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Certified and peasant seeds: which network for millet seed supply?

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I. Background

In West Africa, government policies has placed particular emphasis on strengthening the seed sector to enhance agricultural productivity, food security and rural well-being of 33 million smallholder farming households. Thus, they support quality-improved seed certified by national seed agencies and released it through private sector such as seed cooperative[1]. However, in small-scale farming societies, farmers usually produce their seed on their own farm (range between 58-99%)[2]. Among the sources of supply, farmer-to-farmer seed circulation is the major channel[2,3]. Once inserted, certified seed evolves among peasant seed, outcomes from ancestral crop populations maintained by farmers.

The aim of this study is to characterize farmer seed supply according to the certified or peasant origin of seed and to highlight coexistence modalities of seed supply.

Analyzing coexistence modalities of seed supply between certified and peasant seed through farmer seed networks is a **key asset for the development of an innovative governance of plant genetic resources**[3].



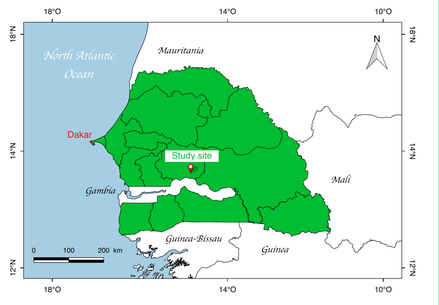
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Label found in certified seed bags. Its and official proof which assures to farmers the high quality of the seeds (purity, germination, etc.)


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Keur Samba women preparing pearl millet for the *Tiéré* (couscous in Wolof). *Tiéré* is an ancestral dish, consumed every morning and evening by the smallholder farming household.

II. Methods

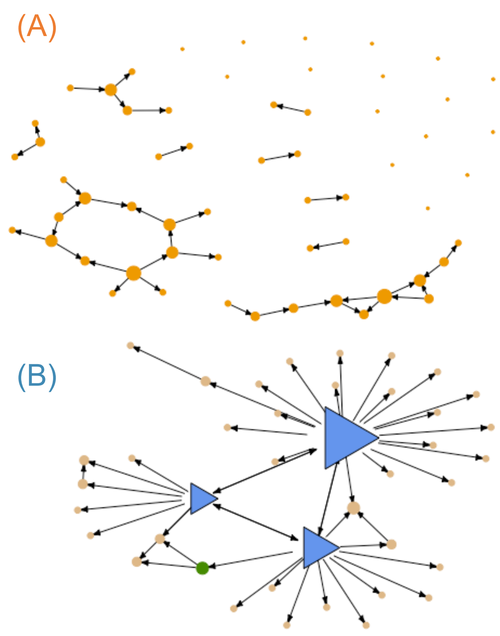


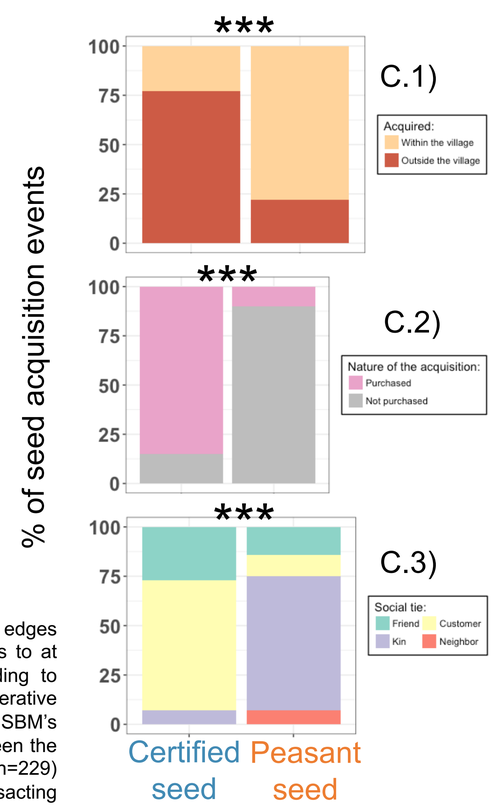
Data collection: we investigated **pearl millet** (*Pennisetum glaucum* (L.) R.Br.) **seed circulation networks**, which is a major cereal for food security and scarred by a strong socio-cultural anchorage. Data were collected in Koungheul Department (Senegal) from an **ethnographic fieldwork** carried out between march and june 2018 in three muslim villages. A **sociometric survey** using a snowball-sampling technique was employed with 79 farmers. Initial sample of respondents came from COORDEC (Coopérative Rurale pour le Développement Concerté de Koungheul) database, a cooperative specialized in certified seed production. After asking which pearl millet varieties they grow, f**armers were asked for any seed lot sown between 2010 and 2017 1) from whom did they received it to know if it was a certified and / or peasant seed lot, and 2) to whom did they gave a seed lot of their harvest.**

Data analysis: pearl millet seed supply was represented using network formalism. Farmer seed networks were splitted according to the certified or peasant origin of the seed and **bi-clustering (stochastic block model (SBM)) were performed to group structurally equivalent nodes**[4]. Results from the network representation and the bi-clustering are interpreted and discussed in light of qualitative data.

III. Results & discussion

1 Seed origin shapes farmer seed networks





Peasant (A) and certified (B) seed acquisition networks. Actors are nodes and edges represent seed flows. Networks are directed, *i.e,* each directed link corresponds to at least one acquisition event from a seed provider to a seed recipient according to interviewed's declaration. Interviewed farmers are circles, triangles are seed cooperative (one node for each village-based structure). The colors of the nodes represent SBM's result. The size of the node is proportional to the number of the connection between the nodes. The histograms represent the percentage of seed acquisition events (n=229) according to C.1) localisation ; C.2) nature and C.3) social ties between transacting partners.

In all, 229 seed acquisition events were recorded. **Seed, whether certified or peasant origin, shapes farmer seed networks (Fig A and B) and modalities of acquisition (Fig C 1:3) are significantly different**[5]. On-farm production rates vary according to the certified **(36%)** or peasant (86%) origin of seed.

Peasant seed acquisition network is extremely poorly connected (Fig A ; d=0.008). With only one group of nodes, the SBM does not distinguish farmers based on their seed access behavior probably due to the low connectedness of the network. Peasant seeds are obtained within the village (78%), by a non-purchased way (90% ; i.e, inheritence, gifting) under the tutelage of kinship (68%) from an individual to another (88%).

Certified seed acquisition is also poorly connected (Fig, B ; d=0.026). The SBM distinguishes farmers (in green and beige) from the cooperative (in blue), which provides mainly (90%) certified seed. They are purchased (85%) outside the village (77%) and involves a customer relationship (66%) which means that seed's provider is an unknown person. Farmer-to-farmer seed circulation are anecdotal. Certified seeds are **socially isolated** due to risk taking (purchase -> indebtedness) and seed cooperative's working methodology.

2 After the harvest, seed origin doesn't matter: pearl millet is pearl millet

After the harvest, pearl millet from certified seed circulates for the same reasons as peasant seed[5].

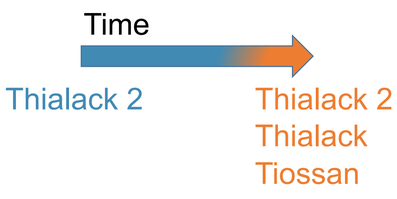
For instance, **Zakat**, which is a form of alms-giving, is a religious obligation for all Muslims. It consists to **redistribute about 10% of the harvest to those who deserve it** (*i.e*, poor, needy, old or sick person).

In rare cases (5% in our study), pearl millet received under zakat **is used as seed**[5]. However, no information relating to the origin of seeds is communicated through this practise[5].

The reasons for the spread of pearl millet (n=538). Circles are proportional to the spread percentages of exchanges



3 One variety hides another

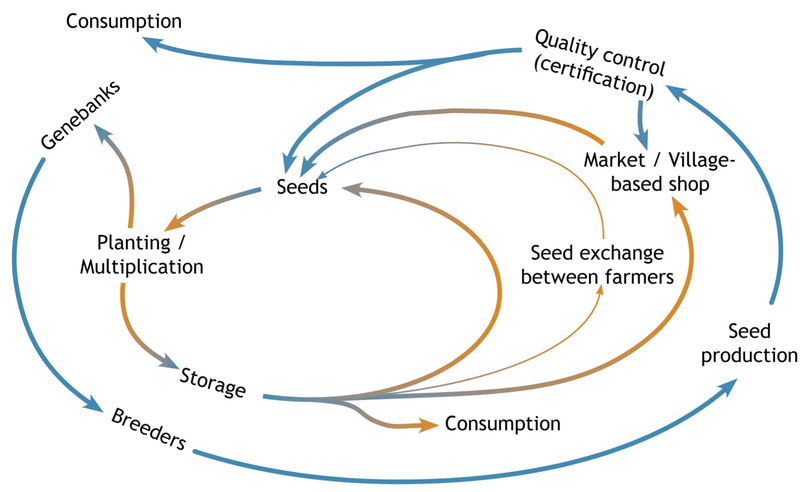


Over time, certified seed changes status and loses its identity. **The perception of the origin of the seed from which the variety is derived differs according to the interlocutor for the same name variety**[5,6]. Varieties bred by research whose seeds have been certified (i.e,Thialack 2) introduced into a community can be **requalified** of peasant or even traditional (i.e,Thialack, Tiossan) by farmers if it has adapted well in the locality. As a result, certified seeds saved on-farm by farmers are regarded as peasant seeds for some of them.

IV. Conclusion

Pearl millet seed supply seems to be **shaped by his certified or peasant origin**, both in modalities and networks mobilized by farmers[5].

Nonetheless, **after the harvest**, certified and peasant seed are commingled and embedded into an open and **complex social network**[5].



Certified and peasant seeds: a coexistence life circuit coming from the harvest. Adapted from Almekinders and Louwaars (1999)

Our results provide a **better understanding of farmer seed networks**. This study highlights **a gap** between **agricultural policies** and **local seed management** by farmers, results that could feed into the reflection on the **governance** of plant genetic resources.

V. Acknowledgements

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