Agricultural mechanizasion as a solution to food insecurity in africa

Sociology, Poverty

AGRICULTURAL MECHANIZATION AS A SOLUTION TO FOOD INSECURITY IN AFRICA Abstract : Achieving food security in its totality continues to be a challenge for ever increasing population of Africa. A approaches are employed in developing countries but with less success due to a number of factors . this paper examines the causes of food insecurity in African. Scanning through researchers works , it was noted that over seventy percent of the food insecure population in africa live in the rural areas. The paper therefore recommends that, if the ever increasing population of the african countries is to be fed, then mechanization of all agricultural operations should be embrace. In conclusion, efforts to words the development of the rural communities in Africa should be increased. Key words: agriculture, mechanization, food security, Africa, rural development. Introduction : Agriculture is the practices of cultivating the soil and raising livestock to produce plant and animals useful to humans and sometimes animals {S. N, Asogwu and O. A Asogwu, 2007}, Agriculture is an important occupation in Nigeria with over 7o% of her population depending on it directly for livelihood. It provides the bulk of employment, income and food for the rapidly growing population as well as supplying raw materials for agro-based industries. World current agricultural production as an average growth rate of 1. 8% as compared to the 3% in the 1960s and therefore at a lesser pace than the demographic growth. The world bank has shown that in sub-saharan Africa (to which Nigeria belongs)the annual food increase needs to reach 4%, i. e. more than double the current figure in order to achieve food security (IBRD, 19890. She suggested that this can be reached through a significant progress in plant and animal breeding that plays a key role in the

development of the agricultural sector as well as a significant impact using appropriate farm mechanization {Pawlat et al , 2002}. Due to number of factors, which include rising population, increasing pressure on land resources, natural and man-made disasters such as drought, desertification, soil erosion and degradation (Raoult-Wack and Bricas, 2001), the problem of sustainable agricultural production in Nigeria has assumed greater importance than ever before. Agricultural development involves three approaches namely bio-chemical, socio-economic, and engineering known as the trio of technologies (Mrema and Odigboh, 1993). The bio-chemical approach includes the development of improved animal and plant species, animal and plant nutrients (fertilizer and feed) and plant and animal protection (veterinary drugs, pesticides and herbicides). The socio-economic approach includes financial packages and management programmes (economic, business management, accounting, sociology, extension services, agricultural machines and equipment (be they human, animal or mechanically powered) for production and post harvest systems handling and storage systems and farm structures, erosion control measures, water resources development as well as irrigation and drainage structures, meteorological systems, and the technologies for optimally utilizing the above and their proper and economic use and management. (Ani and Onwuala, 2002; Ampratwum et al, 2004; Onwuala and Pawa, 2004). Agricultural mechanization implies the use of various power sources and improved farm tools and equipment, with a view to reduce drudgery of the human beings and draught animals, enhance the cropping intensity, precision and timeliness of efficiency of utilization of various crop inputs and

reduce the losses at different stages of crop production. The end objective of farm mechanization is to enhance the overall productivity and production with the lowest cost of production. The contribution of agricultural mechanization has been well recognized in enhancing the production together with irrigation, biological and chemical inputs of high yielding seed varieties, fertilizers, pesticides and mechanical energy. Different researchers have concluded that farm mechanization enhances the production and productivity of different crops due to timeliness of operation, better quality of operations and precision in the application of the inputs. According to NCAER (1980) survey covering 815 farming households in 85 villages, the increase was 72 percent in the case of sorghum, and 7 percent in the case of cotton as compared to traditional bullock farms. ITES, Madras (1975) found that the productivity increase on tractor owning and hiring farm ranged between 4. 1 and 54. 8 percent. The percent increase was comparatively low on custom hiring farms as compared to tractor-owning farms due to higher level of inputs and better control on timeliness of operations. These productivity increases, thus, were attributed to higher doses of fertilizer, irrigation and mechanization. Degree of mechanization is the ration of machine or technological work input to total work input (machine plus manual) into agricultural production. The importance of food security to any nation cannot be over emphasized. The issue of food security became prominent in the 1970s and had been given considerable attention since then. The World Food Programme Report in 1979 conceptualized food security, equating it with an “ assurance of supplies and a balanced supply-demand situation of staple foods in the international market". The report also

emphasized that increasing food production in the developing countries is a panacea to food security. The concept of food security proposes that food is available, accessible and affordable, when and where needed in sufficient quantity and that this state of affair will continue and be sustained (Agboola, P. O., 2002). It is a situation in which sufficient food us available at all times in the right quantity and quality, at affordable process. To accomplish this, we must have a production system that produces enough food in the short run, sustainable in the long run and does not place undue risks on agricultural producers and must respond rapidly to disruptions in the food supply due to disease epidemics, natural disasters, civil disturbances, environmental imbalances and other cause (Agboola P. O. 2002). With these objectives in mind, various efforts at the international, national and local levels had been put in place at one point in time or another to boost agricultural production to make food available to the teaming population and the ever-increasing world population. The world population. The world population explosion witnessed as at the end of 1999, further increased the fear of those concerned about world food security. During this period, the global population exceeded 6 billion. Leisinger, (2002), stated that never before in human history had the population of the earth been as great as it is today, and never before had it grown so rapidly within one century. He stated further that the doubling of world population over the past 40years had put enormous pressure on the natural systems that support all life on Earth. This pressure on natural resources also increased the burden of assuring food security for the entire world’s people international Food Policy Research Institute (IFPRI, 2001) stated in one of her reports, that about 73

millions people would be added to world’s population every year between 1995 and 2010 increasing it by 32 percent to reach 7. 5 billion. However, much of this population growth is expected to occur in the developing world. If this prediction is to go by, then the food security situation of the developing world needs constant assessment via empirical research. Joachim et depal (2004), wrote that these was a strong direct relationship between agricultural productivity, hunger and poverty. He stated further that three quarter of the world’s poor people lived in rural areas and made their living from agriculture. He therefore, concluded that the higher the proportion of the rural population that obtained its benefits from subsistence farming (without the benefit of pro poor technologies and access to markets) the higher the incidence of food insecurity. Challenges to Food Security in Africa The root cause of food insecurity in developing countries is the inability of people to gain access to food due to poverty. While the rest of the world has made significant progress towards poverty alleviation, Africa, in particular Sub-Saharan Africa, continues to lag behind. Projections show that there will be an increase in this tendency unless preventive measures are taken. Many factors have contributed to this tendency including the high prevalence of HIV/AID; civil war, strive and poor governance; frequent drought and famine; and agricultural dependency on the climate and environment. Food security on the continent has worsened since 1970 and the proportion of the malnourished population has remained within the 33 and 35 percent range in Sub-Saharan Africa. The prevalence of malnutrition within the continent varies by region. It is lowest in Northern Africa (4 percent) and highest in Central Africa (40 percent) Over seventy percent of the food insecure

population in Africa lives in the rural areas. Figure 1 shows the distribution of food insecurity in Africa. Ironically, smallholder farmers, the producers of over 90 percent of the continent’s food supply, make up the majority (50 percent) of this population. The rest of the food insecure population consists of the landless poor in rural areas (30 percent) and the urban poor. Throughout the developing world, agriculture accounts for around 9 percent of the GDP and more than half of total employment. In countries where more than 34 percent of the population is undernourished, agriculture represents 30 percent of GDP and nearly 70 percent of population relies on agriculture for their livelihood. This fact has in the past been used in support of the argument as to why developing countries should move away from agriculture and invest in technology. Because over 70 percent of the poor live in rural areas, where also the largest proportion of the food insecure live, it is evident that ; we cannot significantly and sustainably reduce food insecurity without transforming the living conditions in these areas. The key lies in increasing the agricultural profitability of smallholder farmers and creating rural off-farm employment opportunities. The objective of this paper is to h8ighlight the challenges to food security in Africa while providing alternative solutions to the problem that would not only allow for poverty alleviation but also wealth creation. While the focus of this paper is in alleviating food insecurity in the rural areas, effort has been made to address the plight of the urban poor. Farming Households | 50% | Rural Landless Poor | 30% | Urban Poor | 20% | Data from Heidhues et al., 2004 Table 1: Proportion of the Food Insecure in Africa. Wangela Mwariki (2005) listed challenges to food security in Africa as: An underdeveloped Agricultural

sector, Barriers to Market Access, Effects of Globalization, Disease and Infection and Handicapping policies. Other causes of food insecurity in Africa include but not limited to: Rural-Urban Migrations: young men and women who are supposed to be involved in Agriculture, migrates from rural areas where Agriculture is practiced to the cities. With the migration of young ones, old people are left in the farm thereby reducing the output from the farm. Lack of Social amenities in the farming communities: Social amenities such as electricity; pipe borne water, road network etc are still lacking in the farming communities in Africa particularly Nigeria. All programmes aimed at improving aimed at improving the situations in the rural communities are hijacked by the big men in the cities. This makes it difficult for farm workers to enjoy the amenities others are enjoying in the urban areas. It also prevents them from taking their produce to the market because of lack of or bad access roads into the farm. Inadequate communication: Lack of proper channels to communicate new innovations to the farmers by the research institute is another cause of food insecurity in Africa. Innovation that iequis aired on the Television, Radio and News papers do not reach the farmers because they cannot access them. Conservativeness of Rural Farmers: Farmers in the rural areas are always conservatives. They will always want to do thing in the old order. This make it difficult for them to adopt new innovations from research institutes even when they are aware of such innovations. Lack of Funds: The rural people that are involved in farming lack the fund to practice large scale farming required of food security in Africa. Through various Governments make available funds in their annual budget for Agricultural inputs and loans to farmers. This funds always go to wrong

hands, or even when get to the farmers they are always late. Since Agricultural operations are timed, the money is used for different purposes instead of addressing the food security issues they are meant for. These and other factors are limiting the quantities and qualities of Agricultural products produced annually by African farmers. Farm Power: consisting of manual labor, agricultural tools, draught animals, tractors, implements, equipment, and machinery — is an essential farm input. In almost any agricultural production system the annual expenditure on farm power, whether on labor, draft animals, or fuel and depreciation of machines, largely exceeds the costs of other inputs such as agro-chemicals and seeds. In many developing countries, agricultural production and food security are adversely affected because of insufficient us of farm power, low labor productivity and/or labor scarcity. The need to improve agricultural labor productivity is increasingly recognized. In the case such as pump sets for irrigation, the need for machinery is undisputed. Rather than agricultural mechanization, it would be preferable to use the term Farm Power or Labor and handtools, draft animals. And mechanical power, but also other issues related to labor scarcity, such as cropping and farming systems. Finding solutions to environmental problems in agriculture requires (improved) agricultural tools and machinery, for example for soil tillage and pesticide application, post-harvest loss reduction and on-farm processing. Thus it is now (again) recognized that agricultural mechanization is crucial in the fight against hunger and poverty, and at the same time to time to address environmental and health concerns. In order to avoid recurrence of the past mistakes such as described in the introduction, formulation of efficient mechanization

strategies are required. The term mechanization is unfortunately often very narrowly perceived while its real purpose, namely, enhancing productivity of land and labor is often not well understood. In fact an agricultural mechanization strategy ought to be part of an agricultural technology strategy, which is to be part of overall agricultural development strategy. In this context, three principal purposes of mechanization may be summarized as follows: * Increasing in labor productivity. They introduction of machinery to substitute for labor (“ labor-saving") is a common phenomenon associated with the release of labor for employment in other sectors of the economy or to facilitate cultivation of a larger area with the same labor force. * Increase in land productivity. The purpose of mechanization is here to produce more from the existing land. Machinery is a complementary input, required to achieve higher land productivity, for example, through the introduction of pump sets, or faster turn-around-times to achieve higher cropping intensity. In labor surplus economies, net labor displacement or replacement should be avoided. * Decrease in cost of production. Introduction of a machine may lower production costs or offset increased costs of draft animals or labor. Usually, in various degrees, a combination of the three objectives will be achieved. Additional benefits to the user may be associated wit a reduction in the drudgery of farm work, greater leisure, or reduction of risk. These are subjective benefits and difficult to translate into cash. Frequently mechanization increases an individual’s workload, can be hazardous to health and may reduce the social interactions associated with farm work. The adoption Process for Mechanization When reviewing the process of applying labor-saving (or labor productivity enhancing innovations in

agriculture, it is a serious but frequently made mistake to assume that this can be achieved only through applying mechanical engineering technology. In this context, nine different stages in the process of enhancing labor productivity may be distinguished (Rijk 1989): Stage I: Application of improved Hand tool Technology. This process started in prehistoric times when early civilizations developed stick and stone tools which were the only means to enhance labor productivity. In many parts of the world, handtools are the only technology used in agriculture, and even in highly mechanized agricultural systems, improved handtools are still important. Stage II: Draft animal power application. At this stage animal muscle power is substituted for human power, a process which already started in ancient civilizations. A large variety of implements and machines have been developed which use animals as the principle power source. Stage III: Stationary Power Substitution. Mechanical power is substituted for human and animal power, use in stationary operations. Stationary operations are mechanized first because motive power sources required to move across the field are technically more complex and therefore require higher investment. Typically, operations mechanized at this state are paddy dehusking, grain milling, pumping water, and threshing. Stage IV: Motive Power Substitution. At this stage, substitution of mechanical power for muscle power takes place for field operations. If focuses on power-intensive field operations (for example, plowing), and machinery is of relatively simple design, and easy to operate. Mechanization is still straightforward, and crop production practices are usually unchanged. At stage III and IV, mechanization takes advantage of lower costs of new power sources as compared with traditional ones. Stage

V: Human Control Substitution. At this stage the emphasis is on substitution of the human control functions. Depending on the complexity of the control function and the degree of its mechanization, machinery becomes increasingly complicated and costly. A potato lifter is simple in design but fruit and cotton harvesting machinery are complex and expensive. Stage VI: Adaptation of Cropping Practices. This stage features the adaptation of the cropping system to the machine. For example, removing weeds in broadcast crops cannot be done with machines but row seeding and seed drills may be introduced to facilitate mechanization of weeding. Other examples include the increase in row distance to accommodate heavier and larger machinery to speed up field operations. Stage VII: Farming System Adaptation. The farming system and production environment is changed to facilitate further increase in labor productivity and to benefit from economies of scale, necessary to make the investment in expensive machinery financially feasible. An example of this is the rapid decline of mixed farming systems in Europe since the late 1960s when farmers specialized in either dairy, poultry, hog, or crop production. Some crops which are difficult to mechanized may disappear if acceptable substitutes become available, or if these can be produced in countries with low labor costs. At this stage, investments in land development, land consolidation, and rural infrastructure are often needed to facilitate advanced degrees of mechanization. Stage VIII: Plant Adaptation. This stage features the adaptation of the plant and animal to the mechanization system. Mechanization has advanced to a stage were engineering alone can no longer provide further gains in labor productivity. Breeders increasingly take into account the suitability of new varieties for

mechanized production. Stage IX: Automation of agricultural Production. This stage is progressing in countries with high labor costs and sophisticated demands on production and quality. Examples are automated rationing of concentrate feeding for individual dairy cows based on their milk production, and sprinkler irrigation systems activated by soil moisture. The above sequence of mechanization is generally identifiable at an individual farm, although when considering the agriculture sector as a whole in a particular country, the stages are usually less pronounced because of the diversity of an agriculture sector, and several stages may occur simultaneously. However, when formulating an agricultural mechanization strategy, the different options for enhancing land and labor productivity, as well as their economic and financial implication must be well understood. Sometimes, rather than advocating mechanization of certain operations, alternative options may be more attractive. For example, a frequently made mistake is to propose the introduction of mechanical rice transplanters to offset labor cost increase, while changing to broadcast rice is in most cases technically and financially a better solution. Rural development programs must take into account (the future) needs of agricultural mechanization. Thus, the design of irrigation and drainage systems and the field sized and layout must take into account the access of machines to field, the width and strength of bridges. Commercial tree crop plantations must take into account the possibility of future labor scarcity, and thus the tree variety and planting pattern be able to accommodate future mechanized operations. These examples explain why a holistic approach and a multidisciplinary input in strategy formulation are very important.