Participatory variety selection – Farmers testing and evaluating new cultivars of staple food crops in Chad

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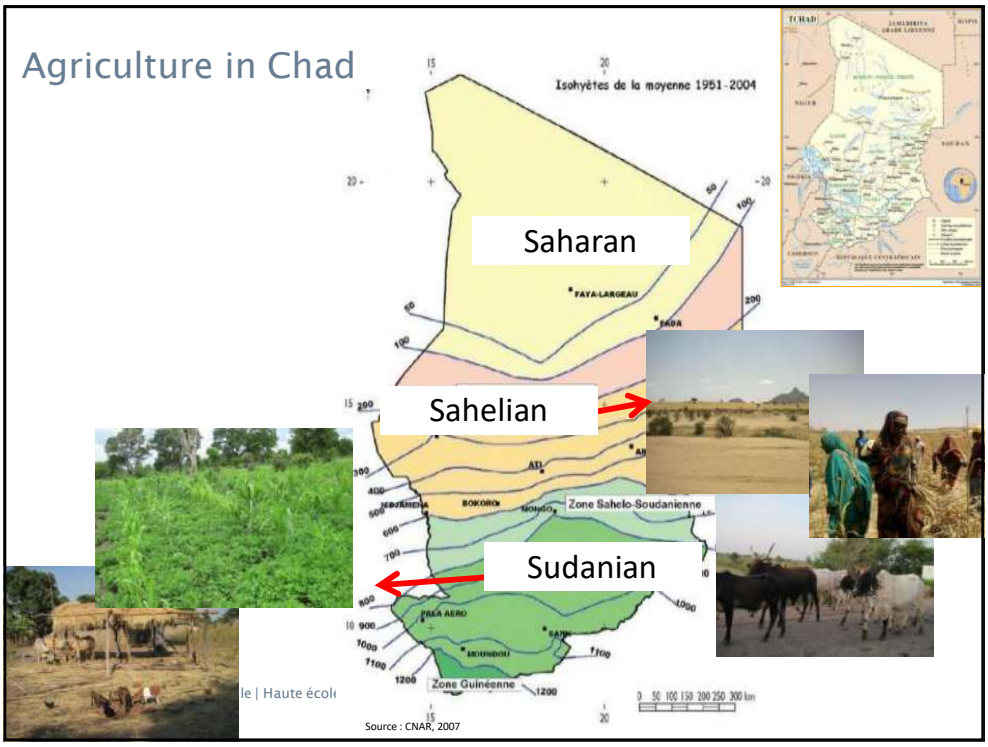
Content

1. Agriculture in Chad
2. Participatory variety evaluation approach
3. Results of farmers' evaluations of new sorghum varieties in southern Chad
4. Lessons learned
5. Conclusions

Agriculture in Chad



Strategy : From the introduction to the diffusion of the new entries

Year	Activities planned
2016-17	Test and evaluate in total 72 new entries in on-farm and on-station trials. Aim: Assess the acceptability of varieties among female and male farmers
2017-18	Test the most acceptable 32 entries in multilocational trials Aim: evaluate the adaptation of these and confirm farmers' preferences
	Produce seed of these
2018-19	Run a second year of multilocational trials
	Continue to produce seed of these
	Pre-launch the most promising varieties (~10); each Farmers' organisation may produce seed of 1 variety on 1 hectare
2019-20	Launch the release of the most promising varieties (based on the yield and farmers' preferences results of 2 years of trials)
	Produce seed of the released varieties with Farmers' organisations and diffuse them

Achieved | To be achieved

Participatory variety evaluation

Methodology and results of the first year of on-farm trials

Material and methods

New genetic materials introduced :

- 17 varieties of groundnut
- 39 varieties of sorghum
- 16 varieties of pearl millet

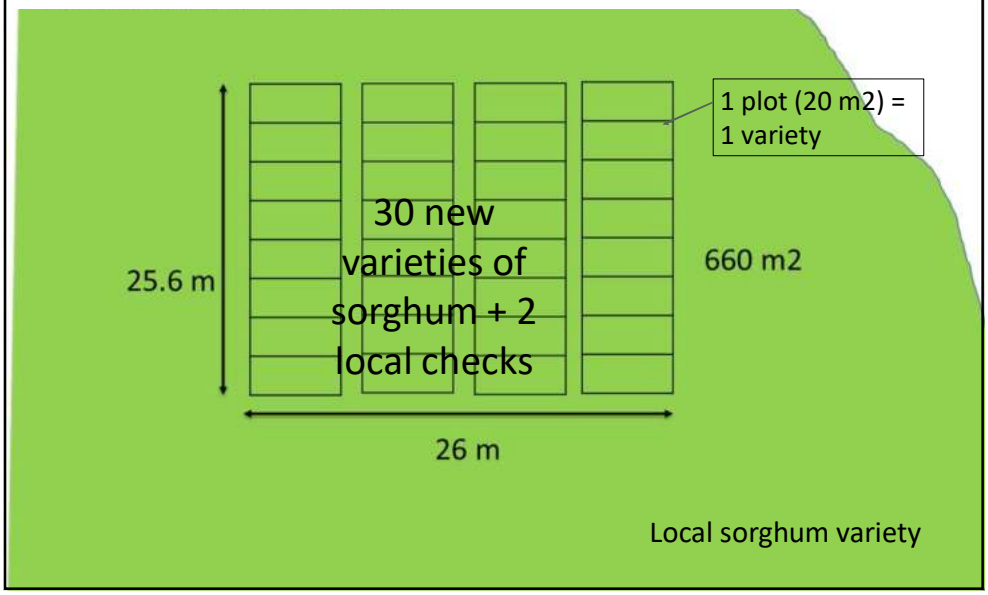
On-farm trials : conducted by farmers under their cultivation practices

- 4 regions per agroecological zones
- 8 farmers per zone for each crop
- Randomized complete block design (RCBD)
- 1 replication per farmer

Varieties' evaluations :

- 30-40 farmers per village evaluated the varieties before harvesting
- Scoring method using score cards of 3 different colors
- Open group discussions for understanding farmers' criteria

Layout of 1 replication in a sorghum field

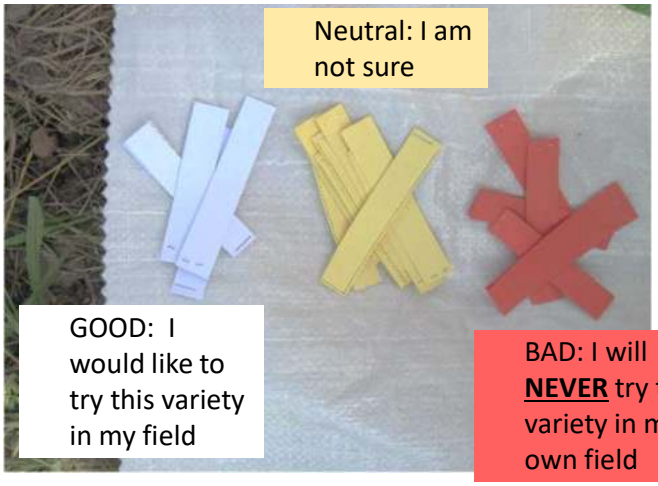


Farmers' evaluations of the new varieties (1)

Farmers' evaluations of the new varieties (2)

Farmers walked around the trial to look at each variety

Farmers' evaluations of the new varieties (3)



Score cards consider as numeric variables:
White card=3
Yellow card=2
Red card=1

Farmers' evaluation

Open group discussion

Question: Why do you like or dislike this variety?

Data analysis

Varieties' evaluations: Linear mixed effects model

- Response variable: mean of preference scores
- Independent variables:
  - Fixed factors: variety, gender, membership of farmer' organization, site
  - Random factor: Farmers who evaluated the varieties

Farmers' criteria: Content analysis

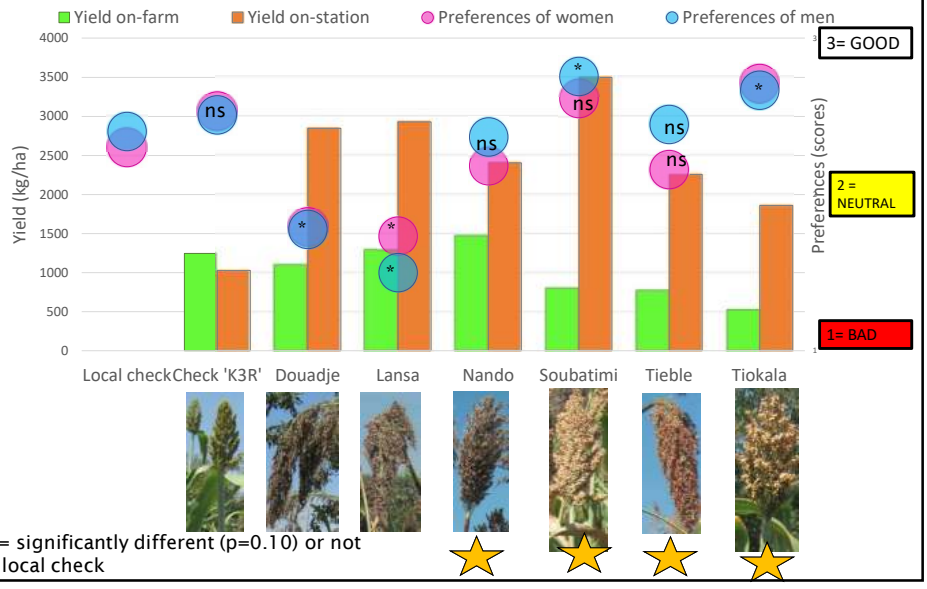
- Frequency of each criteria mentioned by farmers

Yields : Linear mixed effects model

- Response variable: grain yield
- Independent variables:
  - Fixed factor: variety
  - Random factor: farmer

SORGHUM: Farmers' preferences and yield

Example of 6 new varieties of 30 + 2 checks

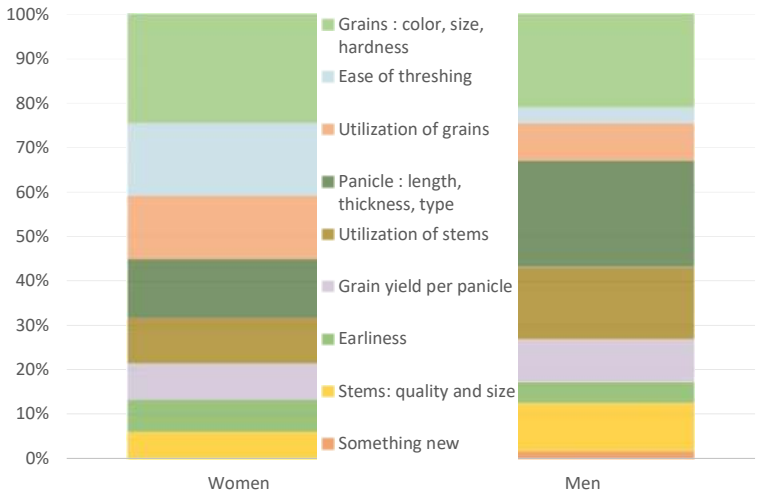


*/ns = significantly different (p=0.10) or not from local check

Varietal characteristics mentioned by farmers : example of 2 sorghum varieties

Tiokala (2.7)	Douadjé (1.65)
+ Large, hard but floury, white grains : quality is good for traditional dishes (la boule, bouillie) and for the market + Large panicle with a lot of grains + Easy to thresh + **Sweet stems ➔ can be sold on the market for 25 to 50 CFA per stem (0.05 – 0.10 euros)** - Risk of theft in the field (because of sweet stems)	+ Large, hard but floury, white grains : quality is good for traditional dishes + A lot of grains per panicle + goose-necked panicle + awns - Difficult to thresh - Looks like wild sorghum - Hard stems → not good for animal feeding - Growing cycle is longer than other new entries

Selection criteria mentioned by female and male farmers



Example of 2 different types of sorghum variety appreciated by farmers

Lessons learned – opportunities and challenges

- Chadian farmers were highly motivated and committed to test and evaluate new varieties
- Many varieties could be evaluated in a short time under many different conditions
- The methodology used for evaluating the varieties before harvesting is adapted (easy to understand = empowerment of farmers)
- In the villages of the trials, farmers were very interested in obtaining seeds of the preferred varieties in order to produce them at their level (farm-saved seed)

Conclusions

- Farmers consider **the total value of a variety** when evaluating it. They consider many different criteria (grain yield, quality of stalks/leaves for animal feeding or other uses, quality of the grains, adaptation of the growing cycle, etc.) for accepting or rejecting it
- Female and male farmers weight the criteria differently. This is related to the different roles of women and men in the household → **it is important to involve both in the process**
- **One third of the new varieties were appreciated** by farmers and seem to **meet their needs and preferences** → a second year of testing will allow to find out which of these can be released
- **Some of the local varieties performed well.** It could be promising to **include them in the participatory variety selection program**

Take-home messages

Even if we better understand farmers' criteria, **we cannot predict how farmers deal with the trade-offs between different traits**. That's why it is important to **give the farmers the responsibility to evaluate new genetic material**. It is the most effective way to select and diffuse varieties that are adapted to farmers 'preferences and conditions.

Varietal diversity is required because farmers need different varieties for different conditions (different planting dates, soil fertility and uses).

Bibliography

Christinck A, Weltzien E, Hoffmann V (éd.), 2005. Setting breeding objectives and developing seed systems with farmers: a handbook for practical use in participatory plant breeding projects. Margraf Publishers, Wageningen Pays-Bas, 196p.

Christinck A, Weltzien E, Hoffmann V, 2009. Définition d'objectifs de selection et creation de systems semenciers en colloaboration avec les paysans. Un manuel pratique pour les projets de selection participative des plantes. Margraf Publishers GmbH, Germany, 196 p.

Weltzien E, Christinck A, 2008. Participatory Breeding: Developing Improved and Relevant Crop Varieties with Farmers. Agricultural Systems : Agroecology and Rural Innovation for Development. Academy Press, Inc, Chapitre 7, 209-249.

L. Morris M, R. Bellon M, 2003. Participatory plant breeding research: Opportunities and challenges for the international crop improvement system. Euphytica 136: 21–35, 2004. Kluwer Academic Publishers, Netherlands.

CHRISTINCK A, HUMPHRIES S, PELEGRINA D, STHAPIT B, VERNOOY R, VISSER B, WELTZIEN E, AND OTHERS. 2006. Bringing Farmers back into breeding. Experiences with Participatory Plant Breeding and Challenges for Institutionalisation. Agromisa Special 5, Agromisa, Wageningen. pp 135

Smale M, Kergna A, Assima A, Weltzien E, Rattunde F, 2014. An Overview and Economic Assessment of Sorghum Improvement in Mali. MSU International Development Working Paper 137 December 2014. Michigan State University, USA.