Diversity management can achieve food and nutrition security in rural households of sub-Saharan Africa raises challenging issues. In these farming systems, a substantial share of the farm production is allocated to self-consumption but the link between production and food diversity within the farm remains fuzzy. Most of published studies use large data samples and statistical analyses to characterize these linkages. But their results are not always conclusive or even contradictory (Jone, 2017; Sibhatu, K.T., Qaim, M., 2018). Review: Meta-analysis of the association between production, diet diversity, and nutritional status in low- and middle-income countries. Nutr. Rev. 75, 769–782. doi:10.1093/nutrit/nux040

### RESULTS

Maize is the main crop and staple food in the region. The top first objective of the farm head is to provide maize for the family consumption throughout the year. Maize is grown in rotation with cotton in farms with sufficient land, workforce and cash flow. Otherwise traditional cereal crops can be grown then sold and exchanged or maize can be bought with income generated from other activities: livestock breeding, market gardening, off-farm activities.

#### Study sites

- **Makognadougou**: on a main road axis connecting the two main cities.
- **Gombélédougou**: quite isolated, close to a natural forest.
- **Wakuy**: the most isolated as compared to the two other villages.

Each village was selected to embrace sociocultural diversity (access to main roads, local market, natural forest): - Gombélédougou: on a main road axis connecting the two main cities.

Three villages were selected to embrace sociocultural diversity (access to main roads, local market, natural forest): - Gombélédougou: on a main road axis connecting the two main cities.

In each village, 14 farms were selected to embrace sociocultural diversity (ethnic group, religion, household structure). Each farm was monitored over one year on a 10-days time step (38 data replicates) regarding (i) crop and livestock management, (ii) crop and food stocks inventory, and (iii) dietary intake. This quantitative monitoring was completed by qualitative interviews conducted with each household head and the women in charge of cooking in order to understand both their crop and food choices.

Current cropping patterns are little diversified. Cereal crops (mostly maize) cover 29% of cultivated areas. Its combination with market-oriented crops (mostly cotton) exceeds 75% of cultivated areas. Legumes (mostly groundnut and cowpea) cover 13% of the cultivated areas in average.

When farm structure and crop choices typologies are crossed, it results in 15 combinations:

- S1 farms with little land and livestock per capita adopt a wide range of strategies (C, CL, CM, LM, MV); farms with the most available land grow cotton, other farms generate income from sales of cowpea, market garden or off-farm activities.
- S1 farms gather all the Peuhl farmers, traditionally breeders: The farm with the most available land grow cotton (CM), the others grow C or CL;
- Farms with better land and livestock assets per capita (S1L, S2 and S2L) grow CLM or CMV. Most farms have a complementary off-farm activity.
- S3L farms are all located in Wakuy and are specialized in cotton/maize rotation (CLM, CM). They have the greatest cultivated areas of the sample (>25 ha).

Crossing the three typologies results in 27 combinations, showing that the link between farm structure, crop choices and food choices is not straightforward.

#### Crop choices typology

**Crop choices typology**

Cropping patterns may combine C = cereal (maize, sorghum, rice), L = legumes (groundnut, cowpea), M = market-oriented crops (cotton, sorghum, vegetables), V = vegetables (onion, tomato, eggplant, cabbage) and house garden plant (gingale, Gunia aurea). Some combinations of C, L, M, and V were identified at farm level.

<table>
<thead>
<tr>
<th>Crop choices typology</th>
<th>Mean</th>
<th>CV</th>
<th>maize</th>
<th>sorghum</th>
<th>rice</th>
<th>cotton</th>
<th>groundnut</th>
<th>cowpea</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>3.13</td>
<td>0.31</td>
<td>0.28</td>
<td>0.13</td>
<td>0.15</td>
<td>0.54</td>
<td>0.32</td>
<td>0.28</td>
</tr>
<tr>
<td>S2</td>
<td>3.59</td>
<td>0.36</td>
<td>0.62</td>
<td>0.24</td>
<td>0.18</td>
<td>0.35</td>
<td>0.24</td>
<td>0.18</td>
</tr>
<tr>
<td>S3</td>
<td>3.59</td>
<td>0.35</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
</tr>
<tr>
<td>S3L</td>
<td>3.59</td>
<td>0.35</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
</tr>
</tbody>
</table>

#### Food choices typology

Consumption frequency of each food item likely to be grown by farmers may vary from 0 (never) to 38 (always) at farm level. Only five of them have a variable frequency within the farm sample. Five types of food choices were identified based on the combined frequencies of these five items.

<table>
<thead>
<tr>
<th>Food choices typology</th>
<th>Mean</th>
<th>CV</th>
<th>maize</th>
<th>sorghum</th>
<th>rice</th>
<th>cotton</th>
<th>groundnut</th>
<th>cowpea</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>3</td>
<td>100%</td>
<td>0.57</td>
<td>0.35</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>CL</td>
<td>2</td>
<td>0%</td>
<td>0.57</td>
<td>0.35</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>CM</td>
<td>3</td>
<td>0%</td>
<td>0.57</td>
<td>0.35</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>CLM</td>
<td>2</td>
<td>0%</td>
<td>0.57</td>
<td>0.35</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>CMV</td>
<td>3</td>
<td>0%</td>
<td>0.57</td>
<td>0.35</td>
<td>0.35</td>
<td>0.22</td>
<td>0.15</td>
<td>0.35</td>
</tr>
</tbody>
</table>

### CONCLUSION

- A common objective to every farmer: to grow and/or to buy maize in order to cover the family needs regarding staple food throughout the year;
- Marketing crops for covering family expenses, including food items purchase: all farms sell part of their production (cotton, maize, legumes);
- Growing legumes participates to food variety in the diets, but it is not its primary objective;
- Using income to increase or not food variety in diets is an individual choice disconnected from farmers’ agricultural strategies.

### References


OpenStreetMap, 2020. © OpenStreetMap contributors licensed under the Open Data Commons Open Database License (ODbL) by the OpenStreetMap Foundation (OSMF) [WWW Document]. URL: https://www.openstreetmap.org/copyright


G. Brulle, E. Kohio, P. Dugué and P.-Y. Le Gal
CIRAD – UMR Innovation, F-34398 Montpellier, France

Mean annual food variety score (FVS) never exceeds 16 food items and 90% of the total consumption is centered on 30 food items out of the 150 possible. FVS is inherently correlated to food choices typology. Three points appear in first analysis:

- The presence of individual field, allowing women to grow legumes, does not seem to impact food variety;
- Mossi ethnic group has a particularly low FVS (most of the F2 farms);
- F5 farms are located in the same village (Gombélédougou).