Grain Legume Processing Workshop

Value Addition to Bean, Cowpea, Groundnut and Soybean by Small-Scale African Farmers

16 to 18 March 2011 Kleen Homes and Gardens
Butere, Kenya
two day training workshop on the processing and preparation of grain legumes

to provide N2Africa Outreach Team members and others to better understand grain legume utilization
to empower their respective grassroots groups, communities or businesses to more wisely consume and add value to their legume produce
combines short presentations with related practicals and demonstrations

topics covered include the role of grain legumes in household nutrition, protecting grain legume quality and meeting industry standards, and disseminating food processing and preparation technologies
All participants share the following qualifications

- A basic knowledge of human nutrition
- Fluency in English
- Willingness to create and consume new foods
- Well positioned to liaise with N2Africa, grassroots groups and the private sector in the future
Some popular grain legume varieties in Kenya: each with its own characteristics and advantages
Some grain legume products we will better understand, learn to process and enjoy during workshop legume breaks and meals (clockwise from top left: bean sprouts, cowpea leaves, soy burger, groundnut clusters, textured vegetable protein, tofu)
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>0900-0930</td>
<td>Course objectives and roundtable introduction</td>
<td>PL Woomer</td>
</tr>
<tr>
<td>0930-1000</td>
<td>Grain legumes in Kenyan households</td>
<td>J Ongoma</td>
</tr>
<tr>
<td>1000-1030</td>
<td>Nutritional value of grain legumes</td>
<td>A Masinde</td>
</tr>
<tr>
<td>1030-1045</td>
<td>Demonstration: Make a quick snack</td>
<td>PL Woomer</td>
</tr>
<tr>
<td>1045-1100</td>
<td><strong>Legume break</strong></td>
<td></td>
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<tr>
<td>1100-1115</td>
<td><strong>Morning Practical:</strong> Assign practical teams and workspace</td>
<td>J Ongoma</td>
</tr>
<tr>
<td>1115-1200</td>
<td>Pre-cooking grain legumes, volume-weight relations</td>
<td>J Ongoma</td>
</tr>
<tr>
<td>1200-1300</td>
<td>Preparing a nutritionally-complete meal</td>
<td>Team</td>
</tr>
<tr>
<td>1300-1400</td>
<td><strong>Lunch break:</strong> eating a nutritionally-complete meal</td>
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</tr>
<tr>
<td>1400-1500</td>
<td>Post-harvest handling and grain quality assurance</td>
<td>PL Woomer</td>
</tr>
<tr>
<td>1500-1600</td>
<td><strong>Afternoon Practical:</strong> Grain quality assessment</td>
<td>PL Woomer</td>
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<tr>
<td>1600-1615</td>
<td>Demonstration: Make a quick snack</td>
<td>J Ongoma</td>
</tr>
<tr>
<td>1615-1630</td>
<td><strong>Legume break</strong></td>
<td></td>
</tr>
<tr>
<td>1630-1730</td>
<td>Preparing a nutritionally-complete meal</td>
<td>Team</td>
</tr>
<tr>
<td>1830</td>
<td><strong>Dinner:</strong> eating a nutritionally-complete meal</td>
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</table>
N2Africa Pilot Grain Legume Processing and Preparation Workshop  
Day 2 - 18 May 2011

0830-0915 Flexible planning of household diets  
0915-0945 Principles of complete nutrition  
0945-1030 Demonstration: Preparing soy milk  
1030-1045 Demonstration: Make a quick snack  
1045-1100 Legume break

1100-1130 Disseminating grain legume nutrition knowledge  
1130-1200 Developing work plans for follow up actions  
1200-1300 Morning practical: A nutritionally-complete meal  
1300-1400 Lunch break: eating a nutritionally-complete meal  
1400-1430 Organizing a grain legume cooking contest  
1430-1600 Afternoon Practical: Creating a winning recipe  
1600-1630 Judging, award of certificates and closing
N2Africa Grain Legumes and their Nutritional Value

Alice Masinde, ARDAP

Grain Legume Processing Workshop
Day 2 Morning Lecture
Nutritional value of grain legumes

- Food legumes offer not only excellent sources of protein and starch, but also fat (oil), vitamins and minerals.

- Different legumes and plant parts have higher concentrations of each.

- These benefits result from the versatility of legumes as sources of edible leaves, green pods, unripe seed, grain and sprouts.
<table>
<thead>
<tr>
<th>legume</th>
<th>edible part</th>
<th>protein</th>
<th>fat</th>
<th>carbohydrate</th>
</tr>
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<tbody>
<tr>
<td>common bean</td>
<td>seed</td>
<td>25</td>
<td>2</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>pod</td>
<td>22</td>
<td>2</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>leaf</td>
<td>27</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>cowpea</td>
<td>seed</td>
<td>26</td>
<td>2</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>pod</td>
<td>33</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>leaf</td>
<td>36</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>groundnut</td>
<td>seed</td>
<td>25</td>
<td>48</td>
<td>8</td>
</tr>
<tr>
<td>soybean</td>
<td>seed</td>
<td>39</td>
<td>22</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>sprout</td>
<td>14</td>
<td>10</td>
<td>43</td>
</tr>
</tbody>
</table>
Vitamins and minerals

- Grain legumes are rich in minerals (calcium and phosphorus) and vitamins A, B (e.g. thiamin) and C
- Leaves and green pods having higher concentrations of these essential nutrients
- Legumes also contain significant fiber, sodium, potassium, iron and other members of the vitamin B complex
# Mineral and vitamin contents of the edible portions of four grain legumes

<table>
<thead>
<tr>
<th>legume</th>
<th>edible part</th>
<th>Ca</th>
<th>P</th>
<th>Vitamin A</th>
<th>Vitamin C</th>
<th>Thiamine</th>
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<tr>
<td>common bean</td>
<td>seed</td>
<td>137</td>
<td>368</td>
<td>11</td>
<td>2</td>
<td>0.42</td>
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<tr>
<td></td>
<td>pod</td>
<td>350</td>
<td>300</td>
<td>24559</td>
<td>834</td>
<td>1.36</td>
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<tr>
<td></td>
<td>leaf</td>
<td>2076</td>
<td>568</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cowpea</td>
<td>seed</td>
<td>124</td>
<td>432</td>
<td>11</td>
<td>1</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>pod</td>
<td>478</td>
<td>432</td>
<td>4027</td>
<td>212</td>
<td>1.24</td>
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<tr>
<td></td>
<td>leaf</td>
<td>664</td>
<td>964</td>
<td></td>
<td>327</td>
<td>3.18</td>
</tr>
<tr>
<td>groundnut</td>
<td>seed</td>
<td>52</td>
<td>438</td>
<td>16</td>
<td>1</td>
<td>0.84</td>
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<tr>
<td>soybean</td>
<td>seed</td>
<td>245</td>
<td>606</td>
<td>11</td>
<td>0</td>
<td>0.73</td>
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<tr>
<td></td>
<td>sprout</td>
<td>251</td>
<td>580</td>
<td>11</td>
<td>0</td>
<td>0.74</td>
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</table>
Soybean nutrition

Soybean is of particular importance because of its high protein content, balanced nutritional composition and opportunities for value-added processing.

Soybeans are rich in omega fatty acids, iron, magnesium, potassium and contain no cholesterol.

Soybeans are particularly important in child nutrition as it prevents stunting due to protein deficiency, supports neurological development, builds stronger bones and strengthens the immune system.
## Nutritional value of soybean products

<table>
<thead>
<tr>
<th>preparation</th>
<th>protein</th>
<th>carbohydrate</th>
<th>fat</th>
<th>fibre</th>
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</thead>
<tbody>
<tr>
<td>boiled soybeans</td>
<td>17</td>
<td>5</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>pressed oil</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>soy sauce</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>soybean curd</td>
<td>8</td>
<td>0.7</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>soy yoghurt</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>textured soy meal</td>
<td>35</td>
<td>28</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Constituents</td>
<td>Soya Milk</td>
<td>Cow's Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td>5.7%</td>
<td>3.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipids (fat)</td>
<td>2.4%</td>
<td>4.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>1.4%</td>
<td>4.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minerals</td>
<td>0.8%</td>
<td>0.7%</td>
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<tr>
<td>Water</td>
<td>90%</td>
<td>88%</td>
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</table>

Soy dairy products are recommended to those with lactose intolerance.
Harvesting groundnuts

- Harvesting is done by lifting the whole plants from the soil, allowing them to dry for a few days, threshing to recover the pods then removing the seeds by breaking the pods open.
- Care must be taken not to split groundnuts, excess broken seeds lower their value.
- Groundnuts must not be harvested in the rain or placed into heaps that remain damp and encourage mold, including dangerous aflatoxin.
### Nutritional value of groundnut products

<table>
<thead>
<tr>
<th>preparation</th>
<th>protein</th>
<th>carbohydrate</th>
<th>fat</th>
<th>fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>peanuts, raw</td>
<td>25</td>
<td>8</td>
<td>48</td>
<td>9</td>
</tr>
<tr>
<td>peanuts, roasted</td>
<td>26</td>
<td>10</td>
<td>49</td>
<td>8</td>
</tr>
<tr>
<td>peanut butter</td>
<td>24</td>
<td>15</td>
<td>50</td>
<td>6</td>
</tr>
<tr>
<td>peanut oil</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
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</table>

- processing groundnut affects its nutrient content to peanut butter results from passing clean groundnuts twice through cereal mills
- roasting may be done by placing groundnuts in an oven or on a pan or hot sand
- Fresh or dried leaves of cowpea may be steamed or boiled
- Drying picked leaves greatly reduces their perishability as the leaves readily re-hydrate
- But consumers are biased against wilted leaves in markets
- The immature green pods of many legumes may be cooked and consumed including those of bean and cowpea
### Nutritional value of raw and boiled cowpea leaves

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Protein</th>
<th>Carbohydrate</th>
<th>Fat</th>
<th>Fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw cowpea leaves</td>
<td>36</td>
<td>50</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>boiled cowpea leaves</td>
<td>22</td>
<td>46</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Leaves are high in protein.

Nutrients lost during boiling

Advantage of steaming or stir frying
Many viable dried grains may be converted into green vegetables by sprouting

- sprouts from bean, soybean and green gram
- wash beans and remove defective grains
- soak 1 cup of seed in water overnight and place into small tubs with drainage
- cover with a clean, moist cloth, keep in the dark
- sprinkle with clean water 3 or 4 times a day
- ready when 3 to 6 cm in length after 4 or 5 days
- wash in clean water to remove seed coats
- eaten in salads or cooked as vegetables
Make a Quick Snack
Glazed Groundnuts and Soy Beverage
PL Woomer
N2Africa Outreach Officer

Grain Legume Processing Workshop
Day 1 Morning Legume Break
Glazed groundnuts  
Makes 10 to 12 clusters

**Ingredients**
- 1 cup raw groundnuts or soybean crunchies
- ½ cup sugar
- 2 tbsp butter or margarine

**Preparation:** In a heavy pan, combine nuts, sugar, and butter or margarine. Cook over medium heat, stirring constantly for 7 minutes or until sugar is melted and golden in color and nuts are roasted. Spread nuts on aluminum foil; separate into clusters. Sprinkle lightly with salt and cool.
Talented cooks improvise!

e.g. glazed groundnuts
substitute soy crunchies
add sesame
add chocolate
Post-harvest handling and grain quality assurance

PL Woomer
N2Africa Outreach Officer

Grain Legume Processing Workshop
Day 1 Afternoon Lecture
Post-harvest handling of legume grains

Drying grain on the ground collects foreign materials and stones that may damage mills.

Field and storage pests often destroy untreated grain.

Mixed colored grains considerably lower the market value.

Each bag is expected to meet a specified weight usually 50 or 90 kg, strong local market for 5 kg beans.

Winnowing involves slowly pouring seeds from one surface to a lower one, permitting even slight wind to remove lighter foreign materials.

Winnowing is time consuming and may be replaced using properly sized sieves.
<table>
<thead>
<tr>
<th>quality parameter</th>
<th>threshold</th>
<th>target</th>
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</thead>
<tbody>
<tr>
<td>moisture</td>
<td>&lt; 13.5%</td>
<td>12%</td>
</tr>
<tr>
<td>split grain</td>
<td>&lt; 5%</td>
<td>3%</td>
</tr>
<tr>
<td>off-color</td>
<td>&lt; 2%</td>
<td>0.5%</td>
</tr>
<tr>
<td>shriveled</td>
<td>&lt; 1%</td>
<td>1%</td>
</tr>
<tr>
<td>insect damaged</td>
<td>&lt; 3%</td>
<td>1%</td>
</tr>
<tr>
<td>foreign matter</td>
<td>&lt; 1%</td>
<td>0.5%</td>
</tr>
<tr>
<td>total defective</td>
<td>&lt; 10%</td>
<td>6%</td>
</tr>
</tbody>
</table>

grow varieties with >40 crude protein and < 18% oil

The grains must also be free from objectionable odors and have no live insects
Quality soybeans (right), foreign matter (left) and off-grade grain (center).
Beware of Aflatoxins!

- Aflatoxins are lethal mycotoxins produced by some fungi.
- They mainly grow on grains and legumes during storage.
- These poisons are heat stable, neither cooking nor freezing destroys the toxin.
- They remain on the food indefinitely, causing liver disease and predisposing humans to cancer.

Some precautionary measures include:
- Storing grain under clean, dry conditions
- Consuming fresh rather than dried groundnuts
- Check for signs of discoloration of grains and seed
- Never swallowing foods with the characteristic bitter taste of aflatoxin
Aflatoxins are naturally occurring mycotoxins that are produced by many species of *Aspergillus*,

Aflatoxins are toxic and among the most carcinogenic substances known.

The native habitat of *Aspergillus* is soil, decaying vegetation, and grains.

20 ppb limit for all food for human consumption
Post harvest handling assures that grain legumes provide quality food and meet buyers’ standards

Excess moisture predisposes to dangerous fungi (mycotoxins)

Tradeoff between field drying and shatter loss during harvesting

Drying on ground collects foreign materials and stones damage mills

Field and storage pests may damage or destroy the crop

Mixed colored grains lower the market value

Post harvest handling tools are essential to meeting legume grain industry standards
Grain Moisture Meters

A method of measuring the moisture content is available through the use of portable grain moisture meters.

Most moisture meters are calibrated to different types of grain.

Two basic models are available: probes which are inserted directly into grain bags, and those with chambers where grain is removed from containers (right). Samples of about 150 g poured into the devise and within a few seconds, the meter provides users with a moisture reading.

Grain moisture contents range between 9% and 13%.
LDS Moisture Analyzer Specifications

Objects: grain and other foods

Moisture range: 3 to 35% 

Error: ±0.5%

Time: < 10 seconds

Temperature range: 0 to 40°C

Humidity: < 80%
Procedure for collection point quality control

1. Sample about 150 g of grain (volume of LDS top chamber)
2. Place into LDS Moisture Analyzer top chamber slot
3. Turn on LDS, set mode to P2 (soybean) using + or - keys
4. Spring feed lower chamber, wait until moisture content (%) appears
5. Record sample moisture content, flag if >12.5%
6. Press OK, sample weight (g) appears, record weight (W1)
7. Remove sample, separate off-grade grain
8. Return remaining sample to upper chamber, feed to lower chamber
9. Check that moisture measurement is the same
10. Press OK, record new sample weight (W2)
11. Calculate off-grade as off-grade (%) = (1 – (W2/W1)) x 100
12. Record off-grade (%), flag if >10%
Grain legumes in Kenyan households

J Ongoma

Kleen Homes and Gardens

Grain Legume Processing Workshop
Day 1 Morning Lecture
Important food legumes: Bean

Description: A bushy or climbing annual with trifoliate, slightly hairy leaves and small, white, yellow or purple flowers bearing long, smooth pods forming large, kidney-shaped seed. Many varieties and land races.


Propagation: By seed, about 2500 seed per kg. Rapid germination.

Uses: Leaves, young pods, young and mature seeds and sprouts are edible.
Important food legumes: Cowpea

**Description:** Erect, prostrate or climbing annual with trifoliate leaves and white, yellow or violet flowers on short pedicels with long to very long, slender, smooth pods bearing round or cylindrical seeds. Branching roots bear globular nodules.

**Ecology:** Grown throughout the tropics and subtropics. Tolerates heat, drought and soil acidity but sensitive to waterlogging. Susceptible to many insects. Native to Africa.

**Propagation:** By seed, about 7000 seed per kg.

**Uses:** Leaves, young pods, young and mature seeds are edible. Palatable to livestock.
Important food legumes: Groundnut

**Description:** An erect (bunch) or trailing (runner) annual herb 60 cm in height with pinnate leaves and fleshy stems. Flowers are yellow, forming at lower nodes, fertilized fruit peg into the soil, pod is rounded and dry.

**Ecology:** Native of S. America, requires about 600 mm of rainfall followed by dry ripening. Best suited to sandy loams, acid tolerant but requires calcium for pegging.

**Propagation:** Mainly by seed (1200 seeds per kg) but stem cuttings root.

**Uses:** Nuts are eaten raw or roasted and milled into peanut butter. Seeds are pressed for vegetable oil. Leaves are fodder.
Important food legumes: Soybean

Description: Bush annual (up to 180 cm) with hairy trifoliate leaves and small flowers forming clusters of short, hairy pods. Roots are deep and bear many round nodules.

Ecology: Grown from tropics to temperate regions. Tolerates acid soils and short-term drought. Promiscuously nodulating varieties recently developed.

Propagation: By seed, about 7000 seed per kg

Uses: Important source of vegetable oil and protein. Edible green and mature seeds. Fodder and hay.

Rust poses a threat to soybean cultivation
Processing grain legumes

- Field legume
- Human food
- Dried grain

- Livestock feed
- Planting seed
- Press cake

- Green pod or seed
  - Sprouting
  - Soaking & cooking
  - Grinding
    - Flour
      - Pressing
        - Cooking oil
        - Press cake

- Fresh pod
  - Shelling
  - Freezing
  - Canning
  - Drying

- Fresh leaf
  - Freezing
  - Canning
  - Drying
Weights and Measures

pinch = about $\frac{1}{4}$ teaspoon
3 teaspoons (tsp) = 1 tablespoon (tbsp)
1 tablespoon = $\frac{1}{2}$ ounce = 15 ml
2 tablespoons = 1 ounce = 30 ml (liquid)
4 tablespoons = $\frac{1}{4}$ cup
16 tablespoons = 1 cup
1 cup = 8 ounces = 240 ml
2 cups = 1 pint
4 cups = 2 pints = 1 quart
1 quart = 950 ml ≈ 1 litre
4 quarts = 1 gallon
Volumetric measurement tools

The traditional cups may easily be translated into the metric system:

1 cup = 240 ml
1 tbsp = 15 ml
1 tsp = 5 ml
<table>
<thead>
<tr>
<th>grain legume</th>
<th>dry weight (g/cup)</th>
<th>soaking uptake (ml water)</th>
<th>cooking time (minutes)</th>
<th>cooked weight (g/dry cup)</th>
<th>cooked volume (cups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney bean</td>
<td>198</td>
<td>225</td>
<td>75</td>
<td>440</td>
<td>2.8</td>
</tr>
<tr>
<td>Nyayo bean</td>
<td>191</td>
<td>188</td>
<td>75</td>
<td>390</td>
<td>2.5</td>
</tr>
<tr>
<td>Mwitemenia bean</td>
<td>183</td>
<td>182</td>
<td>90</td>
<td>393</td>
<td>2.3</td>
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<tr>
<td>White bean</td>
<td>203</td>
<td>208</td>
<td>75</td>
<td>409</td>
<td>2.5</td>
</tr>
<tr>
<td>Black-eye cowpea</td>
<td>211</td>
<td>229</td>
<td>45</td>
<td>480</td>
<td>3.0</td>
</tr>
<tr>
<td>Red cowpea</td>
<td>198</td>
<td>234</td>
<td>35</td>
<td>460</td>
<td>3.0</td>
</tr>
<tr>
<td>Soybean 19</td>
<td>169</td>
<td>217</td>
<td>90</td>
<td>352</td>
<td>2.3</td>
</tr>
</tbody>
</table>
Assessing grain legume cooking characteristics

1. Measure 1 cup of each grain and weigh on scale, record weight
2. Soak grain overnight in 4 cups water
3. Drain excess water, measure volume and weight
4. Transfer to cooking pan, boil each grain in 3 cups of water
5. Sample cooked grain after $\frac{1}{2}$, $\frac{3}{4}$, 1 and 1½ hours, record impressions
6. Drain excess water, measure volume and weight
7. Summarize results in table format
Make a Quick Snack
Glazed Groundnuts and Soy Beverage
PL Woomer
N2Africa Outreach Officer

Grain Legume Processing Workshop
Day 1 Morning Legume Break
Glazed groundnuts

makes 10 to 12 clusters

Ingredients

1 cup raw groundnuts or soybean crunchies

½ cup sugar

2 tbsp butter or margarine

Preparation: In a heavy pan, combine nuts, sugar, and butter or margarine. Cook over medium heat, stirring constantly for 7 minutes or until sugar is melted and golden in color and nuts are roasted. Spread nuts on aluminum foil; separate into clusters. Sprinkle lightly with salt and cool.
Talented cooks improvise!

e.g. glazed groundnuts
substitute soy crunchies
add sesame
add chocolate
Morning Practical: Assign practical teams and workspace

J. Ongoma

Grain Legume Processing Workshop
Day 1 Morning Practical
Organizing a grain legume cooking contest

PL Woomer
N2Africa Outreach Officer

Grain Legume Processing Workshop
Day 2 Afternoon Lecture
Grain Legume Cooking Contest

A great way to stimulate interest in grain legumes, popularize new recipes and acknowledge superior cooking skills within the local community.

- Readily incorporated within farmer field days and agricultural shows.
- Participants arranged in advance and submit a recipe for competition.
- Variety of entries selected by organizers.
- Rules of the contest are established and explained to the contestants.
- Contestants are expected to produce sufficient dishes for both the judges and members of the public.
Participants of the Grain Legume Processing Workshop
Kleen Homes and Gardens
17 and 18 May 2011
Guidelines for the cooking contest rules

1. Entries consist of locally-produced grain legumes and vegetables that are boiled, fried or steamed.
2. Prepared start-to-finish within three hours using no more than two cooking vessels.
3. Grain legumes may be pre-soaked but not pre-cooked.
4. Each contestant is provided similar cooking facilities but must supply their own pot, utensils and ingredients.
5. Only one entry is allowed per participant in a single contest.
6. Every entry must be accompanied by a list of ingredients and recipe.
7. Dishes judged shortly after preparation in the presence of the contestant.
Contestants are provided identical facilities and time to prepare a dish conforming to contest rules.
Selection of Ingredients

- The following ingredients are strictly forbidden; meat, fish, cheese, canned products, noodles, arrowroot corms and cassava roots (due to the lengthy cooking time necessary to detoxify).
- Cooking fat, butter and margarine may be used at the contestant’s discretion.
- Use of grain legume products such as soymilk or milled flour is encouraged.
- Entries are permitted the use of non-indigenous plants, herbs and spices, but excess reliance upon non-traditional ingredients may be penalized during judging.
Judging Criteria

- There are three judges, including a head judge
- Judges evaluate entries on the basis of taste, texture, presentation and any other criteria they deem important
- Contestants may be called upon to sample their own entries before judging, and the judges may ask questions of contestants
- Judging takes place during the periods allocated to the cooking contest while the contestant is present
- The best three dishes are selected based upon taste, presentation, creativity and communication with the judges
- Prizes awarded during a public ceremony.
Judging by top chefs is not necessary, better to aim toward tastes of the local community.
N2Africa Grain Legume Processing Workshop

Exercise 1. Assessing grain legume cooking characteristics (Day 1 Morning)

This practical provides cooperators to gain greater appreciation of available grain legume varieties and their cooking characteristics. The exercise requires advance preparation by organizers (e.g. soaking grain legumes the previous day), and about two hours for participants to complete their tasks. The participants are grouped into teams with each team evaluating one or two different grain legumes, and the results compiled across teams at the end of the exercise. The exercise results in a useful table that identifies the cooking times, tastes and textures of several grain legumes.

Advance preparation. Assemble several different grain legumes and perform steps one and two the day before.

Materials. One kg of six to eight different grain legumes, weighing scale, graduated cup measure, soaking basin (6), cooking pot, cooking apparatus.

Procedure

1. Measure 1 cup of each grain and weigh on scale, record weight, enter into table.
2. Transfer to plastic bowl, soak each grain legume overnight in 4 cups water
3. Drain excess water, blot dry, measure volume and reweigh. Calculate soaking uptake and enter into table. Note: soaking uptake (ml) = soaked weight (g) – original weight (g).
4. Transfer to cooking pan, add ¼ tsp salt, boil each grain in 3 cups of water, record time when boiling begins.
5. Sample cooked grain after ½, ¾, 1 and 1½ hours, record impressions on taste and texture.
6. When each grain is cooked, record time, drain excess water, measure volume using graduated measuring cup and weight using scale.
7. Summarize results in table format (below).

<table>
<thead>
<tr>
<th>grain legume type</th>
<th>dry weight g/cup</th>
<th>soaking uptake ml water</th>
<th>cooking time minutes</th>
<th>cooked weight g/dry cup</th>
<th>cooked volume cups</th>
</tr>
</thead>
</table>
N2Africa Grain Legume Processing Workshop

Exercise 2. Quality Assessment of Grain Legumes (Day 1 Afternoon)

This practical provides cooperators with greater appreciation of available grain legume industry standards and how to rapidly test grain for compliance. Grain standards include threshold values of moisture, insect damage, off-color and diseased grains, and foreign matter. The exercise requires about two hours for participants to complete their tasks. The participants are grouped into teams with each team evaluating a set of different grain legumes and the results compiled across teams at the end of the exercise. The exercise results in a useful table that identifies the cooking times, tastes and textures of several grain legumes.

Advance preparation. Obtain at least six samples of grain, taking care to include samples that contain a large proportion of off-grade grain and foreign matter.

Materials. Weighing scale, grain moisture meter (LDS Moisture Analyzer), sieves (1 cm, 5 mm, 1 mm), brush or small spatula

Procedure
1. Smell the sample for objectionable odors, record impression on table below.
2. Sub-sample about 150 g of grain (about the volume of LDS Moisture Analyzer top chamber)
3. Place into LDS top chamber slot
4. Turn on LDS, set mode to P2 (soybean) using + or - keys
5. Spring feed lower chamber, wait until moisture content (%) appears
6. Record sample moisture content, flag if >12.5%
7. Press OK, sample weight (g) appears, record weight (W1). Transfer to weighing scale and reweigh. Compare weights.
8. Remove sample, place on clean, dry surface, separate off-grade grain using a brush or spatula. Separate sample into categories: acceptable grain, insect damaged, off-color and diseased grains, and foreign matter. Weigh each fraction using a scale. Calculate the proportion of each off-grade fraction as off-grade fraction (%) = (W_{fraction}/W1) x 100. Record the proportion of each fraction and enter into the table.
9. Return acceptable grain sample to moisture meter upper chamber, feed to lower chamber
10. Check that moisture measurement is the same
11. Press OK, record new sample weight (W2)
12. Calculate total off-grade as total off-grade (%) = (1 – (W2/W1)) x 100
13. Record off-grade (%), flag if >10%

<table>
<thead>
<tr>
<th>sample</th>
<th>W1</th>
<th>moisture</th>
<th>insect damage</th>
<th>off color</th>
<th>diseased (shriveled)</th>
<th>total off-grade</th>
<th>odor</th>
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Note: flag by underlining values that exceed industry thresholds.