MAIZE
Production, Marketing, Processing & Utilization In Nigeria

Extension Bulletin No. 217

National Agricultural Extension Research Liaison Services

Acknowledgements

The authors wish to express profound gratitude to the management of NAERLS, for giving us the opportunity to perform this task and to several individuals who provided different levels of assistance that helped that team in achieving the task. We are particularly grateful to the two Assistant Directors of the organization for their support, the cooperation and resourceful support of the Task Force members. We also appreciate the effort of secretarial team especially in organizing the manuscripts. Our profound gratitude goes to the scientists whose works formed the basis of this publication.

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Zaria, July 2014

The production of this Maize Bulletin was supported by West Africa Agricultural Productivity Programme (WAAPP - Nigeria)

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Introduction

Maize is one of the most important staple food crops in Nigeria. Among the cereals, it has the largest area devoted to it cultivation. Indeed, its production area in the country continues to expand because of technological breakthroughs. Maize is a very important food crop for human beings and for livestock. Maize is a major cereal and one of the most important food, feed and industrial crops in Nigeria. It is the most dominant grain crop in the savannah zones and fresh vegetable in the forest belt where it is cultivated twice in a year. It has become an important irrigated crop and increasingly being used as a coping strategy against the ever worsening climatic anomalies throughout the country'. Over fifty million farmers grow maize every year while over ninety million people are employed in its processing and usage daily. Maize provides energy, vitamins and has some amount of protein. Output of maize continued to increase in Nigeria in response to demand. The livestock industry consumes more than half of the total maize production annually. During the era of Commodity Boards, the Nigerian Grains Board coordinated marketing of maize in Nigeria. With the scrapping of the Commodity Boards, no other institutional arrangement has been put in place for maize marketing until 2003, when the Arable Crops Marketing and Development Company (ACMDC) was established (Idachaba, 2004). The establishment of Arable Crops Marketing and Development Company was an integral part of the food security programme, which brought about the re-activation of the strategic grain reserve scheme. Under the scheme about thirty-three silo complexes were built to support national food security stock. Maize constitutes about 70% of annual grains stock in the silos and 40% of the grains in food aids. In this bulletin, we provide some insights on how maize value chain operates with

emphasize on technical information that ensure optimum performance of the chain.

Production trend
Forecasts put the production of maize in Nigeria at about 10 million tones. This is expected to rise as favourable prices entice more farmers to cultivate maize.

Year	Production (Million MT)	Growth Rate
2008	7.97	22.62 %
2009	8.90	12.30 %
2010	8.80	-1.68 %
2011	9.25	5.11 %
2012	8.71	-1.73 %
2013	10.29	11.3%

National Demand
National requirement for maize is estimated at about 16 million tons. With production around 10.3 million tons in 2013, supply deficit is about a shortfall of about 5.7 million tons.

What is a value chain?
The flow of maize from production points through processing to the market occurs along a chain. This can be referred to as Maize Value Chain (MVC) because as the product moves from chain actor to another, such as from producer through intermediaries to consumers, value is added. A value chain is *the full range of activities which are required to bring a product or service from conception through the different phases of production (involving a combination of physical transformation and the input of various services), to delivery to final customers, and final disposal after use* (Kaplinsky and Morris, 2004).

Who are the actors?

Value chain actors are those individuals or institutions that conduct transactions in a particular product as it moves through the value chain. These may include input suppliers, farmers, traders, processors, transporters, wholesalers, retailers, and final consumers. In many cases, there is more than one type actor, as well as multiple channels that supply more than one final market.

The major functions of actors within the value chain
As with most agricultural value chains, the main functions in the maize value chain starts with market demands which stimulate the need to produce. This is determined by consumers- household and industrial consumers. If there are no demands the actors component for MVC would remain unprogressive. The activities of MVC include input supply, moving onto production, harvesting, post- harvest handling and storage. Each of these functions is carried out by different types of actors, using different types of technologies and interacting with different participants in the value chain.

Input supply: This stage is concerned with sourcing of raw materials required for agricultural production, processing, and trade.

Production inputs
The key inputs for efficient maize production are good seed, fertilizers, crop protection products, water and land (soil).

Processing inputs
The key inputs for efficient maize processing include knives (manual peeling) Big bowls (for manual washing) Mechanical washing machine, grinding machine De-watering (drying) device (machine or traditional), Filter or sieve, Fryer, Packing Material e.g. bags.

Marketing/trade inputs
The key inputs for efficient maize marketing are good seed, fertilizers, crop protection products and water. Others include: store/ ware house, Bags, Basins, Wheel barrow, Transport, Market (where sellers and buyers meet) and Consumers.

Inputs may either be procured locally or imported. The final value of an input depend on where it was purchased and may include all manufacturing costs, transportation costs, customs duty and tax, and unofficial payments incurred up to that point. The efficiency of a country's input supply system therefore has a major bearing on the performance of the entire value chain. These often come from interconnected market systems (i.e. separate value chains such as seed supply, fertilizers) with their own segmentation of end users (i.e. small farmers, large farmers) and their own business models. Input suppliers have their own distribution channels and strategies via which they sell their products to the end consumers. The cost of financing

the entire process often affects the price and quality or diversity of the products.

Farm Production: This is carried out by farmers with different farm sizes. Farms may range from less than one hectare to thousands of ha) using different types of technology (from hand hoe to large tractors), applying different levels of inputs and with significantly different yield level. This stage is concerned with primary agriculture production and ends with the sale of a raw commodity at the farm gate. These transactions may occur literally at the farm gate or at some other point where the farmer hands over ownership of the product to the next value chain participant. For maize, most of the initial processing operations such as the shelling or bagging of dry grain may take place at the farm level. Maize producers' has different primary objectives either for primary consumption or for commercial sale.

Climate and soil requirement for maize production

Maize is grown over a wide range of climatic conditions because of its many divergent types. Sellers of all soil fertility improvement and weather apparatus constitute stakeholders related to soils and climate.

Temperature requirement

Maize crop requires warm climate throughout the period of its active life. It does not tolerate low temperature below 13^{o}C which may occur during the dry harmatan period, in which germination is low. During harmatan periods, fresh maize cobs are in great demand and are often scarce because supply is low.

Rainfall

A minimum range of 480-880mm of well distributed rainfall is adequate for maize depending on the variety. Maize can be planted under irrigation. Thus its production domain is not confined to the geographical areas that have adequate rainfalls.

Cultural Practices

Land preparation

In the southern parts of the country where vegetation cover is fairly dense, land clearing should be carried out well ahead of the rains. Make ridges as soon as the rains start. Although the crop benefits from the deep cultivation, maize yields are not reduced when zero tillage is adopted. For high grain yield, sow maize in well prepared ridges of 75cm apart. Because the soils in the savannas are loose, animal drawn implements can be used for preparing ridges or by had hoe and tractor mounted tillage equipment.

(a)  (b) 

(c) 

Fig. 2: Land preparation for maize: (a) mechanized (b) animal traction and (c) manual

Planting date

Plant as soon as the rains are established, preferably immediately after a good rain. The establishment of the rains varies according to the different ecological zones and from one year to another. However, optimum planting date in the major ecological zones usually lies within the following ranges:

i. Sudan Savanna: third weeks of June to early July

ii. Northern Guinea Savanna: Last week in May 1st to 2nd week in June

iii. Southern Guinea Savanna: Mid-May to second week in June

iv. Forest Zone: Late February March for the first season and late July-August for the second season. Plant extra or early maturing varieties by late July and early August in order to allow maturity time to coincide with on-set of dry season

Fig. 3: Planting maize seeds

Fig. 4: Well prepared and planted land

Recommended maize varieties

Recommended drought tolerant maize varieties are presented on Table 1. Purchase certified seeds from reputable sources such as seed company agents and community based seed production associations. Request from the Agricultural Development Project offices near you information on sources of good quality seeds and other inputs.

Table 1

ECOLOGY	VARIETY	CHARACTERISTICS
Lowland Tropics	Sammaz 17	High yield, medium maturity and *Striga* tolerance
Lowland Tropics	Sammaz 18	High yield, early maturity and striga tolerance
Lowland Tropics	Sammaz 19	High yield, Drought and *Striga* tolerance
Drought prone areas and 2nd season planting in Southern Nigeria	Sammaz 20	Highly tolerant to drought with resistant to streak and tolerant to low soil nitrogen
Drought prone areas with striga hermonthica infestation	Sammaz 21	Highly tolerant to *Striga* hermonthica infestation
Drought prone areas of Northern Guinea Savannah	Sammaz 22	Highly tolerant to drought with resistance to streak and tolerance to low soil nitrogen
Drought prone areas of Northern Guinea Savannah	Sammaz 23	Highly tolerant to drought with resistance to streak and tolerance to low soil nitrogen
Drought prone areas of Northern Guinea Savannah	Sammaz 24	Highly tolerant to drought with resistance to streak and tolerance to low soil nitrogen
Drought prone areas of Northern Guinea Savannah	Sammaz 25	Highly tolerant to drought with resistance to streak and tolerance to low soil nitrogen
Wide adaptation	Sammaz 26	Highly tolerant to drought with resistance to streak and

		tolerance to low soil nitrogen
Lowland Tropics	Sammaz 27	Drought tolerant and *Striga* resistant
Lowland Tropics	Sammaz 28	Drought and *Striga* tolerant
Widely adaptation	Sammaz 29	Highly tolerant to low soil nitrogen with resistance to streak
Sudan Savannah and transition zones between Sudan and Northern Guinea Savannah	Sammaz 32	Improvement over Sammaz 28 (99TZEE-Y pop STR) *Extra early maturity *Yellow grain colour
Middle-belt Zone of Nigeria	Sammaz 30	Highly tolerant to low soil nitrogen with resistance to streak
Sudan Savanna and Transition zones between Sudan and Northern Guinea Savanna	Sammaz 31	Early maturity, prolific cob bearing, good stay green, good quality fodder and white grain colour.
Sudan Savanna and Transition zones between Sudan and Northern Guinea Savanna	Sammaz 33	Improvement over Sammaz ** (2000SYNW STR) *High yielding Extra early maturity, White QPM
Sudan Savanna and Transition zones between Sudan and Northern Guinea Savanna	Sammaz 35	Early maturity, good white grain quality and resistance to *Striga* hermonthica

Nigerian Savanna	Sammaz 36	Medium maturity, good stay green, excellent husk cover and yellow grain colour
Nigerian Savanna	Sammaz 37	Medium maturity, good quality yellow grains, tolerant to maize streak virus disease and **Striga** hermonthica infestation
Nigerian Savanna	Sammaz 39	Medium maturity, good quality yellow grains, tolerant to maize streak virus disease and ***Striga*** hermonthica infestation

Seed treatment

Treat maize seeds before planting using recommended dressing chemicals in order to protect them against soil borne pests, diseases and bird attack before and after germination. Recommended chemicals for treating seeds include Marshal 2% dust, Apron Star 50DS, Allstar, Dress force, Seed plus and others. Use 10g to treat between 2 and 5kg of seed depending on the brand of seed dressing chemical available. Wash your hands thoroughly, with soap and water after treating the seeds and after planting treated seeds. Read the label of all agrochemical products before using the products.

Spacing and Planting

Plant at spacing of 75cm x 50cm when two plants per stand or 75 x 25cm when one plant per stand is adopted.

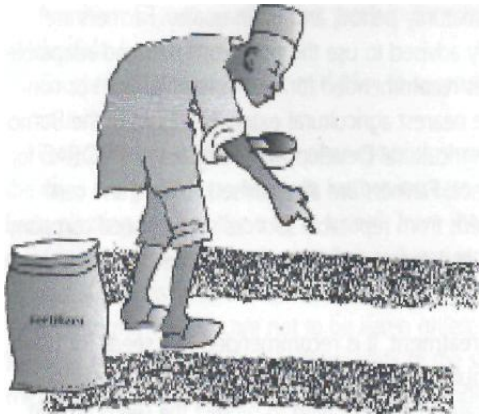


Fig.5: 1 seed per hole planted maize

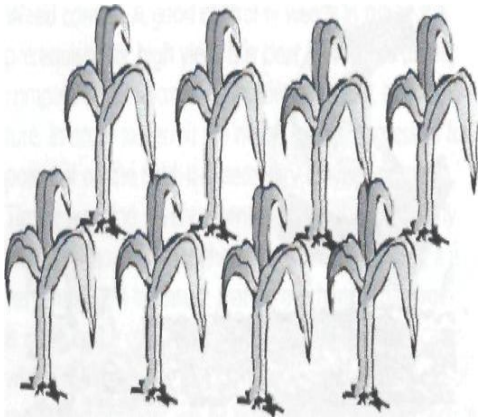


Fig. 4: Planting maize

Seed rate

About 15 to 20kg of maize seeds are required to plant a hectare which is about 2½acre. Plant 3 seeds per hole and later thinned to two plants per stand at about 1-2 weeks alter germination. When maize is grown as an inter-crop, the spacing should be made wider than for sole cropped maize. The practice of alternating rows of maize with other crops is recommended, as this will allow the adoption of recommended packages for each crop.

Fertilizer application

The fertilizer nutrients recommended for maize is 100kg N, 50kg of single super phosphate (SUPA) and 50kg K_2O per hectare in the Sudan ecology (Kano, Katsina, Bauchi, Zamfara, Gombe States) and 120kg N, 60kg P, and 60kg of k in the Northern Guinea Savanna (Kaduna, Niger, Adamawa States). The recommended N-fertilizer rate should be applied in two split applications. First dose is applied at planting or within the first week of planting (that is 50:50:50) using about 6 bags of NPK 15-15-15 while the 2nd dose of 50kg N (about two bags of urea) should be applied between 4 and 5 weeks after planting in the Southern and Northern Guineas Savannah zones but between 3 and 4 weeks after planting in the Sudan to extra early maize varieties. All fertilizers should be buried during application. Weed the maize farm again before the application of the second fertilizer dose.

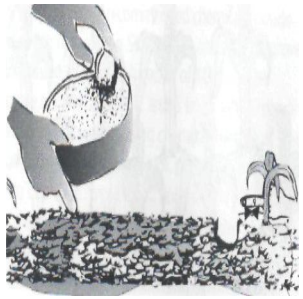


Fig.6a: Fertilizer application in maize

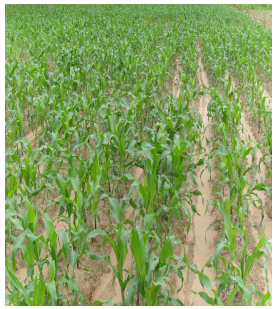


Fig. 6b: Fertilizer application in maize

For early and extra early varieties, note that delay in the application of the first dose of fertilizer beyond the first week after planting will drastically reduce the grain yield. Also the second dose should not be delayed beyond 4 weeks after planting. Apply the fertilizer in small qualities of two coca cola cap fill with NPK poured into a hole made with a stick at a distance of about 5 – 8cm away from the maize plant and below the soil surface at the first application and one coca cola cap fill with urea during the second application. Do not leave applied fertilizers exposed on soil surface in order to minimize the loss of nutrient to the atmosphere. Always cover applied fertilizer with soil.

WEED CONTROL

Manual weed control

Two manual weeding are recommended that should be conducted at 2 weeks after planting and at 4-5 weeks after planting.

Chemical weed control

Wherever economically feasible to do so, herbicides can be used to control weeds on a maize farm. It is important to note that the effectiveness of the herbicides is enhanced by very good land preparation. The herbicide recommendation provided on Table 2 below is for both large scale and small scaled maize farmers.

Control of Striga in Maize

In many parts of savanna zones, *Striga* is a notorious parasitic weed of maize. Under severe infestation, the maize seedlings are usually seriously attacked even before emergence of the *Striga*, with the maize seedlings looking yellowish, stunted, and wilting. To effectively control *Striga* various methods need to be implemented in an integrated fashion. The control options that should be integrated include rotation with soybean, use of tolerant/ resistant varieties, application of the recommended fertilizer rate and other cultural practices.

Table 2:

PRODUCT	RATE	QUANTITY/ SPRAYER (15Lts)	CONDITION OF USE	REMARKS
Glyphosate	4lit.	350mls	Before Land preparation	Wait for 10 days after application before land preparation
Paraquat plus atrazine	3lit. of paraquat plus 5-6 lit. of liquid OR 2.5 3kg of powder atrazine	250mls of paraquat plus 550-600 mls of atrazine	Apply pre-emergence (before the crop germinate).Spray within three days after planting.	Dissolve the atrazine powder in clean water before use, at the rate of 1kg in 1lit. of clean water. Thus the three kg should be dissolved in 3 lit. of water. This will give about 6lit of atrazine.
Paraquat plus Premextra Gold	3lit. of paraquat plus 2-3 lit. of Premextra Gold	250mls of Paraquat plus 250-300mls of Premextra Gold.	Apply pre-emergence (before the crop germinate).Spray within three days after planting.	Note that about 150mls of liquid chemical will fill one container of liquid peak milk of standard size.
Paraquat plus Lasso GD	3Lit. of Paraquat plus 3-4lit. of Lasso GD	300-350mls of Lasso GD		Note that about 150mls of liquid chemical will fill one container of liquid peak milk of standard size.

Pests and Diseases and their Control

Pests and diseases are not yet serious problems in maize except for Striga, stem borers termites and storage pests.

Stem borers

Fig. 7: Stem borer attack in maize

Fig. 8: Stem borer damage

Stem borers (SB) attack on maize especially on second season crop in southern Nigeria is significant where downy mildew is also common. A single spray with 100-120mls of Cypermethrin 10 EC or 80-100 mls of lamdacyhalothrin 2.5EC properly timed is adequate to control stem borers while adopting seed treatment helps to control downy mildew.

Fig. 9: SB infected maize leaf & Fig. 10 Symptom of downy mildew

Fig. 11 Symptom of downy mildew

Harvesting

When maize is to be consumed fresh, harvesting should be conducted when the silk has turned brown (55 – 70 days after planting). But when grains are needed, harvest as soon as grains are dry enough (80 – 110 days after planting depending on the variety). In harvesting, the cobs can be broken by hand from the plant or the whole plant can be cut with a cutlass. Where the entire plant is harvested, they are often stacked in the field to allow the grains to dry further. In the humid zones, the crop can be dried in a traditional ventilated granary or crib.

Post Harvest Processing

Maize shelling: This can be done by anyone of the following methods.

i. Hand shelling

ii. Use of internally ribbed tubes;

i. Beating cobs with stick;

ii. Using single intake disc (hand operated);

iii. Using double intake disc (may be hand/pedal/engine operated)

The method to use is determine mainly by output, although engine operated multi-crop threshers is often available for hire.

Grain cleaning:

This can be done by using the wind for winnowing or use of screens of proper size.

Yield

The average yield of maize is between 2,500 and 4,500kg/ha of threshed grains depending on the level of inputs used. Adoption of recommended fertilizers, varieties, seed-dressing and improved cultural practices ensures high yields.

Fig. 12: harvested maize cobs

Storage and control of storage pests

Maize meant for future use should be dried to 10 to 12% moisture content and properly stored.

The major storage pests of maize are grain weevils (*Sitophilus spp. and Tribolium spp.*). Infestation may be by insects already present where maize grains had previously been stored or by cross infestation between stores or by cross infestation between granaries during storage. Apart from the hygienic condition of granary, chemical control measures may be employed as illustrated below. Maize that will be stored for six months or more should, in addition to proper cleaning condition in the store, be treated with primophos methyl 2% at the rate of 500g per ton. It may be noted that this product may be difficult to obtain in many markets. Request assistance from the Agricultural Development Project near you.

How to apply Actellic (primophos methyl) 2% dust for proper protection against insect damage

a. The walls and floor of the rumbu or granary must be cleaned thoroughly

b. About 22.73kg of threshed grains equivalent of cobs should be spread in the store.

c. One and a half large match-box full of Acetilic dust should be measured.

d. The dust should be sprinkled evenly over the cobs in store.

e. Another layer of cobs should be added to give 22.73kg of threshed grains and this should be repeated until all the maize is treated and the store is full.

f. The store for granary should be tightly closed.

The use of Phostoxin tables or pellets may, alternatively be employed to store more maize in air-tight container or large storage in sacks. Large scale storage in bags such as pyramids will require complete cover with tarpaulin after application with 4- 6 tablets or pellets per tone. The tablets or pellets should be enclosed in perforated envelopes or newspaper. Such storage should not be disturbed frequently for greater effectiveness.

Notes: Whenever phostoxin tablets are used, ensure the Store or container is air-right to avoid the escape of fumes because they are extremely poisonous to human beings when inhaled. Do not keep grains treated with phostoxin in living room.

Assembly: This stage involves the collection of agricultural produce from many farmers and delivery of the raw material to a factory for industrial processing or packaging. In the case of livestock operations, assembly is defined in a broader sense to include the feedlot process for delivery of fattened animals to an abattoir. Bagging and simple grading of crops can also occur at this stage depending on arrangements made at the first point of sale.

Storage: This can take place on farm, in privately owned and managed warehouses, in publicly owned storage sites often managed by government (food reserve) or parastatal agencies or accredited electronic warehouse linked to commodity exchange market. The technologies and management relations will vary depending on adopted storage system.

Processing: The processing stage involves the transformation of agriculture raw materials into one or more finished internationally traded goods. Raw commodities, of course, are also traded and this stage may not apply to every crop. This is the final step in the value chain before marketing. This step also has a broad array of technologies and interrelationships. The processing might target direct maize meal consumption (the simplest, but most predominant use) or animal feeds, where the maize is mixed with other products to produce compound feeds or maize-based prepared products. The end markets for maize varied – split between direct consumption of maize flour or finished manufactured products.

Processing

i. Cottage processing

Maize is processed into different products for various uses at the traditional or home level. In Nigeria, traditional processing of maize has been by pestle and mortar, and at times by stone grinding. However, significant changes occur in the process of maize for major end users. The mortar and pestles and stone grinding are being replaced by motor operated mills located in market places and even in some households (Mitta and Kaml, 1983). Manufacturers are fabricating plate mills using electric motors or petrol engines for grinding maize. Some millers dehull (digestion) the maize, before milling on a premier or hammer will produce flour (Adeyemi, 1993)

Cottage processing of maize uses the following methods:

Cleaning: The first step is to clean the maize. This is necessary to remove foreign material that might contaminate the final product and to remove debris, stones that may damage processing utensils

Winnowing: Winnowing further removes finer particles within the maize

Washing: In clean water to remove dust and other particles.

Drying: Sun drying maize before milling this produces uniform and more flour when maize is milled.

Roasting: Refers to dry treatment of process maize, the dry heat renders the maize brittle and the said coat subsequently cracks thereby making it easy to mill or use. Roasting improves the maize flavor and texture.

Soaking: Is the pre-treatment given to maize for easy fermentation and fast cooking of whole maize.

Milling: Maize could be milled into paste when sacked or cooked or powder depending on the type of food preparation method to be used. The waiser mills of maize (grit) is used for pate or steamed products, while the finer one is the flour.

Sieving: Finer flour of milled maize sieved to remove unwanted particles.

Sprouting: Maize is soaked in water for two or more days. Drain off the water and cover with clean wet jute bag for deliberate sprouting of maize. Sprouting maize are used in recipes as desired.

Large scale utilization

Maize is major cereal crop. It is consumed in diversified forms to meet taste, preference and environment. Maize utilization pattern as human food is changing tending more toward the fast foods. The demand for

convenience foods that meet nutritional and health requirements has put the Nigerians in the use of corn for human foods and industrial products.

- Large Scale: Industrial utilization of maize is largely determined by the quality characteristics of the grains in terms of its physical and chemical attributes of the kernel (Adeyemi, 1993).

i. **Feed uses:** Animal feed accounts for 70 percent or more of total maize utilization. Maize is the feed ingredient of choices in formula feeds because of its low cost and high degree of consistency

ii. **Crop residue: utilization (Forge uses):** Crop residue are basically high energy concentrates and natural supplements to protein-rich feeds. These residues are used mainly during the month of November – April. The use of maize in as forage introduces another critical actor- herdsmen/livestock sector into it value chain.

iii. **Alkaline utilization of maize**: Maize has been the traditional cereal for the preparation of tortillas. Tortillas are flat circular dough pieces that are baked on a griddle. The maize can be treated with spices, condiments and other ingredients to produce a large variety of products.

iv. **Maize in the baking, soft drinks and confectionery industries**: In many African countries, maize is one of the local sources of flour for the baking industries. It is used in the production of composite bread, muffins, fibers, pancakes, biscuits, and doughnut. Maize formulas often include wheat flour (composite flour) in production.

v. **Pop-corn Production**: Popcorn is a popular snack. Consumers' wants popcorn that is tender, good tasting, free from hulls.

Grits Maize

vi. **Fermentation and Distilling:**

Various alcoholic beverages and industrial products are produced by maize distilling and fermentation industries. Malting converts maize starch to sugar with the help of amylase enzyme that are found in the embryo of maize. The fermentation ability of maize starch and sweeteners has also made it an important feedstock for ethanol manufacture. Ethanol is being used both as a complete fuel substitute in gasoline engines and in medicine.

vii. **Breakfast Cereal**: Cornflakes, custard

viii. **Fortified Foods**

ix. **Maize Oil:** Can be extracted using the industrial wet milling process.

Soy-Vita- Whole maize is roasted, milled and sieved to obtain maize flour. 25% of soy flour is mixed with 75% of the maize flour to obtain soy vita that is in high demand by many homes, schools, hospitals or clinics.

Soy-vita contains about 13.25% protein, 9.6% fat, 3.4% moisture and 1.4% crude fiber.

Large scale processing

Major industrial Processing of maize is based on maize types and kind. Three methods of industrial processing exist (Omueti, 1999)

- Industrial dry milling
- Industrial wet milling
- Industrial fermentation

i. Dry milling of maize grain generally involves the physical separation of the parts of the grain as clearly as possible. (see figure 13)

Fig. 13: Brief Description of Dry-Milling of Maize

	Operation	Objectives	Production
1.	Corn Cleaning	Remove foreign materials	Clean grains
2.	Washing (Fresh water)	Remove foreign materials	Clean grains
3.	Tempering	(a) Toughens the tip cap So it stays with the bran	Toughened tip cap of grain
		(b) Loosen, soften, mellow the Germ.	Soft endosperm
		(c) Hydrates the endosperm to obtain maximal grit yields and minimum flour.	Unbroken endosperm
4.	Degerming Using l Attrition mill Cooling/Aspirating & Sifting Drying	Remove hulls	degermed grains
5.	Aspirating/Expelling	Remove crude oil	defatted grits
6.	Sifting	Separation of particles	Flaking grits
7.	Roller Milling	Reduction of particle size	Brewers: grit Corn meal Corn flour
8.	Excursion cooking	gelatinization of starch	Pre-gelled flour

Source: Omueti, O. (1999)

Industrial Wet Milling

Wet milling involves not only the separation of parts of the grain but in addition effects the separation of the parts of grain into their anatomical parts (see fig. 14)

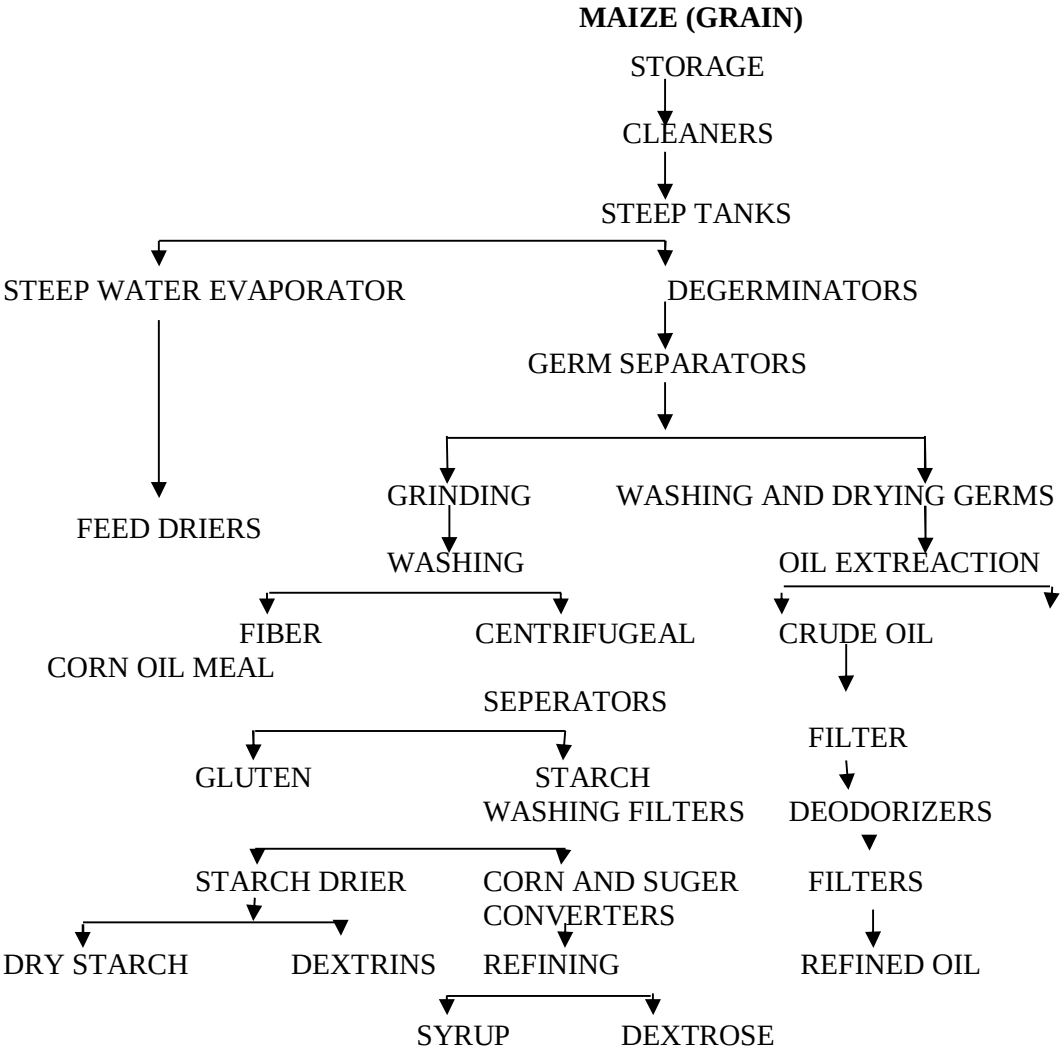


FIG. 14 SIMPLLIFIED WET-MILLING FLOW CHART

Industrial Fermentation

In brewing industry, corn syrup is used as source of fermentable in beer and malt liquor, various alcoholic beverages are produced by maize distillation. Alkali cooking is a process which involves cooking of corn again in boiling lime solution and steeping overnight (Fig. 15)

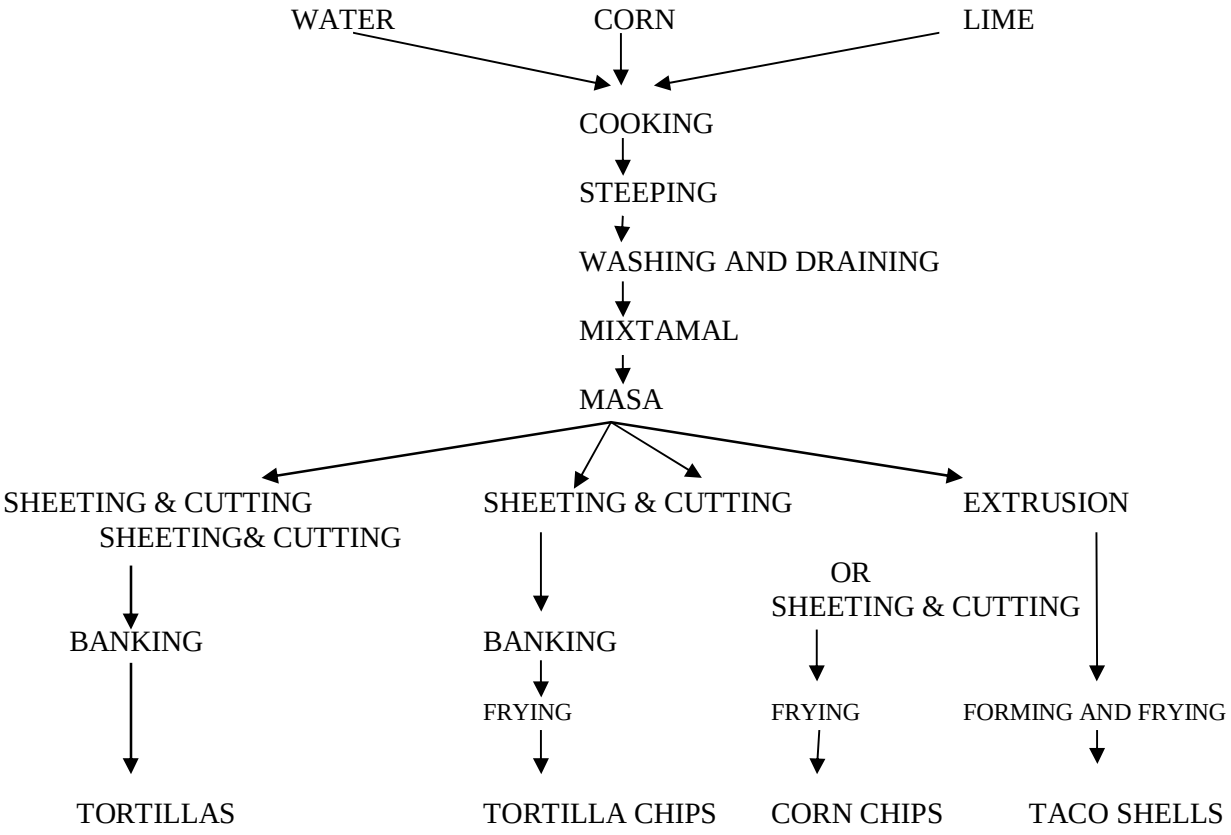


FIG.15: PRODUCTS FROM ALKALINE-COOKED CORN AND MASA

Marketing
Maize production and marketing costs

Quality aspects

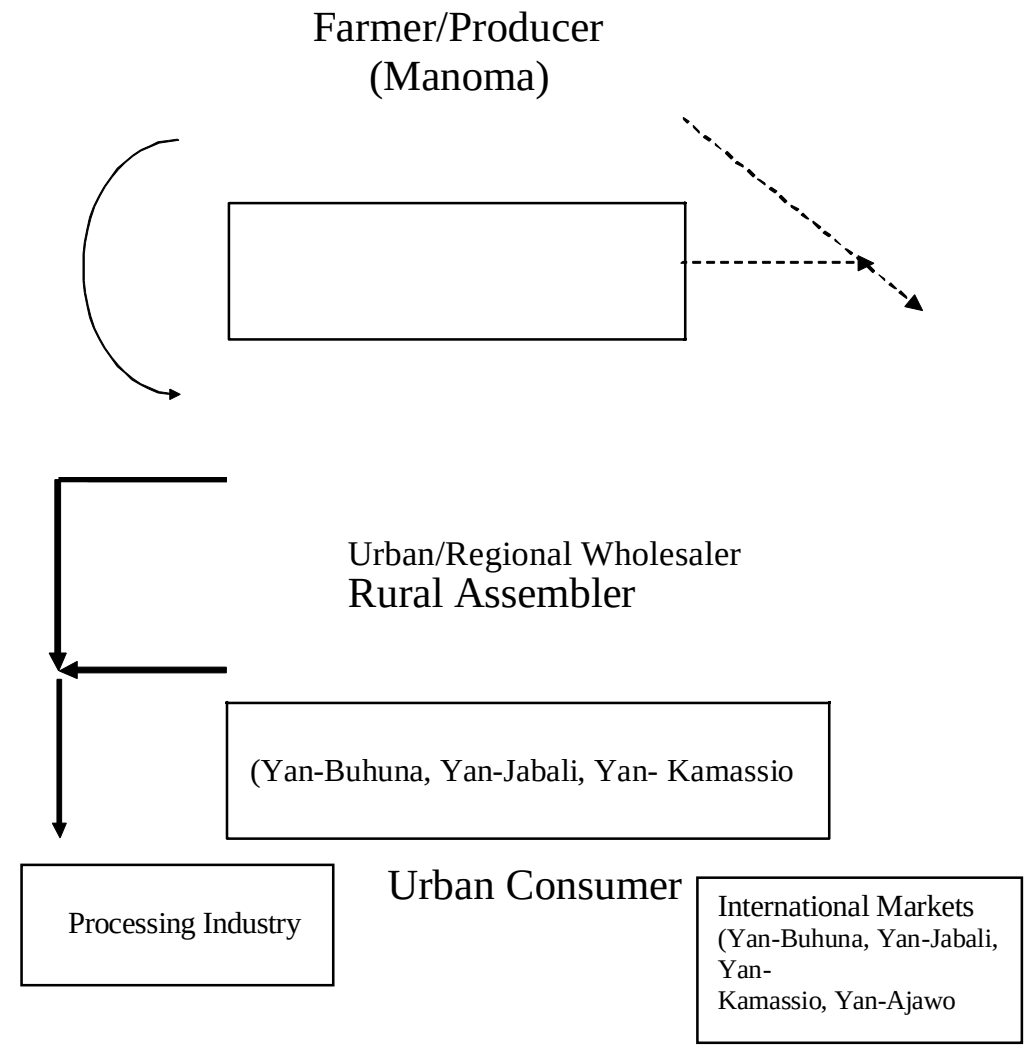
Raw maize specifications as raw material for animal feed and cereal food

 In order to sell maize to agro-processors it is extremely important that the grains meet several quality specifications. If these specifications are not met, the maize may be rejected by the buyer.

The following specifications apply:

- Maize: white or yellow
- Foreign matter: maximum 0.9%
- Broken small grains: maximum 8.0%
- Germinated grains: nil
- Hectolitre weight 70.0 kg/hl
- Moldy grains: nil
- Moisture content: 12.0%
- Heat damaged grains: maximum 1.0%
- Insect damaged grains: 1.0%
- Weather damaged grains: maximum 2.0%
- Dis-colored grains: maximum 2.0%

Figure 16: Marketing channel for Maize in Northern Nigeria.



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Supporting services

In addition to the direct functions within the value chain, supporting services are required for the system to function efficiently. These supporting services can be represented by interconnected chains, such as equipment and input supply (each of which has its own value chain), pure services (such management services to operate storage silos or extension services to provide advice to the farmers) or financial services (including investment capital, working capital, or insurance) cuts across each component of the value chain. Many of the supporting services may be imbedded in the functions of a supplier of another input - for instance seed or input suppliers have a strong incentive to carry out farmer awareness and extension services to increase the sale of their products.

Commodity exchanges, where the product can be transparently traded, are an important service within the value chain though this currently under developed.

CONSUMPTION

Consumer education promotion

Maize is an excellent source of carbohydrate and good quality oil. The energy value of maize is complete when milled whole. Although maize contains about 10% protein, about half of the protein consists of zein, which is especially low in lysine and tryptophan essential amino acids). Diets that rely heavily on maize as an energy source may be deficient in certain amine acids (components of protein) and vitamins.

It is therefore essential to consume foods that complement the protein and vitamins present in maize (protein foamy legume have higher lysine and tryptophan). Researchers have tried to correct this deficiency by developing Quality Protein Maize (QPM) varieties which are rich in both amino acids.

An approach for improving protein quality in maize-based diets is to grow and to use quality protein maize (QPM) varieties. The promotion of these new varieties of superior nutrient qualities has been low hence potential farmers/users of QPM are not yet aware of them. The QPM varieties have nearly double the percentages of lysine and tryptophan. Yellow maize contains vitamins A, while white maize does not. While this vitamin can make a contribution to human nutrition the amounts of the vitamin present is insufficient to meet the needs. The nutritional disease pellagra is sometimes associated with maize-based diets; resulting from a deficiency of niacin. One approach for improving niacin intake in maize-based diets includes complementation with foods rich in niacin such as groundnuts and fish. (Kling 1991)

Several factors affect the nutritive value of maize dishes:

- Variety of maize
- Production environment
- Condition of the grain
- Presence of pathogens
- Portion of the kernel utilized
- Method of preparation
- Complementation with other foods

Storage

Maize grain has generally good storage properties. Moisture content is the principal influence on storability because the maize kernel is fairly hygroscopic. Rats, mice and other rodents are important source of damage to stored maize grain. They cause loses by consuming grain, fouling grain with faeces, urine, hairs and dead bodies, by transmitting disease through body excreta and by destroying containers and bags.

Beneficial uses of the commodity/Superiority to others

Maize kernel is made up of endosperm (82.9% of total dry weight), germ (11.1%), pericarp (5.3% and tip cap, 0.8%). The endosperm consists of starch granules embedded in a protein matrix, with floury granules. Maize is an energy source; the cereals compare favorably with the root and tuber crops and are similar in energy value to dried legumes. Cereals are important contributors of (vitamin, riboflavin, and niacin). Maize is a staple food in Nigeria, can be utilized by small-scale processors and at industrial level to formulate and package various types of food. It is now a common snacks in boiled or roasted forms and eaten with various other foods.

Marketing Maize

Nigeria's maize platform has several new market opportunities for farmers through contract farming, promoting soybean production and livestock sub-sector. This range from the provision of high yielding improved varieties, extension services, seed supply systems by community seed schemes and seed companies, supply of capital items and production/marketing consumables, provision of credits and risks cover and product development. Every effort which support these endeavors also promote maize.

Indeed the challenges to maize value chain are mostly based on factors associated with production, processing and marketing indicators which involve different actors.

The basic marketing channel for maize in Nigeria is very similar to that found in most developing countries in Africa. It is a highly fragmented marketing channel based on individual family enterprises. One problem with the fragmented marketing channel is that market volume for each family enterprise is so small that the mark-ups have to be large enough so that the traders can make a modest profit.

Market Channel: The basic commodity marketing channel for which Maize will ultimately pass typically involves six steps.

1. It may begin with the farmer who produces the crop.
2. The second person is the rural buyer that buys from the farmer and transports the commodities to the accumulating rural assemblers in the nearest market.
3. The next step would be the rural wholesale who buys from the rural assembler and then sells either to local processors or consumers
4. After the rural wholesaler is the transporter who bulks up the commodities he needs and transports them to the processor or to the larger cities of industrial users.
5. Alternatively they will be delivered to the commodity market in the major cities, and distributed to different family enterprises that comprise the distributing wholesalers.
6. The maize is then sold either directly indirectly to consumers or to the retailers. These retailers, many of whom are women, may be dealing with other commodities.

The predominant market model in maize value chain includes but not limited to the following:

Private business model:

As complex and fragmented as it might appear it was developed by the private, profit conscious, traders and may thus have evolved into the optimal business efficient for the economy in which it is operating.

Cooperative Business Model: Co-operative societies are emerging and applying themselves to cooperative marketing and in the process becoming increasingly active in shaping the prices of their commodities. Although the model reduces transaction

cost it is often administratively cumbersome which may impact on its competitiveness.

Cell Phones

Cell phones can be used to facilitate market information services to smoothen distribution of margins along MVC. in order to reduce transaction costs, it is critical for farmers or rural agro-dealers to have easy access to several rural assemblers who buy maize through ICT providers.

Consumer Promotions and natural resource management

The ongoing promotion of maize by agricultural transformation agenda as well as the call for use of maize in mixed cropping scheme with soybean has potential for increased soil fertility improvement.

Small and medium scale Local processing

Local processing and consumption:

Opportunity for promoting the diversified consumption of Maize through local processing will assist the fortune of the crop. Although currently local processing into tuwo, masa, and other staple food commodity are evident expansion of maize based products will increase demand for maize.

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