is shared amongst the components tiers of government in the country, otherwise known as revenue allocation (Ndongko, 1981; Osemwota, 1984; Mbanefoh, 1989; Mbanefoh and Anyanwu, 1990; Osedolor, 1998; Nyong, 1998; Onimode, 1999; Nwokedi, 2009; Uche and Uche, 2004). Revenue allocation or the statutory distribution of revenue from the Federation Account among the different levels of government has generated so much debate since the country's independence in 1960 and is today one of the contentious issues for discussions before the National Conference (sitting at the time of this write-up). As remarked by Uche and Uche (2004), the focus on revenue sharing, as opposed to revenue generation, is the primary cause of economic dependence of Nigeria on oil proceeds.

As earlier stated, from 1970 until very recently, revenue from oil constituted over 80 percent of the country's total earnings. Thus, the importance of the federal center has increased substantially over the years and as a consequence, a desperate struggle to win the state power at the centre ensued since this control meant for all practical purposes, being all powerful and owing everything (Uche and Uche, 2004). This agitation to control the centre has led to abandonment of other income earnings potentials that abound in the federating units. It is in this wise that the authors call for a rethink of the current revenue allocation criteria in Nigeria and a reversion to the system of revenue sharing based substantially on derivation.

It must be restated that before the discovery of oil in commercial quantity in 1956 agriculture was the mainstay of the Nigerian economy. Till date, a greater proportion of the population – about two thirds of the total labour force of the nation, depends on the sector for their livelihood and the rural economy in particular is propelled by agriculture. It is the main source of food for most of the population and also the dominant economic activity in terms of employment and linkages with other sectors of the economy, serving as a major source of raw materials for the agro-allied industries and a potent source of foreign exchange. The sector has been the highest contributor to the nation's GDP over the years – accounting for 42.07 percent in 2008, 35.8 percent in 2009 and 2.2 percentage points to the growth in real GDP in first quarter of 2010 (Uzor, 2011). Agriculture was also the major source of foreign exchange for the economy. For instance, the groundnut pyramids of the Northern region, cocoa farms of the Western region and palm plantations of Eastern Nigeria were the major sources of foreign exchange that sustained the respective regions (Phillips, 1971; Mbanefoh, 1977; Suberu, 1998; Onimode, 1999). The level of decay and

neglect of agriculture in Nigeria is often highlighted by the story of Malaysian farmers learning the rudiments of palm cultivation in Nigeria but now exporting palm products to Nigeria. Oil palm is currently Malaysia's leading agricultural export and the country is the world's largest producer of the commodity. The success story of the sector in the pre-oil boom era has been relegated to the footnote of history following the emergence of crude oil as the prime mover of the nation's economy. This, in turn, created a false sense of affluence which impacted negatively on agriculture culminating in low productivity and relegation of the once vibrant sector. The decline in the share of agriculture in foreign exchange earnings is an apt illustration of negative correlations with oil revenue earnings.

Nigeria is currently a net importer of food, including staples such as rice where local production accounts for just 500,000 tonnes, whereas annual consumption stands at over 2.3million tonnes, leaving a huge deficit of about 2 million tonnes which has to be met with imports. It is estimated that the country spends over US\$300 million annually on rice imports alone. In fact, in the heat of the food crisis in 2008, it was reported that the federal government of Nigeria spent N80 billion in one instance for the importation of rice and also slashed duties on rice imports from 100 to 2.7 percent to cushion the effects of food shortage on the citizenry (Sanni, 2010). The large volume of rice import has over the years sustained rice farmers in business in other countries (e.g. Malaysia) while domestic opportunities abound and has remained largely untapped. The massive importation of agricultural produce is dangerous in that it does not only drain the nation's scarce reserves, it also exposes the economy to external shocks and vagaries especially inflation.

It is worth re-stating the fact that Nigeria's golden years in agriculture was before the discovery of oil in commercial quantity and consequent consignment of agriculture to the backyard. The golden years of agriculture was also when the regions were fully involved in agriculture; each of the regions specializing on products where it has natural comparative advantage (Obi, 1998; Mabogunje, 2001). The export earnings from these produce made the regions financially and fiscally independent from the centre. All these were to change with the discovery of oil and accretion of oil revenues to the federation account for distribution to the various tiers of government.

The decline in crude oil earnings and the resultant drop in revenue accruing to states from the federation account have once again brought the reality of looking beyond the federation account to bear on many states and local governments in Nigeria.

It is pertinent at this point to go back the memory lane on the subject of revenue derivation and allocation in Nigeria and the crisis it has generated over the years. The agitation over revenue derivation and sharing began with the creation of a Central Account for the Federation to which the Regional Governments contributed and

received their allocation of revenue under the scheme of the Amalgamation of the Northern and Southern Protectorates in 1914 introduced by Lord Lugard, who was the first Governor-General of the amalgamated Nigeria. The Scheme placed administrative areas of the Northern and Southern Nigeria under two Lieutenant Governors, each with his responsibility for the area and departmental organization, while these departments, which were practically indivisible, and whose functions were common to both, were centralized under the direct control of the Central Government (Mbanefoh and Anyanwu, 1990; Nwokedi, 2009). Each of the regions submitted separate budgets proposals, which were incorporated in a centralized annual budget.

At the time of the amalgamation of the two regions, the principle of derivation was in operation. Each of the regions collected revenue of its internal resources mainly from agriculture – cash or export crops, taxation, import and excise duties. The mineral sector, which was the responsibility of the central government had not yet been developed to become a major national income earner. Consequently, the Southern Region, which had sea ports and consumed much liquor, and had abundant agricultural cash crops, generated more revenue from taxation, import and excise duties, etc. The Southern Region had far more revenue than was required to meet the budgetary requirements for the administering the region, while the Northern region had not enough revenue to meet its administrative and developmental costs. It had, therefore, to rely on the Colonial Government to defray its annual budget deficit (Colonial Office, 1953).

It was principally to tap the surplus revenue of the Southern Nigeria in order to subsidize the budget deficit of the Northern Nigeria and also to provide most of the fund for Central Administration that the amalgamation process was contrived (Nwokedi, 2009). By 1946, a new constitution was introduced under the then colonial Governor, Sir Arthur Richards, which formally gave birth to a Federation of three Regions, the Northern and the Western and Eastern regions which were created from the old Southern region of Nigeria. The establishment of the three regions necessitated the allocation of the functions and revenues to the regions by the Central Government. To this end, the Phillipson Commission was appointed in 1946 to advise the Federal Government. The Commission recommended the adoption of the Principles of Derivation and Even Development for the revenue sharing amongst the Regions. This recommendation soon gave rise to agitation by some regions, which regarded the principles as unsatisfactory (Ekundare, 1973; Adebayo, 1993, Adesina, 1998, Nwokedi, 2009). The Hicks/Phillipson Commission appointed in 1951 reviewed the revenue allocation formula and recommended some new principles, which would also meet the constitutional changes of the new Macpherson Constitution of 1951. The 1951 Constitution enhanced the federal structure by increased legislative and financial

autonomy to the Regional Governments.

Accordingly, the Federal Government adopted the new revenue sharing formula based on the four principles of Independent Revenue, Need, Derivation and National Interest. But it was not long that disputes amongst the regions over the implementation of these four principles of revenue sharing led to agitation for a review along with further constitutional reforms. With the adoption of revised constitution known as Oliver Littleton Constitution of 1954, which further devolved more legislative and administrative powers from the centre to the regions, the revenue allocation was also revised to reflect the constitutional changes. The Chicks Commission Report of 1953 was introduced. The Chicks formula placed more emphasis on the Principles of Need and National Interest. The Chick Report also recommended that mining should continue to be under Federal control while mining royalties should be allocated to the regions from where the minerals were extracted (Teriba, 1966; Tamuno, 1998).

Just before independence the Constitutional Conference held in 1957 commissioned another revenue review exercise. The Raisman Commission made its recommendations in 1958 (Colonial Office, 1958). The Commission's Report was significant in a number of ways. First, it was the report that was adopted for the Independence Constitution of 1960 by which a sovereign Nigeria was governed. Two, it re-enacted the provision of mineral resources in the Exclusive Legislative List under Federal Government control. Thirdly, it de-emphasized Derivation Principle by reducing from 100 to 50% the revenue derived from mining, rents and royalties to the regions of origin. It redistributed the other 50% as follows: 30% to the Centre and 20% to the newly designed Distributable Pool Account. The reason given by the Raisman Commission for abandoning the application of 100% derivation to region of origin was that at this time there was a great prospect of phenomenal rise in revenue derivable from mineral oil exploration in the Eastern Region and if the percentage derivation was not reduced now then in future, the revenue accruing to the Eastern Region would be awesome and far exceed those of other regions (Colonial Office, 1958).

It therefore recommended that funds from Distributable Pool Account to which the 20% revenue derived from mineral resources was to be paid, should be shared amongst the regions on the principles of "continuity" of existing levels of service and Minimum Responsibilities, as well as the Principle of Need. This implied the use of population as the indicator of need used in the application of previous revenue application formula.

There were subsequent revenue allocation review exercises (see FGN, 1967, 1970, 1971, 1975) but the basic principles adopted by Raisman Commission's recommendation for revenue allocation endured throughout the life of the First Republic as most of them were adopted under Independence Constitution of 1960

and also under the Republican Constitution of 1963, when a fourth region, that is the Mid-Western Region was created. The 1963 Constitution (FGN, 1963) provided in Section 141, the formula for sharing revenue from Distributable Pool Account to the regions as follows:

North	-	Forty Nine Fifths
East	-	Thirty One Ninety Fifths
West	-	Eighteen Ninety Fifths
Mid-West	-	Six Ninety Fifths

The Binn's Commission set up in 1964 to review the Raisman Commission's formula did not make any radical changes but merely added a new principle of Financial Compatibility in the distribution from the Distributable Pool Account (Binns Commission, 1964). This resulted in the redistribution of the fund from the Distributable Pool Account in the following percentage:

North	-	42%
East	-	30%
West	-	20%
Mid-West	-	8%

According to Nwokedi (2009) this new principle was deficient to the extent that it did not realistically and unequivocally determine in relative terms, the cash position of the regions, their tax efforts and standard of services provided by them. Nevertheless, the system remained in force until the military regime upset the fairly stable revenue allocation system under civilian rule and adopted a chaotic system that over-centralized revenue resources and control.

There were some lukewarm attempts with premeditated outcomes to review revenue allocation system under the military (FGN, 1967, 1970, 1971, 1975, 1984). The Gowon Military Regime set up the Dina Committee of 1968. Though the Committee made some useful recommendations, the government rejected its recommendation. Rather, the Gowon Regime preferred to make provisions for allocations by issuance of Decrees. The Decrees were punitive as they were disruptive of the Federal System. Though the country was in a civil war, there was no rational reason other than the militarist autocratic tendency that informed the Gowon Regime to over-concentrate the revenue resources in the Federal Government and to instantly disrupt the Federal System as all the states were severely starved of funds, deprived of independent sources of revenue generation and were constrained to crawl on their knees before the federal government to obtain funds for both their recurrent and capital expenditures. In fact, the advent of the military government under General Gowon marked the beginning of the tendency to disrupt the institutional framework and the principles on which the Nigerian Federation was established. Once the states were starved of the requisite funds to run their governments, and were deprived of

independent source of revenue, they were downgraded to exist as glorified local governments or administrative units of the federal government. It is in this context that reference is made of the following Decrees promulgated by the Gowon regime.

**(i) Decree No. 13, 1970**, which reduced revenue accruing to the states on Export Duties from 100 to 60%; duty on fuel from 100 to 50%, mining rents and royalties from 50 to 45%. The reductions were to be paid into Distributable Pool Account, out of which 50% was retained by the Federal Government and the other 50% shared amongst the states, half of which, on the basis of equality of states and the other half on the basis of population.

**(ii) Decree No. 9 of 1971**, transferred rents and royalties of off-shore petroleum mines from states to the Federal Government while

**(iii) Decree No. 6 of 1975** altered the existing formula of allocation from 45% to 20% of mining rents and royalties accruing to the states of origin. The same year,

**(iv) Decree No. 7 of 1975** introduced standardized personal income tax throughout the Federation thereby undermining states powers to vary taxes and rates as they deemed fit within their jurisdiction (FGN 1970, 1971, 1975).

But while the Federation was staggering under the onslaught of financial strangulation of states by the Gowon Regime, the Mohamed/Obasanjo Military Regime that toppled the Gowon Regime dealt devastating blows to the fragile federal system. In 1979, the Obasanjo Regime commissioned the Technical Committee on Revenue Allocation under the Chairmanship of Professor O. Aboyade to formulate a revenue allocation formula preparatory to the military hand-over to civil administration in 1979 (FGN, 1979). The Aboyade Committee stabbed the Federation at its most vital organ by destroying the principle of derivation, which had been the basic tenet of true fiscal federalism. The Committee in its report urged the abrogation of the application of the principle of derivation in revenue allocation, which it erroneously attributed to be largely responsible for poisoning inter-governmental relations and for hampering the sense of national unity. The Committee went further to assert that the derivation principle had the effect of denying the Federal Government the powers to effect inter-state redistribution of income. The Committee's report must have created the basis for the virtual abandonment of the principle of derivation by successive military regimes, when revenues accruing to the states were drastically reduced to pitiable levels. But as later events have proved, the de-emphasis of the principle of derivation has caused more political tensions and threats to national unity in recent times than in the post-colonial era when states were allocated 50% of revenue derived from their natural resources (Oyediran and Olagunju, 1979; Rimi, 1980; Ehwarieme, 1999; Gurr et al., 2001, Uche and



Uche, 2004).

It is also to be observed that the Committee's report must have encouraged the Obasanjo military regime to abandon the usual practice of embodying the formula of revenue allocation in the Constitution as exemplified in Section 41 of the 1963 Constitution (FGN, 1963). Rather the Regime preferred to embody in the 1979 Constitution a set of guidelines for determining the mode of revenue allocation but transferred the responsibility of determining the formula for revenue allocation for the Federation to the National Assembly acting on the recommendation of a Revenue Allocation and Fiscal Commission established under the constitution (FGN, 1979). Furthermore, for the first time in the constitutional history of Nigeria, provision was made in the 1979 Constitution for the allocation of revenue from the Federation Account to the Local Governments which were specifically listed in Part 1 of the First Schedule of the Constitution (FGN, 1979). This provision is strange to Federal Constitution and was later to cause controversy between the Federal and State Governments. This controversial provision was replicated in the 1999 Constitution (FGN, 1999). To be specific, Section 162(2) of the 1999 Constitution vests on the National Assembly the power to determine the formula for revenue allocation on the recommendations of the proposals from the President of the Federal Republic of Nigeria based on the advice of the Revenue Mobilization Allocation and Fiscal Commission<sup>6</sup>, provided that the National Assembly must ensure that the principle of derivation of not less than 13 percent of the revenue accruing to the Federation Account directly from the natural resources must be constantly reflected in any revenue allocation formula. And in accordance with Section 162(3) of the 1999 Constitution (FGN, 1999), the National Assembly has powers to distribute the amount outstanding to the credit of the Federation Account among the federal and state governments and the local government councils in each state. These provisions under the 1979 Constitution did not explode into open and bitter controversy between the federal and state governments, but resentments were noticeable amongst marginalized oil-producing ethnic communities during the civilian rule under the 1979 Constitution leading to the setting up of Presidential Commission on Revenue Allocation (see FGN, 1980a, 1980b, 1980c, 1980d, 1980e). But under the 1999 Constitution, the provisions of the Constitution on mode of revenue sharing caused violent social eruptions and disputes between the federal and state governments (FGN, 2001). The controversy between the federal and state governments reached its peak with each suing the other in the Supreme Court (FGN, 2001). The disputes centered on which tier of governments, federal or state has possession of off-shore

mineral resources, deciding the effective date of payment of 13 percent derivation and direct allocation of revenue from Federation Account to the local governments and payment of primary school teachers in the local governments.

Because of the great significance of the Supreme Court ruling on April 5, 2002 (Supreme Court, 2002), on the contentious constitutional disputes between the federal and state governments and its far-reaching implications in re-defining the powers of the two tiers of government on resource control, revenue derivation and funding of local government, a comment on the salient points on the Supreme Court ruling is important here.

The Federal Government had asserted that it had exclusive right to the natural resources located within the continental shelf of Nigeria and therefore denied the right of any state in the Federation to any revenue derivable from that natural resource. The eight littoral states namely, Bayelsa, Akwa Ibom, Cross Rivers, Delta, Lagos, Ogun, Ondo and Rivers disputed the federal government claim and each contented that its territory extended beyond the low-water mark into its territorial water and even onto the territorial continental shelf and the exclusive economic zone. The littoral states therefore maintained that natural resources derived from both onshore and offshore are derivable from their respective territory and in respect thereof, each was entitled to the "not less than 13 percent" allocation as provided in the proviso to sub-section (2) of Section 162 of the 1999 Constitution.

In order to resolve the dispute, the Federal Government took out a writ of summons in the Supreme Court praying for "a determination of the seaward boundary of a littoral state within the Federal Republic of Nigeria for the purpose of calculating the amount of revenue accruing to the Federation directly from any natural resources derived from the state pursuant to Section 162 (2) of the Constitution of the Federal Republic of Nigeria, 1999" (FGN, 1999).

All the states of the Federation were joined in the suit. In their counter-claims (Proposal, 2001), some of the states mostly oil producing states, challenged the constitutionality of the Federal Government action in refusing to pay their 13 percent derivation in accordance with Section 162 (2) of the Constitution with effect from the date of coming into force of the 1999 Constitution, and also the non-inclusion of revenue derived from gas exploration from their states in their 13 percent derivation. They therefore sought the court injunction to restrain the federal government from violating the Constitution in the manner declared. They also disputed the Federal Government's claim on off-shore resources.

After hearing the arguments of both parties to the dispute, the Supreme Court (Supreme Court, 2002) ruled among others as follows:

i. That the seaward boundary of a littoral state within the Federal Republic of Nigeria for purposes of calculating

<sup>6</sup> Revenue Mobilization Allocation and Fiscal Commission is a commission set up by the 1999 Constitution to advise the president on the model for sharing revenue accruing to the Federation Account among the three tiers of government (FGN, 1999).

the amount of revenue accruing to the Federation Account directly from any natural resources derived from the state pursuant to Section 162(2) of the 1999 Constitution is the low-water mark of the land surface thereof or (if the case requires as in the Cross Rivers State with an archipelago of islands) the seaward limits of inland waters within the state.

ii. That the 1999 Constitution having come in force on 29<sup>th</sup> May, 1999, the Principle of Derivation under the proviso to Section 162(2) of the Constitution came into operation on the same day 29<sup>th</sup> May, 1999 and the Federal Government is obliged to comply therewith from that date

iii. That the under-listed policies and/or practices of the Federal Government are unconstitutional, being in conflict with the 1999 Constitution, that is to say:

a) Exclusion of natural gas as constituent of derivation for purposes of the proviso to Section 162(2) of the 1999 Constitution

b) Non-payment of shares in respect of proceeds from capital gains taxation and stamp duties

c) Funding of the Judiciary as a first line charge on the Federation Account

d) Funding of Joint Venture Contracts (JVCs) and the Nigerian National Petroleum Corporation (NNPC) priority projects as first line charge on the Federation Account.

e) Unilaterally allocating one percent of the revenue accruing to the Federation Account to the Federal Capital Territory of Abuja.

The Supreme Court (Supreme Court, 2002) also ruled that it was unconstitutional for the Federal Government to allocate funds from the Federation Account to the local governments in the Federal Capital Territory as they should not be classified as local governments in the states under the Constitution. Furthermore, the Court considered it irregular for the Federal Government to allocate funds from the Federation Account direct to the local governments in the states and paying salaries direct to local government primary school teachers in the states thereby by-passing the state governments which have primary responsibility for local governments. It was argued that such funds should be paid into the State/Local Government Joint Account for states to disburse to their respective local governments in accordance with sub-section 5 of Section 162 of the 1999 Constitution (FGN, 1999).

From the above Supreme Court ruling, it is evident that apart from the off-shore claims which went in favour of the Federal Government, that the states emerged from the suits happier and collectively richer than before because most of their funds that were arbitrarily held or disbursed by the Federal Government has been declared unconstitutional and the Federal Government was obliged to comply with the Supreme Court ruling. For instance, the funds hitherto taken out of the Federation Account as a first line vote by the Federal Government (before sharing the balance) to fund the Judiciary, Nigeria National Petroleum Corporation (NNPC) and the Federal

Capital Territory, Local Governments, servicing of external debts and retention of derivation from gas exploration and capital gains tax, must now be returned and be paid into the Federation Account for sharing amongst the two tiers of government as provided in Section 162 of the Constitution. In the same vein, monies realized from sales of Federal Government-owned companies and parastatals hitherto kept in a separate and exclusive account of the Federal Government must now be paid into the Federation Account for disbursement in accordance with revenue sharing arrangements under the Constitution.

It must be mentioned that though the states, in general, gained by the Supreme Court ruling as more revenue accrued to them from a fuller Federation Account not tampered with, by first line deductions by the Federal Government, the littoral states were particularly sad and have been increasingly restive over the court ruling on off-shore derivation which deprived them of revenue from off-shore oil exploration. The most adversely affected states include Ondo, Akwa Ibom and Cross River States whose 13 percent derivation stem mostly from off-shore operations. Indeed, faced with mounting socio-political pressure and discontent from the littoral states against the Presidency for initiating the Supreme Court ruling on the resource control, the then President, Olusegun Obasanjo, after a cabinet meeting on July 17, 2002 (FGN, 2001) worked out in interim political solution by giving the most affected littoral states namely: Akwa Ibom and Ondo States, monthly allocations of N600 million and N210 million respectively.

Whatever informed the President's action and however laudable it would seem in some quarters, the fact remains that his action was a mere palliative and had not addressed the main question of evolving a satisfactory revenue allocation formula which would take into account the Supreme Court ruling and also the need to devolve more revenue and powers to the states in response to popular demand for a true fiscal federal system in Nigeria.

## **DISCUSSION AND POLICY IMPLICATION OF A ROLLBACK TO DERIVATION MODEL**

What does a rollback to the derivation model portend for Nigeria in general and the federating units in particular? A fiscal federal system in Nigeria based essentially on derivation has enormous benefits to the states and the country in general. First, a revenue formula that gives greater weight to derivation will enable each state in the federation to look inwards and exploit the resources – human, mineral and others that abound in their localities. By so doing, the country would diversify her revenue base and decouple its fiscal operations from the vagaries associated with oil revenue. Secondly, apart from helping to douse the tension and feelings of injustice which is widespread in the oil producing states, it will also help to

encourage the non-oil producing states to develop other natural resources especially agriculture, which was the mainstay of the regions then and which have long been abandoned in their struggle for their share of the oil money. It should be noted that revenue allocation was never an issue in the country until crude oil became the mainstay of the economy. In fact, in the early years of independence, the then three regional governments controlled their resources and paid tax to the Federal Government. The Northern, Western and Eastern regions controlled 50 per cent of proceeds from the hides and skin, groundnut, legumes and other food crops from the North; cash crops like cocoa and kola nuts from the west; and palm produce from the east. The three regions had a clear vision of what they wanted. The vision, which was progressive and complementary, not only made the regional governments economic power bases, it also made Nigeria a major exporter of agricultural products (Arowolo, 2011).

Moreover, derivation principle will naturally increase the revenue base of oil producing states tremendously in the short term but with time; other states will be encouraged to exploit other resources that abound in their areas as they too will be allowed to retain 50% of the proceeds of the revenues accruing from their areas. This will bring about the much needed diversification of the economy. The argument that re-distribution of resources from the much endowed states to less endowed states will promote even development is akin to weakening the strong to strengthen the weak. This is clearly counter-productive as Nigerian experience has shown. Since crude oil was discovered in commercial quantity in Nigeria about 58 years ago, the country has lapsed almost irretrievably into a mono-product economy. Successive governments in Nigeria has harped on the need to diversify the economy but none so far has been able to break out of what has come to be known as the 'oil doom syndrome' or 'resource curse'. Nigerian governments at all levels seem content with merely gathering the enormous rent from crude oil exploration and sharing same without any value addition or developing other productive non-oil sectors of the economy.

Furthermore, derivation model will give each state of the federation a lot of fiscal space to compete with other states in areas of development and capacity building. As was the case in Nigeria's history, the Western region used revenues from cocoa to sponsor free education in their region; the Eastern region also did the same with revenues from palm oil production while the Northern region also encouraged their region in education, manpower and capacity building through scholarship and other incentives. The regional governments then demonstrated that development can only move from the states to the centre and not the other way round.

Again derivation will stem the tide in incessant and unproductive state creations. Indeed, part of the sad history of military rule in Nigeria is in areas of state

creation. The military governments hindered the practice of true federalism in Nigeria through incessant and unsystematic creation of new states. The outcome of this was an excessively bloated fiscal structure and many of the states created were not financially viable as they lacked the fiscal capacity to achieve any meaningful development. Although it was argued that creation of states and local governments by the military government was to produce a balanced federation, the emergence and proliferation of states and local governments have continued to pose new problems for intergovernmental fiscal relations. Presently, only about three states (namely Lagos, Kano and Port Harcourt) out of the 36 states in the federation are viable and could potentially maintain reasonable level of service from their internally generated revenue. The rest of the states including the federal capital territory exists in parasitic fashion – living and depending entirely and miserably from the proceeds of the federation account. And the call for more states to be created remains unmitigated and getting louder by the day. It is also one of the contentious issues before the constitutional conference sitting at the time of writing the paper. The only reason for those calling for more states to be created is to enable them have a greater share of the federation account – not that the new states to be created can stand alone fiscally and financially. Only a true fiscal federation will stem this tide.

Derivation will also help to bring about fiscal discipline and proper prioritization needed in the states and the federal government. The current revenue sharing formula places too much funds in the hands of the federal government which has little to do in addressing the yearnings of the people at the grassroots. These enormous funds in the hands of the federal government have led to wastages, wanton corruption and high cost of governance. Undoubtedly, the states need a greater percentage of revenue allocation. After all, the states and local government areas are closer to the people and are, therefore, in a better position to directly address the yearnings of the people at the grassroots. Derivation can help to bring down the cost of governance as each state in the federation including the federal government will learn to cut its coat according to the size of its cloth.

Finally, to ensure stability and avoid dislocation of existing services in states, the rollback to the derivation model could be by increments – perhaps, an accretion of 1.5% per annum for the next 24 years. This would amount to additional 36% percent to the present 13% bringing the total to 49%. It is envisaged that the 24-year period is enough for non-oil producing states to readjust to new fiscal discipline and long enough for the country to decouple from its near-total dependence on proceeds from oil.

## Conclusion

Nigeria has depended precariously on revenue from oil

for too long. This dependence on a single product for the country's fiscal operations has been traced to the institution of a revenue sharing formula that de-emphasized derivation in favor of other principles. It is obvious that unless the country returns back to the era when derivation was a major index for revenue sharing, the current agitations by oil producing states will linger and the country's economy may never be diversified away from oil. This reversion will naturally affect most states in Nigeria that are not naturally endowed especially oil but there are abundant other resources that these states could exploit especially agriculture. In the long run, this may be a small price to pay compared to the impending catastrophe that the country could face in the world in the near future without oil.

### Conflict of Interests

The authors have not declared any conflict of interests.

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*Full Length Research Paper*

# Income distribution in rural Egypt—A three-village case

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**Using household survey data, this paper examines the case of three villages in rural Egypt to shed light on the determinants of income distribution. We first employ decomposition techniques to identify the contribution of farm and non-farm income to overall household inequality. We then use regression analysis to identify the role of different factors in determining the level of farm and non-farm income. Based on the analysis of household income structure and its determinants, we clarify the strong effect of land holding on rural household income distribution, and the differing effects of non-agricultural employment opportunities through the linkage to non-agricultural labor markets. Overall, while non-farm employment is obviously an important determinant of income distribution in rural Egypt, the relationship between land, non-agricultural sector, and household income levels assume different patterns according to the specific socio-economic (village) setting.**

**Key words:** Egypt, rural household, income distribution, land, case study.

## INTRODUCTION

### Research issue

One of the most important constraints hindering development in rural Egypt is the limited availability of irrigated land. The land in Egypt is fertile but scarce and densely populated, as it depends on the Nile River. With scarcely any rainfall and almost all of the population living along the Nile River, the population density in Egypt is one of the highest in the world. In addition, with continuing population growth combined with Islamic hereditary law, rural land in Egypt is increasingly fragmented.

One result is that land in rural Egypt continues to be the most influential determinant of the household income distribution (Adams, 2002)<sup>1</sup>. For example, Adams (2002) analyzed the household income distribution in rural Egypt

based on a nationwide household survey conducted by the International Food Policy Research Institute in 1997 and found that overall inequality in rural Egypt was because of high levels of income inequality in the agricultural sector, largely through land ownership.

However, we should understand the survival strategy of rural Egyptian households in relation to the socioeconomic settings that differ within rural Egypt. In fact, there are substantial regional variations in poverty and opportunities between and within Lower and Upper Egypt (Ghanem, 2014; World Bank, 2006)<sup>2</sup>. For instance, Lokshin et al. (2010) revealed significant differences in the rate of growth and poverty dynamics between the two regions. In Upper Egypt, where most of the country's rural poor live, household expenditure did not grow, despite the

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significant increase in average household expenditures in Egypt as a whole (Lokshin et al., 2010). Thus, the question outstanding for the future development of rural Egypt is: what are the mechanisms underlying income generation in each of the different possible socioeconomic settings? Egyptian villages are under the same condition of being constrained by land and water. Nonetheless, as the Sustainable Rural Livelihoods Framework (Scoones, 1998; 2009) suggests, the endowments of assets (human, financial, and physical and social capital) upon which rural Egyptian households build their livelihoods may differ within rural Egypt. However, because the available data have been limited to official statistics derived from nationwide sample surveys or agglomerated data at the village level, this issue has not yet been the subject of attention<sup>3</sup>.

In this paper, we employ household survey data and examine the income distribution pattern in three villages as a case study to shed light on the factors that influence income generation in rural Egypt. First, we apply decomposition techniques to pinpoint the contribution of farm and nonfarm income to overall household inequality. This is useful to analyze the contribution of different income types to income inequality in each village. Second, we use regression analysis to identify the role of different factors in determining the level of farm and nonfarm income.

The three villages included in this study were part of a 2007 survey and joint research project between the Graduate School of Economics at Hitotsubashi University and the Central Agency for Public Mobilization and Statistics (CAPMAS).<sup>4</sup> The villages were from different regions within the Nile Basin: Central (or Southern) Lower Egypt, Middle Egypt, and Upper Egypt<sup>5</sup>.

## LITERATURE REVIEW

In rural Egypt, nonfarm employment currently accounts for most employment, and nonfarm employment opportunities continue to increase. However, the empirical evidence on the effect of nonfarm income on rural income inequality is mixed. In fact, a study in a 2006 World Bank report provides contrasting findings to that of Adams (2002). Adams (2002) found that nonfarm income reduces poverty and improves income distribution, because in Egypt where land is highly productive, the poor lack access to land and are thus "pushed" to work in the nonfarm sector. In the 2006 World Bank report, on the other hand, El-Laithy et al. (2003) concluded that households in Upper Egypt that earned higher incomes from nonfarm employment belonged to high-income classes, whereas the poor remained in the agricultural sector.

This contradictory result may be because of the heterogeneity of the nonfarm sector. According to the World Bank, nonfarm opportunities in Upper Egypt are not only limited but also narrow, undiversified, and skewed

toward microenterprises (World Bank, 2006, pp. 10-11). Thus, as Sato (2003) pointed out for China, analyzing aggregate nonfarm income at the national level may fail to reveal the differential income–inequality effects according to the different socioeconomic settings.

Studies on other developing countries have shown that nonfarm income affects the rural income distribution pattern differently because the nonfarm activities are diverse (Lanjouw and Feder, 2001). For instance, Zhu and Luo (2006) found that self-employment income in China worsens income inequality, while wage employment has an equalizing effect on income distribution. Adams (2002) obtained similar results for Egypt. Conversely, Senadza (2011) indicated the opposite for rural Ghana, suggesting that nonfarm income increased income inequality. Elsewhere, Stifel (2010) found mixed results for rural Madagascar, mainly because low-income households tended to be engaged in low-return nonfarm activities. As Senadza (2011) noted, these findings perhaps confirm the existence of entry barriers in nonfarm activities. That is, because the poor lack the necessary human or financial capital, they predominantly engage in lower-skill casual wage employment; hence the inequality-reducing effect of wage income.

As for migration, while it is also widely agreed to influence nonfarm activity, there is no consensus on its impact on income distribution. In the case of rural Egypt, labor migration to the oil-producing Arab countries in the 1980s particularly attracted the attention of researchers, with studies such as Adams (1986; 1991) and Richards and Martin (1983) confirming the large revenues derived from emigration as a factor underlying improvements in the consumption levels of rural inhabitants. However, the case studies in this area provide divergent findings and no guidance as to the effect on income distribution.

Thus, it is critical to identify the availability and type of nonfarm employment opportunities, along with the human, financial and other capital that households possess, in order to understand better the rural household strategies used for income generation. In this regard, the sustainable livelihoods framework is a useful framework for analysis (DFID, 1999). This assumes that people may have access to five categories of assets (human, financial, physical, social, and natural) and combine these to achieve their objectives through livelihood strategies. Complex socio-institutional webs as well as the politico-economic environment in which they operate influence these strategies.

In the case of rural Egypt, all villages share a common natural context in that they are all dependent on the Nile River. However, they differ in many aspects, and each has its own unique characteristics. In the case of our three study villages (Abu Senita, Homa, and Awlad Sheykh), although all are dependent on the Nile River and have fertile but scarce land, they differ in terms of market access, sociopolitical environment, and human capital endowment. For example, Abu Senita has better human

capital (in terms of the level of education) than the two other villages and has more nonfarm employment opportunities available in the locality or in nearby towns. Similar to Awlad Sheykh, Homa has a lower educational level but is located not far from Cairo. Finally, Awlad Sheykh is located in a remote area and has the least nonfarm employment opportunities nearby, but there are many village migrants abroad, as explained in detail later<sup>6</sup>.

## METHODOLOGY

### Study area and data collection

The data for the study are from a household survey that included three villages. As shown in Figure 1, Abu Senita is located about 60 kilometers north of Cairo in *markaz* Bagur, in the Menufiya governorate. Homa is 80 kilometers south of Cairo and 30 kilometers north of Beni Suef city in *markaz* Wasta, in the Beni Suef governorate<sup>7</sup>. Awlad Sheykh is about 550 kilometers south of Cairo in *markaz* Dar Salam, in the Sohag governorate.

We selected these three villages for analysis following the advice of CAPMAS staff. The first criterion for selection was a medium or small population size so that the survey covers most of the households in the village. The second criterion was similarity to the average characteristics of the three regions (Lower, Middle, and Upper Egypt) based on the basic indicators available at the village level, notably age structure, employment, and educational level<sup>8</sup>. We did not select the villages to make the results of this study generalizable to rural regions as a whole but to be indicative of the income distribution in the specific rural Egyptian locales.

According to the 2006 population census, there are 4,408 villages in Lower and Upper Egypt, with an average population size of 9,253. Compared with this average population size, the three villages (Abu Senita, Homa, and Awlad Sheykh) share the common feature of being relatively small, with populations of just 5,376, 7,398, and 6,757 persons, respectively.

Household members are those declared as such by household heads. According to the CAPMAS definition, a household comprises members who had lived and eaten together in the same residence for more than six months during the 12 months prior to the survey (CAPMAS, 2006). Therefore, the definition of households is in terms of consumption. However, because we aim to study the income generation behavior of households, we prefer to define households as units of income pooling. We therefore include those members who were absent from the household for more than six months.

The randomly sampled number of households for each village is 600. For each household, CAPMAS staff interviewed the household head using the questionnaire<sup>9</sup>. If the household head was absent because of migration abroad or some other reason, the spouse of the household head was interviewed. The numbers of household members are 2,743 persons for Abu Senita, 3,644 persons for Homa, and 3,068 persons for Awlad Sheykh. When members absent for more than six months are excluded, the corresponding figures are 2,683, 3,283, and 2,738, respectively. As discussed, according to the 2006 population census, the respective village populations are 5,376, 7,398, and 6,757 persons, respectively. Therefore, our survey covers 50.8, 43.2, and 42.3% of the population in the three villages, respectively. Among the population, the percentage absent for more than six months is 2.2% in Abu Senita, 9.9% in Homa, and 10.8% in Awlad Sheykh. Among the households, the percentage of households with one or more members absent for more than six months is 9.0% in Abu Senita, 44.2% in Homa, and 48.8% in Awlad Sheykh.

Table 1 summarizes the main socioeconomic characteristics of the three villages as drawn from the 2006 population census. As shown, the households in Abu Senita have a lower rate of dependency than the national rural average and Homa and Awlad Sheykh, as we can see from the proportion of the population aged under 15 years and 64 years or older. The population in Abu Senita has a generally higher educational level.

As for nonfarm employment, there are also differences between the three villages as to the volume as well as the type of nonfarm activities<sup>10</sup>. Nonfarm activities are much more common in Abu Senita than in other two villages. The main form of nonfarm employment is as an employee or schoolteacher in the government sector; that is, employees of government institutions in either the village itself or a local town. In the other two villages, agriculture is the main economic activity, nonfarm employment opportunities are fewer than in Abu Senita, and the male labor force in nonfarm activities chiefly comprise agricultural waged workers and those employed in the private construction sector as temporary workers.

According to the household survey data, more than 80% of the private sector nonfarm workers in these two villages are construction workers working in the village, in a local town or in Cairo. In Homa, most work in Greater Cairo or in other Arab countries such as Jordan, Libya, Saudi Arabia and the UAE<sup>11</sup>. In Awlad Sheykh, the labor force mainly comprises male agricultural workers and those working abroad in construction, especially in the UAE<sup>12</sup>. Therefore, unlike Abu Senita, the urban unskilled labor markets within and outside Egypt play an important role in shaping the employment structure in these two villages. The proportions of agricultural waged workers are also higher in Awlad Sheykh and Homa. In fact, agricultural waged workers constitute between 29.7% (Homa) and 30.7% (Awlad Sheykh) of all waged workers, compared with only 4.7% in Abu Senita.

In terms of land distribution, the average area of cultivated land per household, including landless households is 0.4 *feddans* (1 *feddan* equals 0.42 hectares) in Abu Senita, 0.6 *feddans* in Homa and 0.2 *feddans* in Awlad Sheykh (Table 2)<sup>13</sup>. The Gini coefficient of cultivated land per household is 0.66 for Abu Senita and Homa, and 0.82 for Awlad Sheykh. Thus, Awlad Sheykh has a very limited area of cultivated land owned by only 32% of the households compared with Homa, which has a larger area of land and more households who own land<sup>14</sup>. This severe land constraint alone may have pushed the households in Awlad Sheykh into nonfarm employment.

### Definition of household income

The definition of household income in our survey follows that of CAPMAS, defined as the sum of farm, wage, nonfarm self-employment and other sources of income that households received during the 12 months prior to the survey. Household income comprises the following six components according to CAPMAS.

- (1) **Farm income.** Farm income is gross agricultural revenue minus material costs. Gross agricultural revenue is the gross value of cash derived from agricultural activities including cultivation, livestock husbandry, forestry, and fishery. It includes the value of agricultural products consumed by the household.
- (2) **Nonfarm wage income.** Nonfarm wage income is the sum of wages, bonuses and allowances received from employers such as government institutions and public and private enterprises. In this analysis, we further classify wage income into wage income from nonfarm and farm activities.
- (3) **Nonfarm self-employment income.** The total value of net cash income (sales minus material costs) from nonfarm self-employment activities in commerce, manufacturing, construction, transportation, services, etc.
- (4) **Income from real estate.** This includes rental income from land,

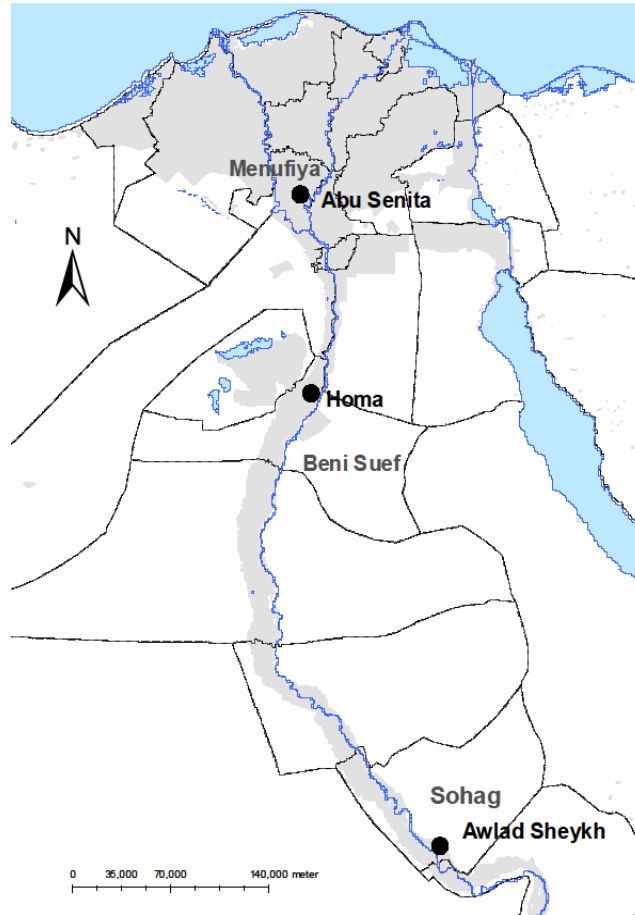


Figure 1. Location of the surveyed villages.

apartments or buildings and other real estate. It also includes imputed rent (the estimated value of the property where the household rents).

**(5) Financial income.** This is income derived from bonds, deposit interest from banks, post offices, "investment certificates," etc.

**(6) Other income.** Other income is mainly transfer income comprising retirement pensions, social security, social welfare payments to poor families, and private transfers from within Egypt or from abroad (gifts from relatives and money sent by migrants). In most cases, other income is from retirement pensions<sup>15</sup>.

Based on the estimates of income implied by these definitions, Awlad Sheykh (4412 LE) (Livre Egyptienne or Egyptian pounds) has the highest per capita income among the three villages, followed by Abu Senita (3,338 LE) and then Homa (2,833 LE). According to the CAPMAS "Income and Expenditure Household Survey 2004/2005," average per capita income for rural households was 2,372 LE (CAPMAS, 2006, p. 6). Therefore, the three villages have above-average household income levels for rural Egypt. Household incomes are particularly high in Awlad Sheykh, while those in Homa are similar to the average for rural Egypt.

The Gini coefficient of per capita income for Awlad Sheykh is the largest (0.395), whereas that for Abu Senita is the smallest (0.229), with Homa having an intermediate Gini coefficient (0.305). According to the UNDP Cairo Office's "Egypt Human Development Report 2008," the Gini coefficient of per capita GDP for rural Egypt (2004/2005) was 22.3 (UNDP, 2008, p.297). Therefore, although village- and aggregate-level comparisons are crude, it appears that

the levels of income inequality in Abu Senita and Homa are about average, whereas Awlad Sheykh has a relatively high level of income inequality.

With regard to the sources of income, farm income represents less than 25% of all income in all three villages. The main source of income in the three villages is nonfarm wage income. However, its share of income varies greatly between the three villages. At 60% of total income, the proportion of nonfarm wage income is unusually high in Awlad Sheykh.

#### Gini decomposition analysis of household income

The Gini coefficient is probably the most intuitive measure of inequality, with its neat correspondence to the Lorenz curve and easy-to-interpret decompositions of the farm and nonfarm income effects. Following Lerman and Yitzhaki (1985), the Gini coefficient for total income inequality,  $G$ , is:

$$G = \sum_{k=1}^K R_k G_k S_k$$

where  $S_k$  is the share of component  $k$  in total income,  $G_k$  is the source Gini, corresponding to the distribution of income from source  $k$ , and  $R_k$  is the Gini correlation of income from source  $k$  with the distribution of total income.

**Table 1.** Basic socioeconomic characteristics of the surveyed villages and rural regions in Egypt, 2006.

	Survey villages			Rural regions			
	Abu Senita	Homa	Awlad Sheykh	Lower Egypt	Middle Egypt	Upper Egypt	Whole Egypt
Population	5,376	7,398	6,757	8,450	9,533	10,687	8,787
Number of households	1,139	1,548	1,426	2,008	2,054	2,278	2,003
Aged under 15 years (%)	29.7	40.1	41.9	31.6	38.1	36.3	33.9
Aged 15 - 64 years (%)	64.7	56.7	54.7	64.7	58.1	59.3	62.4
Aged 65 years and older (%)	5.6	3.1	3.4	3.6	3.8	4.4	3.7
Illiteracy (%) (10 years & older)	19.6	52.0	57.1	33.1	44.9	39.2	36.8
Workers in government sector (%)	51.7	11.9	5.9	27.3	16.6	13.1	22.3
Workers in public sector (%)	1.7	0.2	0.2	2.0	0.6	0.3	1.6
Workers in private sector	46.5	87.9	93.9	70.8	82.8	86.6	76.1
Unemployment rate (%)	9.4	6.9	10.6	9.1	5.1	10.3	8.7
Workers in agriculture (%)	19.4	60.6	57.6	40.3	55.9	46.7	43.8
Workers in construction (%)	7.9	20.5	11.2	6.7	8.9	12.8	8.1
Workers in commerce/transport (%)	15.9	6.8	17.8	14.7	10.3	13.3	14.3
Number of villages				2,666	744	828	4,837

Source: CAPMAS (2008), Population Census 2006. Notes: 1. Population and number of households for rural regions indicate the village average in each region. 2. Workers in commerce/transport include those in trade, restaurants, hotels, and transport.

**Table 2.** Household land distribution in the surveyed villages (%).

Land owned by households	Abu Senita						Homa						Awlad Sheykh					
	Households		Land owned		Land cultivated		Households		Land owned		Land cultivated		Households		Land owned		Land cultivated	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Landless	272	(45)	0.0	(0)	19.7	(8)	278	(46)	0.0	(0)	42.3	(11)	404	(68)	0.0	(0)	8.3	(7)
Less than 0.5 <i>feddan</i>	116	(19)	50.1	(22)	71.9	(28)	75	(13)	22.0	(6)	30.0	(8)	98	(16)	22.6	(19)	23.8	(19)
0.5-0.9 <i>feddan</i>	113	(19)	92.1	(41)	92.3	(36)	157	(26)	114.5	(31)	114.6	(30)	71	(12)	47.5	(39)	49.8	(40)
1.0-1.9 <i>feddans</i>	89	(15)	51.9	(23)	46.1	(18)	36	(6)	51.0	(14)	46.5	(12)	10	(2)	14.2	(12)	14.2	(12)
More than 1.9 <i>feddan</i>	13	(2)	31.5	(14)	29.1	(11)	53	(9)	177.6	(49)	150.9	(39)	13	(2)	36.2	(30)	27.2	(22)
Total	603	(100)	225.6	(100)	259.1	(100)	599	(100)	365.1	(100)	384.3	(100)	596	(100)	120.5	(100)	123.3	(100)
Average <i>feddan</i> per household			0.37		0.43				0.61		0.64				0.20		0.21	
Gini coefficient per household			0.660		0.659				0.718		0.665				0.835		0.821	

Source: 2007 household survey data.

Gini decomposition enables us to identify how much of any overall income inequality is because of a particular income source. It thus permits us to question whether an income source is inequality increasing or decreasing based on whether an enlarged share of that income source leads to an increase or decrease in overall income inequality. The influence of income component upon total income inequality can be decomposed to produce the following three easily

interpreted terms:

- a) how important the income source is with respect to total income ( $S_k$ ),
- b) how equally or unequally distributed the income source ( $G_k$ ) is, and
- c) whether the income source correlates with total income ( $R_k$ ).

### Empirical model for estimating the determinants of household income

While Gini decomposition permits us to know whether an income component increases or decreases income inequality, it does not allow us to ascertain what factors contribute most to the inequality-increasing or inequality-decreasing effect in a given income component. One way of investigating this question is by conducting regression analysis to identify the factors that influence the participation of households in farm and nonfarm activities and the income derived from them.

The method used for the regressions is the two-step Heckman procedure<sup>16</sup>. In our case, this is suitable because many households in our sample have no farm or nonfarm income. From the estimated probit equation, we compute the Inverse Mills Ratio, which is the expected value of the contribution of the unobserved characteristics to the decision to participate, conditional on the observed participation. This enables us to examine two dimensions together: whether the household selects farm or nonfarm activities; and if it does select these activities, how much household income changes as a result.

We assume that the capacities to participate in farm and nonfarm activities are determined by the household's endowment in physical and human capital and by the environment where the household is located. As the focus of our study is on three villages, we omit the environmental factors and introduce the following independent variables in the participation equation (Table 3).

**(i) Land holding (cultivated land).** The cultivated land area of the land owned by the household and its squared value, or of the land rented out by the household, in *feddans*. For a rural household, land is the main form of physical capital. We consider it as exogenous<sup>17</sup>.

**(ii) Human capital.** The level of education of household heads and household members aged 10 years and older. We assume that households with a higher education level engage in more nonfarm activities and that human capital has an important effect on the level of nonfarm income.

**(iii) Household structure and labor force.** Gender of household head (female = 1, male = 0), household size (number of household members), labor force rate (ratio of labor force to total number of household members aged 15 years and older) and gender composition of the labor force (ratio of number of male workers to total number of workers). We define as workers household members who are at least 15 years old and in the labor force. In addition, we include the age of the head of household and its squared value to account for life cycle effects.

**(iv) Employment structure.** Engagement of the household member in nonfarm self-employment (having a member engaged in nonfarm self-employment = 1, otherwise 0)<sup>18</sup>.

**(v) Emigration<sup>19</sup>.** To control for the influence of emigration, we specify a dummy variable indicating whether household member (s)

work outside Egypt (having an employed migrant abroad = 1, otherwise = 0).

**(vi) Capital.** Total amount (in Egyptian pounds) of assets including bank deposits, estimated price of nonfarm real estate, and other financial assets.

The probit model in the first stage of the estimation is:

$$\Pr(y_1) = f(x_1, x_2, \dots, \varepsilon) \quad (1)$$

where  $\Pr(y_1)$  is a participation dummy equal to 1 if a household engages in farm/nonfarm activity and 0 otherwise,  $x_1 \dots$  are the variables specified in Table 3 and  $\varepsilon$  is a normally distributed error term<sup>20</sup>.

In the second stage of the Heckman model, we use ordinary least squares (OLS) regression to estimate the determinants of farm and nonfarm income per capita, with the Inverse Mills Ratio as a control variable. This second-stage regression uses the same independent variables but excludes the age and gender of the household head and household size in the income equations to reduce the problem of collinearity<sup>21</sup>. The dependent variables are the logarithms of farm and nonfarm incomes per capita. Nonfarm income combines wage income and income from self-employment.

## EMPIRICAL RESULTS

### Structure of household income

From a decomposition analysis based on the pseudo-Gini coefficient, the components of total income have the following characteristics (Table 4). To start with, according to the pseudo-Gini coefficient, farm income is unequally distributed in Abu Senita. The pseudo-Gini coefficient for other income (mainly retirement pensions) is also high. These values imply that farm income and social security allowances have much more influence than the other components on overall income inequality in Abu Senita.

Homa and Awlad Sheykh have contrasting income distribution patterns to Abu Senita. Their nonfarm wage incomes are extremely unequally distributed. Moreover, in Homa and especially Awlad Sheykh, the percentage contributions to overall income inequality are extremely high. This implies that overall income inequality is mainly the result of an unequal distribution of nonfarm wage income.

### Level and structure of household income, excluding migrant households

Because emigration could affect the income distribution patterns described in the previous section, in this section, we exclude migrant households before comparing the household income level and structure across the three villages.

Migrant households constitute households in which one or more members work outside Egypt as wage earners. Wage earners working abroad account for 24.4% (Homa) and 64.1% (Awlad Sheykh) of all wage earners, including

**Table 3.** Means and standard deviations of the variables used in the estimation.

		Abu Senita				Homa				Awlad Sheykh			
		Farm activities		Nonfarm activities		Farm activities		Nonfarm activities		Farm activities		Nonfarm activities	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Dependent variables</b>													
Participation in farm and nonfarm activities	Have farm income (=1) or not (=0)			0.6	0.5			0.7	0.5			0.5	0.5
	Have nonfarm income (=1) or not (=)	0.8	0.4			0.6	0.5			0.6	0.5		
Income	Household farm income per capita (LE)	1,097	1,169	562	811	896.109	1008.07	475.4831	737.6011	956	1,379	353	886
	Household nonagricultural income per capita (LE)	1,297	1,199	1,899	1,401	1,057	1,330	1,851	1,325	2,057	2,989	3,988	3,249
<b>Explanatory variables</b>													
Land	Amount of cultivated land owned ( <i>feddan</i> )	0.5	0.6	0.3	0.4	0.8	1.2	0.5	1.0	0.3	0.6	0.1	0.5
	Amount of cultivated land rented in ( <i>feddan</i> )	0.2	0.3	0.1	0.3	0.2	0.4	0.1	0.4	0.0	0.2	0.0	0.1
Education	Share of illiterates (%)	21.8	26.7	12.9	18.3	51.0	30.1	43.3	30.4	51.8	31.5	44.4	29.8
	Share of read & write (%)	14.4	20.2	14.5	19.5	15.8	19.2	16.2	20.1	16.1	20.3	17.9	21.1
	Share of primary level (%)	10.8	16.1	11.5	16.1	11.6	16.3	11.4	16.9	9.5	15.2	10.8	16.5
	Share of preparatory level (%)	8.2	13.8	8.0	13.8	5.6	11.1	5.2	10.7	6.0	11.9	6.1	12.4
	Share of secondary level (%)	33.4	29.0	38.6	30.9	12.8	19.3	17.5	24.2	13.4	18.9	15.6	20.0
	Share of university level (%)	11.4	20.1	14.5	23.5	3.2	12.0	6.4	18.6	3.2	10.0	5.3	14.8
Labor	Labor force participation rate	71.7	25.4	67.7	24.1	75.4	22.3	69.2	22.1	60.9	25.5	53.9	19.5
	Percentage of males in the labor force	62.5	25.4	71.8	25.3	58.2	21.4	69.8	23.8	74.4	30.0	89.2	19.5
Household size		4.9	1.8	5.1	1.5	6.5	2.8	6.4	2.8	5.4	2.3	5.4	2.1
Age of household head		51.3	12.1	46.9	10.4	47.6	13.2	44.5	12.2	48.4	13.3	43.7	11.5
Nonagricultural self-employment dummy		0.1	0.3	0.1	0.4	0.1	0.3	0.2	0.4	0.1	0.3	0.1	0.3
Migration abroad dummy		0.0	0.1	0.0	0.1	0.2	0.4	0.3	0.4	0.3	0.5	0.6	0.5
Capital	Amount of assets (LE)	70,907	83,696	62,625	72,888	64,611	68,886	61,350	62,938	55,693	57,510	53,527	53,130
Female household head (=1) or not (=0)		0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.0	0.2
Number of samples		381				381				462			

Source: 2007 Household survey data. Note: SD is standard deviation

agricultural wage laborers. The proportions of households with members working abroad are 0.3% in Abu Senita, 19.9% in Homa and 42.8% in Awlad Sheykh. The percentage shares of the wages of these migrant household members in household wage income are 1.5% in Abu Senita, 48.3% in Homa, and 83.9% in Awlad Sheykh.

Therefore, emigration is a unique source of nonfarm wage employment and income, especially in Awlad Sheykh.

Table 5 reports the estimation of the income levels excluding migrant households. It shows that the level of household income decreases and the Gini coefficient falls when we exclude migrant

households. This change is particularly remarkable in Awlad Sheykh. As a result, the household income level in Awlad Sheykh becomes much lower than in Abu Senita. Therefore, emigration contributes greatly to raising household income. We draw two findings from the Gini coefficients of total income when excluding migrant households.



**Table 4.** Structure of household income in the surveyed villages.

		Proportion of each income component to total income (%)	Pseudo-Gini coefficient of income components	Contribution to the Gini coefficient of total income (%)
Abu Senita (603)	Nonagricultural wage income	38.2	0.193	24.6
	Agricultural wage income	0.4	-0.216	-0.3
	Farm income	21.3	0.335	23.9
	Income from nonfarm self-employment	5.3	0.340	6.0
	Income from real estates	12.6	0.308	13.0
	Income from financial assets	1.3	0.661	2.9
	Other income	20.8	0.431	29.9
	Total income	100.0	0.299	100.0
	Per capita annual income (LE)	3,338		
Homa (598)	Nonagricultural wage income	41.2	0.391	52.8
	Agricultural wage income	10.1	0.275	9.1
	Farm income	24.3	0.222	17.7
	Income from nonfarm self-employment	4.2	0.258	3.6
	Income from real estates	11.6	0.262	10.0
	Income from financial assets	0.4	0.560	0.8
	Other income	7.9	0.228	5.9
	Total income	100.0	0.305	100.0
	Per capita annual income (LE)	2,833		
Awlad Sheykh (589)	Nonagricultural wage income	60.0	0.558	84.7
	Agricultural wage income	8.5	-0.004	-0.1
	Farm income	13.9	0.213	7.5
	Income from nonfarm self-employment	3.3	0.242	2.0
	Income from real estates	6.1	0.187	2.9
	Income from financial assets	1.6	0.502	2.1
	Other income	6.7	0.057	1.0
	Total income	100.0	0.395	100.0
	Per capita annual income (LE)	4,412		

Source: 2007 household survey data. Notes: 1. Some households are excluded because of seemingly implausible observations. 2. Figures in parentheses are sample sizes.

One is that because the Gini coefficients for Homa and Awlad Sheykh decline, emigration contributes to increasing household income inequality. The second is that the Gini coefficient for Awlad Sheykh remains high when we exclude migrant households. This implies that Awlad Sheykh would have high-income inequality, even without emigration. By contrast, income inequality in Homa would be lower without emigration.

The decomposition analysis based on the pseudo-Gini coefficients reveals the following. As previously pointed out, nonfarm wage income is the single most important source of income contributing to overall income inequality. However, when excluding migrant households from the analysis, nonfarm wage income contributes to decreasing income inequality. By contrast, farm income contributes to increasing income inequality in Awlad Sheykh. The change in the pseudo-Gini coefficient of nonfarm wage income

for Homa is therefore not as marked as that for Awlad Sheykh.

As explained in the previous section, one reason for this difference between Homa and Awlad Sheykh is that migrant households tend to be landless in Awlad Sheykh and landowners in Homa. Hence, excluding migrant households could result in an overestimation of income inequality in Awlad Sheykh and an underestimation in Homa. However, judging from the pseudo-Gini coefficient of farm income, although its evaluation is difficult, we consider inequality in farm incomes as the most important contributor to overall income inequality in Awlad Sheykh. This is not the case for Homa.

This dissimilarity relates to the difference in the distribution of nonfarm wage incomes between the three villages. In fact, the pseudo-Gini coefficient of nonfarm wage income is smaller than that of total income in all

**Table 5.** Structure of household incomes in the surveyed villages, excluding migrant households.

		Proportion of each income component to total income (%)	Pseudo-Gini coefficient of income components	Contribution to the Gini coefficient of total income (%)
Abu Senita (601)	Nonagricultural wage income	37.6	0.168	21.8
	Agricultural wage income	0.4	-0.211	-0.3
	Farm income	21.8	0.342	25.7
	Income from nonfarm self-employment	5.5	0.347	6.5
	Income from real estates	12.8	0.311	13.7
	Income from financial assets	1.2	0.639	2.7
	Other income	20.6	0.423	30.0
	Total income	100.0	0.291	100.0
	Per capita annual income (LE)	3,275		
Homa (480)	Nonagricultural wage income	33.9	0.306	38.4
	Agricultural wage income	8.1	0.066	2.0
	Farm income	28.1	0.243	25.3
	Income from nonfarm self-employment	6.1	0.389	8.8
	Income from real estates	14.0	0.312	16.1
	Income from financial assets	0.3	0.222	0.2
	Other income	9.6	0.257	9.1
	Total income	100.0	0.270	100.0
	Per capita annual income (LE)	2,446		
Awlad Sheykh (341)	Nonagricultural wage income	19.9	0.242	14.7
	Agricultural wage income	13.1	0.028	1.1
	Farm income	30.3	0.433	40.1
	Income from nonfarm self-employment	8.8	0.545	14.7
	Income from real estates	10.4	0.319	10.1
	Income from financial assets	1.8	0.594	3.2
	Other income	15.7	0.334	16.1
	Total income	100.0	0.327	100.0
	Per capita annual income (LE)	2,650		

Source: 2007 Household survey data. Notes: 1. Some households are excluded because of seemingly implausible observations. 2. Figures in parentheses are sample sizes.

three villages. However, closer examination of nonfarm wage income reveals considerable differences in the income structure in all three villages. The share of nonfarm wage income is largest in Abu Senita, but its pseudo-Gini coefficient is extremely small. By contrast, in the absence of migrant households, Awlad Sheykh has a low share of nonfarm wage income. Even when excluding migrant households, Homa has almost the same share as Abu Senita, but its pseudo-Gini coefficient is higher than that of Abu Senita.

#### Source of income from nonfarm employment, excluding migrant households

The question is: why is there more uneven distribution of nonfarm wage income in Homa and Awlad Sheykh than in

Abu Senita, even when we exclude migrant households? One reason could be that the predominant form of nonfarm employment is government employment in Abu Senita but private sector employment in Homa and Awlad Sheykh, as explained in the previous section.

Table 6 details the farm and nonfarm wage distributions by income category, excluding migrant households. In Abu Senita, income from the government sector accounts for a large share of nonfarm wage income. Although this is also true of Homa and Awlad Sheykh, the share is particularly high in Abu Senita, especially among low-income households.

Another reason, specifically for Homa, is that even the households with higher incomes tend to rely on nonfarm activities as their main source of income. This is not the case for Abu Senita and Awlad Sheykh when excluding migrant households. In these two villages, households

**Table 6.** Distribution of wage incomes by income category, excluding migrant households (%).

	Income categories	Per capita	Share of wage income in overall per capita income			
		income	Agriculture	Nonagriculture		
		(LE)		Sector		Private
				Government		
Abu Senita (601)	Lowest	1,742	2.2	45.0	(80.7)	(19.3)
	Second	2,117	0.0	50.5	(73.4)	(26.6)
	Third	2,745	0.8	45.1	(72.2)	(27.8)
	Fourth	3,658	0.2	38.7	(75.3)	(24.7)
	Highest	6,341	0.2	29.8	(67.6)	(32.4)
	Total	3,318	0.7	41.8	(72.7)	(27.3)
Homa (480)	Lowest	1,239	17.3	18.3	(50.6)	(49.4)
	Second	1,646	9.5	34.2	(17.2)	(82.8)
	Third	2,336	7.0	38.8	(25.5)	(74.5)
	Fourth	2,735	8.3	40.2	(24.8)	(75.2)
	Highest	4,501	6.3	32.1	(28.0)	(72.0)
	Total	2,491	9.7	32.7	(26.3)	(73.7)
Awlad Sheykh (341)	Lowest	1,111	23.0	27.9	(56.1)	(43.9)
	Second	1,864	23.4	20.6	(28.2)	(71.8)
	Third	2,135	20.4	18.9	(45.2)	(54.8)
	Fourth	2,991	11.8	23.0	(33.2)	(66.8)
	Highest	5,437	7.7	19.3	(8.8)	(91.2)
	Total	2,703	17.3	22.0	(30.3)	(69.7)

Source: 2007 Household survey data.

with higher incomes rely on farm income, whereas those with low incomes survive by undertaking nonfarm activities, such as government employees in Abu Senita and agricultural wageworkers or construction workers in Awlad Sheykh.

### Results of the participation equation

In this subsection, we first examine the determinants of household participation in farm and nonfarm activities. We then turn our attention to the determinants of income in each of these activities. Tables 7 and 8 present the results of the household participation probit regressions.

We find that household land area plays a positive role in participation in farm activities, and a negative role in participation in nonfarm activities in all of the three villages. With a 1 *feddan* increase in land, the probability of participating in nonfarm activities decreases by 66.2% in Awlad Sheykh, 69.2% in Homa, and 146.2% in Awlad Sheykh. As the estimated coefficient for land is much larger than that for human capital and the labor force, it is clear that access to land is the most determinant factor for participation in farm activities and for encouraging households to look for alternatives to farming-only. It plays an especially strong role as a pull-and-push factor for farm

and nonfarm activities in Awlad Sheykh, as its coefficient is higher than the other two villages (390.5% higher for farm activities and 146.2% higher for nonfarm activities).

However, the estimated coefficient for the square of land area is significant and negative for participation in farm activities, and vice versa for nonfarm activities, inferring an inverted U-shaped relation between land area and farm activities. This means that households in the highest income category earn income both by renting out their land and by performing nonfarm activities.

We also observe that the coefficient for land area owned is lower in Homa than in the other two villages (140.4% for farm and 69.2% for nonfarm). This conforms to the observation in the previous section that households in Homa in the higher income categories earn nonfarm income. One possible explanation is the low return of land as shown later in the farm income equation. Because land in Homa generates relatively little farm income, Homa households have a relatively strong incentive to take up nonfarm activities.

The results also indicate that education influences the choice of participation in farm and nonfarm activities. In fact, the share of university-level education is negatively and significantly associated with participation in farm activities in all three villages. If the household has more members with a university education, the probability of

**Table 7.** Estimation of probability of participation in farm activities (probit analysis).

		Coefficient	z-statistic		Coefficient	z-statistic		Coefficient	z-statistic
Land	Amount of land owned ( <i>feddan</i> )	2.374	8.19	**	1.404	4.93	**	3.905	6.35
	Amount of land owned squared ( <i>feddan</i> )	-0.479	-5.84	**	-0.112	-2.71	**	-0.851	-5.31
	Amount of land rented in ( <i>feddan</i> )	(omitted)			(omitted)			(omitted)	
Education	Share of illiterates (%)	-0.002	-0.31		-0.011	-1.50		-0.006	-1.13
	Share of read & write (%)	-0.009	-1.47		-0.019	-2.33	*	-0.001	-0.24
	Share of preparatory level (%)	-0.013	-1.90		-0.009	-0.92		-0.005	-0.69
	Share of secondary level (%)	-0.008	-1.50		-0.015	-1.84		-0.002	-0.29
	Share of university level (%)	-0.015	-2.51	**	-0.035	-4.11	**	-0.019	-2.52
Labor force	Labor participation rate (%)	0.016	6.09	**	0.028	7.60	**	0.019	5.45
	Percentage of male in the labor participation (%)	0.000	0.06		-0.022	-6.64	**	-0.006	-2.27
	Household size	0.137	2.35	*	0.232	4.19	**	0.051	1.37
Age	Age of household head	0.104	2.44	*	0.044	1.21		0.042	1.21
	Age of household head squared	-0.001	-2.45	**	0.000	-1.05		0.000	-0.88
Nonfarm self-employment dummy		0.088	0.07		0.321	1.23		-0.489	-3.32
Migration abroad dummy		-0.830	-3.56	**	-0.826	-3.12	**	-0.424	-1.73
Capital	Amount of nonfarm assets (LE)	0.000	0.88		0.000	1.62		0.000	-1.66
Female household head		-0.076	-0.32		-0.109	-0.35		-0.160	-0.57
Constant		-3.625	-3.04	**	-1.343	-1.17		-1.037	-1.06
Adjusted R-squared		0.351			0.553			0.304	
N		476			471			558	

Source: 2007 household survey data. Notes: 1. \*\* denotes significance at the 0.01 level \* denotes significant at the 0.05 level. 2. The dependent variable is whether the household has farm income (yes = 1, no = 0). 3. The reference variable for educational level is primary education.

participation in farm activities decreases by 1.5% in Abu Senita, 3.5% in Homa, and 1.9% in Awlad Sheykh. However, these are not statistically significant, with the exception of Homa, which has a weak coefficient of 2%. Regarding the effect of life cycle as measured by the age of the household head, this is positively and significantly associated with participation in farm activities in Abu Senita, with an additional year of age of the household head increasing the probability of participating in farm activities by 10.4%. This implies that farm activity is largely a life cycle phenomenon, commenced at an older age after performing nonfarm activities. We do not observe this same pattern in the two other villages, as the estimated coefficients for the age of the household head is not statistically significant. One possible interpretation is that there are more nonfarm employment opportunities, specifically in the government sector, in Abu Senita, so that the household heads commence farm activities only when they reach retirement age or when inheriting land from their fathers. The age of the household head is not associated with participation in nonfarm activities, because these can start while the household member is living with a father who is the household head.

The probability of participation in both farm and nonfarm

activities increases with labor, as the estimated coefficients for both labor force rate and household size are positive and statistically significant. The estimated coefficients for the percentage of males in farm labor participation are negative and statistically significant in both Homa and Awlad Sheykh (-2.2 and -0.6%, respectively). This suggests that any additional agricultural labor input is mainly female. This reflects the clear gender division of labor in these two villages, as widely observed in Upper Egypt; men engage in nonfarm activities, and women engage in farm activities.

As expected, migration abroad is highly correlated with participation in farm activities, with the associated probability of participation in farm activities decreasing by 83% in Abu Senita, 82.6% in Homa, and 42.4% in Awlad Sheykh. Nonfarm self-employment also has a significantly negative effect on participation in farm activities in Awlad Sheykh, with the probability decreasing by -48.9% if a household engages in nonfarm self-employment.

### Results of farm and nonfarm income equations

Tables 9 and 10 present income regressions for farm and

**Table 8.** Estimation of probability of participation in nonfarm activities (probit analysis).

		Abu Senita			Homa			Awlad Sheykh	
		Coefficient	statistic		Coefficient	statistic	Coefficient	statistic	
Land	Amount of land owned ( <i>feddan</i> )	-0.662	-2.21	*	-0.692	-4.90	**	-1.462	-4.24
	Amount of land owned squared ( <i>feddan</i> )	0.034	0.42		0.071	3.40	**	0.368	3.01
	Amount of land rented in ( <i>feddan</i> )	-0.563	-2.08	*	-0.232	-1.41		0.123	0.24
Education	Share of illiterates (%)	-0.018	-2.52	**	-0.008	-1.55		-0.013	-2.08
	Share of read & write (%)	-0.008	-1.17		-0.004	-0.59		-0.007	-0.92
	Share of preparatory level (%)	-0.005	-0.62		0.002	0.24		0.000	-0.02
	Share of secondary level (%)	0.001	0.13		0.007	1.09		-0.003	-0.35
	Share of university level (%)	0.008	0.96		0.020	2.33	*	0.000	-0.04
Labor force	Labor participation rate (%)	0.012	3.48	**	0.001	0.37		0.006	1.76
	Percentage of male in the labor participation (%)	0.019	5.57	**	0.021	6.18	**	0.014	3.98
	Household size	0.264	3.94	**	0.119	3.99	**	0.093	2.55
Age	Age of household head	0.070	1.35		0.040	1.48		0.062	1.69
	Age of household head squared	-0.001	-1.76		0.000	-1.84		-0.001	-1.91
Nonfarm self-employment dummy		(omitted)			0.698	3.95	**	1.200	8.07
Migration abroad dummy		1.184	2.57	**	(omitted)			(omitted)	
Capital	Amount of assets (LE)	0.000	-0.05		0.000	0.60		0.000	0.48
Female household head		-0.193	-0.78		0.232	0.88		-0.096	-0.31
Constant		-2.509	-1.74		-1.946	-2.14	*	-2.204	-2.08
Adjusted R-squared		0.600			0.290			0.376	
N		601			532			552	

Source: 2007 household survey data. Notes: 1. \*\* denotes significance at the 0.01 level \* denotes significance at the 0.05 level. 2. The dependent variable is whether the household has farm income (yes = 1, no = 0). 3. The reference variable for educational level is primary education.

nonfarm activities, respectively. The samples used in each of the regressions include only households engaged in the activity, so they allow us to assess which factors are associated with higher or lower income within each activity. In each case, we control sample selection bias by including the Inverse Mills Ratio computed from the corresponding participation equation shown in Table 3 as an additional regressor.

We find that the amount of cultivated land owned has a strongly positive correlation with household income in the three villages. With the exception of migration abroad, land displays the highest coefficient in the income equations<sup>2, 2</sup>. The coefficient for land owned displays the magnitude of the effect of land, such that in Abu Senita and Awlad Sheykh, the addition of 1 *feddan* of land increases farm income by 237 and 391%, respectively. This result is identical to Adam's (2002) finding that land is important for income distribution in rural Egypt. However, the coefficient for land area differs between the three villages. In fact, it is much lower in Homa than in the other two villages, such that the addition of 1 *feddan* land increases farm income by only 140% in Homa. This may relate to Homa's relatively low level of productivity, which may be because

of differences in cropping patterns or water scarcity<sup>2, 3</sup>.

Land area, either owned or rented, is uncorrelated with nonfarm income, except for Awlad Sheykh. In Awlad Sheykh, a 1 *feddan* increase in land decreases nonfarm income by 92%. This reflects the strong effect of land on whether households take up farm or nonfarm activities, as mentioned in the results of the participation equation. The estimated effects of the labor force rate and the gender composition of the labor force are as expected, as in the results for the participation equation. The level of education has no significant effect on farm income but significantly positive effects on nonfarm income in Abu Senita and Homa. However, the coefficient for the household share of education at a university level is very low. Being a university graduate increases nonfarm income by only 0.8% in Abu Senita, 1.4% in Homa, and only 0.4% and statistically insignificantly in Awlad Sheykh. This may be because the opportunity for nonfarm employment with high educational return is very limited in village<sup>2, 4</sup>, where the labor force is relatively homogeneous and mostly employed in construction, which has low entry barriers.

Having a migrant in a household has an extremely

**Table 9.** Estimation of farm income equation (total per capita farm income per year in LE).

		Abu Senita			Homa		Awlad Sheykh		
		Coefficient	t-statistic		Coefficient	t-statistic	Coefficient	t-statistic	
Land	Amount of land owned ( <i>feddan</i> )	2.473	8.52	**	1.803	15.47	**	2.537	7.51
	Amount of land owned squared ( <i>feddan</i> )	-0.399	-5.69	**	-0.185	-12.58	**	-0.463	-5.15
	Amount of land rented in ( <i>feddan</i> )	(omitted)			(omitted)			(omitted)	
Education	Share of illiterates (%)	0.008	1.96	*	0.002	0.31		0.001	0.25
	Share of read & write (%)	0.001	0.20		-0.007	-1.22		0.000	-0.06
	Share of preparatory level (%)	0.001	0.18		-0.002	-0.30		-0.001	-0.15
	Share of secondary level (%)	0.001	0.34		-0.002	-0.29		0.003	0.51
	Share of university level (%)	0.001	0.13		-0.010	-1.52		0.001	0.16
Labor force	Labor participation rate (%)	0.008	3.01	**	0.008	2.74	**	0.006	1.77
	Percentage of male in the labor participation (%)	-0.005	-2.60	**	-0.003	-1.14		-0.007	-3.17
	Migration abroad dummy	-0.552	-0.72		-0.269	-1.98	*	-0.327	-2.34
	Nonfarm self-employment dummy	-0.269	-1.13		-0.602	-3.19	**	-0.475	-1.68
Capital	Amount of assets (LE)	0.000	0.30		0.000	-1.29		0.000	-2.26
	Inverse Mills ratio	-0.286	-1.12		-0.101	-0.42		-0.319	-1.23
	Constant	4.811	11.91	**	4.801	9.59	**	5.816	10.06
	Adjusted R-squared	0.670			0.580			0.479	

Source: 2007 household survey data. Notes: 1. \*\* denotes significance at the 0.01 level \* denotes significance at the 0.05 level. 2. The dependent variable is the logarithm of farm income per capita per year. 3. The reference variable for educational level is primary education.

important effect on nonfarm income. If a household has a migrant abroad, nonfarm income increases by 76.7% in Homa and 218% Awlad Sheykh. It has a lower effect in Homa, which may relate to the differences in the places of emigration. In fact, migrants in Homa tend to work in Jordan and Libya, where we assume that they earn a lower wage than in the UAE, where the majority of migrants from Awlad Sheykh work. Nonfarm self-employment greatly influences nonfarm income in Abu Senita. In fact, it is the highest income-generating factor, raising nonfarm income by 34.4% if the household is engaged in nonfarm self-employment.

The Inverse Mills Ratio reflects the correlation between the unobserved terms in the participation and the income equations. We first note that the coefficient on the Inverse Mills Ratio in the nonfarm income equation is not significant. Therefore, selectivity is not present, so we could safely estimate this equation without the Inverse Mills Ratio. However, the Inverse Mills Ratio in the nonfarm income equation is significant and positive in Abu Senita and specifically in Awlad Sheykh. Given that the Inverse Mills Ratio is inversely related to the selection criterion to “participate in nonfarm activities,” the negative effect thus implies that these participating households have lower nonfarm income than a purely farming household.

## DISCUSSION

This paper examined household income structure and its

determinants in three villages as a case study of household income distribution in rural Egypt. A question is why farm income is so unevenly distributed and why it makes such a large contribution to overall income inequality in Abu Senita and Awlad Sheykh when we excluded migrant households.

The results confirm the findings of Adams (2002) that land assets continue to be the major determinant of household incomes in rural Egypt. In fact, the land distribution is highly unequal in all three of the villages that we examined, and as a result, landholders form the high-income classes, whereas landless households, forced into the nonfarm sector, comprise the low-income classes. The observed income distribution pattern in the three villages confirms that access to land, as Adams (2002) has argued, is the key determinant of income in a land-scarce labor-rich setting.

However, the extent of this effect differs between the three villages according to the level of nonfarm employment opportunities<sup>2 5</sup>. Opportunities for nonfarm wage employment are best in Abu Senita, followed by Homa, and worst in Awlad Sheykh, excluding migration abroad. However, it is the type of market development that most affects the pattern of income distribution. In Abu Senita, where most of the labor force works in the government sector, incomes are quite equally distributed. Government employment is the largest source of income, and this contributes greatly to reducing income inequality in Abu Senita.

In Homa, private sector income constitutes the main



**Table 10.** Estimation of nonfarm income equation (total per capita nonfarm income per year in LE).

		Abu Senita			Homa			Awlad Sheykh	
		Coefficient	t-statistic		Coefficient	t-statistic	Coefficient	t-statistic	
Land	Amount of land owned ( <i>feddan</i> )	-0.208	-1.77		-0.087	-0.81	-0.922	-3.12	
	Amount of land owned squared ( <i>feddan</i> )	-0.038	-0.71		0.010	0.53	0.206	2.64	
	Amount of land rented in ( <i>feddan</i> )	-0.392	-4.09	**	-0.321	-3.19	**	-0.189	-0.60
Education	Share of illiterates (%)	-0.002	-0.62		0.003	0.84	-0.004	-1.14	
	Share of read & write (%)	0.000	-0.20		0.005	1.13	-0.001	-0.32	
	Share of preparatory level (%)	-0.002	-0.89		0.003	0.65	0.001	0.23	
	Share of secondary level (%)	0.002	1.17		0.007	1.72	0.006	1.39	
	Share of university level (%)	0.008	3.56	**	0.014	2.96	**	0.004	1.04
Labor force	Labor participation rate (%)	0.006	4.20	**	0.006	2.36	*	0.004	1.33
	Percentage of male in the labor participation (%)	0.006	4.15	**	0.013	4.45	**	0.008	2.39
Migration abroad dummy		(omitted)			0.767	6.34	**	2.177	11.84
Nonfarm self-employment dummy		0.344	4.39	**	(omitted)			(omitted)	
Capital	Amount of assets (LE)	0.000	3.02	**	0.000	0.66	0.000	0.60	
Inverse Mills ratio		0.303	1.90	*	0.351	1.40	1.264	3.70	
Constant		6.296	28.54	**	5.077	10.40	**	5.300	9.99
Adjusted R-squared		0.224			0.214			0.520	
N		460			340			350	

Source: 2007 household survey data. Notes: 1. \*\* denotes significance at the 0.01 level \* denotes significance at the 0.05 level. 2. The dependent variable is the logarithm of nonfarm income per capita per year. 3. The reference variable for educational level is primary education.

source of nonfarm wage income. However, the distribution of this income is highly unequal, likely because there are more households in the high-income category engaged in nonfarm activities. Another reason is the linkage between employment in Homa and Cairo's unskilled construction labor market. In general, the income distribution of private sector employment is more unequal than government sector income because it involves much more diverse activities, in that the labor and other resource requirements and returns are in no way homogeneous<sup>2 6</sup>.

Awlad Sheykh has the fewest nonfarm employment opportunities, and hence, the ownership of land largely determines the income structure (in the absence of outward migration). In addition, our analysis confirms the importance of emigration for rural income distribution. In fact, emigration contributed to leveling out household income levels in Homa and especially Awlad Sheykh. In Awlad Sheykh, emigration contributed to lowering income inequality, and this more than offsets the effect of land assets on income distribution. This is because most migrant households are landless, and the income generated from emigration is relatively high.

## Conclusion

In summary, this paper found that there is no simple

correlation between the development of the nonfarm sector, land distribution, and household income in rural Egypt. Although land plays a crucial role throughout rural Egypt because of dependence on the Nile, the mechanisms behind income generation and income distribution differ according to the specific socioeconomic setting. If there is no opportunity for nonfarm activity in a land-scarce and labor-abundant setting, and if outward migration is absent, income distribution will be determined solely by land ownership and therefore quite unequal. If the development of the nonfarm sector takes place in the government sector, as in Abu Senita, income distribution is much more egalitarian. However, given the current economic orientation of a liberal economy, this is unlikely to develop. If land has little effect on income generation, and nonfarm opportunities are limited to sectors with low entry barriers, such as the construction sector in Homa, income distribution may also be equal but associated with low household income.

With regard to the issue of poverty, which is beyond the scope of this article, the findings here suggest that the reduction of poverty depends upon the volume of nonfarm opportunities. This is because as Adams (2002) pointed out for Egypt as a whole, poor households mainly participate in nonfarm activities in rural Egypt. However, it remains unclear whether poor households benefit from nonfarm opportunities in the same way across rural Egypt,

the poorest households typically being agricultural wagedworkers as in Homa and Awlad Sheykh. This could be one of the possible reasons accounting for the difference in poverty trends in Lower and Upper Egypt.

In future research, it would be necessary to conduct additional case studies in other villages with unlike socioeconomic settings in order to develop these arguments on the relationship between land, nonfarm opportunities, and income in rural Egypt, and to identify different policies for pro-poor development in rural Egypt.

## Conflict of Interests

The author has not declared any conflict of interests.

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<sup>1</sup> There are many studies dealing with poverty and income distribution in rural Egypt, as rural poverty has been considered to be one of the most important social problems since the mid-20th century. Studies such as Abdel-Fadil (1975) and Radwan and Lee (1986) relate to the 1960s and 1970s. These share the view that land distribution is the core problem for income distribution and poverty in rural Egypt. From the 1980s, attention has focused on raising agricultural productivity through increasing agricultural technology, capital, and labor inputs as a means of improving household income (Dyer, 1997; Richards and Martin, 1983). However, the findings of these more recent studies largely agree with those of the 1960s and 1970s, in that land area remains the most important determinant of the rural income distribution.

<sup>2</sup> UNDP Cairo Office (UNDP and INP, 2003) and Roushdy and Assaad (2007) identify the substantial disparities in the incidence of poverty, even between individual localities, especially in Upper Egypt, using poverty maps.

<sup>3</sup> Recently, some raw data have become available from surveys such as the Income and Expenditure Household Survey conducted by CAPMAS, likely as part of changes relating to the democratic movement in Egypt since the 2011 revolution. See Verme et al. (2014).

<sup>4</sup> The Graduate School of Economics at Hitotsubashi University conducted household surveys in 19 villages, including the three villages in this analysis. See the website for the Project for Database on Egyptian Socio-Economy (<http://middleeast-asia.com/Egypt>).

<sup>5</sup> For classification of the regions, see Iwasaki (2008) and Kato & Iwasaki (2011).

<sup>6</sup> As to the difference in the cultural context, as exemplified in family system, see Iwasaki (2006).

<sup>7</sup> Prior to the land reforms of the late 1950s, half of the land in the village belonged to a large landowner living in Cairo. However, following the land reform, most inhabitants are either small farmers or landless.

<sup>8</sup> In addition, we collected the histories of the candidate villages in order to discern the type of village, especially whether they were 'qarya' (natural villages) or 'izba' (historically large landowners' villages). The three villages dealt in this article are of the 'qarya' type.

<sup>9</sup> The multipurpose questionnaires included sections on education, employment, agriculture including livestock, nonfarm enterprises, housing, agriculture, household expenditure, assets, and attitudinal questions.

<sup>10</sup> The proportion of households engaged in nonfarm activities is 58.5% in Abu Senita, 42.1% in Homa, and 61.5% in Awlad Sheykh, based on an estimation of working days/year in farm and nonfarm activities.

<sup>11</sup> Of those working in the nonfarm sector, 37% work in Greater Cairo, 8% in Jordan, 5% in the UAE, 4% in Saudi Arabia, and 3% in Libya.

<sup>12</sup> Of those working abroad in Awlad Sheykh, 60% work in the UAE, 19% in Saudi Arabia, and 10% in Kuwait. According to the villagers, most of those in the UAE work in Abu Dhabi. Migration to Abu Dhabi started in the early 1980s and increased following the Gulf War. Although the number of migrants decreased after 9/11, many continue to work in Abu Dhabi.

<sup>13</sup> According to Adams (2002), the average area of land per household for rural Egypt is 0.43 *feddans*. Therefore, relative to rural Egypt as a whole, Abu Senita household land areas are at the average, Homa households are above average and Awlad Sheykh are below average.

<sup>14</sup> Moreover, in contrast to Abu Senita, whose land is owned mostly by small peasants of less than 1 *feddan*, the 49% of the land in Homa is owned by 9% of the households having 2 *feddans* or more land.

<sup>15</sup> The proportion of other income, comprising mainly retirement pensions, is high in Abu Senita. This village includes many government employees, and these are more likely to be covered by the retirement pension.

<sup>16</sup> We also estimated a tobit model. However, we strongly rejected the null hypothesis of the normality of the error term in all regressions. Nonetheless, the signs and magnitudes of the estimates for the explanatory variables were similar to our main results.

<sup>17</sup> Land is in most cases exogenous in the three villages because most of the farmers own the land through inheritance.

<sup>18</sup> We removed the nonfarm self-employment dummy in some cases because of collinearity in the probit analysis and income equations. The estimated effect of this variable in the standard regression of overall household income equation is as follows. Nonfarm self-employment in the three villages behaves similar to nonfarm wage employment in the sense that households pushed off the land mostly do this type of work. The evidence is that the nonfarm self-employment dummy significantly negatively correlates with farm income. In addition, second only to the emigration dummy variable, the nonfarm self-employment coefficient is the largest in magnitude. This implies that nonfarm self-employment significantly affects nonfarm income.

<sup>19</sup> We estimate an OLS regression using the same variables and excluding migrant households. We conducted the probit analysis to consider the self-selection bias problem through which households divide themselves into migrant or nonmigrant households, using a dummy variable indicating whether the household has a migrant as a dependent variable and the characteristics of the households available in the data set (land size, education, and age) as independent variables. Even though the probit analysis yielded unsatisfactory results, this estimation yielded similar results to the main analysis.

<sup>20</sup> We checked the variables used in both stages for normality using the coefficient of kurtosis and skewness and variance inflation factors (VIFs) to test for multicollinearity. By convention, if the value of a VIF is greater than 10, the variables are highly collinear. We employed Breusch-Pagan/Cook-Weisberg tests to test for heteroscedasticity.

<sup>21</sup> The participation equation can have exactly the same regressors as the income equation and can therefore be collinear through inclusion of the Inverse Mills Ratio as a nonlinear function of the regressors. Therefore, the recommendation is to include variables that are not determinants of nonfarm income to enhance the identification of the Inverse Mills ratio in the second-stage regressions.

<sup>22</sup> We also confirm land area having the largest coefficient in the OLS regression result for overall household income using the same variables in the farm and nonfarm income equations.

<sup>23</sup> Farmers in Homa sell wheat and maize but not vegetables, as in Awlad Sheykh.

<sup>24</sup> Among the household members working at the time of the survey, those with a university-level education represented 28.4% of the working population in Abu Senita, 9.4% in Homa, and 9.6% in Awlad Sheykh. Among these, 71.0% in Abu Senita, 53.2% in Homa, and 54.6% in Awlad Sheykh worked in the government sector, as a primary school teacher, or as a local administration (agricultural cooperative, local administration office, health center, etc.) employee.

<sup>25</sup> The structure of the agricultural sector could also explain the differences in the income distribution between villages. For example, irrigation systems differ in Delta, Fayoum and Upper Egypt (Mehanna, Huntington and Antonius, 1984). Regional differences in cropping patterns between the Northern Delta, the Southern Delta, Cairo, Middle Egypt, Fayoum, Upper Egypt and the Frontier governorates (Richards, 1982, p. 209) lead to regional differences in agricultural productivity (Esfehany, 1988). For regional differences relating to land distribution, which is a historical issue, see, for example, Dyer (1997).

<sup>26</sup> The Gini coefficients of nonfarm wage income excluding migrant households are 0.89 in Abu Senita, 0.93 in Homa and 0.95 in Awlad Sheykh.

*Full Length Research Paper*

## Access of urban farmers to land, water and inputs for urban agriculture in Dodoma municipality, Tanzania

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**This paper examines the access of urban farmers to land, water and inputs for urban agriculture (UA) towards household food security, employment creation and income generation in Dodoma municipality. A cross-sectional survey was employed involving 300 urban farmers from both squatter and non-squatter settlements. Structured questionnaires, focus group discussions, key informants, observations and documentary review were used to collect data relevant for the study. Based on the analysis of this study, urban farmers are constrained by land tenure insecurity, erratic water access and inadequate inputs for optimizing plot productivity and ambivalent application of urban legislative frameworks. The study found that no support has been given to urban farmers to enable them to have access to land, water and inputs in order to practice UA. The apparent lack of political will necessary to promote access to land, water and inputs for UA is reflected in weak or absent policy frameworks, resulting in an enormous capacity deficit. Policy makers and planners need information for planning and managing access of urban farmers to land, water and inputs for UA.**

**Key words:** Urban agriculture, urban farmers, access, land, water, inputs.

### INTRODUCTION

Mougeot (2006) defines Urban Agriculture (UA) as the production of food and non-food plant, tree crops and animal husbandry both within (intra) and fringing (peri) built urban areas for households' consumption as well as for sale to the rapidly growing urban population. It is a dynamic concept that comprises a variety of livelihood systems ranging from subsistence production and processing at household level to fully commercialized

agriculture. It takes place in different locations and occurs under varying socio-political conditions and policy regimes. This diversity of UA is one of its main attributes, as it can be adapted to a wide range of urban situations and to the needs of a diverse range of stakeholders. According to Oludare and Ademiluyi (2009), UA in varying forms and types is currently a common activity in most urban areas globally as it is found both in the developing

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and developed countries. UA is increasingly considered as a means to poverty alleviation in order to improve food security, to provide employment, food and income to urban dwellers (Foeken, 2013). UA is in reality and in many cases a response to crisis and a coping strategy of the urban poor (Jacobi et al., 2000).

UA in Tanzania is practiced in a generally favourable political and legal context. During the 1970s and 1980s, the national government, faced with a poor economy, issued policies encouraging people to undertake UA. Policies behind this included *Siasa in Kilimo* (Politics is Agriculture) in 1972 and *Kilimo cha Umwagiliaji* (Irrigated Agriculture) in 1974, *Kilimo cha Kufa na Kupona* (Agriculture for Life and Death) campaign launched by the national government in 1974-75, with the aim of increasing food supplies by promoting agri-cultural production in both urban and rural areas and *Mvua za Kwanza ni Zakupandia* (First Rains are for Planting) in 1974/75 (Mlozi, 2001; Foeken et al., 2004; Mlozi et al., 2004). Others were the National Economic Survival Programme (NESP) of 1981/82, the National Food Strategy in 1982, the 1983 National Livestock Policy (NLP), the National Agricultural Policy (NAP) in 1983, and the National Economic Recovery Programme (ERP) of 1986-1990, Agriculture and Livestock Policy of 1997, National Human Settlements Development Policy of 2000, The Land Use Planning Act, 2007, and The Urban Planning Act of 2007, Urban Farming Regulations of 1992 Tanzania Development Vision (2025), National Strategy for Growth and Poverty Reduction of 2005/2010, Kilimo Kwanza strategy (Agriculture First) of 2008, Town and Country Planning Act of 1956 revised in 1961 (Cap 378) and many other legislative frameworks (Namwata, 2013; Mlozi, 2003; Foeken et al., 2004; Mlozi et al., 2004; Magigi, 2008). Although the importance of UA in urban economies is increasingly gaining recognition from local and international agencies, urban land use planning and development policies at the local level have failed to tap adequately into UA as a viable strategy to poverty reduction among urban dwellers. Surprisingly, local governments planning processes have looked upon UA as incompatible with urban development and as a relic from rural-urban migration that dwindles as cities and urban economies grow. UA has not been given any planning attention, other than restricting it as much as possible or permitting it only as a temporal use of the sites concerned until urban functions took over its use (Namwata, 2013; Arku, 2009; Castillo, 2003; Obuobie et al., 2003). In order to promote UA in urban areas and Dodoma municipality in that particular, efforts are needed in order to plan for land, water, inputs and other services to support UA as a profitable and sustainable undertaking (Namwata, 2013). However, lack of information on land, water, inputs and other services for UA is a common omission by many Local Government Authorities (LGAs) in Tanzania. This information will help motivate LGAs to

make the right decisions on accessing land, water and inputs to urban farmers for UA in Dodoma municipality.

## THE STUDY AREA AND METHODOLOGY

Dodoma municipality is traced back to 1973 when it was declared the National Capital under Presidential Decree No. 320 of 1973. Since then, series of successful events have followed. In 1980 Dodoma municipality was established. In 1995 the Government shifted Parliamentary activities to Dodoma and has recently been declared by the Government to be a Centre of Education (DMC, 2011). Dodoma municipality covers an area of 2,769 square kilometers of which 625 square kilometers are urbanized. Based on the 2012 National Population and Housing Census, the population of Dodoma municipality was 410,956 people of whom 199,487 are males and 211,469 are females. The estimated total number of households is 107,000 with an average household size of 4.4 people (URT, 2013).

Dodoma municipality is administratively divided into one parliamentary constituency, 4 divisions, 37 wards, 100 *mitaa*<sup>1</sup>, 39 villages, and 222 hamlets (*vitongoji*<sup>2</sup>). The four divisions are Dodoma urban (22 wards), Hombolo (6 wards), Kikombo (3 wards) and Zuzu (6 wards). Dodoma municipality is situated in an economically depressed area. On average, Dodoma receives 570 mm of rainfall per annum with temperatures ranging from 16 to 36°C with mean temperatures of 29°C (DMC, 2011). Although it has rich agricultural land, it is affected by harsh semi-arid climatic conditions. In the urban areas the main activities of the residents are commerce, urban farming and civil service employment while in the rural areas; farming and livestock keeping are the prime means of existence (DMC, 2011).

A cross-sectional approach was adopted in this study. According to Bailey (1994), the design allowed data to be collected at a single point in time to capture important aspects of this study. The sample size for this study was calculated using the formula for large samples as modified from Poate and Daplyn (1993):

$$n = \frac{Z^2 C^2}{X^2}$$

Where  $n$  is the minimum sample size required;  $Z$  is 1.96, the value of  $Z$  at the 95 percent confidence interval;  $C$  is the variation within the population of urban farmers, which has been assumed to be 50 percent since no previous studies were found; and  $X$  is the expected level of accuracy, which has been estimated at 5 percent. The sample size was calculated as:

$$\frac{(1.96)^2 (50)^2}{(5)^2} = 384.16 \approx 384$$

The estimated size of the sample as per the formula is 384 respondents. However, it was decided on a representative sample of 300 respondents based on the limited available resources (financial, human and time) as shown in Table 1. A four multi-stage sampling process was used to select a representative sample for the study. Stage one, a list of four (4) divisions in the municipality was proposed as a sampling frame for this study.

<sup>1</sup> *Mtaa* (*Mitaa* in plural) is a Swahili word which is used to describe the lowest level of administration in any urban setting of the Local Government Authority.

<sup>2</sup> *Kitongoji* (*vitongoji* in plural) is a Swahili word which is used to describe the lowest level of administration in any rural setting of the Local Government Authority.

Quantitative data were collected using structured questionnaires.

In stage two, a list of twenty two (22) wards in Dodoma urban division was obtained and eight (8) wards with significant UA activities were purposively selected. In stage three, a list of thirty seven (37) *mitaa* in the selected wards was obtained and fifteen (15) *mitaa* as shown in Figure 1 with significant UA activities were purposely selected. In stage four, primary data were collected from twelve (12) respondents (urban farmers) from each *mitaa* using convenience and/or snowball sampling methods (Figure 2).

In qualitative approach, different types of respondents were purposively selected to participate in in-depth interviews and Focus Group Discussions (FGDs). Key informants for in-depth interviews were drawn from the municipality, CDA and other actors who have a stake in UA activities. The key informants were 17 ward executive officers, 25 *mitaa* executive officers, 2 planning officers, 2 extension officers and 2 land officers from the municipality. Other key informants were 2 land officers from the municipality and 2 officers from Dodoma Urban Water Supply and Sewerage Authority (DUWASA). On the other hand, a total of 8 FGDs were conducted in the study area whereby 96 respondents who were adult community members participated. Data were analyzed using both quantitative and qualitative techniques. Qualitative data were analyzed through content analysis. Qualitative data were translated and categorized into various themes and sub-themes based on the objectives of the study. Subsequently, quantitative data from the questionnaires were coded, summarized and analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics were used to obtain frequency counts of various coded responses and to compare means of quantitative responses of variables. Descriptive statistics were used for comparison purposes on variables of interest for explaining the phenomena. Chi-square test was employed to assess associations between variables on various attributes related to UA. Data were analysed by category of settlements (squatter and non-squatter) and comparison of variables was made by settlement.

## RESULTS AND DISCUSSION

### Accessibility of urban farmers to land for UA activities

Accessibility of urban farmers to land for UA in the context of this paper refers to ownership of land for UA among farmers. Accessibility relates to the opportunity for the actual utilization of available land by needy households or groups, taking into account administrative procedures and conflicts that may arise. The accessibility means the availability of land as well as the power to use it. In many cases, the ownership and tenure patterns of land are not known because of lack of records or frequent change of hands; further, land may also be far from where farmers live and public transportation and roads could be inadequate or not available so available land may be too costly for farmers to rent (Namwata, 2013; Flynn-Dapaah, 2002). Table 2 shows distribution of urban farmers by ownership of land for UA.

Overall results show that 55.7% indicated that they owned land plots on which they carried out UA activities with an average size up to 2 acres (44%). All variables on accessibility to land for UA activities among urban farmers between the squatter and non-squatter areas were found to be statistically not significant at  $p > 0.05$

with exception of the problems they encountered in accessing land. Also, overall results in Table 2 show that urban farmers carried out their UA activities on residential plots (34.3%), rented plots (23.1%) and governmental plots (21.3%). Obuobie et al. (2003) suggested that there are two main ways by which farmers can gain access to land for farming in both urban and peri-urban areas of Accra. These are the formal and informal access. Though Accra has a formal land delivery system, in the urban areas, this is more or less closed to agricultural uses. In the peri-urban areas where it is expected to be open to agricultural uses, the procedure is complex, inordinately long, not appropriately efficient or cost effective (Flynn-Dapaah, 2002). The findings of this study are confirmed by Mubvami and Mushamba (2008), Al Hudhud (2007) and Kyessi (2001) who deduced that land may be available but not accessible because of social or political reasons. Likewise, Al Hudhud (2007) added that the usability of available and accessible land is determined by factors such as topography, size of plot, soil texture and quality, availability of water and security of tenure. Land tenure determines who can use what land and how. Land tenure determines the level of investment that urban farmers themselves put into UA activities. The financial institutions are often not willing to give credit services to urban farmers as they lack legal rights to land and are therefore unable to use it as collateral. In this respect, as can be deduced from the observation by Kyessi (2001) that the problem of land tenure is the major challenge for UA as a viable long-term source of food and income in urban and peri-urban areas in Tanzania.

### Problems in accessing land for UA activities

On the other hand, urban farmers encountered a number of problems in accessing land for UA activities (Table 3). These included unsuitable land (24.3%), shortage of land (21.3%), lack of money to buy land (18.8%) and high prices of buying land (16.8%). Likewise, overall results show that 59.7% needed an extra land for UA activities. The majority of urban farmers indicated that they are actively searching for land, and mention to have plans to borrow from government or relatives, or seek funds to buy. According to Smit et al. (2001), in cities around the world, a vast amount of land is farmed that is neither officially allocated for that purpose nor reported. Informal or illegal land transactions include usufruct agreements between landowners and farmers. However, private landowners often will not lease their land for farming because of the lack of adequate laws governing tenancy and lease arrangements. Public landowners may also hesitate to make land available for farming.

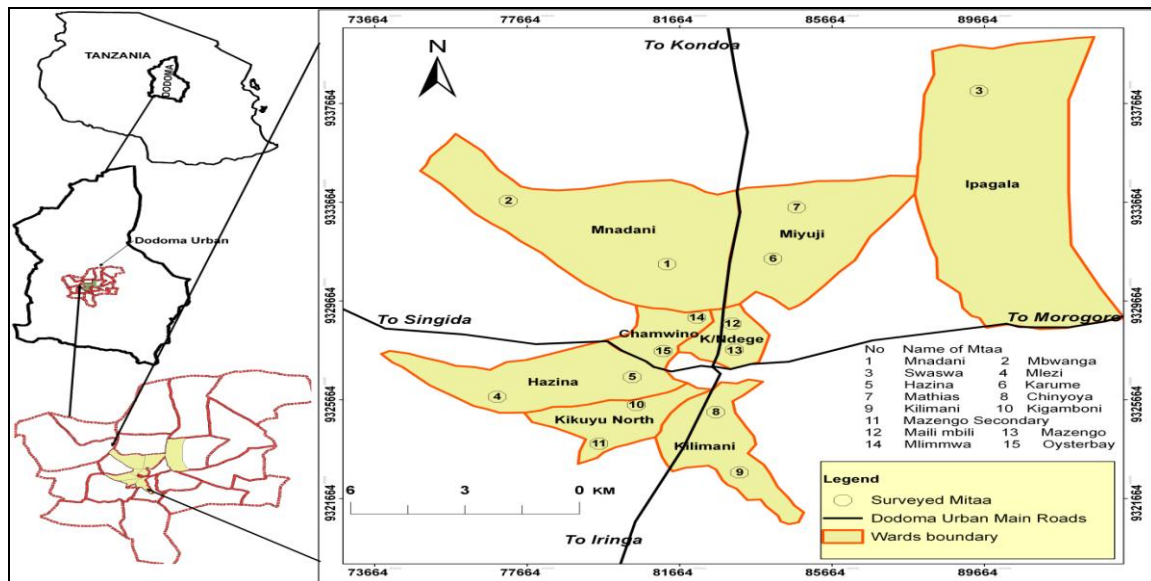
### Level of security on land for UA activities

Findings from focus group discussion revealed that one

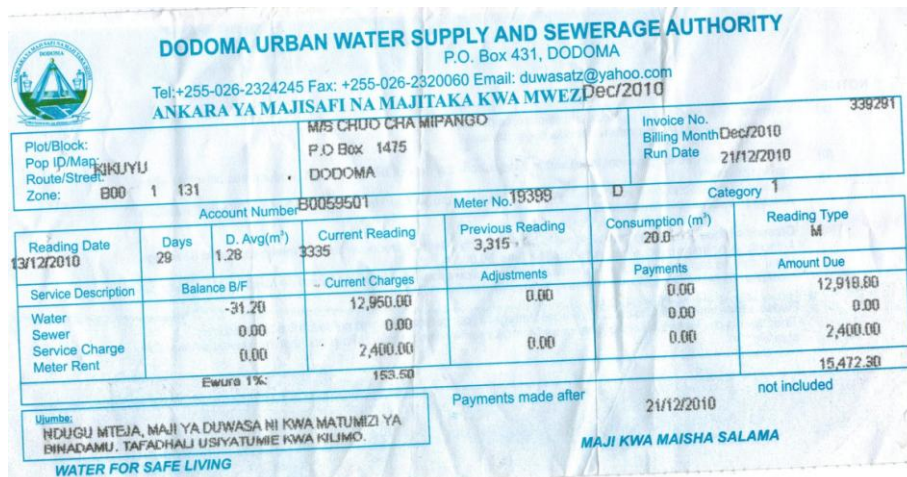


**Table 1.** Sampling procedure of respondents (urban farmers).

Sampling procedure	No
All divisions in the municipality (Dodoma urban, Hombolo, Kikombo and Zuzu)	4
Purposely selected Dodoma urban division since it has significant UA activities	1
All wards in Dodoma urban	22
Purposely selected wards with significant UA activities in Dodoma urban division with both squatter and non-squatter settlements	8
All <i>mitaa</i> in the selected eight (8) wards	37
Purposely selected <i>mitaa</i> with UA activities in the selected wards	15
Convenience and/or snowball sampling methods were employed to select respondents involved in UA activities from 15 <i>mitaa</i>	12
Total	300



**Figure 1.** Map of surveyed *mitaa* in Dodoma municipality.



**Figure 2.** Water Bill with words that strictly prohibit the use of tap water for UA

**Table 2.** Ownership of Land for UA Activities (N=300).

Variable	Area of residence				All (n = 300)	Chi-square value
	Squatter (n = 119)		Non-squatter (n=181)			
	N	%	N	%	N (%)	
Do you own land for UA activities						
Yes	68	57.1	99	54.7	167 (55.7)	0.17 <sup>ns</sup>
No	51	42.9	82	45.3	133 (44.3)	
Average size of land owned by household						
Up to 2 acres	37	43.0	55	45.5	92 (44.4)	2.47 <sup>ns</sup>
2.1-4 acres	23	26.7	27	22.3	50 (24.2)	
4.1-8 acres	11	12.8	11	9.1	22 (10.6)	
Above 8 acres	10	11.6	17	14.0	27 (13.0)	
I don't know	5	5.8	11	9.1	16 (5.3)	
If not owned, typology of land for UA						
Rented	17	27.4	22	20.6	39 (23.1)	7.13 <sup>ns</sup>
Government plot	16	25.8	20	18.7	36 (21.3)	
Open space	8	12.9	8	7.5	16 (9.5)	
Residential	15	24.2	43	40.2	58 (34.3)	
Commercial and industrial	-	-	1	0.9	1 (0.6)	
Along road and streets	-	-	1	0.9	1 (0.6)	
Surveyed/unsurveyed plots	6	9.7	12	11.2	18 (10.7)	

ns = Non significant (P>0.05), \* = Significant at (P< 0.05).

**Table 3.** Problems in accessing land for UA activities (N=300).

Variable	Area of residence				All (n = 300)	Chi-square value
	Squatter (n = 119)		Non-squatter (n=181)			
	N	%	N	%	N (%)	
Need for more access to land for UA						
Yes	74	62.2	105	58.0	179 (59.7)	0.52 <sup>ns</sup>
No	45	37.8	76	42.0	121 (40.3)	
Problems in accessing land for UA						
High prices of land	22	27.8	12	9.8	34 (16.8)	17.59*
Lack of money to buy land	12	15.2	26	21.1	38 (18.8)	
Lack of information to access land	7	8.9	16	13.0	23 (11.4)	
Absence of friends	-	-	2	1.6	2 (1.0)	
Shortage of land	13	16.5	30	24.4	43 (21.3)	
Uncertainty of land status	3	3.8	3	2.4	6 (3.0)	
Land grabbing	-	-	2	1.6	2 (1.0)	
Unsuitable land for UA	21	26.6	28	22.8	49 (24.3)	
Conflicts with other urban uses	-	-	3	2.4	3 (1.5)	
Urban pressure on land markets	1	1.3	1	0.8	2 (1.0)	

ns = Non significant (P>0.05), \* = Significant at (P< 0.05).

of the greatest constraints to UA development and growth is the limited access to land and the lack of secure of tenure on that land, particularly where UAs are competing

with other uses that provide greater profit for the landowner (Table 4).

Observations of this study indicate that many UA



**Table 4.** Land security for UA activities (N=300).

Variable	Area of residence				All (n = 300)	Chi- square value
	Squatter (n = 119)		Non-Squatter (n=181)			
	N	%	N	%	N (%)	
Level of security on land for UA						
High security	11	12.9	23	17.3	34 (15.6)	4.61 <sup>ns</sup>
Medium security	31	36.5	54	40.6	85 (39.0)	
Low security	25	29.4	23	17.3	48 (22.0)	
Insecure	18	21.2	33	24.8	51 (23.4)	

ns = Non significant (P>0.05), \* = Significant at (P< 0.05).

activities were undertaken on open spaces, unsurveyed plots and underdeveloped surveyed plots without the direct permission or agreement of land owner. Generally, urban farmers had either no or informal arrangements with owners of the land they use for UA activities. The insecure land-use title and unclear timeframe in which the land can be used makes UA undertaking highly insecure. According to Smit et al. (2001), both landholders and farmers need secure access to and exploitation of a property. Since agricultural use does not have to be permanent, landowners' fears can be assuaged with the right contractual arrangements. The validity and enforceability of permits, leases, and contracts determines whether such arrangements will be practice-able. Where no arrangements exist, the informality, illegality, and thus the precariousness of the activity (eviction is always a possibility) are not conducive to efficient farming. With low tenure security and questionable legality, the farmer is not motivated either to follow efficient farming practices or to be concerned about the long-term condition of the land, the need to regenerate the soil, or the impact of the farming activity on the environment. Such farmers are also considered high-risk borrowers by credit agencies.

Furthermore, even urban farmers who own their land may face problems from zoning laws that prevent them from farming. In Kampala, middle- and low-income urban farmers identify access to land, harassment, and eviction as important problems. Farmers may or may not be given any notice to quit the land to make room for other development. The benefit to landowners is that continuous cultivation keeps the land clean of weeds and prevents encroachment as well as urban sprawl as the cultivators provide the on-site enforcement against unofficial settlement (Obuobie et al., 2003; Obuobie, 2003; Flynn-Dapaah, 2002). This is mostly practiced by open-space farmers in the low-density areas of the city. These farmers are either engaged in seasonal farming (growing crops such as maize, tomatoes, pepper, okra, groundnut etc), relying entirely on rainfall or are engaged in irrigated vegetable farming (growing crops such as lettuce, cabbage, cucumber, spring onion, cauliflower,

green pepper) when there is a water source nearby (Obuobie, 2003; Flynn-Dapaah, 2002). There exists another similar informal arrangement, only in this case an individual or a private organization owns the land. Access to land is either through direct negotiation involving the prospective farmer and the landowner or caretaker, or through the mediation of a third party. This arrangement is used both by urban and peri-urban farmers. Household farmers are normally tenants of the houses and cultivate the land around it and therefore do not pay for such cultivation. Some open space farmers pay a token depending on the individual landowner. But more often than not individual landowners, like government agencies, view farming on their land as a way of preventing encroachment (Obuobie et al., 2003).

### Accessing water for UA activities

Water is very important for UA activities. Overall results in Table 5 show that 54.5% indicated to have not received reliable water supply for UA. The differences on reliability of water supply to urban farmers in both squatter and non-squatter residential areas were found to be statistically significant at  $p < 0.05$ . The results of this study are confirmed by Obuobie et al. (2003) who suggested that availability and access to low-cost water for farming in the urban and peri-urban areas of Accra is another key factor affecting farmers. Water access allows vegetable production in and for the lean season and is crucial for profit generation. Household farmers use mainly pipe borne water and *grey water* (water from bathrooms and kitchens); open-space farmers use drain water, streams/rivers, pipe borne water and hand-dug wells, in decreasing order; peri-urban farmers rely mainly on rainfall and streams/rivers. There are no formal procedures that farmers follow to get water for farming. Pipe-borne water is perceived to have the best quality, but is expensive and therefore unaffordable to many.

For those who have a reliable access to water for UA, most of them (68.1%) indicated to have used tap water

**Table 5.** Access to water for UA activities (N=300).

Variable	Area of Residence				All (n = 300)	Chi-square Value
	Squatter (n = 119)		Non-Squatter (n=181)			
	N	%	N	%	N (%)	
Do you have a reliable source of water?						
Yes	33	32.4	84	54.2	117 (45.5)	11.83*
No	69	67.6	71	45.8	140 (54.5)	
Main sources of water for UA						
Tap water	63	66.3	110	69.2	173 (68.1)	5.55 <sup>ns</sup>
Stream/furrow	16	16.8	22	13.8	38 (15.0)	
Wastewater/stabilization ponds	15	15.8	18	11.3	33 (13.0)	
Deep and/or shallow wells	1	1.1	9	5.7	10 (3.9)	
Both deep & shallow wells and stream/furrow	16	16.8	22	13.8	38 (15.0)	

ns = Non significant (P>0.05), \* = Significant at (P< 0.05).

for UA activities. Generally, it is strictly prohibited by DUWASA that tap water supply is for human consumption and not for UA activities (in *Kiswahili: maji ya DUWASA ni kwa matumizi ya binadamu. Tafadhali usiyatumie kwa kilimo*) as shown in Figure 2. For household farmers, the houses in which they live are usually connected to the water supply system. Though pipe-borne water supply is meant for drinking, cooking and other domestic or industrial uses, household farmers may extend it to watering of perishable crops and pay for it. However, due to the difficulty in meeting the increasing domestic and industrial demand, DUWASA, has cautioned the public to put a stop to the use of treated water for irrigation purposes.

An official from DUWASA stated that: "Water is not enough for all household and non-household activities, as the DUWASA water-supply system can hardly keep up with the requirements of the increasing population of urban dwellers. Access to a reliable tap water is very problematic as some areas do not have a tap water supply system particularly in squatter areas. So development and growth of UA will depend on a reliable water source and is likely to be limited". Observation revealed that some UA farmers used water from streams or furrows, deep or shallow wells and rainfall for undertaking UA. Some urban farmers were found using raw wastewater with little consideration for health consequences (Figure 3). Differences between the two settlements in terms of the various sources of water for UA activities were found to be statistically not significant at  $p > 0.05$ . These findings confirm the work of Drechsel *et al.* (2002) who suggested that open-space farmers frequently irrigate their crops with polluted surface water. They locate their farms along major drains and streams to access water for irrigation. Each farmer

controls, more or less, the portion of the drain or stream that is within the span of his farm and regularly maintains water drawing points within the drain or stream for fetching water effectively with watering cans. In the wet season when there is enough water in streams/rivers or drains, every farmer is free to fetch water from any point along the drain or stream but there are restrictions in the dry season, which sometimes lead to conflicts. Stream/river and major drains have continuous flow and farmers pay no fee for using the water.

During focus group discussion with farmers, it was observed that water is very essential for crop productivity as most of them were involved in crop cultivation than livestock keeping. Most crops have differing critical growth periods, and if water stress occurs during critical stages of growth, yield is directly affected. Some crops are not drought resistant like crops and some drought resistant like maize, sunflower and vegetables. Which are not commonly grown in the urban setting of the municipality. When moisture requirements are not met during this critical phase permanent, irreparable damage usually is the result. The crop quality is diminished, or ultimately the crop yield is reduced and hence farmers are affected by and large. As such, urban farmers are compelled to use any available water at their disposal for irrigating their crops.

### Accessing inputs for UA activities

Foeken *et al.* (2004) reported three categories of capital inputs that can be used for UA activities in Tanzania. The first category consists of cultivation inputs directly related to the growing process. Some are chemical, such as artificial fertilizers and pesticides, and some non-chemical

**Table 5.** Access to water for UA activities (N=300).

Variable	Area of Residence				All (n = 300) N (%)	Chi- square Value
	Squatter (n = 119)		Non-Squatter (n=181)			
	N	%	N	%		
Do you have a reliable source of water?						
Yes	33	32.4	84	54.2	117 (45.5)	11.83*
No	69	67.6	71	45.8	140 (54.5)	
Main sources of water for UA						
Tap water	63	66.3	110	69.2	173 (68.1)	5.55 <sup>ns</sup>
Stream/furrow	16	16.8	22	13.8	38 (15.0)	
Wastewater/stabilization ponds	15	15.8	18	11.3	33 (13.0)	
Deep and/or shallow wells	1	1.1	9	5.7	10 (3.9)	
Both deep & shallow wells and stream/furrow	16	16.8	22	13.8	38 (15.0)	

ns = Non significant ( $P>0.05$ ), \* = Significant at ( $P< 0.05$ ).



**Figure 3.** Swaswa wastewater stabilization pond in Ipagala Ward in 2013.

(traditional), mainly organic (and more environmentally friendly) inputs like manure and crop residues. The second category consists of equipment including hand tools for farm work such as hoes and machetes, and a higher-level technology that includes motorized implements. The third category is money drawn from family resources or other formal or informal institutions. In the context of this study, the first category of cultivation inputs directly related to the growing process was considered as shown in Table 6. Some were chemical, such as artificial fertilizers and pesticides, and some non-chemical (traditional), mainly organic inputs like manure and crop residues. Overall results in Table 6 indicate that

59% did not use inputs for UA and for those who use it they mostly use farm yard manure (55.2%). The differences of respondents' use of various types of inputs between squatter and non-squatter settlements were found to be statistically significant at  $p< 0.05$ . It was learnt that majority of urban farmers indicated to apply farmyard manure (FYM) because it is cheap to use, increases crop yields for a long time once applied, FYM fertilizes the soil for a longer time and is environmentally friendliness and retaining moisture for longer time in soil. Even those who were using other types of inputs apart from farmyard manure were sourced within the urban limits of the municipality. According to Smit et al. (2001), lack of

**Table 61.** Access to inputs for UA activities (N=300).

Variable	Area of Residence				All (n = 300) N (%)	Chi- square Value
	Squatter (n = 119)		Non-Squatter (n=181)			
	N	%	N	%		
Do you use inputs in UA activities						
Yes	44	37.0	79	43.6	123 (41.0)	1.32 <sup>ns</sup>
No	75	63.0	102	56.4	177 (59.0)	
Type of inputs used						
Chemical fertilizer	16	33.3	15	17.4	31 (23.1)	15.79*
Farmyard manure (FYM)	26	54.2	48	55.8	74 (55.2)	
Crop residue	3	6.3	-	-	3 (2.2)	
Chemical insecticides	1	2.1	14	16.3	15 (11.2)	
Chemical pesticide	2	4.2	9	10.5	11 (8.2)	
Costs of inputs used in UA (Tshs)						
Less than 20,000	14	40.0	47	61.8	61 (55.0)	1.32 <sup>ns</sup>
21,000-30,000	8	22.9	13	17.1	21 (18.9)	
31,000-40,000	10	28.6	10	13.2	20 (18.0)	
41,000-50,000	-	-	3	3.9	3 (2.7)	
Above 50,000	3	8.6	3	3.9	6 (5.4)	
Aware of the places for getting inputs for UA						
Yes	16	13.4	38	21.0	54 (18.0)	2.77 <sup>ns</sup>
No	103	86.6	143	79.0	246 (82.0)	

ns = Non significant (P>0.05), \* = Significant at (P< 0.05)

access to farming inputs such as seeds, fertilizer, pesticides, equipment, chicks and heifers, feed, and medicine — is another major constraint facing urban farmers. These inputs are not readily available in cities because the markets and sales channels are either not developed and organized or are oriented toward rural farmers. Moreover, the limited supplies are of uncertain quality. For example, the available seeds may not produce high yields. For many poor farmers, the only source of seeds is spoiled produce in the marketplace. Moreover, equipment and tools are usually designed for rural agriculture and are seldom well suited to urban needs, smaller fields, and more intensive production. There is a vast untapped global market for agricultural supplies and equipment appropriate to urban farming. Italy and Japan produce special equipment for small-scale and urban farmers, but they are the exception rather than the rule.

## CONCLUSION AND RECOMMENDATIONS

Evidence from this paper indicates that urban farmers are constrained by land tenure insecurity, erratic water access and inadequate inputs for optimizing UA productivity and profitability. There is need for urban

planners, policy makers and other stakeholders to integrate UA into their urban system design and planning so as to address problems for accessing land, water and inputs for UA. The starting point for this should be policy and planning recognition that UA is central to the livelihoods of many urban dwellers and urban farming households. Once this policy recognition is institutionalized, the next step should be improving access of urban farmers to supportive infrastructures and services. On accessing land for UA, the municipality in collaboration with relevant authorities such as CDA and the Ministry in charge of land should survey and temporarily allocate the open spaces and any other public land for UA. On the other hand, the municipality in collaboration with CDA should enforce effectively the Master plan for Dodoma National Capital City that recognizes UA as one of the urban land use. On accessing water for UA, the municipality in collaboration with DUWASA and development partners should initiate innovations that will promote water use efficiency for UA. On the other hand, they should promote systems for rainwater collection and storage, construction of wells and the establishment of localized water efficient irrigation systems (e.g. drip irrigation) in UA to stimulate production and to reduce the demand for potable water. The municipality of Dodoma in collaboration with

development partners facilitates adequate supply of inputs such as quality seeds, natural fertilizers and bio-pesticides in small quantities to a well established network of urban farmers.

### Conflict of Interests

The author have not declared any conflict of interests.

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