

DYNAMICS OF SOYABEAN PRODUCTION IN NIGERIAN AGRICULTURE

K. N. FUTULESS, H. E. SHEHU and P. M. JONAH

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ABSTRACT

Despite large oil reserve, Nigeria as a developing country has urgent economic problems which only agriculture can alleviate. The introduction of soyabean in Nigerian agricultural system can diversify the food for both man and his livestock. Soyabean is a crop with high potentials, but its future in the agricultural system may depend on its performance as a component of polyculture and acceptability in the traditional cropping systems. Soyabean has desirable characteristics for intercropping such as erect growth habit, and high productivity under wide row spacing, nevertheless, soyabean is currently rarely used in intercrop combinations. Successful introduction of soyabean into intercrop system will ensure greater diversification of crops grown within each agroecological region of the country. The general adoption of the crop has been very limited despite some notable success in some specific areas like expansion and utilization. Soyabean production problems are mostly critical during establishment, maturity and storage.

KEY WORDS: Agricultural system, Cropping system, sustainable agriculture, *Glycine max*, productivity, soyabean adoption.

INTRODUCTION

"Agriculture is as old as man" so the saying goes. Fortunately or unfortunately, Nigerian agriculture is the typical peasantry system of agriculture in which over 80% of the population engages in agriculture and is responsible for over 90% of the total production in the agricultural sector. Nigeria remains a poor country inspite of her immense oil endowments. With a projected population of 147 million, one physician to 5882 people, 43% illiteracy rate a GNP of \$310 (CBN, 2000) and a fast declining agricultural labour force represents an ugly economic situation for the most populated Black Country in the world. These among other reasons prompted NPC (2001) to report that the structure of the Nigerian economy exhibits the characteristics of a developing economy, with a narrow disarticulated production base, a monocultural production structure, a degraded environment and the predominance of subsistence and commercial activities.

With the failure of oil wind falls to turn Nigeria economy around, it follows that agriculture must be given the prime responsibility to do so. This is because agriculture remains the most important sector of the Nigerian economy. The current global concern has shifted from the need to produce enough food to feed the world's growing population to a new interest on how to produce enough food over time without adversely affecting the environment for the future generation. One important requirement for sustainable food production is that soil, a non renewable natural resource must be properly utilized by planting crops. Soyabean (*Glycine max* (L) merr.) is a crop with considerable potential for integration into Nigerian farming systems. Soyabeans has been grown in Nigeria for the past half century. The production attained commercial recognition when the British administration introduced a Malayan variety as an export during the 1940s, farmed by the Tiv people in Benue state, where agro-ecological condition favoured production. The general adoption of the crop has been very limited, despite some notable success in some specific areas like diversification and

utilization (Smith *et al*, 1995). Soyabean is one of the most important leguminous crops in the world. The crop is cultivated on about 52.37 million hectares of land worldwide, with a yield of 100.83 million metric tones (Duke, 1990). Currently, Nigeria produces 77,000 metric tones annually (Anon, 1985) which is indeed a very low share of the soyabean production.

The challenge this paper poses therefore is how can soyabean production be made more productive on a sustainable basis in Nigerian agriculture?

Growth of interest in Soyabean Production

Smith *et al*, (1995), in explaining the upsurge in soyabean production in Nigeria found that, dominant reasons given by farmers for producing soyabean were based on the profitability and uses in home consumption. Soyabeans suitability for intercropping and its low labour and fertilizer requirements were also among the reasons given. On a unit to unit basis, soyabean costs more than any other legume, yet its yield per hectare competes favourably with the other traditionally known component legume crops such as cowpea and groundnut which are widely grown with the cereal crops.

There is increased profitability of soyabean because of its diverse use as cash food crop in some parts of the country. In addition, the major increase in the demand of soyabean has also been induced by changes in government policy, and the adoption of improved varieties. The adoption of the improved varieties, with their yield advantage, also contributes to the increased profitability of soyabean production (Odo and Futlless, 2000). The International Institute of Tropical Agriculture (IITA) carried out exploratory research on a number of food legumes in the early 1970s and found that soyabean was relatively free of serious diseases and insect pest problems. It also has high yield potential when compared with other legume crops such as cowpea and groundnut. Soyabean also gave relatively stable yields which are especially important for the small scale farmers.

The demand for soyabean has continued to increase

more than for other crops because the production of the traditional sources of vegetable oil from groundnut and oil palm over the years remained largely stagnant. Soyabean responds to increased demand by the processing industries which substitute soyabean for groundnut oil feed cake production (Smith *et al.*, 1995). Soyabean has been known to produce a stable yield which gives the farmer an assured opportunity to harvest from year to year (Smith *et al.*, 1995). It is note worthy that soyabean has desirable characteristics for intercropping such as erect growth habit and wide adaptability to various agro-ecologies (Futuless, 2002). A major focus of farming systems research in the country is to diversify the base of arable cropping system and move away from the domination of cereals in the savanna, and root and tubers in the forest zones. This could help to prevent the build up of biotic constraints specific to the dominant crops, improve the nutrition of the farm families and diversify income resources. Soyabean is one of the major crops that are currently perceived to have the best potential for achieving these objectives (COMBS, 1992).

Current State of Soyabean Adoption in the Cropping System

1. From 1988 through 1990 there was a rapid expansion of soyabean production in the Savanna ecology of Nigeria.
2. There were considerable efforts from 1985 – 1991 by National Programmes in Nigeria to increase soyabean production and utilization in the rain forest and the rain forest savanna transition ecologies. There was little adoption of soyabean production by farmers, but soyabean utilization was well accepted.
3. The Cassava Based System Research Group in collaboration with the University of Nigeria at Nsukka conducted a survey from 1988 to 1989 in Ohsu. This represented a humid tropic ecology in southern Nigeria. The research demonstrated that humid tropic ecology was a marginal environment for soyabean production hence there is little scope for increase production (IITA, 1989).
4. The Maize Based System Research Group conducted on-farm research on soyabean in two locations at Ayepe and Alabata in the rainforest transition ecologies, respectively of Nigeria from 1985 to 1989 and found little or no adoption for utilization (IITA, 1989).
5. From 1989 through 1992, a series of soyabean-sorghum intercropping trials were conducted with ICRISAT at Zaria and Bagauda in the Northern Guinea Savanna. The research showed that, sorghum yield was not reduced when intercropped with soyabean. Sorghum mean yield was about 2500kg/ha in both sole and intercropping while a soyabean yield of about 800kg/ha was a bonus to the farmers. Similarly, Futuless (1998) conducted a trial on sorghum-soyabean intercropping in Sudan Savannah zone. The trial also indicated that sorghum yield was not reduced when intercropped with soyabean. There was a very consistent message from these studies and observations that soyabean was adopted by farmers in the Savanna but not in the rainforest zone of Nigeria.

Constraints of Soyabean Production

Some of the constraints identified by soyabean

producers in Nigeria includes:-

1. Root-knot nematode: This has been described as cosmopolitan in distribution, attacks several economically important crops, causing serious losses resulting in yield reduction. In the tropics, the root knot nematode is considered the most serious pest of crops where Weber *et al.* (1995) reported a 90% yield loss in Soyabean.
2. Birds: Birds cause serious damage at the time of seedling emergence. Birds often cause the greatest damage during the early hours of the morning and in late afternoon, though in some places doves have been seen pulling out seedling throughout a major portion of the day (IITA, 1989).
3. Rodents: Rats, rabbits and other rodents can cause serious damage, especially in small plots of soyabeans, by eating the leaves and tops of the plants beginning as soon as the first true leaves begin to appear. They also may cause damage to the crop late in the season by eating the seed in the nearly mature green pods. Rodent damage is most common near fallow areas where vegetation is dense.
4. Seed storability: Most of the large seeded varieties do not store well when kept in humid tropical environments. Seed deterioration is greatly accelerated by high temperatures and high relative humidity. Some varieties identified at IITA have superior seed keeping quality and some improved varieties have been developed like TGX 536 – 02D, Samsoy-1 and Samsoy-2 that store better.
5. Poor stand Establishment: Poor stand establishment is a common problem in the tropics. This may be caused by pests like birds and rodents. Inconsistency of rainfall at planting may also lead to poor stand establishment which in the long run may lead to low yields.
6. Pod dehiscence: A considerable range exists among varieties and strains in their ability to hold seed after they reach maturity. Many types will shatter before the seeds reach 13 percent moisture. Some varieties will hold seed for at least six weeks after reaching 13 percent moisture. Seed holding is of greater economic importance where large land areas are harvested with hand labour. Shattering resistance appears to be quantitatively inherited.
7. Lodging: If the plants fall to the ground (lodge) before pod filling is completed, yields may be greatly reduced. Varieties should be selected for strong, rigid stems and good root systems. Late-maturing, indeterminate varieties are often prone to lodging when grown on fields with high soil fertility.
8. Water requirements: Water is often the primary limiting factor on soyabean production and is therefore an important management concern. Growth of soyabean from germination to maturity is, in general, proportional to the available moisture supply (Boyer, 1970). The period of germination is critical for soyabean, at this time, excess moisture or prolonged drought may be injurious. A shortage of moisture during the pod filling stage reduces yields more than during early stages, including the flowering stage. Deficiency of soil moisture between germination and

Table 1: Effect of different sowing Dates on Plant Development and Yield of Soyabean at Maiduguri in 1996 and 1997.

Date of sowing	Height of Soyabean/plant 12 WAS (cm)	Number of leaves/plant 12 WAS	Number of branches/plant 12 WAS	Number of pods/plant 12 WAS	Yield at harvest (kg/ha)
1996					
SD ₀	45.6	49.25	19.9	84.9	560.0
SD ₁	45.8	58.05	18.7	143.3	976.25
SD ₂	45.9	50.7	10.6	111.7	1000.0
SD ₃	48.0	32.45	9.6	109.8	690.0
SD ₄	50.1	30.5	16.4	106.9	502.5
LSD (0.05)	NS	10.15	1.89	2 6.30	122.10
1997					
SD ₀	41.2	59.86	14.3	66.8	382.5
SD ₁	40.2	57.95	12.4	122.8	500.0
SD ₂	44.9	42.81	11.3	95.7	755.0
SD ₃	41.8	43.53	10.7	67.9	576.0
SD ₄	43.9	40.45	11.3	54.6	130.0
LSD (0.05)	NS	8.78	2.38	22.07	96.06

SOURCE: Futuless and Odo (1999)

KEY: SD = Sowing date
 WAS = Weeks after sowing
 NS = Not significant
 LSD = Least significant difference

SD₀ - 4/7/1996/1997
 SD₁ - 11/7/1996/1997
 SD₂ - 18/7/1996/1997
 SD₃ - 25/7/1996/1997
 SD₄ - 1/8/1996/1997

flowering retards vegetative growth. Under conditions of optimum soil moisture, differences in yield among varieties are largely relative to the difference in yield produced under different moisture conditions. Short periods of excessive moisture after the period of bud differentiation will result in very poor yields.

- Date of planting, population density and row spacing. In principle, delay in sowing later than a given date results in a progressive reduction in the potential yield of a crop. Plant population defines the number of plants per unit area, which determines the size of the area available to the individual plants. Futuless, (2003) examined the possibility of closer row spacing for Soyabeans.
- Ripening and harvesting: Soyabeans mature when the pods have turned brown or grey in colour, depending on the variety. They should be harvested under dry conditions. The mature pods rattle when shaken and are ready for harvest. Shattering (natural breaking/opening of pods) may follow. Therefore, harvesting should not be delayed to avoid shattering because the drier the atmosphere, the more critical it is for delayed harvesting.

Suggested solution and production potentials.

To attain a sustainable improved soyabean culture in the country, the best agronomic practices should be applied for better and increased productivity. Soyabean as a leguminous crop is relatively free of the current serious diseases and pests that bedevil the productivity of traditional legumes such as cowpea and groundnut. Soyabean production in association with other crops is a possible option that can diversify the cropping system. There have been rapid increases in soyabean production in the country from 1986 to date. Soyabean production is faced with many constraints in Nigeria. The critical periods include; crop establishment maturity and storage. There is a high prospect for soyabean production in Nigeria because of its potentialities and also because it can

easily be incorporated into local cropping pattern. This will ensure sustainability and stability in the farming enterprise in Nigeria at any given season. With the growth in soyabean consumption, interest and financial support, all aspects of research has increased substantially over the past decade. The need to achieve increased food production above the rate of population growth is urgent and important if food security and poverty alleviation are to be achieved.

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