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SOCIO-ECONOMIC POTENTIAL OF TAUNGYA FARMING SYSTEM FOR SUSTAINABLE FOOD PRODUCTION IN NIGERIA

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Abstract: **The taungya system is an agroforestry management system in which tree crop species are introduced into fields where arable crops have been initially cultivated. Desirable tree species are planted after two to three years of crops cultivation on the same parcel of land giving the opportunity for harvestable tree crops. Taungya system embraces multiple land use practices involving production of trees and agricultural crops due to its simplicity to operate especially as it required no high level of education or skill to be implemented. In the tropics where land is a major factor of production and great pressure and dependence of the inhabitants on land for their sustenance, the introduction and practice of taungya will not only improve food production, it will alleviate the wasteful land use under the traditional agricultural production systems, purification of the environment and immensely contributed to the socio-economic well-being of the rural inhabitants. The overall objective of this article was to show the potential of taungya system for sustainable crop production. The article meticulously highlighted the historical development of the system, the various problems militating against its operations, its benefits and even the environmental implications, with a view to positively repositioning the system for greater sustainability. Finally, the discourse revealed that taungya system has the potentials for sustainable crop production.**

Keywords: **Taungya system, land use, rural inhabitants, socio-economic, potential, sustainability, crop production.**

I. INTRODUCTION

Taungya farming system involves multiple land use practices embracing both production of forestry and agricultural crops. Land is considered the most vital factor of production in the tropics and there is great dependence of population on land for livelihood. The practice of Taungya farming system has helped to solve the problems associated with the wasteful utilization of land under the traditional agricultural production system, increased food supplies and greatly contributed to the socio-economic well-being of the rural population (Ruthenberg, 2000). The continued development of Taungya farming system in the tropics is favoured by socio-economic factors especially if the limitations of labour and capital can be eliminated through adequate government support of the programmes (Mergen, 2008).

In the tropics land is considered the fundamental factor of production where the primary occupation of the people is agriculture, which provides employment for about 70% of the viable labour force (Watson, 2003). Agriculture forms the dominant sector of tropical economics, not only as the principal source of food production for the majority of the population but also in the area of the sector's share of total quantity or amount of National production that usually goes beyond 60 per cent in most tropical Countries (Olawoye, 2005). The level of development is directly proportional to the prices of agricultural and forestry products in International markets (Olawoye, 2005). Tropical agriculture is indeed very labourous particularly in extensive, farming which relies on the system of shifting cultivation which could also be

regarded as rotational farming where by the farmer cultivates parcel of land for a few years, abandon it to fallow to regain fertility and move on to cultivate another parcel of land. The framers may cultivate many pieces of land successively before returning to re-cultivate the initial piece of land where he started in the cultivation cycle.

To ensure a more proper utilization of land due to increasing population and reduction in the available land due to the takeover of land for various economic development, such as roads and bridges constructions, construction of schools, markets, hospitals, recreational centres, etc. The practice or introduction of taungya farming system becomes imperative.

A. Farming systems

Farming system is a source of management strategy to derive economic, social and sustained agricultural production to satisfy different requirements of farm livelihood while at the same time preserving resources and maintaining a great standard of the environment (Lal and Miller, 1990). Farming system is a policy deciding unit that includes the farm household, cropping of various crops as well as the domestication of animals that change and improve the principal factors of production such as labour, land and capital into viable commodities which can be eaten or sold for the purpose of income generation (Fresco and Westphal, 1988).

B. Types of farming systems

There are many types of farming systems adopted to produce crops and livestock. These include the following;

1. Integrated Farming System
2. Subsistence Farming System
3. Conventional Farming System
4. Commercial Farming System
5. Alternative Farming System
6. Organic Farming System
7. Agro-ecological Farming System
8. Taungya Farming System
9. Bio-intensive Farming System
10. Bio-dynamic Agriculture
11. Specialized Farming System

C. Meaning and Historical Development of Taungya Farming System

Kio (1992) said that Taungya Farming System is a system of plantation establishment whereby willing shifting cultivators are engaged to establish and care for tree crops together. Shifting cultivation and taungya farming system are sometimes described as being the same but they are different because shifting cultivation is a sequential system of growing woody species of agricultural crops, while the taungya farming system is a simultaneous combination of the two plants at the early stages of forest plantation establishment.

Taungya farming system was viewed as a low-cost mechanism adopted by governments for forest plantations development that occupy farmers who are interested to plant and carter for forest crops and at the same time allowed to grow food crops in between the young tree crops for three to four years (Watson, 2003). It is indeed a land use farming system whereby poor farmers are given the opportunity to cultivate crops in the first year between the planted tree seedlings of forest plantations.

The practice consists of land preparation, tree planting, growing agricultural crops for between two or four years until shade from the trees become dense and they move on to repeat the cycle in a different area.

It is a form of agro-forestry system in which short term corps are grown in the early years of the plantation of a woody perennials species of trees in order to properly utilize the land, control weeds, reduce establishment costs, generate early income for the farmers and ginger the development of the woody perennials species of trees.

Departmental taungya farming system was introduced in Cross River State of Nigeria in 1971. The scheme was operated by forest labourers who had no previous experience in farming. It has the under listed features:

1. The farmers were paid wages and do not own the farm crops harvested;
2. There was no allocation of fixed plots to individual farmers. Instead, the farmers were allocated to different phases of the programme such as nurseries, site preparation, planting, harvesting, processing, and sale of crops; and
3. Employment of farmers was not based on family units but on individuals. Thus, it was possible for each member of a household to work as a paid employee in the same taungya establishment.

D. The state of taungya farming in Nigeria

The total area of traditional taungya farms in Nigeria in 1979 was 9,226 ha. This is a decrease of about 3.6 per cent since 1975. Only two states, Oyo and Ondo, increased their area, whereas taungya farms in Cross River, Imo, Kwara, and Ogun states declined (Oke, 2002). Most states could not increase their acreage because of lack of funds and a reduced number of farmers participating in the practice. Anambra State does not practice taungya farming officially, but forest workers still intercrop food crops with trees. There are no data from Anambra state on this. Only Cross River and Ogun States still carry on departmental taungya farming, and there was a sharp decline in the area cultivated in 1979 compared to 1975 (Oke, 2002). Ondo State stopped the practice because income gotten on food crops usually went to the agricultural division of the ministry. The state's Pulpwood Afforestation Project has reactivated the practice and about 270 ha of early maize, cowpeas, and late maize were planted in 1981.

In 1975, more than 70 per cent of the plantations in the moist lowland forest zone were established fewer than one of the taungya systems. No reliable data are available for 1979, but the proportion is believed to be approximately the same. Some states have been allowing farmers to cultivate their taungya farms but have not been able to plant the trees because of lack of funds. This development can lead to over recording of the plantation area, and it could result in the forest authority's losing control of all or part of the forest reserves.

In 1979, however, the number of taungya farmers had fallen to 17,744, despite the facts that the area of traditional taungya which is also referred to as village taungya system remained nearly the same and that in some states taungya farms were not planted with trees. This decline may reflect the continuing lack of recruits to traditional taungya farming (Olawoye, 2005; Ball 1997).

In Nigeria the agricultural crops cultivated in traditional taungya farms are many and varied. They are chosen because of the dietary habits of the farmers' families or the available markets rather than because of their interaction with the tree crop (Oke, 2002). Yams, maize, and vegetables, which make the greatest demands on soil fertility, are grown first, followed by cassava. A second crop of maize may be grown, but it is low-yielding and is generally used for seed the following year. In departmental taungya the only two crops grown are maize and cassava. In Cross River State, in rare cases, two crops of maize are grown, the second being for seed (Oke, 2002)

In the past, it was forbidden to grow certain crops, such as cocoa, rubber, plantains, etc., because they were permanent or semi-permanent crops that competed with the forest crop and could lead to alienation of the forest reserve if they grew long enough. Crops such as rice or guinea corn were banned because they are aggressive root competitors, and tobacco was banned probably because of root eel worm. Spreading cassava was also banned, and in Delta State, where taungya started some 40 years ago, all cassava was forbidden. These rules have now been considerably relaxed. Plantains may be grown in Ogun, Ondo, and Oyo states as boundary markers and in Edo and Delta States throughout the plot. Rice and guinea corn are raised in Delta, Kwara, and eastern states. The tree crops planted in Nigeria are Gmelina arborea, teak (Tectona grandis), opepe (Nauclea diderrichii), and white afara (Terminalia ivorensis).

The number of traditional taungya farmers has fallen, whereas the average area they cultivate has increased (Olawoye, 2005). The reasons for this change are not clear. It might be expected that traditional taungya farmers cannot farm a larger area because they are predominantly older than 45 years (Olawoye 2005), and they may not be able to draw on many family members because of the spread of full-time education. They may, however, be employing more casual labour, or the standards of maintenance may have fallen. Problems with transport from villages to farm areas continue and may increase since the sites for new plantations are becoming further away due to the fact that some land previously occupied by forest have been taken over for development (Olawoye, 2005).

II. TAUNGYA SYSTEMS FROM BIOLOGICAL AND PRODUCTION VIEWPOINTS

The past concentration on and bias towards, export 'cash' crop production in the tropics was a major factor in the incidence of food shortages and malnutrition, the true dimensions of which are only now being appreciated (Okurume 1990). Data available from FAO (1996) indicate that the annual growth rate of food production per person in developing countries fell from 0.6 per cent in 1961-1970 to 0.2 per cent in 1971-1975. In Africa, the annual growth rate in 1971-1975 was 2.1 per cent compared with 0.4 per cent in 1961-1970 (Enabor, 2009).

The population of the tropics has grown very rapidly in the last two decades, averaging 2.5 per cent a year compared with 1 per cent in the developed countries of the temperate region (UN, 2009). Given their small industrial sectors and their limited capacity to absorb excess labour in agriculture, developing countries have faced continuing fragmentation of farm units to accommodate requirements of new families. The institutional framework of land use in most tropical countries directly encourages such fragmentation of holdings.

The fragmentation of holdings and the prevailing institutional framework that does not fully view land as a factor of production have contributed to declining agricultural productivity and food shortages in the tropics. Equally important are the failure to introduce appropriate technologies (superior farming implements, seed varieties, and production techniques) and the inefficient organization of agricultural production. The causes of declining agricultural productivity with particular reference to Nigeria have been well documented by Olayide (1993). To overcome the constraints would require a revolution in agricultural production in the tropics, an event likely to occur only in the distant future.

Solutions to the defects of shifting cultivation as a form of extensive agriculture have been provided by the system known as taungya-combined production of forestry and agricultural crops on forest lands. King (1998) found that the system has been practiced for a long time and existed at some time in all the five continents. He also indicated that, despite the differences in terms or labels used, the taungya system always exhibited certain basic attributes and required some preconditions for its adoption. The preconditions, such as land hunger and low standard of living of the population, are clearly socio-economic in nature. The fact that the system is virtually extinct in the economically advanced countries supports this assertion.

The socio-economic environment is central to the prospects and limitations of taungya systems. Indeed, King (1998) concluded that the system was self-terminating once a country achieved a certain level of economic development.

III. SOCIOECONOMICS IN THE DEVELOPMENT OF TAUNGYA SYSTEMS

The introduction of the taungya system into the humid tropics was a response to various socio-economic factors. For example, in Nigeria a major objective was to solve the problem of high cost of forest regeneration (Enabor 2009). In Ghana, the objective was to solve the existing land hunger problem in the rural areas (Brookman-Amissah, 2008). Whatever the reasons for introducing taungya, King (1998) insisted that the successful establishment and development of taungya is depended on the pre-existence of land hunger, underemployment, and low standards of living among the rural farmers. Apart from these three prerequisites, other socio-economic factors contributing to the development of taungya include population growth, land availability, farm labour supply, food supply, income-generating potential, availability of infrastructural facilities and organizational institutions.

In Burma, where taungya originated, it was used mainly as a means of regenerating both the soil and the forest by employing and improving upon shifting cultivation. It was essentially a method of shifting cultivation because forest land was cleared, farmed for a few years, and allowed to revert to forest so that fertility was restored naturally. It was an improved system because selected tree species such as Casuarina equisetifolia and Leucaena glauca were sometimes planted to assist in re-establishing the forest fallow (Nao, 2008). The indication is that a low population density and a long fallow period were required for the system to be successfully practiced. Under the present high population densities, it is doubtful that the system in its original form would succeed in many tropical countries especially when the government policies supported its development (Nao, 2008).

The modern taungya system seems to differ significantly from the original concept. The practice has been reserved to forest estates, and rapidly growing rural populations have often put pressure on foresters and forced them to adopt taungya within the estates. Kio (1992) concluded that until the industrialization of tropical countries becomes large enough to absorb the increasing rural population, pressure on forest estates by farmers would continue. The greater the pressure on forest lands, the more taungya would be sustained.

With population growth, an increasing number of farmers have found it difficult to acquire more land for farming. Immigrant labour required for the various forest operations or activities may not get land outside the reserve to grow food to meet their own consumption requirements and that of their families. The introduction of taungya would be a big relief to such farmers in the communities. So, in some parts of south-west Nigeria, Ijalana (2009) found immigrant fishermen (llajes) constituting about 90 per cent of taungya farmers because they could not get land outside the reserves. Nigerians working their way to or from Mecca have similarly been mentioned by King (1998). In general, where arable land is too scarce to permit agriculture or forestry as single land uses, taungya will develop. Over the past fifty (50) years in Nigeria, the adoption of taungya has constituted an effective means of providing more farmland to the farmer and, at the same time, transforming the natural forest into more productive forest plantations at relatively low direct cost to government

A. Food supply and income generation

Nao (2008) estimated that taungya systems in Nigeria have directly provided enough food for about 900,000 people, constituting about 1 per cent of the country's food needs. In Thailand the indication is that taungya farmers produce enough food to feed themselves and sell the surplus to the market to generate income, and in China, taungya farmers contribute about 60 per cent of the country's food requirements

Under the traditional (village) taungya system, income generation is left entirely in the hands of the farmer, who may find it difficult to get a ready market for the produce. However, Kio and Bada (2001) found that although most of the taungya farmers sold less than half of the total crop volume harvested, they obtained between N15, 000 and N23, 000 per year. Also, Lowe (1994) maintained that most of the food produced by taungya farmers is consumed locally, yet farmers may earn between N18, 000 and N32, 000 a year if they concentrate on yam production. If maize 3and cassava are produced, the estimated income would be N20, 000 – N25, 000.

Despite such improved income estimates for the taungya farmer, Olawoye (2005) contended that the living conditions of the traditional taungya farmers have not improved as compared with those of other rural villagers. In contrast, the departmental taungya farmer has enjoyed substantial benefits in terms of provision of infrastructure and other amenities. The indication is that, although a low standard of living is required as a condition for the introduction of taungya, its continued successful development depends on the extent to which it improves the standard of living of the farmers. As long as improvement does not occur, the capable farmer will look to the urban centres in search of a better living standard, the practice of taungya being left to less efficient hands.

B. Infrastructural facilities and social amenities

Some of the major infrastructural facilities that may affect the development of taungya systems include transport, marketing, and storage facilities. To the farmers who do not have means of transportation and have to walk to the farm, the distance from home to the farm is a major determinant of their level of participation in taungya farming. In well-organized taungya systems accommodation at very convenient places may be provided for the farmers to reduce the distances they cover to the plantation.

Where transport facilities are readily available or where land shortage is acute, farm distance is less vital in determining the farmer's participation. For example, King (1998) showed that farmers in Trinidad travelled up to 16 km to participate in taungya because transportation was relatively cheap and easy. In Kerala (India), there was no distance limit because of the acute land shortage problem and low standard of living of the farmers. In Nigeria, Ijalana (2009) found that taungya farmers travelled between 3 and 6 km by motor vehicle or bicycle to the farms. Distance may not constitute a limitation to participation but it surely has an effect on the level of productivity. Farmers who travel long distances may reach the farm already tired and weak. They may arrive late and have little time to participate before closing time. Thus Mergen (2008) estimated that 3-5 km should be the maximum walking distance for the farmers.

The improved crop yield obtained from taungya farms is not meaningful if there is no means of storing the excess food produced or transporting it to the market for sale. Farmers can only be encouraged to produce more if they get reasonable returns from their produce.

The availability of schools, regular electricity, sanitary and health facilities may encourage farmers, particularly young ones, to stay in the rural areas and participate in taungya rather than migrate to the cities where these social amenities are available. Moreover, such facilities would improve the farmers' capabilities and make them more comfortable and productive workers.

Easy access to credit facilities for taungya farmers would enable them to improve their methods of cultivation and to store, process, and sell their produce at the right time to obtain maximum profit. Credit facilities are also necessary to enable farmers to acquire improved farm inputs, such as fertilizers, herbicides, and farm machinery.

IV. TYPES AND BENEFITS OF TAUNGYA SYSTEMS

There are basically three types of taungya systems:

Departmental Taungya system

Leased Taungya system and

Village Taungya system

A. Departmental taungya system

This is the type of Taungya system whereby agricultural crops and plantation are raised by the forest department by engaging (employing) daily paid workers or labourers to work. The ultimate aim of raising agricultural crops along with the plantation is to keep along the land free of unwanted vegetation or weeds. By so doing, the tree plantation is properly taken care of.

B. Leased taungya system

In this system, the forest land is given on lease to the person who offers the highest money for raising agricultural crops for a specific number of years and ensure care of tree plantation.

C. Village taungya system

This is the most successful of all the three taungya farming systems. In village or traditional taungya farming system, the people have settle down in a village inside the forest for the purpose of raising crops. Usually each family has about 0.7 to 1.9 hectare of land where trees are raised and crops are cultivated for 2 to 5 years.

D. Problems of taungya farming system

The taungya farming system has many problems. These include:

a) Problems of taungya plantation development as faced by the foresters

b) Problems of taungya plantation development as faced by the farmers

c) Socio-economic problems of taungya farming system

d) Limitation of taungya farming system

E. Socio-economic implications of taungya systems

Inter-cropping not only gives the farmers an income, it also controls the weeds which otherwise compete with the tree seedlings. In addition to the weeding benefit, fire control is also an important reason for inter-planting (White, 2005).

Several million people live in villages surrounding forest areas. Most of them are small farmers or farm labourers, and about half of them are under-employed or unemployed and illiterates. Such social drawbacks place great pressure on forestlands. Hence, forest policy should not emphasize only on management of forest areas for the production of timber and commercial non-timber forest products, but be directed at increasing employment opportunities, rural community development, poverty alleviation as well as giving to the farmers some form of training.

Wiersum (1982) reiterated that taungya gradually evolved in response to changes in socio-economic conditions and was included in the forestry regulation as an obligatory technique for teak plantations establishment. Taungya system is adjusted in areas of high population density to meet current socio-economic conditions.

Taungya was mainly considered as an effective means of reforestation, and its contribution to improving the welfare of the local farmers was subsidiary to the successful establishment of timber plantations. Again, a prerequisite of taungya is forestry and the primary objective of the forest enterprise may not be hindered by increased food production (Wiersum, 1982).

Taungya systems incorporate secure terms of use and access for rural communities to pursue farming as well as forest plantation development over the long term. While taungya system has been used most widely in humid and sub-humid areas, it might also be applied in dryland Africa for the rehabilitation of grazing lands or the establishment of woodlots. It could be useful in any situation where deforestation and land degradation can be treated by a mixture of temporary cropping with tree establishment (Wombo, 2008).

V. MAJOR BENEFITS FROM TAUNGYA SYSTEM

The major benefit obtained by the taungya farmers is the food production though they occasionally depend on teak branches for firewood. Agyeman (1998) reported that more than 80 % of the local inhabitants living inside and near forest reserves had not benefited from reservation and wanted the Government to initiate local community-friendly forest management policy frameworks. The study has also shown that establishment and management of forest plantations through the taungya method involves a series of year-round operations. Taungya plantations development provide a wide array of opportunities for workers to earn more income and community stability. Taungya system is meant to contribute to national food production, provide more employment opportunities, increase income and welfare of the forest fringe communities. Thus, taungya system satisfies both social and economic needs of people who participate in it (White, 2005).

VI. SUSTAINABILITY OF TAUNGYA FARMING SYSTEM

Taungya farming system being described as a system of combining the establishment of tree crops and crops must be sustained. The sustainability of this system is derivable or made possible for the continued provision of timber (wood) which is commercially used in manufacturing different types of furniture. The transformation of many areas which were hitherto rural communities is a reason for taungya system to remain sustained.

Taungya farming system which was previously a montane farming system provided opportunities which were instrumental in orienting the hill farmers to the production of timber rather than to understand the huge investment needed for irrigated agriculture. The growing cities needed timber and the highlands were in a position to supply the product. Thus the dead trees within the forest were of great essentiality for replacement (Wen Hui Bao, 1987). The immediate and regular existence of market for timber is usually sufficient to stimulate the growth of a forestry facility or industry hence makes the taungya system sustainable. Thus to maintain the sustainability of this system, there should be fast growing timber species have to be available to satisfy the desires of the foresters.

Again, the role played by land tenure system makes taungya farming system sustainable. In the modern systems of taungya as practiced today, the land on which the plantation is to be established belongs to the state government or to a corporate land holder. Villages are granted the rights to till plots of land on the agreement that they plant and care for the tree crops for the first few years of the rotation. All income from the timber accrues to the government or land owner. This explained various situation where natural upland as well as lowland forests on government lands were converted to sustainable successional taungya farming system in which revenue derivable from reduction of forest establishment cost. Again, tree survival in compartments under taungya system is better than in compartment under pure wood system. This denies an allegation that intercropping young trees with food crops under the taungya system is detrimental (Betters, 1998).

For the peasant farmers, the food crop yields and financial earnings realized are sufficient to attract their participants. These benefits are in addition to the means of subsistence and social security which the taungya system provides to them. Therefore, the taungya farming system should be sustained.

VII. ENVIRONMENTAL IMPLICATION OF TAUNGYA FARMING SYSTEM

The environment in agriculture includes everything around the farmer including air. Taungya farming system has much impact on the environment as highlighted below:

1) It helps in the purification of the air. The plants (trees) use the carbon (iv) oxide (CO_2) during photosynthesis to reduce the pollutants in the air.
2) The forest trees act as places of attraction for recreation.
3) Taungya system helps to provide cool and fresh breathing air for the populace.

4) The root of the various trees act as binding force on the soil particles thus eradicating soil erosion.

5) The leaves of the different plants in the forest help to add more fertility to the soil as they die, fall and decay.

6) The forest plantation also serves as a safe haven for various animals to breed.

7) Taungya farming system is helpful in the improvement of the eco-system

8) Taungya farming system helps to checkmate global warming that has become the worlds' disturbing factors recently.

VIII. CONCLUSION

Taungya farming system has enormous benefits in the socio-economic well-being of the rural dwellers, state and Nigeria at large. The system plays prominent role in increasing the yield and income of the households and also improve their livelihood desires by actively participating in the taungya farming system. Although, taungya farming system alone is not a panacea to alleviate rural poverty and suffering, household's decision to adopt such land-use can undoubtedly aid them cope with emergencies. The revenue regenerated from taungya farming system enhances their well-being. It is therefore expedient to increase and improve the economic potential of taungya farming system through the adoption of sound management practices. Eventually, taungya farming system will help to checkmate, reduce to the barest minimum the destructive tendencies of forest encroachers which is borne out of the growing desire for man to meet the desired economic and financial needs for survival. This in essence, helps to properly pace values to the taungya farming system which has to be carefully followed in order to promote or increase the inherent economic potentials of taungya farming system. Based on this therefore, it becomes imperative and advisable that the government should support and promote the taungya farming system in order to provide more resources for the ever-increasing population of the country.

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