A Place for Soy in Nutrition and Agricultural Development

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Nigeria Food consumption and nutrition survey

- Based on the agro-ecological zones and principal food crops concept
- Crops grown and foods consumed
- Types of foods consumed and nutritional deficiencies
- National representative sample size

Dry savanna
Humid forest
Mid-altitude
Moist savanna
Prevalence of malnutrition among children 0-59 months in Nigeria by agroecological zone

- Nationally, chronic under nutrition (stunting) was the major form of malnutrition (42%)
- Followed by underweight at 25% and wasting at 9%
## Soybean Production in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Acreage (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>601,000</td>
</tr>
<tr>
<td>South Africa</td>
<td>150,000</td>
</tr>
<tr>
<td>Uganda</td>
<td>144,000</td>
</tr>
<tr>
<td>Malawi</td>
<td>68,000</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>61,000</td>
</tr>
<tr>
<td>Rwanda</td>
<td>42,160</td>
</tr>
<tr>
<td>Democratic Republic of Congo</td>
<td>30,000</td>
</tr>
<tr>
<td>Zambia</td>
<td>15,000</td>
</tr>
</tbody>
</table>

Source: FAO, 2005
Improved varieties

- 17 improved varieties officially released by national agricultural research and extension systems in West and Central Africa

- Show considerable increases in grain and fodder yields

- Improving soil fertility in the savannas

- Enhancing the yield of subsequent crops such as maize and sorghum
Role of soybean in cropping systems in the savanna

➢ The effect of previous soybean crop on maize grain yield in a rotation arises due to residual N availability either from the roots, fallen plant parts of soybean or nitrate-sparing effect

➢ Sanginga *et al.* (1997) estimated a net contribution of 18 kg N/ha to soil on the average after grain removal and it ranged from -8 to 43 kg N/ha depending on the soybean line grown

➢ Further study by Sanginga *et al.* (2002) substantiated the beneficial effect of soybean to maize; 1.2 – 2.3-fold increase in maize yield when grown after soybean as compared to maize after maize
Role of soybean in cropping systems in the savanna

- On-farm study in southern Guinea savanna using TGx 1456-2E and TGx 1660-19F indicated that these lines fixed 39-54% of their total N requirement that amounted to 56-70 kg N/ha in TGx 1456-2E and 51-78 kg N/ha in TGx 1660-19F (Osunde et al., 2003)

- A maize grain yield of 3 t/ha was reported by these workers indicating the tremendous contribution from a 2-year soybean rotation

- They recommended growing of promiscuous soybeans in rotation with maize even without the residues of soybean being returned to the farm land
Soybean in Nigeria

- Introduced by the British in 1908 for new sources of supply at Moor Plantation, Ibadan
- 1928 successfully introduced at Samaru, Zaria
- European demand for oilseeds during World War II, expansion in acreage and in 1947 the first exports of 9 tonnes were recorded
- Yields reached 1,100 kg/ha
Soybean in Nigeria

- Became a cash crop in the Benue Valley which became the leading area of production

- Grown in mixed cultivation with sorghum, millet, and citrus

- Most were exported as a cash crop to Europe, with a small amount fed locally to animals, a small portion used as food in the northern States (Ashaye, 1975)

- Onochie (1965) investigated the use of soyfoods in Nigeria and suggested soybeans be mixed with a paste of cowpeas to make olele and akara
Soybean in Nigeria

- Fortify wheat flour in Bread
- Made into soymilk, which could then be used in traditional recipes
- Akinrele (1966) and Oke (1967) recommended its use as a fortifier for *ogi*
- Ashaye and colleagues (1975) reported that various ethnic groups have discovered that when pounded to a powder:
  - it can be used in the place of melon to thicken a soup
  - locust bean to make *daddawa*
Promoting Soybean Processing and utilization

- IITA began soybean improvement research in 1974
- Average yield per hectare in Africa was 660 kg/ha
- Total production was only 0.2 million tons
- Using IITA-developed varieties, the average yields in West Africa today is 1.1 t/ha
- Nigeria has the highest 6-year (2000-2005) average production of 486,000 tons on an area of 553,260 ha
Promoting Soybean Processing and Utilization

- Improve nutrition and create demand, IITA and its partners began the development of small-scale and home level processing technologies in 1985

- Successfully used to increase the protein content of traditional foods

- New products were developed and promoted

- Over 25,000 people in rural areas were trained
Promoting Soybean Processing and Utilization

- The number of farmers growing soybean in target villages increased by 35%

- Impact study conducted in 4 states showed:
  - Markets had increased from 2 in 1987 to 42 in 1993
  - Retailers from 4 to 824
  - Benue State: more women involvement in production
  - Improved varieties: 9% of farmers in 1989 to 75% in 1997 on 30% of the area planted to soybean
Nutritional analysis

- Soybean oil
  - 61% polyunsaturated and 24% monosaturated fat
  - Contains no cholesterol
  - Polyunsaturated fats in the diet shown to lower cholesterol levels
  - Rich in the essential polyunsaturated fatty acids
    - linoleic and linolenic (precursors to hormones)
Nutritional analysis

- **Soy protein**
  - Higher in protein content than other legumes and many animal products
  - Quality of the protein is highly notable and approaches the quality of meat and milk
  - Defatted soy flours are about 86% protein and are low in moisture
Nutritional analysis

- Soy fiber
  - Contains both soluble and insoluble fiber
  - Soluble fiber may help lower cholesterol and control blood sugar
  - Insoluble fiber increases stool bulk, may prevent colon cancer, and can help relieve symptoms of several digestive disorders
## Nutritional content of a serving of soybean products

<table>
<thead>
<tr>
<th>Food Product</th>
<th>Calories</th>
<th>Protein</th>
<th>CHO</th>
<th>Fat</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature Soybeans (yellow), cooked</td>
<td>149</td>
<td>14.3</td>
<td>8.5</td>
<td>7.7</td>
<td>1/2 cup (86 g)</td>
</tr>
<tr>
<td>Soybeans, green</td>
<td>127</td>
<td>11.1</td>
<td>10.0</td>
<td>5.8</td>
<td>1/2 cup (90 g)</td>
</tr>
<tr>
<td>Soy flour, defatted</td>
<td>82</td>
<td>11.8</td>
<td>9.6</td>
<td>0.3</td>
<td>1/4 cup (25 g)</td>
</tr>
<tr>
<td>Soymilk</td>
<td>100</td>
<td>7.0</td>
<td>8.0</td>
<td>4.0</td>
<td>1 cup (245 g)</td>
</tr>
</tbody>
</table>
Soy’s nutritional value for people with HIV/AIDS

- Poor nutrition increases the risk and progression of disease. In turn, disease exacerbates malnutrition.

- Protein requirements of HIV-infected persons jump to 50-100% higher than for uninfected persons.

- Soy protein and adequate calories can help to prevent body from wasting, which is often associated with HIV/AIDS.

- Soy plays a role in nutritional maintenance, an essential feature of optimal effectiveness of medicine while helping to minimize nutrition-related side effects.
Why should we continue promoting soybean

- **Nutritive value**
  - High content of good quality protein
  - High content of essential minerals and vitamins
  - Good source of essential fatty acids

- **Economic benefits**
  - Cash crop of high economic value to farmers

- **Industrial raw material**
  - Oil industry
  - Livestock and poultry industry
Constraints to soybean production

- Seed production and distribution
- Pod shattering especially in the hot dry savanna environment
- Diseases such as rust, red leaf blotch, bacterial blight among others
- Insects and pests such as pod sucking and defoliating insects
- Lack of varieties tolerant to midseason moisture loss
- Lack of high yielding varieties tolerant to low phosphorus
- Lack of market and processing knowledge for home consumption
Constraints and challenges for utilization

- Novelty and inertia to change

- Cannot be cooked and eaten like any other bean
  - Long cooking time
  - Unpalatability or beany/rancid flavor

- The egg and chicken scenario
  - No utilization, cultivation dies
  - No beans on the open market, utilization dies
Constraints and challenges for utilization

- Inadequate knowledge of appropriate processing

- Presence of anti-nutritional factors
  - Heat labile such as trypsin inhibitors, lipoxidase enzymes, goitrogens, phytates
  - Heat stable factors such as flatulence factors, saponins, isoflavones
Conclusion

- Soybean has a great potential in the development of three key sectors of the economy
  - Health
  - Agriculture
  - Industry

- There is however the need for more research and development activities if the full potential of soybean is to be realized in Nigeria

- Provides good opportunities for small-holder farmers in Nigeria
Conclusion

➢ Considerable potential

– Improving declining soil fertility
– Enhancing household nutrition security
– Raising rural incomes as an important cash crop
– Raw material for the local food and feed production industries
– Reducing poverty