

The cover features a photograph of a white plastic seedling tray filled with dark soil and numerous small green seedlings. The tray is placed on a blue and white striped surface. A semi-transparent dark grey rectangle is overlaid on the top half of the image, containing the journal's title and publication information in white text.

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Full Length Research Paper

Exploring the need and suitability of “The green revolution” in South Africa

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South Africa has for years, been a self-sufficient country in terms of its food resources. However, its food security has been noted to be only at national and not household level. In fact, poverty has remained the major characteristic of most rural communities of South Africa. Rural development and poverty alleviation have therefore been the main focus of the nation's democratic government since it first came into power in 1994. At the same time, other challenges such as the ever-growing population have resulted in the national government having a hard time balancing its efforts and resources to meet the needs of the citizens such as human settlements, jobs, infrastructure, etc. The technologies adopted successfully during the Green Revolution era in Asian countries have emerged as a potential vehicle to drive rural development and address the food insecurity challenges experienced, particularly at household levels. As much as these technologies brought great success and economic growth in Asian countries, concerns have been raised about their suitability in South Africa. This paper attempts to highlight and discuss both the merits and demerits of these technologies with specific reference to the country of South Africa. The idea is to debate their suitability in South Africa so that an informed decision on whether the Green Revolution could be the answer to the nation's rural development and household food insecurity challenges can be made.

Key words: Green revolution, food security, poverty, rural development, population growth.

INTRODUCTION

Hazell (2009) defined the Green Revolution as the introduction of a package consisting of modern inputs such as improved seed cultivars, fertilizers, and pesticides aimed at enhancing crop production to curb escalating hunger and poverty in Asia. The same challenges of hunger and poverty are still well pronounced in Sub-Saharan Africa to date, with millions

of rural people undernourished and a growing urban population suffering from high food prices. In fact, literature from Gaus (2012) suggests that Sub-Saharan African countries exhibit the world's highest level of food insecurity and also rank lowest globally in terms of agricultural productivity. At the same time, human population has continued to grow and Haub and Kaneda (2013)

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predicted that between now and 2050, the 51 countries of sub-Saharan Africa will add more population (1.3 billion) than any world region. The region's natural resources are already struggling to sustain the current population as difficult decisions have to be made on how to strike a balance between using these limited resources like land for agricultural and human settlement purposes. Furthermore, the condition of productive land has deteriorated immensely both in terms of quantity and quality due to erosion, overpopulation, overgrazing and global warming thereby promoting food insecurity even more. South Africa is no exception because its food security is only at national level whereas its rural citizens continue to suffer from poverty, malnutrition and food insecurity, with the black community being the most disadvantaged (Hart et al., 2009; Mathole, 2005). In Koch's (2011) view, the country's rural food insecurity crisis is mainly linked to a lack of food purchasing power caused by poverty, unemployment and more recently, steep increases in food and fuel prices, energy tariffs and interest rates.

This is a common phenomenon in most, if not all, developing countries. The big question therefore is how to strike a balance between the available natural resources and the growing population pressure to ensure food security especially at household level. This paper tries to evaluate if the same technologies adopted during the Green Revolution era could be adopted here in South Africa to enable the nation's agricultural sector to provide enough food to sustain the ever-rising population. The Bias is towards crop production since the Green Revolution technologies were limited to crop production.

Problem statement

More than 14 million South Africans (35%) are estimated to be vulnerable to food insecurity, with the majority being the elderly, women and children (Rose and Charlton, 2002). However, rural households are the ones most affected by food insecurity, with 85% of them regarded as unable to afford even the 'below average dietary energy costs' (Jacobs, 2009). In addition, the nation has a 2% annual population growth rate which poses a big threat to food security as the population is expected to rise to at least 82 million by the year 2035 from 49 million in 2009 (Chisasa and Makina, 2012). This could result in a possible shift in government priorities and resources away from agriculture to address the human settlement needs of the citizens thereby putting a further strain on food security. To cope with such an expanding population, either the quantity of food imports will have to drastically increase and/or better farming technologies have to be introduced to increase food production. Furthermore, not only should these technologies result in more output but they should also be suitable for small-holder farmers as these occupy the biggest combined

agricultural land in the country and the majority are also located in rural areas where poverty and food insecurity are well-pronounced. Is the Green Revolution approach therefore the solution to South Africa's food production challenges?

SUPPORT FOR THE GREEN REVOLUTION APPROACH FOR SOUTH AFRICA

Proponents of the Green Revolution school of thought have based their opinions on the history of the well-documented agricultural successes that emanated from the modern plant breeding, improved agronomy and the development of inorganic fertilizers and modern pesticides. According to the International Food Policy Research Institute (IFPRI) (2002), the driving factor behind the Green Revolution was the High Yielding Varieties (HYVs) that could mature quicker and grow at any time of the year thereby allowing successful and continuous in and out of season production. Other positive qualities documented by the IFPRI (2002) include making varieties that were very responsive to plant nutrients, and stiffer straw to support the weight of heavier heads of grain. Furthermore, with limited agricultural land available, monoculture was a common practice hence the new plant varieties had to be resistant to major pests and diseases common in such intensive farming conditions whilst not losing their good consumption qualities.

These interventions resulted in huge increases in returns which in turn enhanced the farmers' incomes. Wolf (1986) argued that developing countries increased their cultivated land by only 20% between 1965 and 1980 but managed to increase their rice and wheat production by 75% and thus improving livelihoods. Despite the human population increasing by 60%, the absolute number of poor people in Asia declined between 1975 and 1995 from 1.15 billion to 825 million in 1995 (IFPRI, 2002). Not only did the new interventions enhance total output but they also led to a decline in food prices which automatically improved farmers' real incomes thereby allowing them to afford to diversify their food and attain a more balanced diet. Thus, by raising rural incomes, the Green Revolution contributed to the overall economic development through creating a market in rural areas for non-agricultural products and services which in turn led to new jobs being created and money circulating locally. South Africa's rural communities do need such forward and reverse linkages between different economic sectors, especially if they are self-sustainable. Having such linkages would stimulate rural development and create self-sustaining economies in rural areas thereby creating jobs, enhancing the development of other industries and reducing the need for rural-urban migration, among other things.

The proponents of this school of thought therefore advocated that the re-introduction of these very technologies would revive the dwindling South African agricultural sector and help meet the food requirements of the citizenry. They further pointed out that government and the private sector will have to play a leading role in financing the research and production of HYVs and other necessary inputs such as fertilizers, pesticides and irrigation systems to support the smallholder farmers who are very poor in terms of resources but outnumber their commercial counterparts.

SUITABILITY OF THE GREEN REVOLUTION IN SOUTH AFRICA

The Green Revolution was a great success in "less developed" countries like India, Pakistan, Bangladesh, Indonesia and China. Some of the interventions contributing to its success could also be adopted in South Africa to boost the agricultural sector that has gradually continued to shrink and be overtaken by other sources of income such as social grants as a major source of rural household income. Grain crops occupy more than 60% of South Africa's cultivated land. In fact, South Africa is the main maize producer in the Southern African Development Community (SADC) and exports even to overseas markets such as Japan, Taiwan, Mexico and South Korea. Its commercial farms are mainly in North West province, the Free State, the Mpumalanga Highveld and the KwaZulu-Natal Midlands producing at least eight (8) million tons of maize grain annually (du Plessis, 2003). However, du Plessis (2003) further argued that the current challenge in maize production is that the natural, unmodified maize cultivar is very sensitive to temperature, doing well in warm weather and not so well in areas where the mean daily temperature is less than 19°C or where the mean of the summer months is less than 23°C. As a result, its production in South Africa is only limited to summer when temperatures are warm. The great success stories of the maize Green Revolution in Zimbabwe and Kenya in the mid-eighties show that the same agricultural interventions could be a success in the Sub-Saharan African countries (Eicher, 1997; Karanja, 1993; Hassan and Karanja, 1997). This creates a strong case for adopting them even here in South Africa so that production is perennial.

Another great performer of the Green Revolution era was wheat, which is also the second most important field crop in South Africa. According to DAFF (2010), its production is throughout South Africa and average yield ranges from 1,5 to 3 million t/ha. This includes 2 to 2,5 t/ha under dryland and about 5 t/ha under irrigation, with the Western Cape, Northern Cape and Free State being the largest producers accounting for 84% of production. Two cultivars of wheat are grown in South Africa, the summer

wheat meant for temperatures of between 22° and 34°C and winter wheat meant for cool temperatures of between 5° to 25°C (DAFF, 2010). What makes wheat very important in South Africa is that it is used to make bread, which is a staple food in the country. Despite the mass production of the crop, the nation remains a net importer due to excessive local demand, unsteady erratic rainfall due to climatic change and, as some would say, the government's decision to open up the domestic market to the global forces. Poor infrastructure and high transport costs have also led to wheat prices going up and beyond what the majority of the citizens, particularly those in rural areas can afford. It is therefore of paramount importance that local production be increased to curb price increases by stimulating economies of scale through mass-production and also to meet the demand without necessarily increasing the size of the land under cultivation because land too is a limited resource in the country. Intensively cultivating HYVs of the crop seems a reasonable intervention under the circumstances.

Other than wheat and maize, there are a number of other important crops that South Africa is already producing, albeit not adequately. These include millet, sorghum, oats, sugar cane, sunflowers, pulses (such as cowpeas, beans and groundnuts), fruits and vegetables, just to mention but a few. Intervention is needed to enhance their production without necessarily increasing the area under cultivation since land is already scarce. However, evidence from Pingali and Heisey (1999) points at the fact that the agronomists behind the Green revolution only bred HYVs of cultivars of three cereal crops (maize, wheat and rice) and none of the crops that dominate the agricultural sector in countries in the Sub-Saharan Africa like South Africa. If HYVs of these crops have to be introduced, then the onus will be on South African breeders to develop them locally and this will require excessive sums of money.

It is worth noting though that introducing the HYVs of the Green Revolution will always come with both positive and negative effects on the farmers, the economy and the environment, just like any piece of technology. It is therefore critical to assess these drawbacks with particular reference to the South African context to determine if they are worth carrying along for the sake of achieving food security.

CRITICAL DRAWBACKS AFFECTING THE GREEN REVOLUTION'S APPLICABILITY IN SOUTH AFRICA

This new agricultural intervention did not come without some drawbacks, the same drawbacks that have become the backbone of the campaign against the adoption of the Green Revolution technologies by proponents of organic farming in South Africa. It is critical to carefully scrutinize these drawbacks from the South African perspective to

arrive at an informed conclusion of whether to continue and push for their adoption or discard them completely and pursue alternative interventions. What is also important to note is that what could be regarded as a serious challenge in a particular region, nation or group of people could actually be a minor challenge with a simple solution in another. This means that every region or nation is unique in its own way hence even the challenges of the Green Revolution should be analyzed *vis-à-vis* the ability of the nation of South Africa to handle or avoid them through its available resources or lack thereof.

In terms of these drawbacks, the first one documented by Shiva (1991) was that the High Yielding Varieties (HYVs) introduced required large quantities of pesticides and nitrogenous fertilizers for them to perform well and surpass the indigenous varieties. According to Leibbrandt et al. (2010), poverty rates in South Africa have remained very high despite increases in the real income levels of people within different races in the country. This will automatically make the affordability of pesticides and fertilizers to be a huge stumbling block, especially also considering that these are required in large quantities for the Green Revolution to succeed. In fact, Stats SA (2014) documented that at least 25.2% of the nation's population was unemployed by the end of March 2014, the worst rate of joblessness seen since 2008, and not much has been done to reduce this figure thus far. Furthermore, the contribution of wage income and remittances to household incomes has fallen and replaced by social grants whose contribution went up from 2.5 million in 1998 to nearly 16.1 million beneficiaries (or 22 per cent of households) by the end of 2012/13". Such high unemployment and poverty rates suggest that a sizeable number of citizens are not in a position to adopt and sustain these technologies using their own funds even if they wanted to. If Machete (2004) and Eicher's (1994) perception that smallholder agriculture in South Africa is the best way to promote rural development, then the high cost of implementing the Green Revolution techniques will be a great stumbling block.

Smallholder farmers in South Africa are not able to borrow capital due to lack of collateral hence will be left out should such technologies be adopted. Collateral comes in the form of land but even though some communities have agricultural land that they cultivate, they do not have title deeds for these pieces of land, hence do not qualify for financial assistance. Mbilinyi (1997) further wrote that financial constraints also manifest themselves in the form of very high interest rates on borrowed loans as financial institutions try to offset risk in the event that loans are not repaid. This, coupled with very high transaction costs has made smallholder farmers to struggle in their attempts to acquire the needed capital and use their farms as the main source of their livelihoods. Introducing more capital-demanding technologies will not help smallholder farmers

at all, unless these technologies are free or at least heavily subsidized – even though subsidies affect the government's financial reserves.

Looking at the impact of excessive use of nitrogenous fertilizers from an environmental point of view, soils tend to suffer and lose vital trace elements that cannot be replenished through these fertilizers. Even though there is proof that replenishing soil nutrients through fertilizers is effective in the short run, soils do need a break and can do with being left fallow for a while. Leaving the land fallow for some time is recommended so that the lost trace elements could be replenished naturally by "Mother Nature". Unfortunately, improved cultivars can grow in and out of season thereby making the land to be cultivated throughout without a fallow break.

The crops' severe demand for water could lead to salinization of the soil which in turn could raise the water table levels in areas where drainage is poor thereby depriving crops of oxygen. Evidence from du Preez et al. (2011) indicates that South African soils already have low organic matter levels; with at least 58% containing less than 0.5% or-organic carbon and only 4% contain more than 2% organic carbon. Barnard (2000) studied the carbon content of South Africa's topsoils and arrived at a conclusion that the nation is characterized by topsoils with very low organic matter levels. If this is already the case, then intensive monoculture could worsen the situation. It is such findings that led Sanginga (2012) to conclude that Africa cannot achieve the fruits of a Green Revolution without first having a 'Brown Revolution' which refers to the improvement of soil conditions by applying both organic and inorganic fertilizers.

The existing body of knowledge from DAFF (2012) shows that at least 80% of South Africa's agricultural land is mainly suitable for extensive livestock farming, with only 3% of the 12% arable land considered truly fertile land. The Eastern Cape Province is already known as the livestock province of the country due to its high numbers of livestock such as cattle, sheep and goats (Makara, 2010). The vast Karoo areas of the Northern and Western Cape and the Southern Free State also concentrate more on livestock than crop production due to the type of natural vegetation which favours the former. Yet the Green Revolution was solely on crop and not livestock production.

The question that comes to mind therefore is whether these interventions are applicable in a country like South Africa where livestock rearing dominates crop cultivation in terms of land suitability. A census of agricultural households done by Stats SA in 2011 could partially answer this question as its findings show that KwaZulu-Natal (24.9%), Eastern Cape (20.7%) and Limpopo (16.3%) had the highest numbers of households involved in agriculture, with Northern Cape and Western Cape having 1.9 and 2.9%, respectively. Therefore, if expensive interventions as those of the Green

Revolution should be implemented then focus should be mainly on the three provinces with the highest participation in agriculture as these most likely have the skills, experience, dedication and favourable climatic conditions for successful farming.

In addition, the high dependency of these crops on water is a big challenge as the water resource is very scarce in South Africa. According to Scholes (2001), from early 2001 all of the nation's ground water resources have been quite limited, all surface waters had already been committed for use and surplus water was imported from neighbouring countries such as Lesotho to meet the demand. DWAF (2004) further indicated that based on the current and predicted demographic trends, South Africa is likely to have a water deficit of approximately 1.7% by year 2025. Blignaut et al. (2009) concurred with DWAF (2004) and blamed global climatic change and loss of natural habitat for the 6% decline in mean annual rainfall over the last 40 years in the country. Going forward, water scarcity is likely to persist due to demographic changes, urbanisation and a growing middle class society, with higher water, food and electricity demands. At present, the mean annual 464 mm of rainfall in the country is unevenly distributed, way below the world average of 860mm, with only 10% of this water available as surface water, one of the lowest conversion ratios in the world (WESA, 2013). As such, introducing water-draining technologies when the nation's water reserves are already strained will only result in a serious water shortage. At the same time, striking a balance between food production and water preservation is not that easy as both are equally important.

Literature from Hazell (2009) suggests that in order to sustain the high water requirement by the new HYVs, Asian countries invested heavily in infrastructure before the start of the Green Revolution. For example, by 1970, at least 25% of the agricultural land was already irrigated in Asia and India already had 10.4 million hectares under canal irrigation and another 4.6 million hectares of tank irrigated land by 1961 (Evenson et al., 1999). Investment in similar infrastructure continued between 1970 and 1995 thereby making it possible for the irrigated area to grow from 25 to 33%. Such investments are needed in South Africa if the Green Revolution is to succeed because of the high water demand by the new cultivars. Currently, the available infrastructure in the country, particularly in irrigation schemes has dilapidated so much that most of it is not even usable anymore. In keeping with van Averbeké et al. (2011), South African agriculture has gone through the Irrigation Management Transfer (IMT) and revitalization era which commenced in 1990. This was aimed at eradicating poverty and improving the quality of life among black people in rural areas and informal urban settlements by focusing on food security at community or group level through the establishment of small schemes. However, key constraints such as poor

management (50% of the cases), water inadequacies (13%), conflict (12%) and theft (7%) have limited the impact of this initiative. Bembridge (2000), Kamara et al. (2001) and Shah et al. (2002) further came to the same conclusion that human (capacity) and social (institutional) resource problems have further stifled the efforts of revitalizing smallholder irrigation schemes in South Africa. Such poor attempts to revitalize the irrigation schemes already mean that successfully adopting the HYVs of the Green Revolution will not yield positive results as these cultivars require large and regular quantities of water.

Other challenges that could threaten the adoption of the Green Revolution technologies include their heavy reliance on mechanization at the expense of labour. South Africa's current high levels of unemployment present a strong case against such technologies that will result in workers, farm workers in this case, losing their jobs and the salaries of those remaining employed pushed down. At present, the agricultural sector is one of the most employment-intensive sectors of the economy, representing about 7% of formal employment in the country (DAFF, 2013). Smallholder agriculture's low "cost-per-job" characteristic puts the sector at an advantage to fight high unemployment rates in the country and drive rural development but then again, the Green Revolution technologies will stifle farm job opportunities as they are more capital than labour intensive.

Conclusion

The discussion above suggest that in terms of the demand for maize and wheat, the country's two most produced and consumed crops, supply is currently almost at par with demand. Deficits only exist when rainfalls are low but this has not been the case since 2001. In fact, the country even has surplus at national level which it exports to SADC and European nations. As such, not much intervention is needed to enhance production at national level. However, this is a completely different case when one focuses on rural citizens without the resources to produce their own crops. Such citizens are still in deep poverty as the majority are unemployed hence cannot afford to purchase the same maize and wheat crops which are abundant at national level. Thus, interventions to improve farm productivity particularly at household level without necessarily cultivating bigger pieces of land are needed in the country. However, evidence suggests that despite the great merits of the Green Revolution technologies, the extent of their negative effects mostly likely renders them not suitable for the nation, especially its smallholder farming sector. Almost all natural resources in the country such as land, water and even fertile soils have been fully allocated. As such,

implementing technologies whose positive impacts are biased towards a single national priority (food security) at the expense of non-renewable resources like water does not seem logical at all.

Furthermore, part of the success behind the Green Revolution in Asian countries was the infrastructure, especially irrigation infrastructure, which was already well-established before the revolution. This infrastructure enabled adequate delivery of water to the crops in the fields thereby boosting yields. Twenty years post democracy, South Africa's irrigation infrastructure is still very poor, especially in the rural areas of Limpopo and Eastern Cape Provinces, the country's poorest provinces despite government's attempts in the Irrigation Management Transfer (IMT) era to revitalize existing schemes in the 1990s. The targeted schemes are in the same rural areas characterized by alarming levels of poverty, unemployment and food insecurity, hence in need of urgent assistance. Development economists have proposed smallholder agriculture focusing on such rural citizens be revitalized to stimulate rural development and curb the growing "social grants dependency syndrome" but the expensive HYVs do not seem like the best solution. However, the Green Revolution approach favours the rich commercial farmers at the expense of the poor in South Africa.

As stated earlier, their heavy reliance on chemical fertilisers, pesticides and herbicides has a negative long term effect on soil fertility, soil cover, pollutes and poisons water supplies and fragile ecosystems. Even the farmers themselves and farm workers face a realistic danger of being harmed by these toxins which they will be exposed to on a daily basis. These risks seem too enormous to be transferred to South Africa's rural population that is characterized by high poverty and illiteracy rates. Be that as it may, perhaps not every trait of the new crop cultivars should be rejected in South Africa. For example, the HYVs that is able to withstand pests and diseases much better than landraces. South African Breeders should therefore focus on creating such traits in their traditional cultivars to enhance production. The Green Revolution has provided important lessons that countries like South Africa could learn to improve their own crop production and these lessons should be embraced.

In conclusion, it goes without saying that the ever-rising human population calls for the staple food production sector in the country to be developed by improved productivity and not by expansion of farmland. However, adopting the Green Revolution technologies will not address part of the reason behind food insecurity - high birth rates fueling population growth. Therefore, if any approach is to have the maximum desired effect, it should then be structured in such a way that it addresses all the causes of poverty and food insecurity whilst also paying attention to its affordability to the targeted poor citizens. Unlike those of the Green Revolution, the

technologies should also be labour-intensive so that they create salaried jobs and also be user- and environmentally friendly. Based on these points, South Africa should not push for the introduction of the Green Revolution approach in the country as its demerits outweigh its merits, unless proper research is done and cultivars suitable for the resources the country currently has are developed. All stakeholders therefore have to sit down again and craft the best strategy to fight food insecurity and poverty in rural areas whilst also promoting rural development and the self-sufficient citizenry.

Conflict of Interest

The authors have not declared any conflict of interest.

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Full Length Research Paper

Sustainable development in the Arab Region: Achievements, constraints and opportunities

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The process of rural development is considered an important priority for any society that seeks economic, social and cultural development, especially in the developing countries. Rural development aims to make a planned change evolutionary for the advancement of local communities in the countryside economically, socially, culturally and environmentally with democratic approach ensure broad participation in planning, implementation and assessment, and is targeting an integration between the official and popular efforts to make the required changes for the development of natural and human resources, and the spread of justice in the distribution of development returns and reaping the benefits in the communities, and the integration of development efforts at the national level, Therefore, this paper will review the current status for rural development in the Arab region and also the assessment of progress in the Arab region in addition the constraints and challenges after that the opportunities and outlook of the future and finally the recommendations regarding the policies and proposed programs for future work in the Arab region.

Key words: Community development, integrated rural development, rural development.

INTRODUCTION

As the rural communities in most of the Arab countries are considered as agricultural communities, the content of rural development in these countries includes the agricultural development plus the other aspects of life in rural areas. As stated in the definition adopted in a joint study by the Food and Agriculture Organization (FAO) of the United Nations and the United Nations Educational, Scientific and Cultural Organization - UNESCO (2003), rural development interests and contains agriculture, education, infrastructure, health and building rural capacities and institutions. And rural development, in its broad and integrated concept has many of the core dimensions that must be integrated to bring about

sustainable rural development in the Arab region, and these dimensions are the economic dimension, the social dimension, the human resources dimension and the Environmental dimension. The concept of rural development has been developed historically across several eras and stages from the domestic limited concept of the development of society which is founded on the idea of encouraging self-help to provide social services in communities across the concept of integrated rural development to the overall concept of sustainable rural development that has emerged and found growing interest and support from all development organizations in recent days, so the rural development is considered

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more than a concept since it contains all aspects of development.

CURRENT STATUS FOR RURAL DEVELOPMENT IN THE ARAB REGION

The current situation of rural development in the Arab region have been studied in light of the studies available for rural development activities in 13 countries in the region, namely Sudan and Saudi Arabia, Iraq, Jordan and the Syrian Arab Republic, Bahrain, Oman, the State of Palestine, the State of Qatar, Kuwait, Egypt, the Republic of Tunisia, and the Algerian People's Democratic Republic (United Nations, 2002).

Rural development policies in Arab predominantly aims to the development of natural and human resources and improve the economic and social level of the population. The available studies show that the policies and programs of rural development in Sudan, for example is based on giving priority to the development of the agricultural sector, vegetable and animal, especially the traditional sector and food security, and seeks to improve the social and economic conditions in the countryside and reduce migration from the countryside to the cities through the expansion of integrated rural development programs supported by international organizations, and to ensure proper utilization and development of natural resources, and improve the mechanisms of partnership between the public and private sectors and civil society organizations and voluntary organizations in development work in the countryside, and the empowerment of women to the comprehensive development.

In Saudi Arabia, programs and policies focus on the phenomenon of poverty radical and permanent treatment through supporting programs which give poor people the chance to rely on themselves. Rural development programs in the Kingdom of Saudi Arabia in particular aims to improve the productivity of agricultural crops by adopting latest farming techniques, and state interested in rural women's empowerment programs and the development of her capabilities and remove barriers to their participation in development activities.

In Iraq, the focus is in rural areas to supply farmers agricultural inputs subsidized prices, and provide small-scale farmers in countryside soft loans for the development of agricultural production and increasing income, and state facilitate marketing operations and works to ensure that farmers get the prices of their products parallel to the international prices and provide loans to small farmers through the Agricultural Bank to invest in the development of the agricultural work and increase production and income. In Jordan, state supports small projects financing programs and improve economic security for working families which have low income, and work to increase employment opportunities in rural areas and secondary municipalities through the

development of rural communities and shared village councils, and infrastructure development, and implementation of income-generating projects and environmental activities, and capacity building of human resources.

In Syria, rural development policies aim to develop agricultural production and improve the incomes of producers, and poverty reduction, and food security, and to ensure the provision of needed national consumption of food commodities. The policy aims to ensure development of economic investment for natural resources and benefit from them in order to achieve and maintain sustainability of degradation, depletion and pollution. Particular attention is given to the agricultural manufacturing, and to train cadres to keep pace with the development of production process, and the banking system contributes to the development and modernization of agricultural production, and state adopts pricing and marketing policies to encourage increased agricultural production and improve quality. And State gives special attention to women's empowerment programs and enhances their participation in development work by providing training services and the provision of credit.

In Bahrain, development programs are targeted at improving the level of social services available in rural generally, and the development of agricultural production by entering good high-yield varieties and breeds, and provide inputs at subsidized prices, and providing soft loans without interest to encourage production, and state interested in widening the circle of popular participation in rural development programs.

In Oman, special attention is given to develop agricultural, animal, fisheries wealth on a sound footing and using the latest technology available, and to the spread of the modern education methods of honeybees in rural areas, and to raise the efficiency of artisanal fishing and provision of soft loans for young people in the field of fish production, and are enhancing and activating the role of rural women in various agricultural areas.

In the State of Palestine, rural development programs aim to raise the efficiency marketing agricultural crops to maximize profitability for farmers, and to develop the skills and abilities of the unemployed and the poor to enable them to work to improve their living conditions, and state interested in promoting opportunities for the participation of the poor in the economic process through the provision of land and capital and other elements of commodity production. In the State of Qatar, rural development programs directed to support the agricultural sector by research and extension services and providing production supplies, and special attention is given to encourage national initiatives and community participation in the development business, and support women's productive activities.

In Kuwait, the state give special attention to the development of natural resources and improve

agricultural productivity, and expand popular participation in rural development programs, and the creation of jobs for all who are able to work in the state, and provide free various facilities for citizens including treatment, education, and soft loans for those wishing to marry or construction from the citizens.

In Egypt, rural development programs are interested in spreading techniques of modern agricultural production to raise the level of productivity and profitability of agricultural producers, and to revitalize and activate the role of NGOs and coordination between them and the government authorities in the fight against poverty and to provide direct assistance to the poor through social aids and subsidized loans for unemployed youth to finance their small activities aiming to generate income. The state pays special attention to the economic empowerment programs for rural women and the provision of social services, including education and free health services.

In the Republic of Tunisia, rural development programs focus on the rehabilitation of farmers and workers in agriculture technically and socially to develop their knowledge and skills to contribute in agricultural development, and to promote social programs and solidarity in the areas of health, education, housing and food to raise the living standards of the poor.

In Algeria, rural development programs is given special attention to the goal of ensuring sustainable use of natural resources and maintaining ecological balance, and activate the participation of communities in the process of sustainable economic development, and enable the poor to have access to credit and support their productivity (United Nations, 2002).

ASSESSMENT OF PROGRESS IN THE ARAB REGION

Arab countries varies among themselves and internally in terms of available resources to bring about sustainable rural development and the provision of its components, and therefore in terms of the possibility of making the desired progress towards achieving the Millennium Development Goals (MDGs) in the expected time frame. There have been remarkable achievements in the last decade in the Arab region, including many aspects of economic and social development in rural areas and environmental sanitation aspects, especially in the countries most developed in the region, but the rates of development in many countries of the region may become low due to weak possibilities and threats to social stability resulting from high rates of displacement population due to disasters and conflicts from the countryside to the other rural areas suffer from lack of the elements of sustainable development or to urban areas. And it has resulted from population movements in some countries in the region much deteriorated in the social and economic services and significant increases in the rates of poverty, especially in rural areas.

The Arab region which is rich by land resources have achieved remarkable achievements in the field of sustainable development - especially the Gulf Cooperation Council (GCC) - which resulted in an improvement in the lives of citizens, rising per capita income and improved health and education services and capacity-building programs, and the growing role of the private sector and public participation in a lot of countries in the region. But on the other hand, some countries in the region have continued to suffer from lack of security, political instability and poor infrastructure. As a result, the inability to make any significant progress towards the goal of poverty reduction, but there are indications of a serious problems resulting from low incomes and widespread unemployment and poor nutrition in rural and urban areas alike, and the displacement of large numbers of the rural population to cities as a result of poor service and lack of development, especially in remote areas, which have been suffering from marginalization and neglect. And assigned the decline in fighting poverty rates in some Arab countries in the region to overall policies and structural reform pressing programs, as is the case in Sudan, for example. And it is not expected that developing countries in the region will be able to make significant progress in the implementation of the Millennium Development Goals (MDGs) in the absence of assistance and support required by rich nations in the region and other donors and international development organizations. But as reflected in the report of the Economic and Social Commission for Western Asia - ESCWA (2005), providing financial assistance alone is not a guarantee to achieving the Millennium Development Goals (MDGs) in those countries unless it have the elements of good governance.

Arab region is still in need of further efforts to establish strategic partnerships at the regional and global levels and to adopt economic and social policies that would provide climate supportive of the efforts required to bring about sustainable development.

Progress in achieving the goal of eradicating extreme poverty and hunger

Based on the data contained in the ESCWA (2005) report on the state of poverty in ten (10) countries of the Arab region, which includes about 64% of the population of the region, the poverty rate has nearly doubled in developing countries in the region, and this foretells the impossibility enable these countries to achieve the first development objective of the millennium (the elimination of extreme poverty and hunger). And also came in a recent study, ESCWA (2007) that proportion of people living below the minimum poverty level in the countries of the Arab region do not suggest the possibility of progress towards poverty reduction, where it was shown that the proportion of poverty in the Arab countries combined declined slightly

from 19.5% in 1990 - 1995 to 18.2% in the period 2000 to 2004. In developing countries poverty rate fell from 46.8% in the period 1990 - 1995 to 37.1% in the period 2000 - 2004. It turns out that the poverty rate has fallen in Mashreq and the Maghreb Arab countries by 3.5% points respectively during the same time period. There are no statistics can be built upon to estimate the proportion of poverty that are believed to be low based on national poverty lines in the Gulf Cooperation Council (GCC). As for the goal of reducing the proportion of people who suffer from hunger by half by the end of 2015, the available data do not indicate the possibility of being able to do that at the level of the Arab region, where the number of those who had not had the minimum needs of required food energy in 2004 was 23.3 million or equivalent to 8.6% of the population in the Arab region, and the number of people in this category 20 million in 1991 (8.8%). Data on the nutritional status of the population in the Arab region for the last three years are not available (United Nations, 2005).

Progress in achieving the goal of popularization of primary education

It is seen from the figures obtained from ESCWA (2007) report that most of the Arab countries in the region have made significant progress towards achieving popularization of primary education by 2015, as the statistics shows an increase in the ratio of tangible infant students in primary education in the Arab region as a whole amounted to 80.5% on average, an increase of about 10% of the placement, which achieved 15 years ago. The statistics shows that the placement rate in primary education in the Gulf Cooperation Council (GCC) and the Middle East and Maghreb currently stands at about 90%, and it is expected that these countries can achieve the goal of popularization primary education by the end of 2015. By contrast statistics shows that more than half of the children of developing countries in the region not ripe opportunity to engage in formal primary education, and the proportion of the prevailing conditions, the inability of these countries to achieve popularization primary education during the specified period is the expected outcome; it is also expected to remain illiteracy prevalent more in these countries. Therefore efforts must be intensified in developing countries by the developed nations to help achieve the goal of popularization primary education, as well as working with countries in the region to upgrade the quality of education in order to cope with the economic and technological changes in the world (FAO/UNESCO, 2003).

Progress in achieving the goal of promoting gender equality and women's empowerment

It is expected that if progress rates continue towards

promoting gender equality and the empowerment of women, the Arab countries will be able to achieve the goal of gender equality at all levels of education by the end of 2015. The available statistics are signs of tangible progress in the Arab region in the direction of empowering women to participate in agricultural activities and business income-generating economic. But countries in the region vary in the degree of progress towards the goal of integrating women in public economic and social activities, as there are several factors that could lead to perpetuate economic inequality between the sexes and inequitable access to basic social services in some countries. The rates of women's participation in political activities are limited, compared to rates of participation in productive activities. As evidenced by the data ESCWA (2007) report, the proportion of women for jobs in the industrial sector and the services sector amounted to 18.3% in 2004, women held only 8.7% of the seats in the parliaments of the Arab region in April 2007. The Economic and Social Commission for Western Asia (ESCWA) Reports indicates that illiteracy rates among women in the age groups 15 years and older compared to men is still high in the Arab countries in the region United Nations (New York, 2007).

Progress in achieving the goal of reducing child mortality

ESCWA Reports indicated that Arab countries had made significant progress towards the goal of reducing mortality rates of children under five, which has thanks to popularization of immunization programs and reproductive health in a lot of countries in the region. According to data from ESCWA (2005) report, there has been a decrease in the number of deaths of children under the age of five in the Arab region per thousand births from 91 in 1990 to 70 in 2003. And from ESCWA (2007) report data, the mortality of children under the age of five has declined by 27% in 2005 from the 1990 estimate. Therefore it is expected that the Arab region can achieve the goal of reducing child mortality by one-third by the end of 2015 like Saudi Arabia, Emirates, Qatar and Maghreb, with the exception of developing countries in the region as Alkmuruz, Djibouti, Mauritania, Somalia, Sudan and Yemen.

There has been a decline in the number of child deaths by more than 50% of the 1990 estimate, which fell to 37 in 2003 achieved in the Maghreb. The ESCWA (2005) data indicate that the largest decrease in the number of deaths of children under five years of age has been achieved in GCC from 39 in 1990 to 23 in 2003. The available statistics shows that mortality rates of children under five years of age is higher in countries that suffer from economic and social underdevelopment and armed conflict including Djibouti, Iraq, Mauritania, Somalia, Sudan and Yemen, in these countries die more than 10%

of the children by their fifth. And statistics show that more than half of the children who die in the Arab region are children in this developing countries (Alkmuruz, Djibouti, Mauritania, Somalia, Sudan and Yemen), and children are dying in these countries due to malnutrition, poor health services and low awareness and education level (United Nations, 2007).

Progress in achieving the goal of improving reproductive health

Some progress has been made towards the goal of improving reproductive health in the Arab region, but the death rates of women in childbirth is still high in many countries of the region and it indicates to the impossibility of achieving the Millennium Development Goal of reducing the number of deaths by three quarters by 2015. According to available databases the average number of women who die in every thousand births in the Arab region has dropped from 465 in 1990 to 337 in 2002, and in the GCC from 29.8 in the Arab East to 144.8, and in the countries of the Maghreb to 165.5 but In developing countries the average number of women who die in every thousand births is very high, with a 716.7 and this is assigned to the weakness of maternity care services in these countries (United Nations, 2004).

Progress in achieving the goal of combating HIV/AIDS, malaria and other diseases

Available statistics on the incidence of AIDS in the Arab countries region indicate that HIV spread to the Arab countries region, where they were monitoring 42% increase in the number of cases of the disease between 1990 and 2003, which the number of people living with HIV amounted to 13.865 inhabitants, most of the injuries were at the least developed countries in the region and it is believed that 1% of the population in the age group 15 to 45 years old with HIV. And about the malaria disease, there are signs that there is a decline of infection in the Arab region. The ratio of the spread of HIV and other diseases as malaria and tuberculosis larger than the observed ratios in the Arab countries region, and this because of weak monitoring and treatment possibilities that need to be further developed (United Nations, 2007).

Progress in achieving the goal of ensuring environmental sustainability

Some Arab countries have made significant progress since 2000 in efforts to meet the challenges of sustainable development. However, there is still a need in many countries of the region to the laws and policies of development to adopt ways and means of sustainable

use of natural resources, especially land, water and energy resources in the region. According to a study prepared by the United Nations Development Program (2003), only five countries have adopted strategies to protect the environment in the Arab region. And it is clear from ESCWA (2005) Reports that the rate of desertification is increasing in Arab countries region, due to the lack of adoption of policies to rationalize the use of natural resources, and weak commitment to the development and implementation of laws required for environmental protection in many countries of the region (United Nations, 2005).

Progress in achieving the goal of establishing a global partnership for development

The achievement of the Millennium Development Goal concerned with the development of global partnerships for development in the Arab region is depending on the cooperation of developed countries and international organizations with the countries of the region and with each other to provide the necessary support the operations of the economic and social development and the creation of the elements of integration regional and global development and sustainability. It turns to the observer that there are still obstacles to achieving this goal in the Arab region, due to lack of commitment of rich countries in providing support to many countries of the region, and because of external debt remained restricts some countries and cause the economic blockade on it, in addition to internal instability resulting from the lack of adoption policies concerned with the equitable distribution of power and wealth to bring about economic integration and social stability. All these factors have weakened of the possibility of countries in the region and particularly the developing ones to create the environment required for the establishment and development of regional and global partnerships to serve the goals of sustainable development in the region (United Nations, 2007).

CONSTRAINTS AND CHALLENGES

There has been a significant progress towards achieving the Millennium Development Goals in some countries in the Arab region, but achieving these goals has been impossible in some Arab countries, especially in developing countries of the region, due to many factors which include high foreign debt, low rates of economic growth, weakness of project financing, lack of exercise of justice in the distribution of resources and benefits of development, spread of conflict and persistent political instability, lack of commitment to implement policies and strategies that would increase the capabilities of the poor and preserve the environment and ensure sustainable

use of resources and the balance in the development of rural and urban areas and to ensure the provision and improvement of services health and education for the entire population.

There are many obstacles and challenges that have the potential to adversely affect the rural development programs and their contributions to the achievement of the Millennium Development Goals in the Arab region if it is not addressed by the corrective optimal way, including

- (1) High rates of poverty, particularly in developing countries in the region that are associated in some cases with high rates population growth.
- (2) National laws and development policies that impede the development of equitable distribution of access to resources and development services in some countries in the region.
- (3) The spread of ways to use the natural resources reduce the sustainability of its bid, with the subsequent damage to the environment, and this related to the spread of poverty and land tenure policies that lead to the degradation of resources and poor utilization, and the change in the weather.
- (4) Poor infrastructure in rural areas and lack of employment opportunities for the growing numbers of the population.
- (5) High rates of migration from rural to urban areas, especially among the educated categories of rural youth.
- (6) The policies that limit the participation of rural women in economic, social and political activities.
- (7) Lack of financial and technical support to rural development programs of local, regional and global resources, and in particular in developing countries in the region, as detailed below.

i) the main challenge facing the tasks of bring about sustainable rural development is the continuing high rates of poverty in many countries of the region, and it has resulted to a bad dealing with available resources and practices that increase the deterioration of its components. This calls for devising policies that encourage the best use of resources that will ensure the sustainability of the use of them, and create attractive climate for investment activities, especially among small-scale producers, and contributes to the creation of economic and social balance between rural and urban areas to ensure social stability in the Arab countries region.

ii) The second source of challenge to the tasks of sustainable development is the growing in population in the poorest countries in the Arab region, which suffers from deterioration and decline in natural resources as a result of climate change and natural abuse and policies that have increased rates of desertification and lack of suitable alternatives to make a living in rural areas.

iii) The third challenge facing the tasks of making sustainable rural development countries in the poor Arab

region is to increase the number of learners among rural youth and the growing of their aspirations and lack of employment opportunities, as well as the absence of policies and programs that will direct energies of young people to contribute to the development work volunteering in the rural areas.

iv) The fourth challenge that negatively affect opportunities to bring about sustainable rural development in many countries in the Arab region with a rural nature is increasing rates of migration to urban areas by young people and especially those who are educated, which negatively affect the programs directed to the development of rural communities.

v) The fifth challenge harmful to rural development in many countries of the Arab region, especially the poor ones are in the country adoption of policies that sustain development work for the service of categories which are able in rural communities and neglect clearly the needs of small producers which weakens their access to production services and their active opportunities participation in programs Community Development.

vi) The sixth challenges that still hamper the efforts of sustainable rural development in many countries of the Arab region is weak mechanisms and programs of integrate women in productive activities, and the relatively low rates of education, capacity building and access to productive services among women, especially in rural areas.

vii) The weakness of international support is considered the biggest obstacle facing the rural development programs in the Arab region, especially in the least developed countries in the region.

OPPORTUNITY: OUTLOOK

The goals of sustainable development in the Arab world can be achieved in the future by working together as follows:

i) The pursuit of sustainable peace and security in the Arab region on the basis of fairness to create the perfect climate for development programs.

ii) Enhance the Arab cooperation and coordination with the regional and international organizations and also with the countries of the world, especially the Islamic countries and Group of the 77 and China in order to achieve better opportunities to negotiate in international forums and to seek support of these groups to the efforts of the Arab countries to achieve security and just and comprehensive peace in the Arab region and the world, according to international legitimacy.

iii) Take advantage of opportunities to attract capital to the region by encouraging investment, taking into account the social and economic returns and environmental investment projects.

iv) Take advantage of opportunities to join multilateral

international and regional conventions to serve Arab interests, and to promote regional cooperation in the field of preservation of the environment.

v) Use of available services to the United Nations organizations and non-governmental organizations working in the region in training and capacity building at all levels (UNDP, 2003).

RECOMMENDATIONS REGARDING THE POLICIES AND PROPOSED PROGRAMS FOR FUTURE WORK IN THE ARAB REGION

i) Working on reducing the degradation of the environment and natural resources, and work on the management of it by a sustainable method which achieve water and food security, and the preservation of ecosystems and biodiversity, and combating desertification.

ii) Support the role of the private sector and civil society organizations and its groups and encourage their participation in the development and implementation of sustainable development plans and strengthen the role and status of women in society.

iii) Develop national strategies to combat poverty, and the preparation of projects for capacity building and integration of vulnerable groups in development projects.

iv) Attention to the training and capacity building of rural women and enhance their participation in development projects, particularly in the business within the family income-generating activities, and labor-intensive development projects in rural areas.

v) Attention to training executive and supervisory cadres on the national and local levels and coordination to bring the sectoral integration in development programs.

vi) Training of local communities to raise the administrative capacity to deal with natural resources available to ensure their sustainable utilization.

vii) Employ resources in labor-intensive development projects, especially in the countries of the region with heavyweight population in rural areas.

viii) Involve citizens in the planning and implementation of projects in rural areas.

ix) The development of infrastructure and development services in rural areas and adopt policies that ensure equity in the provision and delivery of services to all categories of producers in rural areas.

x) The development and application of sound development policies that take into account the limited availability of natural resources and the need to adopt appropriate usage patterns to ensure sustainable utilization.

xi) Strengthen cooperation among Arabic States in the fields of planning and implementation of natural resource development programs and human capacity with countries in the region.

xii) Coordination between Arab countries to seek

international organizations and institutions that can give support for the development and sustainability of rural development programs in the region.

Conflict of Interest

The authors have not declared any conflict of interest.

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Full Length Research Paper

Evaluating the effects of fertilizer subsidy programmes on vulnerable farmers in Kenya

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The National Accelerated Agricultural Inputs Access Programme (NAAIAP) established in 2006 was envisioned as a safety net programme that would address the problem of food insecurity and poverty among poor farmers. This study using cross-sectional data obtained from 200 farmers employs Multinomial Logistic analysis and data from the 2009/2010 agricultural season to estimate the subsidy effects of the NAAIAP program on poor and vulnerable farmers of Tana River Sub-County. To control for errors of inclusion and exclusion the study focused on those farmers who had actually received vouchers. Observations point to predominantly aging male farmers with primary level of education and whose main source of income is farming earning them an average of \$1 a day. These farmers owning on average seven acres, lack titles to their pieces of land of which only half was utilized for production, had not accessed financial services despite such services being within reach; a factor that could be attributed to their lack of collateral and low levels of realized annual incomes from sales through roadside markets and general information asymmetries. Model results show that returns on investments to various income categories from use of fertilizer is sensitive to residual effects of previous fertilizer application, timing or use of fertilizer during the right season, and communal financial support structures such as group saving. These findings therefore avail deeper insight to policy makers and provide valuable information which has implications on policy, design, targeting and programme implementation.

Key words: Subsidy, fertilizer, National Accelerated Agricultural Inputs Access Programme (NAAIAP), smallholder, Kenya.

INTRODUCTION

Fertilizer subsidies are instruments to increase productivity (Druiilhe and Hurlle, 2012) and is an important

component in raising crop yields on the continent; on average, farmers in sub-Saharan Africa use about 13 kg

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of fertilizer nutrients per hectare (ha) of arable land compared with the developing country average of 94 kg/ha (Minot et al., 2009). Eleni (2009) note that with the partial or complete removal of explicit subsidies to smallholders, hybrid maize seed purchases and fertilizer use declined in the early 1990s in this region and population growth has outpaced grain production growth in most of Eastern and Southern Africa. In Malawi subsidies were reintroduced in 1998 after deregulation by the Structural Adjustment Program (SAP) through the Starter Pack Scheme (which evolved into a Targeted Inputs Program (TIP)) following years of perennial food shortages (Chibwana et al., 2010). Evaluation studies show Malawi started registering surplus maize output to the tune of more than 1 million ton per annum since the implementation of the program. Maize yield doubled from 1.6 ton/ha in 2000 to 2005 to 2.27tons/ha in 2009/2010 (Levy and Barahona, 2002; Dugger, 2007; Gurara and Salami, 2012).

Opinion literature is divided on the effectiveness of subsidies with two clear schools of thought emerging; (Druilhe and Hurle, 2012) indicates that available evidence, suggests that such programmes have been effective in raising fertilizer use, average yields and agricultural production but that their success is highly dependent on implementation. Market-smart subsidies can also provide rapid gains coupled with good rains, monitoring, learning and adjustments should be made for long run sustainability especially in terms of better targeting and involvement of the private sector. Subsidies should also be embedded as part of the wider agricultural development strategy. Studies (Minot et al., 2009) conclude that if fertilizer subsidies are a cost - effective way of assisting the rural poor, they can be justified on the grounds of equity. If they help farmers offset these constraints and reach optimal application rates such that the additional farm income exceeds the cost of the subsidy program then they can be justified on efficiency grounds.

On the other hand traditional arguments against subsidies have centered around distortions to the inputs market through 'displacements'(Druilhe and Hurle, 2012), welfare losses (Crawford et al., 2006), financial costs, efficiency (Filipski and Taylor, 2011), sustainability of public investment and to achieve desired political and social ends (Banful, 2011), for those supporting pro - poor market and small holder development, the capacity of such initiatives to promote greater inclusion and capacity for the most vulnerable is desirable. It is important to note that subsidies will impact input and output markets and interact with trade policies, and yielding positive outcomes is not always given. Druilhe and Hurle (2012) posits that when inputs and output markets do not work, there might nonetheless be a case for subsidies, and this might well be the situation in Sub Saharan Africa.

Kenya's agricultural sector accounts for 65% of its exports and 60% of total employment (KIPPRA, 2013). This sector

however faces formidable challenges which affect greatly the poor and vulnerable small holder population. KENFAP (2011) conclude that lack of finance or appropriately packaged financial services pose great challenge to smallholder agricultural productivity in Kenya [making] it difficult for farmers to procure inputs needed to increase farm productivity. With Kenya being a primarily agriculture based economy; performance in the maize subsector has had great bearing on both food security and overall economic growth. Doward et al. (2007) highlights the factors limiting smallholder agriculture in Malawi as being high levels of poverty, low productivity, increased vulnerability, seasonality, high dependence on maize, price fluctuation, land pressure, poor market development and infrastructure, fragility of casual labor markets and 'coping strategies' of poor people. Given that the evidence of the effects of market-smart subsidies is limited in literature; this paper seeks to fill in the gap between theory and practice.

BACKGROUND

Overview of fertilizer policies in Kenya

Kenya's economy is dependent on agriculture, which contributes to rural employment, food production, foreign exchange earnings and rural incomes. The agriculture sector directly accounts for about 26% of Kenya's Gross Domestic Product (GDP) and 27% indirectly through linkages with manufacturing, distribution and other service related sectors. The sector accounts for 65% of Kenya's total exports, 18 and 60% of formal and total employment respectively (KIPPRA, 2013). Kenya's fertilizer market was liberalized during the early 1990s which saw the elimination of price and market controls, import permits and quotas and licensing requirements.

This reforms coupled with the freeing of the foreign exchange regime in 1992, led to increased entry and investment of private sector participation in the markets resulting in growth in fertilizer use from less than 200,000mt in 1990 to over 450,000mt in 2009 (IFDC, 2012; Ariga and Jayne, 2010) this upsurge in fertilizer use was partly a result of the government maintaining a stable fertilizer policy, foreign exchange controls and not interjecting market uncertainties through large - scale subsidy programs until 2007. This stability led to increased private investment in fertilizer distribution (10 importers, 500 wholesalers and over 6,000 retailers) (IFDC, 2012).

The early part of Kenya's input subsector in the 1970s and 1980s saw the formation of state-run Kenya National Trading Corporation (KNTC) and Kenya Grain Growers Cooperative Union (KGGCU) which became Kenya Farmers Association (KFA) working together and doubling as both input and output service providers as well (Ariga and Jayne, 2010). The 1970s as a result of the conflict of interest that existed in the operational

structures of KFA, Agricultural Finance Corporation (AFC), and National Cereals and Produce Board (NCPB) with the introduction of fertilizer subsidies a policy change was made in favor of introducing another agency Kenya National Trading Corporation (KNTC) charged with importing fertilizer which then KFA would distribute to farmers (Ariga and Jayne, 2010) a move aimed at increasing competitiveness of the sector and keeping fertilizer prices low. The 1980s saw the government relax its monopoly allowing the private sector to compete with the public state agencies however private companies were still required to abide by stringent licensing and official pricing requirements. From the late 1980s and early 1990s the state began easing trade restrictions in fertilizer and maize markets. The experience of Kenya shows how a stable policy environment can foster an impressive private sector response that supports smallholder agricultural productivity and poverty alleviation (Minde et al., 2008).

The Kenyan Government over time has encouraged farmers to use fertilizers through creating and sustaining a relatively stable policy environment, financing infrastructure and supporting fertilizer markets. From 1974 to 1984 the government gave agricultural input marketing monopoly to Kenya Farmers Association and credit provision was solely through the Agricultural Finance Corporation (AFC). As a result, the Government had extensive controls over imports, pricing, and marketing of fertilizer using policy instruments such as price subsidies, price control, licensing of importers and distributors and import quotas (Gugerty and Cook, 2009; Ariga and Jayne; Yamano and Arai, 2010).

This monopoly impeded market development by stifling competition. Widespread corruption and bureaucratic costs led to a policy change in 1972 that saw the creation of another state agency Kenya National Trading Corporation (KNTC), tasked with importing fertilizers for distribution by KFA (Ariga and Jayne, 2010). In the later part of the 1980s the government began allowing other firms to enter an albeit highly regulated fertilizer market. Fertilizer traders were to abide by official prices and the state influenced competition through strict trade licensing requirements and control of the allocation of scarce foreign exchange to importers (Ariga and Jayne, 2010 quoting Argwings-Kodhek, 1996). This period also saw the government removing import quota restriction for example in January 1990 and abolishing licensing requirements for fertilizer imports in 1992.

In 1993, the government fully liberalized the fertilizer marketing system by decontrolling prices and decreasing the percentage of fertilizer provided by donor aid to only five percent of total supply (Gugerty and Cook, 2009; Minde et al., 2008; Ariga and Jayne, 2010) quoting (Kimuyu, 1994) Ariga and Jayne (2010) also observe that Government price controls and import licensing quotas were ultimately eliminated, and fertilizer donation by external donor agencies were phased out.

Kenya's National Accelerated Agricultural Inputs Access Programme (NAAIAP)

Following the African Fertilizer Summit in 2006, the Kenyan government developed a proposal through its Ministry of Agriculture for a three – year Kshs. 36 billion (US\$525 million) input subsidy programme aimed at reaching 2.5 million smallholder farmers (Government of Kenya, 2006).

The National Accelerated Agricultural Inputs Access Programme (NAAIAP) was envisioned as a safety net programme that would address the problem of food insecurity and poverty among resource poor farmers with the stated objectives of improving access to and affordability of key inputs for smallholders with less than one hectare of land while addressing the Millennium Development Goal of reducing extreme hunger (Sheahan et al., 2014; Kiratu et al., 2014) through increased productivity and reinvestments into agriculture. *Kilimo plus* one of the components of the NAAIAP programme targets resource poor farmers owning less than a hectare of land. Farmers are identified, vetted and recruited into this programme through the help of community multi-sectorial stakeholder organizations, local leaders and extension agents. Once qualified for the programme the farmer is issued a grant voucher redeemable at an accredited stockist that entitles them to a starter kit of 10 kg certified seed, 50 kg basal fertilizer and 50 kg top dressing fertilizer with the overall objective of building stockist capacity and strengthening the agro-dealer input supply networks throughout the country.

The stockist then redeems in cash the equivalent of the voucher face value from the governments appointed financial agent or District Agricultural Offices (NAAIAP Design and Implementation Framework, 2009). Targeted farmer would receive the *Kilimo Plus* "starter kit" for two agricultural seasons before graduating to the *Kilimo Biashara* Package where farmers would pay for inputs at the market price but receive subsidized credit from local financial institutions (Sheahan et al., 2014). The group approach would be used for initial entry training to deliver capacity building through field days and demonstration while at the same time serving as resource mobilization agents through cereal banks and warehouse receipting schemes that would cushion farmers against grain price fluctuations and provide capital and collateral for successive production (NAAIAP Design and Implementation Framework, 2009). The initial projected cost per farmer for the starter package and training to be provided by the government extension agents was estimated at US\$211 (Government of Kenya, 2006).

Selection of project districts is done on the basis of (i) suitability for maize, sorghum and/or millet production, (ii) high incidences of poverty (iii) lack of similar programs in the district (Sheahan et al., 2014). Within the implementing districts, the program used participatory approaches in the selection of beneficiary farmers,

conducted through multi stakeholder community based committees. These stakeholder forums comprised the basic implementation units of the program and were created to ensure fairness in the selection of beneficiaries and participating input dealers (Ministry of Agriculture, 2011).

In assessing the key impacts of NAAIAP during a recent FAO workshop¹ on smallholder maize production, Ms. Rose Mwangi mentioned that the project has succeeded in creation of demand for extension, inputs, markets, credit and partnerships, increased production from 4 to 20 bags per acre and reduced distances to input sources from 15 to 35 km down to 3 to 9 km. She says in future, NAAIAP targets to reach 2 million more farmers, but this would require an investment of Kshs. 18.7 billion. The programme also expects to generate 26 million bags of marketable maize valued at Kshs. 78 billion, and to develop a grain market pull system that will attract more supply and enhance utilization of improved inputs. Odame and Muange (2012) however identified weaknesses in program design and implementation that favored farmers and agro-dealers who were already experiencing sufficient agricultural productivity compared with their counterparts who faced greater agricultural difficulties.

Additionally they criticize the project for focusing on maize to the exclusion of other potential staple crops as an example of a 'one-size-fits-all' policy; they also identify a critical need to simplify the voucher redemption process possibly by devolving it to lower administrative units or contracting the redemption function to private financial institutions.

Although the implementation of the program has been constrained by stockist apathy due to bureaucratic government procedures, climate change, pest and viral disease attacks on maize, fluctuating input prices, weak group structures leading to weak cereal banks, poor targeting, erratic and delayed disbursement of funds, double allocation, leakages (sale of inputs to non – beneficiaries or agents for immediate cash) and inadequate group development to aid reduced cost of input distribution and to aid in collective marketing. Kiratu et al. (2014) examining qualitative data from the project found out that most farmers perceived the programme positively.

EMPIRICAL APPROACH

NAAIAP is implemented through project districts that are identified based on a certain set of predetermined criteria key amongst them being the level of poverty and vulnerability within the district. The Ministry of Agriculture runs a separate subsidy program through which the government sells inorganic fertilizers to farmers through the National Cereals and Produce Board (NCPB) at prices lower than the prevailing commercial rates (Sheahan et al., 2014; Mather and Jayne, 2011; Peter and Rotich, 2013). Each beneficiary district

in any given season is allocated an average of 1000 grant vouchers valued at between Kshs. 6000 – 8000 (US\$68-91) depending on the prevailing world input price. After issuance of the inputs the farmer is then trained and supported by the extension system through visits, demonstrations, field days and other training methodologies to ensure that they use the inputs for the given season and to avoid leakages and stockpiling. At the point of issuance of the inputs a baseline questionnaire is administered to the beneficiary in which their initial production and household information is captured and this is followed afterwards by a second impact questionnaire to the same beneficiary to now capture the production, income and welfare effects accredited to participation in the programme. A sample of 10% of the beneficiaries in every season in every district is taken for the baseline and impact survey by extension agents and questionnaires collected, sorted and data entry and cleaning done by the Agribusiness Officers at the division and district level.

Previous studies that have attempted to study the effects subsidies have on the agricultural sector tended to focus on household fertilizer use decisions (Ariga et al., 2010; Alene et al., 2008; Jama and Pizarro, 2008), "crowding in" or "crowding out" effects within the private fertilizer market (Omiti et al., 2007; IFPRI, 2012) and generally whether there is a case for subsidies that can be supported by commensurate increases in production and productivity (Alene et al., 2008; Jama and Pizarro, 2008; Dorward et al., 2011; Druilhe and Hurle, 2012). Fewer other studies have focused on targeting and impacts of fertilizer subsidies on vulnerable farmers (IFPRI, 2011; Chibwana et al., 2010; Sheahan et al., 2014) with findings from these studies indicating that poor and vulnerable households were in most programs not the final primary beneficiaries of the subsidized inputs. This study has therefore taken a more direct approach, given that it has been done in a predominantly poor and vulnerable district and therefore from the onset, close to all farmers who benefited from this programme are either poor and vulnerable or could not afford to buy inputs given their high cost and/or low returns from their production activities. Among the factors found to be closely correlated with greater fertilizer adoption and use are farming systems, crop type, education, family headship, farm size, credit access, and income from off – farm employment (Chibwana et al., 2010). This study using data from the 2009/2010 agricultural season seeks to estimate the subsidy effects of the NAAIAP program on poor and vulnerable farmers of Tana River Sub-County. To control for errors of inclusion and exclusion (Coady et al., 2002) the study focused on those farmers who had actually received vouchers. Community-based targeting has been advocated as a participatory approach and is the method of choice for the entire program.

Model specification

The assumption that each individual i is rational and chooses a set of goods from a consumption bundle implies a multinomial model that can be estimated as follows. Let IU_{ij}^* denote the indirect utility that would be obtained by selecting the j th treatment where $j = 0, 1, 2, \dots, J$ and

$$IU_{ij}^* = z_i' \alpha_j + \delta_j l_{ij} + \varepsilon_{ij} \quad (1)$$

Where z_i' is the exogenous covariates associated with parameters α_j and ε_{ij} which are the independently and identically distributed error terms. This equation also incorporates a latent factor l_{ij} for the unobserved characteristics and is assumed to be independent of the error term ε_{ij} . b_j is a set of binary variables representing the

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observed treatments choice and $b_i = b_{i1}, \dots, b_{ij}$ and $l_{ij} = l_{i1}, \dots, l_{ij}$. The probability distribution of the effects of a treatment can be summarized as:

$$\Pr(b_j | z_i, l_i) = g(z_i' \alpha_1 + \delta_1 l_{i1}, z_i' \alpha_2 + \delta_2 l_{i2}, \dots, z_i' \alpha_j + \delta_j l_{ij}) \quad (2)$$

Where g is an appropriate multinomial probability distribution function defined as follows:

$$\Pr(b_j | z_j, l_j) = \frac{\exp(z_j' \alpha_j + \delta_j l_{ij})}{1 + \sum_{k=1}^j \exp(z_j' \alpha_k + \delta_k l_{ik})} \quad (3)$$

The dependent variable of choice is household income. The multivariate regression is estimated as follows:

$$I_i = \varnothing_0 + \varnothing_1 HH_i + \varnothing_2 FC_i + \varnothing_3 GR_i + \varnothing_4 MK_i + \varnothing_5 FS_i + \varnothing_6 Q_i + \varepsilon_i \quad (4)$$

Where: I_i is the household income per year (in Kshs.) given that the poor and vulnerable farmers in Tana River rely on farming as their main source of livelihood, changes in income are better explained by the impact of subsidies. The other reason being that because this is a household that had not before received any form of support in terms of subsidies their baseline income would be a good measure of their initial marginal livelihood state.

Explanatory variables include, Vector HH which represents household characteristics including age, education, household size, and farm size. Farmers demand for fertilizer is influenced largely by the farmer's capacity to invest in fertilizer use, commodity and fertilizer prices, profitability of fertilizer use, crop yield response to fertilizer and availability of complementary inputs. These factors are largely influenced by the decision making characteristics of the household. Studies find age to be negatively correlated with fertilizer use (Doss and Morris, 2001; Feder and Umali, 1993; Feder et al., 1985) however in poor households their circumstances leave little options for choice and so we expect that this would be different. The age of the household is measured in number of years while the sex of the household head is represented by a dummy variable equal to 1 if the household is male, otherwise equal to 2. Our hypothesis is that if targeting considers vulnerability then age will be a key indicator for determining beneficiaries especially if the programme targets elderly-headed households. We predict that since female headed households are more vulnerable than male headed households we expect that female headed households will be preferred to male headed households in the targeting process. GR represents the group variable that captures group membership, and savings mobilization activities (Table 1).

FC represents the farm characteristics variable which includes area of land under maize cultivated during the 2009/2010 agricultural season measured in hectares. Farm characteristics include land registration, ownership, and size. Farmer's use of inputs in the previous season, other crop enterprise within the farm, livestock type and number, and extension service received. We hypothesize that larger farm sizes provide incentives for farmers to maximize productivity and land ownership also provides security of tenure thereby allowing the farmer to invest more capital into production.

MK represents produce marketing in which we allocate a dummy variable of 1 if the farmer sold produce and 2 if otherwise, which captures data on sale of produce in the last season with. Studies have shown that market orientation plays an essential role in assuring better incomes and welfare levels for smallholder producers, and therefore contributes to poverty alleviation. In addition, by creating demand for production inputs and investment

goods, markets promote economic growth and providing better market access is more likely to induce smallholder farmers to commercialize (Azam et al., 2012). Produce marketing also captures the details of quantities used on the farm, sold, value and the marketing channels include farm gate, roadside or market sales. Studies have shown that transaction costs determine the level of produce and marketing channels available to farmers which in turn affects the cost of goods delivered to the market and the amount of sales returns accruing to the farmer (Smale and Jayne, 2003; Alene et al., 2008; Omiti et al., 2007). This variable also considers the status of feeder roads in the area and assigns a dummy variable of 1 for all weather roads and 2 for roads that are impassable during rainy seasons. Distance to agro – input stockists tests both for the access to inputs, and captures the cost of access and sustainability of the programme once the farmers are weaned into the more commercially oriented *Kilimo Biashara* component of NAAIAP. Distance from the agro-dealer also captures information on the overall impact of the programme in reducing the distance traveled by farmers through making fertilizer available at a distance that is cost effective to the farmer. Distance to the market employs a dummy variable of one to four for a distance of between less than three kilometers to over ten kilometers. Market infrastructure and institutional aspects of market access are crucial for improving opportunities of smallholders for increased market participation and in addition to determining market orientation; infrastructural and institutional conditions also have a significant bearing on scale of smallholder production (Tung et al., 2007).

Financial services is captured by the FS variable and includes both formal and informal financial services available and accessible to the farmer, distance to the nearest financial service provider, access which is assigned a dummy variable value of 1 for access and 2 for otherwise. For those that have accessed financial services this variable also captures the type of financial service preferred by the farmer. Major constraints to production by smallholder farmers includes high cost of inputs, inadequate market access, poor infrastructure and exploitation by middle men (MAFAP, 2013), financial services therefore give farmers the requisite capacity to access inputs and capital to invest in production. We hypothesize that farmers demand for fertilizer is closely correlated to the farmer's capacity to access credit given the availability of these input services at the right time and affordable prices.

Q is a vector of other control variables. The model controls for households participation in the labour market, ownership of household business, remittances, region and rainfall. Given that participation in the labour market, ownership of household business, and remittances all affect the level of a household's affordability of inputs. Region and rainfall are controlled for given that the farmers are all from Tana River County and that rain fed agriculture is close to non-existent in this region.

In this study we use cross sectional data from the 2009/2010 agricultural season NAAIAP programme beneficiaries collected from households in Tana River County, specifically Tana River Sub-County covering a total of 1,000 beneficiary households. A sample of 200 households is used for both baseline and impact analysis.

MODEL RESULTS AND DISCUSSION

Descriptives and observations

Observations and descriptive analysis results in Table 2 indicate that majority the respondents were males aged between 41 and 51 years of age with primary level of education and whose main source of income was farming that earned them an average of Kshs. 30,000 to Kshs 40,000 (\$330 – 430) annually. Farmers in the study area did not have titles to their pieces of land with each farmer

Table 1. Description of variables.

Variable	Description
Gender	Gender of Household head (1=male 2=female)
Age	Age of the Household head (1=<18yrs, 2=19 to 29yrs, 3=30to40yrs, 4=41to51yrs, 5=52to62yrs, 6=63 to73yrs, 7=>74yrs)
Marital status	Marital Status of Household (1=widowed 2=single 3=married)
Education level of H/hold	Education level of Household (1=none 2=incomp.prim. 3=compl.prim. 4=incomp.secon. 5=complete secondary 6=polytechnic 7=tertiary college 8=university)
Household status family	Household head (1=male 2=Female)
Income source	Sources of family income (1=farming 2= casual employment 3=permanent employment 4=business)
Annual household income	1=Kshs<20,000, 2=Kshs 20001-30,000, 3= Kshs 30,001-40,000, 4= Kshs >40,001
Group membership	Membership to a group (1=yes 2=no)
Training received	Training received (1=yes 2=no)
Land size	Total land owned by household (Acres)
Land ownership	Type of land ownership (1=title2=no title3=rented4=communal)
Proof of ownership	Availability of land title deed (1=yes 2=no)
Areas under cultivation	Total land cultivated (Acres)
Extention services received	Receipt of Extension services (1=yes2=no)
Area under maize	Total area planted with maize (Acres)
Amount of fertilizer used	Quantity of fertilizer applied (Kilograms)
Maize yield	Yield from maize crop (Kilograms)
Season of yield	Season of production (1=Long rains 2=short rains)
Maize yield previous season	Maize production in previous season (Kilograms)
Sale of produce	Farmer's sales of produce (1=yes 2=no)
Market channel	Marketing channel used (1=farmgate2=roadside3=market)
Feeder roads	Status of feeder roads (1=allweather2=not all weather)
Market infrastructure	Nearest market (1=<3km,2=3-5km,3=5-10km,4=>10km)
Use of inputs last season	Did the household use inputs last season (1=yes2=no)
Group savings mobilization	Group undertakes savings (1=yes 2=no)
Access to financial services	Financial services available to household (1=yes 2=no)
Presence of ready market	Availability of ready market (1=yes 2=no)

owning an average land size of 7 acres of which only half was utilized for production giving an average maize yield of 100 kgs. Farmers sold their produce mainly through road side markets that were located close to their farms. The study also observed that farmers had not accessed financial services despite such services being within reach a factor that could be attributed to their lack of collateral and low levels of realized annual incomes.

The Multinomial Logit (MNL) model offers certain advantages in treatments where there are unobserved products attributes, it is a preferred method where the

dependent variable in question is nominal and is made up of more than two categories. Results for the MNL are presented in Table 3. Annual household income is used as a measure of the level of poverty and vulnerability at the household level. Contrary to programme design and objectives our results indicate that at lower levels of annual household income only sales and group savings correlate positively to annual income.

Education levels, market infrastructure and group membership were significant but did not contribute positively to increased household incomes amongst the

Table 2. Values of Variables used in regression analysis.

Variable	Obs.	Mean	Std. Dev.
Gender	200	1.37	0.485
Age	200	3.97	1.149
Marital status	196	2.34	0.616
Educ. level of H/hold	197	3.04	1.161
Household status	199	1.15	0.372
Family income source	200	1.17	0.777
Annual household income	200	2.59	1.107
Group membership	199	1.35	0.48
Training received	197	1.03	0.185
Land size	200	6.72	4.242
Land ownership	200	2.04	1.076
Proof of ownership	200	1.43	0.496
Areas under cultivation	200	3.49	2.321
Ext. services received	198	1.04	0.208
Area under maize	197	1.61	0.888
Amount of fertilizer used	198	78.88	117.624
Maize yield	200	100.63	104.298
Season of yield	199	1.25	0.437
Maize yield prev. season	198	5.66	2.804
Sale of produce	200	1.39	0.488
Market channel	200	2.31	0.927
Feeder roads	200	1.79	0.408
Market infrastructure	200	3.54	0.819
Use of Inputs last season	184	657.75	2207.372
Group Savings mobilization	200	1.59	0.493
Access to financial services	200	1.56	0.497
Presence of ready market	200	1.4	0.673

very poor. In very low level income households what is sold at the farm gate contributed to a very large extent to the family income and in most cases due to the formalities of credit availability and low levels of education groups become an important and in many ways a sole source of credit for reinvestment into agriculture, partly accounting for the highly negative but significant relationship between extension services and household income. Hahlbrock and Hockmann (2011) in Russia, support the fact that group affiliation has a positive effect on the performance of the farm. Similar studies in Mali (Baden, 2014) find that group members were more empowered than non-members in the realms of decision-making over agricultural income, access to credit, technology transfer and freedom of movement. Farming households either store, sell or consume farm produce. The potential for and wisdom of storing, consuming or selling and saving the earnings from retail purchases are determined primarily by the spread between farm gate and retail market prices, shifts in this relationship between these prices from one season to the next affect farmers profoundly and group saving not only

provide financial security and a low cost form of insurance but provide a viable option for smoothing out market volatility effects.

In the middle incomes category marital status and group savings were found to be significant and positively affected annual household incomes with household status, land size, use of inputs, group membership and having a ready outputs market remained significant but did not have a positive influence on household incomes. Uneze (2013) confirms that savings is important for accumulation of capital required to generate future incomes and as such group savings have been shown to be vital for securing credit and low interest loans. In a predominantly polygamist Islamic community like the one in which this studies were carried out marital status is commensurate with larger families and more labour and thus more income, given that women and children are known to be most active in farm work. The study found out that in the middle income category land size is also a significant.

At higher levels of household income only sales had a positive and significant effect on income this could be

Table 3. Multinomial logit regression results for annual household income.

Annual household income	Kshs <20,000	Kshs 20001-30000	Kshs 30001-40000	Kshs >40001
Constant	19.093(0.01)	-17.458(0.03)	0.486(0.1)	31.304(0.01)
Gender	-0.099 (-0.16)	-0.923 (-1.47)	0.098(0.16)	0.735(1.19)
Age	0.337(1.14)	-0.427(-1.54)	0.333(1.1)	0.395(1.46)
Marital status	0.525(0.99)	1.24*(2.05)	1.636**(2.64)	-1.06*(-1.81)
Educ. level of H/hold	-0.492*(-1.81)	-0.169(-0.7)	-0.306(-1.25)	0.192(0.81)
Household status	-0.604(-0.75)	0.156(0.18)	-2.064**(-2.50)	-0.249(-0.31)
Family income source	1.071(0.68)	0.226(0.54)	2.128(1.49)	1.85(1.3)
Group membership	-0.11(-0.17)	0.69(1.05)	-0.647(-0.99)	-0.749(-1.17)
Training received	2.627(1.08)	15.206(0.02)	4.139(1.61)	-21.386(0.00)
Land size	-0.158(-1.39)	0.038(0.35)	-0.257**(-2.34)	-0.077(-0.72)
Land ownership	-0.493(-1.25)	0.113(0.31)	-0.729*(-1.87)	-0.294(-0.8)
Proof of ownership	-0.388(-0.6)	-0.202(-0.3)	0.305(0.48)	-0.282(-0.43)
Areas under cultivation	-0.056(-0.32)	-0.002(-0.01)	0.048(0.3)	-0.094(-0.58)
Ext. services received	-18.300***(-3.78)	2.151(1.39)	-2.582*(-1.84)	-2.325(-1.55)
Area under maize	0.294(0.66)	-0.435(-1.01)	0.254(0.06)	0.22(0.58)
Amount of fertilizer used	0.004(1.15)	0.00(0.26)	-0.001(-0.17)	0.001(0.32)
Maize yield	0.002(0.77)	-0.002(-0.26)	0.001(0.59)	-0.002(-0.45)
Season of yield	1.19(1.4)	1.584(1.49)	0.957(1.13)	-3.444***(-2.74)
Maize yield prev. season	-0.139(-1.09)	-0.002(-0.02)	0.16(1.53)	-0.059(-0.46)
Sale of produce	1.25*(1.91)	-1.359*(-1.99)	0.406(0.62)	1.026(1.63)
Market channel	-0.157(-0.46)	0.019(0.06)	0.215(0.62)	0.029(0.09)
Feeder roads	-0.699(-0.92)	0.376(0.46)	0.381(0.49)	-0.448(-0.55)
Market Infrastructure	-0.631*(-1.77)	0.027(0.07)	-0.223(-0.61)	-0.142(-0.4)
Use of inputs last season	-1.027(-1.21)	-2.406**(-2.36)	-	-3.305***(-3.19)
Grp savings mobilization	2.397*(2.29)	-0.943(-0.86)	2.856*** (2.85)	0.396(0.36)
Access to Finl services	-0.13(-0.21)	-0.405(-0.64)	-0.175(-0.3)	1.04(1.61)
Presence of ready market	-0.752(-1.22)	-0.046(-0.08)	-1.473*(-2.17)	0.176(0.31)
N	179	179	179	179

attributed to the fact that at higher levels of income farmers are better linked to and integrated into the market than lower income farmers and thus are already experiencing the benefits of commercialization. Whereas season of yield and use of inputs were found to have a significant impact on the incomes of this category of farmers this effect was found to be indirect. This could explain the fact that most farmers at these levels of household incomes find fertilizer purchase and use extremely unaffordable with each purchase having a direct negative effect and sometimes leaving a huge impact on household income and this could account for the reasons why farmers at these levels of poverty and vulnerability fail to use these inputs. This being a predominantly arid and semi-arid area commodity markets are also prone to shocks (droughts and relief supplies) that cause crop prices to behave in “contra-seasonal” manner.

When controlled for use of fertilizer in the last six months, season of yield assumed positive significance of the low income farmer group. For farming communities

that depend on the fluctuating commodity markets where the relationship between the seasonal production and prices greatly affect household incomes, cyclical seasonal price quantity variations in the markets therefore determine to what extent the farmer can recoup investments and derive benefits from market sales and farming. Similar scenarios prevail for the middle income category of farmers with sales becoming significant as well. Thus the covariance of price and farm incomes, and the opportunities and ability to produce intertemporally at reasonable cost determines the extent of transitory benefits of fertilizer use.

CONCLUSION AND POLICY IMPLICATIONS

The National Accelerated Agricultural Inputs Access Program (NAAIAP) was designed by the Kenyan government as safety net program for poor farmers who did not have adequate financial resource to purchase farm inputs during every production cycle and to address

the issues of extreme hunger and poverty in line with the Millennium Development Goals (MDGs). This program was intended to benefit those households that were before then using insufficient or no fertilizer and seeds for their production. However, results from our analysis indicate that even within the poor and vulnerable farmers such a blanket program fails to achieve its objectives given the disparities and resource endowments in the various groups of farmers due to their productive capacity and income levels.

Contrary to programme design and objectives our results indicate that at lower levels of annual household income only sales and group savings correlate positively to annual income. In the middle incomes category marital status and group savings were found to be significant and at higher levels of household income only sales had a positive and significant effect on income. Market access plays an essential role in assuring better income and welfare levels for smallholder producers, and thus contributes to poverty alleviation. The majority of the smallholders in Kenya cultivate their farms for subsistence and very little of this production gets to the market.

These results are consistent with previous research studies (Azam et al., 2012; Omiti et al., 2007; Tung and Costales, 2007) on smallholder market access, who found out that by creating demand for production inputs and investment goods, markets promote economic growth. In addition Market linkages, support infrastructure and structures that are friendly to the poor and vulnerable are essential. However at village level, market participation is hampered by poor quality and high cost of inputs, high transaction costs, high market charges and unreliable market information. However significant provision of inputs to poor farmers may be to reduce their production costs market infrastructure and institutional aspects of market access are crucial for improving opportunities of smallholders for increased market participation and in addition to determining market orientation; infrastructural and institutional conditions have a significant bearing on scale of small holder production.

This study proposed the introduction and/or strengthening of Farmer Saving groups (FSGs) which are self-managed community-based groups composed of between 10 and 20 members that provide basic financial services to their members as a key component of the NAAIAP program. These groups respond directly to felt needs within the community through provision of secure saving platforms, basic loaning facilities with flexible terms and some form of insurance against fluctuations in the market. These groups offer simple and cost effective entry level financial services to people who are poor or isolated from mainstream financial service providers.

Market linkages and participation project components, and lobbying for policies that link farmers to markets and market supporting and enhancing infrastructures are essential elements of the project that needs to be

incorporated into the NAAIAP programme. Development of farmer friendly markets, small scale value addition projects and smallholder market access support, protection and capacity building will help enhance confidence in smallholder farmers and strengthen their footprint in the output market.

Conflict of Interest

The authors have not declared any conflict of interest.

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Full Length Research Paper

Determinants of job performance of field level workers on social safety net programmes in Bangladesh

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The study aims to clarify determinants of performance of field level workers in Social Safety Net Programmes (SSNPs). Data were collected from a sample of 70 field level workers from five upazilas (Sub-district) namely Itna, Mithaiman, Karimgonj, Tarail and Nikli under Kishoregonj district in Bangladesh. A pre-tested and structured interview schedule was used to collect data from 06 October to 06 November, 2013. Three methods of rating; self, supervisory and beneficiary ratings were used to appraise the performance of field level workers. To appraise the performance, 20 job responsibilities relevant to the field level workers in SSNPs were selected. Average scores were calculated as the overall extent of performance of field level workers in SSNPs which ranged from 20 to 100. Logistic regression analysis was performed to identify the determinants of the extent of performance of field level workers in SSNPs. Those with poor level of job performance had least score. Majority of field level workers attained the fair level of job performance, though the good performance amount to be 46%. Out of twelve selected characteristics of field level workers age, level of education, time allocation, training exposure, extension media contact, knowledge, and awareness in SSNPs showed significant positive relationships with their extent of performance in SSNPs. The result of logistic regression analysis indicated that socio-economic characteristics such as age and knowledge on SSNPs were statistically significant determinants to the performance of field level workers on SSNPs.

Key words: Performance appraisal, social safety net programmes, extension service, field level workers, Bangladesh.

INTRODUCTION

Bangladesh is a small agrarian country. The life expectancy in Bangladesh is 70.29 years (BBS, 2012). In the report of the UNDP, Bangladesh placed 142th position in Human Development Index (Human Development Report, 2014). For their livelihoods, rural people depend on land, which is fertile but extremely vulnerable. Most of

the country is made up of floodplain and the alluvial soil provides good arable land. The large areas are at risk. The large areas are at risk because of frequent floods and cyclones, the acute scarcity of land in the country are the main causes of poverty in rural areas. Forty-five percent of the population in Bangladesh live below the

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poverty line (BBS, 2011). Rural population (% of total population) in Bangladesh was last measured at 71.11 in 2012, according to the World Bank. Rural population refers to people living in rural areas as defined by national statistical offices. Though being a low estimate, 20% of the rural poor are in chronic poverty. They suffer from a persistent food insecurity, no own land and assets, being uneducated, and serious illnesses or disabilities. Twenty-nine percent (29%) of the rural population is considered moderately poor. They are deprived of basic human needs.

With the limited assets, the Bangladesh government is fighting against the poverty. The country has been trying to spread the benefit of its growth in various forms, of which Social Safety Net Programmes (SSNPs) in the recent years are principally assumed to reduce the poverty. In Bangladesh, SSNPs was introduced after becoming independent in 1971. The term Social Safety Net is typically applied to a set of social programmes that are primarily or totally focused on less advantaged and more vulnerable people. The SSNPs are designed to serve people with little money, in-educate education, poor health, or physical or mental disabilities or those living in situations where they risk abuse or neglect (Vivin, 1994). Public SSNPs are established and created by government action through different department officials and staff that must turn those policies into action. One way to understand where SSNPs are located in the broad context of public policy is to consider three interrelated spheres of public action: Social Policy, Economic Policy, and other public policy. Thus, the social safety net encompasses many programmes and activities established by a host of public policies including those specifically related to poor and vulnerable people as well as those focused more broadly on the entire society.

The financial allocation to SSNPs has been gradually increasing over the years. Starting in 1975, it has been growing fast both in finance and coverage. In 1996, SSNPs contributed 0.8% of the GDP and 5.7% of the total public expenditure (World Bank, 2008). With the gradual expansion, SSNPs contributed 2.64% of the GDP in 2010 to 2011 (Government of Bangladesh (GoB), 2012).

The scope and perimeter of SSNPs has been widened much in the recent years. There are currently 30 specific programmes on Social Safety Nets under the Bangladesh government, of which 10 are conditional programmes, 8 unconditional programmes, 5 credit schemes, and 3 conditional subsidy programmes (Rahman et al., 2011). Those SSNPs are currently being implemented across more than 15 government agencies². These agencies provide services under seven categories such as infrastructure, technical support, credit, relief/food, training/skill development, social mobilization, and health (Zohir et al., 2007). In addition, a number of programmes are being operated by an extensive network of NGOs and development partners. Each agency has to carry out more than one specific duties related to social protection.

Field level workers such as *union* worker, trade worker, technician, office assistant, and meson provide services on SSNPs at the grass-roots. They select beneficiaries based on the prescribed selection criteria. As field level workers act as one of key communicators for SSNPs, the success or failure of SSNPs obviously depend on the job performance of field level workers (Ahmed and Shaikh, 2004). Performance requirements are a determination of the acceptable behavior directly related to the worker's performance on the job or operation.

It was found that only 14% of all households received benefits from SSNPs (BBS, 2005). Another study found that 11% of participants in the primary education stipend programme met none of the eligibility criteria for the programme participation, while almost none of the participants met at least three criteria (Ahmed and Shaikh, 2004). Leakages in the 'food for work programme' have been estimated to be 26% (World Bank, 2003). Consequently, still now the SSNPs are not fully materialized among the beneficiaries.

Therefore, towards skill development of field level workers, the study aims at identifying determinants to job performance of field level workers in SSNPs.

METHODOLOGY

Study area

The study was carried out in five *upazilas* (Sub-district) under Kishoregonj district in Bangladesh (Figure 1). Those *upazilas*, where SSNPs were getting popularity among the vulnerable rural poor, were selected as a study area.

Sampling procedure and sample size

A total number of 70 field level workers and officers (*Itna*: 13 persons, *Mithamain*: 9 persons, *Nikli*: 11 persons, *Tarañ*: 21 persons, and *Karimgonj*: 16 persons) were assigned at three nation building departments (*Upazila* Social Welfare Office, *Upazila* Engineering Office, and *Upazila* Project Implementation Office) engaged in implementing SSNPs (Table 1).

The designations of these field level workers are *union* worker, trade worker, technician, office assistant, and meson. Data were collected from those 70 field level workers and officers from the five *upazilas*. Total sampling method was used for selecting sample number of the study.

Data collection

A structured interview schedule was used to collect data from the field level workers during 06 October to 06 November, 2013. Before collecting data, an interview schedule was submitted as a pre-test to verify potential shortcomings in comprehension and to validate its appropriateness. A pilot test of the interview survey was conducted with 15 field level workers in the study area. Based on the results, some revisions on the interview schedule were made.

Measurement of the variables

So as to identify determinants to the job performance of field level



Figure 1. A map of Kishoreganj District (showing the location of Itna, Mithamain, Nikli, Karimganj and Tarail upazilas).

workers, the study proposed causality: job performance as a result (dependent/explanatory variable) and socio-economic characteristics as causes (independent variables). For the latter, independent variables, were adopted 12 socio-economic characteristics of field level workers (age, level of education, household size, annual family income, organizational participation, social mobility, communication media contact, time allocation, relationship with senior officers, SNNPs training exposure in the past 5 years, knowledge on SSNPs, and awareness of SSNPs). For the job performance as a dependent variable, 20 job activities (Table 2) were adopted in practice and each of those job activities was appraised by 3 methods such as self-rating, supervisor-rating, and beneficiary-rating. The job performance on each activity was measured by a five-point rating scale such as excellent, good, fair, poor, and very poor performance. The corresponding scores were 5, 4, 3, 2, and 1 point, respectively. As to self-rating, it means that the field level worker himself/herself appraises the performance of each activity based on the scale of "excellent", "good", "fair", "poor", or "very poor". Supervisor-rating means that the job performance of a field level worker is appraised by officers who supervise the field level worker at the relevant office. In accordance to Table 1, it is sure that the job performance of a field level worker is measured by 2 or 3 officers. Meanwhile, in beneficiary-rating, though a beneficiary was selected at random, the job performance of a field

level worker on activity is appraised by the beneficiary only. The method was used by Isalm et al. (1987) and Hoque and Usami (2008) to measure the performance of extension workers.

Afterward, the score of job performance of a field level worker was calculated to be an average from such three ratings. Then, the overall job performance amount to the total scores from accumulating the 20 job performances. Hence, it could range from 20 (20 jobs x 1 point) to 100 (20 jobs x 5 points); 20 for the very poor performance and 100 for the excellent performance. In addition, from the viewpoint of the difficulty of job activity, Performance Index (PI) was calculated by the following formula:

$$\text{Performance Index (PI)} = \frac{\text{Total score received}}{\text{Maximum total score}} \times 100$$

Where, Total score received = $P_{ex} \times 5 + P_g \times 4 + P_f \times 3 + P_p \times 2 + P_{vp} \times 1$; P_{ex} = Number of respondents with 'Excellent' performance; P_g = Number of respondents with 'Good' performance; P_f = Number of respondents with 'Fair' performance; P_p = Number of respondents with 'Poor' performance; P_{vp} = Number of respondents with 'Very Poor' performance; Maximum total score = 350 (5 points x 70 persons).

The possible PI score for a job activity could range from 0 to 100,

Table 1. Number of field level workers and officers in the selected officers.

Upazila	Number of filed level workers and officers						Total Number of FLWs and officers
	Office of Social Welfare		Office of Engineering		Office of Project Implementation		
	FLWs	Officers	FLWs	Officers	FLWs	Officers	
Itna	6	3	3	3	4	3	13
Mithamain	4	3	2	2	3	3	09
Nikli	6	3	2	2	3	3	11
Tarail	12	3	3	2	4	3	21
Karimgonj	10	3	2	2	4	3	16

Notes: FLWs: Field level workers.
Source: Authors' Field Survey (2013).

where 0 means "very poor" and 100 for "excellent".

Data analysis

For the features of job performance as well as field level workers, descriptive statistics such as range, frequency, mean, standard deviation, and rank order were used. For the qualitative nature of the causality between job performance and socio-economic characteristics of field level workers, Pearson's Product Moment Correlation was analyzed. Furthermore, for the quantitative nature of it, the logistic regression analysis was conducted to identify determinants to job performance. The model was:

$$\text{Logit}(p) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12}$$

where p : job performance; X_1 : age; X_2 : level of education; X_3 : household size; X_4 : annual family income; X_5 : organizational participation; X_6 : social mobility; X_7 : communication media contact; X_8 : time allocation; X_9 : relation with senior officers; X_{10} : SSNPs training exposure in the past 5 years; X_{11} : knowledge on SSNPs and X_{12} : awareness of SSNPs.

The reliability of all the variables was investigated by calculating Cronbach's alpha.

RESULTS AND DISCUSSION

Characteristics of field level workers in social safety net programmes

Table 3 shows the socio-economic state of 70 field level workers in SSNPs at the study area. In terms of mode, they were featured by senior (above 45 years old), higher secondary education level, medium size of household, and high annual household income. Furthermore, in the aspect of social activities, they had low participation in organization, moderate social mobility, and high communication media contact. In this study, social mobility was measured based on the respondents' frequency of visit to the other villages, upazila headquarters, district and other research organizations. At the office, time allocation to works was at the moderate level and the relationship to supervisor was

fair. Regarding SSNPs, the level of knowledge was high, while the awareness of SSNPs was at the medium level.

Performance of field level workers in social safety net programs

Performance of field level workers ranged from 45 to 81 against the possible scores of 20 to 100. Accordingly, the mean was 60 (standard deviation: 8.65). As shown in Table 4, it was lower than that of self-rating but higher than those of supervisor-rating and beneficiary-rating. Based on this mean (namely 60), 70 field level workers were classified into three categories: "poor performance" (score: 20-40), "fair performance" (score: 41-60), and "good performance" (score: above 60). The distribution of field level workers according to their job performance scores is shown in Table 4. It can be seen that (1) those, whose level of job performance is poor, are least and (2) the majority of field level workers have attained the fair level of job performance, though the good performance amount to be 46%.

Job performance of field level workers appraised by self, supervisor, and beneficiary

Table 5 shows that, based on the average PI (60.45), 11 activities out of the 20 activities attained the PI above the average, while the other 9 job activities are below the average. The former 11 job activities are mainly characterized by 'working with groups' and 'data collection' as a regular official duties but so are the latter 9 job activities by working with groups along with motivating farmers/beneficiaries by extension workers' own capacity.

Socio-economic determinant to job performance of the field level workers in SSNPs

The result of correlation analysis on relationship between

Table 2. List of activities in SSNPs.

S/N	Activities
Collection of Information (CI)	
A ₁	Maintaining a daily dairy of the activities performed
A ₂	Identifying the problems and need for the beneficiaries
A ₃	Collecting information and maintaining overall records about beneficiaries
A ₄	Conducting special surveys on natural hazards or emergencies
Working with Group (WG)	
A ₅	Arranging and conducting group meeting, training, field day in the line with work ed programmes and extension plans
A ₆	Working with the poor people to increase their income generating activities
A ₇	Maintaining regular contact with the beneficiaries and senior officers
A ₈	Undertaking all important tasks of public interest as instructed by the government
A ₉	Undertaking any other duties that are determined by the senior officers
A ₁₀	Assisting the field level workers to conduct KAP (knowledge, attitude, practice) survey as required
A ₁₁	Assisting beneficiaries for obtaining information and other assistance from the organization
A ₁₂	Identifying other beneficiaries group, working with temporary groups and encourage the formation of new groups where necessary
Providing Training (PT)	
A ₁₃	To train the beneficiaries at the field as well as Upazila office level
A ₁₄	Regular observation of SSNPs training activities by the trained leader at the field level
Preparing Report (PR)	
A ₁₅	Consultation with the expert of SSNPs
A ₁₆	Helps in preparing the annual report on SSNPs
Motivating Farmers (MF)	
A ₁₇	Helps an individual to be more punctual in everyday life due to working with people in and outside of the community through SSNPs
A ₁₈	Motivating the rural poor people to increase their social participation to make effective SSNPs
A ₁₉	Helping the rural poor people in making their future plan
A ₂₀	Reinforce in taking initiatives towards participation in social development work through SSNP

Notes: Extent of responses: excellent (score 5), good (score 4), fair (score 3), poor (score 2) and very poor (score 1). Source: Authors' Field Survey, 2013.

socio-economic characteristics and job performance is shown in Table 6. From the viewpoint of statistical significance, there are three types of characteristics: basic characteristics such

as age and education, engagement such as time allocation, communication media contact, SSNPs training exposure in the past 5 years, and recognition to SSNPs such as knowledge and

awareness. Thus, according to correlation analysis, these significant characteristics should put into consideration improving job performance of the field level workers.

Table 3. Salient features of field level workers (n = 70).

Variable (Unit)	Range		Categories	Respondent		Mean	SD*
	Observed	(possible)		Number (n=70)	Percent (%)		
Age (Years)	20-59 (-)		Young (up to 30)	8	11.43	45.16	9.92
			Middle age (31-45)	20	28.57		
			Old (>45)	42	60		
Level of education (Years)	8-18 (-)		Secondary (up to 10)	21	30	12.06	2.85
			Higher secondary (12)	32	44.29		
			Above higher secondary (> 12)	17	25.71		
Household size (No of persons)	2-12 (-)		Small (2-4)	23	32.86	5.43	2.29
			Medium (5-6)	31	44.28		
			Large (>6)	16	22.86		
Annual family Income (000' TK)	176-467 (-)		Low (<200)	7	10	288.30	73.02
			Medium (200-300)	31	44.29		
			Large (>300)	32	45.71		
Organizational participation (Points)	2-9 (1-30)		Low (<10)	70	100	4.53	2.05
			Medium (10-20)	0	0		
Social mobility (Points)	2-18 (0-18)		Low (<7)	20	28.57	8.97	3.84
			Moderately (7-12)	39	55.71		
			High (>12)	11	15.72		
Communication media contact (Points)	20-32 (0-36)		Low (<13)	0	0	26.40	2.95
			Medium (13-25)	29	41.43		
			High (>25)	41	58.57		
Time allocation (Hours/week)	31-58 (-)		Short (<40)	26	37.14	43.31	6.41
			Medium (40-50)	32	45.72		
			High (>50)	12	17.14		
Relationship with senior officers	23-44 (10-50)		Poor relationship (<22)	0	0	34.34	4.99
			Fair relationship (22-35)	40	57.14		
			Good Relationship (>35)	30	42.86		
SSNPs training exposure in the past 5 years (Points)	3-25 (-)		Short term (<7)	29	41.43	8.43	4.01
			Midterm (7-10)	21	30		
			Long-term (>10)	20	28.57		

Table 3. Contd.

Knowledge on SSNPs (Points)	17-24 (0-24)	Low (<8)	0	0	21.20	2.22
		Medium (8-17)	1	1.43		
		High (>17)	69	98.57		
Awareness of SSNPs (Points)	6-12 (0-12)	Low (<4)	0	0	7.94	1.39
		Medium (4-8)	48	68.57		
		High (>8)	22	31.43		

SD = standard Deviation. Source: Authors' Field Survey, 2013.

Table 4. Job performance of field level workers appraised by self, supervisor, and beneficiary (n=70).

Level of job performance	Field level workers		Mean	Standard deviation
	Number (n =70)	Percent		
Self-rating				
Poor performance (20-40)	0	0	65.13	8.67
Fair performance (41-60)	29	41.43		
Good performance (above 60)	41	58.57		
Supervisor-rating				
Poor performance (20-40)	0	0	59.72	9.13
Fair performance (41-60)	37	52.86		
Good performance (above 60)	33	47.14		
Beneficiary-rating				
Poor performance (20-40)	4	5.71	55.79	8.91
Fair performance (41-60)	49	70		
Good performance (above 60)	17	24.29		
Average				
Poor performance (score: 20-40)	0	0	60.23	8.65
Fair performance (score: 41-60)	38	54.29		
Good performance (score: above 60)	32	45.71		

Source: Authors' Field Survey (2013).

Table 5. Distribution of field level workers by performance level and job activity in SSNPs (n = 70)

Activity	Number of field level workers (n = 70)					PI	Rank
	Excellent	Good	Fair	Poor	Very Poor		
Above average PI							
Collecting information and maintaining overall records about beneficiaries (CI)	23	18	15	11	3	73.47	01
Helps in preparing the annual report about SSNPs (PR)	11	30	22	7	0	72.86	02
Undertaking all important tasks of public interest as instructed by the government (WG)	14	23	27	5	1	72.57	03
Maintaining regular contact with the beneficiaries and senior officers (WG)	9	29	22	10	2	71.14	04
Identifying the problems and need for the beneficiaries (CI)	10	19	34	5	2	68.57	05
Regular observation of SSNPs activities by the trained leader at the field level (PT)	12	24	21	7	6	68.29	06
Assisting the field level workers to conduct KAP (knowledge, attitude, practice) survey as required (WG)	5	29	16	20	0	65.43	07
Motivating poor people to increase their social participation in different SSNPs (MF)	0	8	57	11	0	64.29	08
Consultation with the expert of SSNP	7	24	17	15	7	62.57	09
Assisting beneficiaries in obtaining information and other assistance from the organization (WG)	5	20	27	14	4	62.29	10
Maintaining a daily diary of activity (CI)	10	22	17	6	15	61.71	11
Below average PI							
To train the beneficiaries at the field level (PT)	2	23	17	10	18	56.57	12
Helping the rural poor people in making their future plan (MF)	4	11	17	38	0	56.00	13
Helps an individual to be more punctual in everyday life due to working with people in and outside of the community through SSNP (MF)	2	19	17	24	8	55.14	14
Working with the poor people to increase their income generating activities (WG)	3	12	24	16	15	52.00	15
Arranging and conducting group meeting, training, field day, in the line with worked programmes and extension plans (WG)	4	12	17	20	17	50.29	16
Reinforce in taking initiatives towards participation in social development work through SSNPs (MF)	10	17	17	18	8	49.43	17
Identifying existing other beneficiaries group, working with temporary groups and encourage the formation of new groups where necessary (CI)	1	12	17	28	12	49.14	18
Undertaking any other duties that are determined by the senior officers (WG)	0	16	16	21	17	48.86	19
Conducting special surveys on natural hazards or emergencies (CI)	4	6	18	31	19	48.29	20

CI: Collection of Information; WG: Working with Group; PT: Providing Training; PR: Preparing Report; MF: Motivating Farmers. () : shown the category of activities shown Table 2. Source: Authors' Field Survey, 2013.

On the other hand, as shown in Table 7, knowledge and awareness on SSNPs showed high multicollinearity value between them. Thus, based on results from such correlation analyses, the practical Logit Model can be fixed as follows:

$$\text{Logit}(p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_7 X_7 + \beta_8 X_8 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12}$$

where p : job performance; X_i : age; X_2 : level of

education; X_7 : communication media contact; X_8 : time allocation; X_{10} : SSNPs training exposure in the past 5 years; X_{11} : knowledge on SSNPs and X_{12} : awareness of SSNPs.

Result of logistic regression analysis on determinant to job performance

Result of logistic regression analysis is presented

in Table 8. Based on Wald and p-value, knowledge of SSNPs (odd ratio, (OR): 1.83, 95% CI: 1.03 – 3.25, p-value<0.05) and age (odd ratio, (OR): 1.12, 95% CI: 0.99– 1.25, p-value<0.1) were found statistically significant determinants to the job performance of field level workers. The main reason is likely that the age as an indicator of experiences is a sufficient condition and knowledge on SSNPs is a necessary condition.

Table 6. Result of correlation analysis between selected socio-economic characteristics of field level workers and their job performance (n=70).

Socio-economic characteristics	Coefficient
Age	0.612**
Level of education	0.737**
Household size	-0.117
Annual family income	0.006
Organizational participation	0.157
Social mobility	0.173
Communication media contact	0.691**
Time allocation	0.313*
Relationship with senior officers	0.225
SSNPs training exposure in the past 5 years	0.658**
Knowledge on SSNPs	0.731**
Awareness of SSNPs	0.772**

** : at 1% level of probability; * : at 5% level of probability. Source: Authors' Field Survey (2013).

Table 7. Multicollinearity analysis among socio-economic characteristics of field level workers (n=70).

Variable	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂
X ₁	1	.435**	-.140	-.72	.46	-.007	.558**	.085	.100	.437**	.465**	.557**
X ₂		1	-.079	.149	.159	.241*	.647**	.328**	.109	.551**	.587**	.659**
X ₃			1	.022	-.095	-.055	-.058	-.088	.024	-.117	-.080	-.065
X ₄				1	.161	.002	.075	-.010	-.066	-.004	.021	-.102
X ₅					1	.037	.166	.028	.188	.111	.075	.097
X ₆						1	.074	-.176	-.085	.111	.241**	.243*
X ₇							1	.179	.080	.507**	.593**	.589**
X ₈								1	.037	.313**	.184	.195
X ₉									1	.195	.065	.080
X ₁₀										1	.527**	.596**
X ₁₁											1	.736**
X ₁₂												1

Source: Authors' Field Survey (2013).

Table 8. Result of logistic regression analysis on job performance (n=70).

Variable	Coeff.	S.E. (B)	Wald (Z-Test)	p-value	Odd ratio (B)	95% C.I.	
						Lower	Upper
Constant	-26.778	8.08	10.10	0.001	0.00		
Age	0.109	0.060	3.32	0.07	1.12	0.99	1.25
Level of education	0.372	0.287	1.68	0.19	1.45	0.83	2.55
Communication media contact	-0.024	0.213	0.01	0.91	0.98	0.64	1.48
Time allocation	0.001	0.072	0.00	0.99	1.00	0.87	1.15
SSNPs training exposure in the past 5 years	0.218	0.187	1.36	0.24	1.25	0.86	1.80
Knowledge on SSNPs	0.605	0.293	4.27	0.03	1.83	1.03	3.25
Awareness of SSNPs	0.500	0.485	1.07	0.30	1.65	0.64	4.26
Log-Likelihood = 35.349		G = 61.177	df = 7	p-value < 0.000			

Source: Authors' Field Survey, 2013.

Table 9. Result of logistic regression analysis on job activities (n=70).

Activities/Characteristics	Collection of information				Working with groups						Providing training		Preparing report		Motivating farmers					
	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₁	A ₁₂	A ₁₃	A ₁₄	A ₁₅	A ₁₆	A ₁₇	A ₁₈	A ₁₉	A ₂₀
Age				√	√				√	√	√	√					√		√	
Level of education		√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√
Communication media contact		√			√	√	√	√	√	√	√	√	√		√		√		√	
Time allocation	√																			
SSNPs training exposure														√		√				
Knowledge on SSNPs			√	√	√	√	√	√					√				√			

Source: Authors' Field Survey, 2013.

Comparing to the high and significant correlation to the job performance, the socio-economic characteristics such as level of education, communication media contact, SSNPs training exposure, and awareness of SSNPs turned to be not significant to the job performance.

Moreover, Table 8 shows the determinants to only average job performance of field level workers on all 20 activities. However, these activities are different in nature from each other. Thus, identifying activity-wise determinants will certainly help field level workers to improve their performance on their specific activities.

Table 9 shows the results of logistic regression analysis on 20 activities. This study categorized the activities into five aspects (collection of information, working with group, providing training, preparing report, and motivating farmers).

Activities in SSNPs and their relevant determinants

Collection of information: Table 9 shows that time allocation is the most contributing characteristic to maintaining a daily diary (A₁). The main reason is likely that spending more time is a necessary condition in maintaining daily diary.

Level of education is the statistical significant determinants to the second (A₂) and third (A₃) activities as both of the activities were on collection of information. Proper knowledge is the prerequisite condition to collect information efficiently. Socio-economic characteristics such as age and knowledge are the most contributing determinants to the fourth activity (A₄) as it was characterized by conducting special survey. The reason is like that as age as an indicator of experience and knowledge as a prerequisite condition for conducting special survey.

Working with groups: Socio-economic characteristics such as level of education and communication media contact are the common statistically significant determinants to the both activities under this aspect. This is because all of the activities under this aspect were characterized by mainly group works which could be enhanced by acquiring knowledge and skills through formal education as well as non-formal education such as maintaining communication media contact.

Providing training: Level of education, communication media contact, and knowledge on SSNPs are the most contributing determinants to the activity like to train the beneficiaries at the field

as well as the Upazila Office (A₁₃). On the other hand, SSNPs training exposure is the only crucial factor to the activity like regular observation of SSNP training activities by the trained leader at their field level (A₁₄). The reason is like that knowledge and skills are the necessary condition for providing training those can be gathered by acquiring education and communicating with the mass media. However, efficient observation of training needs practical knowledge which could only be gathered by attending training.

Preparing report: Socio-economic characteristics such as level of education and communication media contact are statistically significant determinants to the activity like consultation with experts of SSNPs. This is because this activity is characterized by mainly theoretical knowledge of field level workers which could be enhanced by acquiring knowledge and skills through education and non-formal education such as maintaining communication media contact. Level of education and SSNPs training exposure of the field level workers are contributing determinants to the activity like helps in preparing annual report. This is because report writing is a practical oriented works which needs proper knowledge and skills gained by acquiring education and participating

training programmes.

Motivating farmers: Socio-economic characteristics like age, level of education, communication media contact, and knowledge on SSNPs of field level workers are the common contributing determinants to this aspect. The reason is like that age as an indicator of experience is sufficient condition for motivating farmers and knowledge as well as skills gained from the education and communication media contact as an indicator of required condition.

CONCLUSION AND RECOMMENDATIONS

The study reveals that, field level workers whose level of job performance is poor, are least where the majority of field level workers have attained the fair level of job performance, though the good performance amount to be 46%. Knowledge of SSNPs and age were found statistically significant determinants to the average job performance of field level workers on all 20 activities. The main reason is likely that the age as an indicator of experiences is a sufficient condition and knowledge on SSNPs is a necessary condition for field level workers to increase their performance on SSNPs. On the other hand, in the case of performance by individual activity, socio-economic characteristics of field level workers such as age, level of education, communication media contact, and knowledge on SSNPs were the common statistically significant determinants. The reason is that all of the activities are different from each other. Based on the findings from this study, the following recommendations were made:

1. Those organizations that are responsible to provide SSNPs, should make need-based planning to increase the field level workers' performance giving appropriate weight on the experienced workers as a sufficient condition and resource persons,
2. Relevant agencies should provide adequate and standard inputs to the non-formal educational activities like communication media contact, outreach education, training etc. and make these inputs available to the proper authority,
3. The organizations should motivate field level workers to acquire updated knowledge, and skills on SSNPs through arranging regular discussion.

Notes:

1. Poverty line less than US\$ 2/day,
2. Department of Women Affairs, Department of Social Service, Ministry of Social Welfare, Directorate of Relief and Rehabilitation, Department of Food, Local Government Engineering Department, City Corporation, Department of Primary Education, Department of Agricultural Extension,

Directorate General of Health Services, Department of Livestock Services, Department of Fisheries, Department of Youth Development, Bangladesh Small and Cottage Industries Corporation, and Bangladesh Rural Development Board,

3. County,

4. The name of five Upazila are Itna, Mithaiman, Karimgonj, Tarail and Nikli.

Conflict of Interest

The author(s) have no conflict of interest.

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