

Some practical techniques concurrently contributing to desertification control and livelihood improvement in the Sahel, West Africa

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1. Introduction

Desertification is one of the globally concerned problems with complex phenomena related to land degradation and poverty in sub-humid, semiarid and arid areas. More than twenty years has past, since the ratification of the UNCCD in 1994. So far, there have been many efforts made by international organization, local government and NGOs, however, the problems still remain unsolved (UNDP, 2003; Easterly, 2006). Tollefson and Gilbert (2012) evaluated the achievement as “F (fail grade)”.

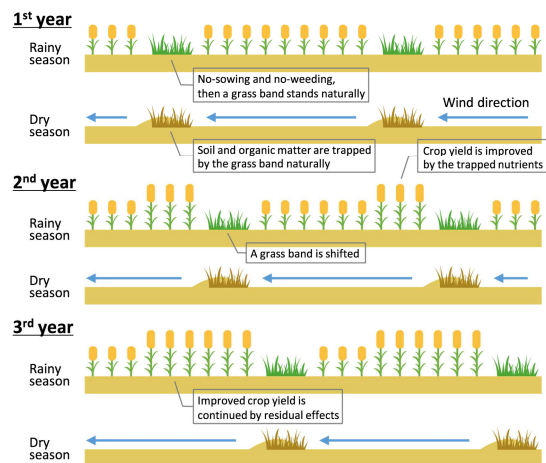
Why desertification have not been prevented and even became worse? It may be explained from its causes closely linking with poverty. As defined in UNCCD (1994), the causes of desertification are both climatic variations and human activities (Geist, 2005; Zdruli et al., 2010). If the latter is carefully focused, the causes are the daily activities to support people’s livelihood and basic needs for survival, such as habitation, cropping, animal husbandry and gathering of fuel woods. So, difficulty of desertification control is that it is to deal with while maintaining the causes.

Phenomena of desertification are the combinations of accumulated causes and consequences at local level and human-scale under complex social-ecological environments. On the other hand, this fact suggests that the hints of solutions can be found at this scale.

In this article, we introduce some practical techniques concurrently contributing to desertification control and livelihood improvement in the Sahel West Africa. We also show an idea for improvement of current agricultural extension method and/or participatory approach employed in rural development activities by local government, aid organizations and NGOs.

2. Desertification in the Sahel

Sahel region of West Africa is one of the frontlines of desertification. Since 1960s, human impact has been drastically increased. Traditional fallow cultivation system, which maintained soil fertility and prevents soil erosion, is no more standing due to the conversion of land use to continuous cultivation or short-fallow land. Prolonged exposure of land surface accelerates soil erosion by wind and water and, thus, the decrease of soil fertility. This vicious cycle is commonly



happened in semi-arid West Africa.

Figure 1: Outline of ‘fallow-band system’ in the field of pearl millet (source: Global Environmental Forum, 2013)

3. Practical techniques innovated collaborating with local people

3.1 ‘Fallow-band system’ for wind erosion control and crop growth improvement

Figure 1 shows the design of 'fallow-band system' (Ikazaki et al., 2011a) developed on the basis in Ikazaki et al. (2011b).

At the beginning of rainy season, the bands with 5 m width and stretching from the north to the south are set at the interval of 30 m to 60 m in cultivated field. In each band, seed of pearl millet are not sown, weeding practice is not done and, consequently, a band with wild grasses and herbs is naturally established. The plants in fallow-band, left during dry season after crop harvest, captures top soils and coarse organic matter blown by seasonal easterly wind. In the rainy season of next year, the position of the fallow-band is shifted on the windward.

Effectiveness of wind erosion control was evaluated. Setting the apparatus at the windward (A) and leeward (B), we monitored the amount of top soil and coarse organic matters (OM) blown by wind during dry season and next early rainy season (Figure 2). The amount [A - B] gives the captured ones by the fallow-band. A single fallow-band prevented 74 % of soil loss and 58 % of OM loss (Ikazaki et al., 2011a).

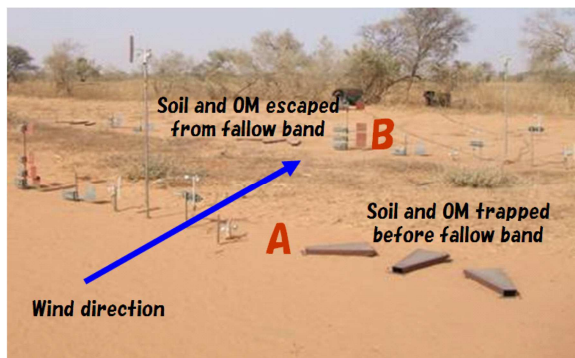


Figure 2: Field measurement for wind erosion control

Figure 3 shows the difference of crop growth in the field under continuous cultivation (right) and after one year fallow-band (left). This drastic effect was explained by the loss or accumulation of relatively fertile top soil and organic matters. Since the residual effect remains for three to four years, the grain yield from the entire cultivated field, including the one under continuous cropping and once placed under fallow-band, increases year by

year. Although the effect is not kept with the increasing trend, the yield stayed at the level of



50 to 75 % increase.

Figure 3: Effect on crop performance

Supported by Japan International Cooperation Agency (JICA) and Global Environmental Forum (GEF, Tokyo), the technique was extended to 439 households in 75 villages, 23 districts and 5 regions in Niger, as of March 2013. Further effort of the extension has still been continued under the collaboration with Organization Nigerienne des Educateurs Novateurs, a local NGO in Niger.

3.2 Lines of Andropogon for water erosion control and income generation

Soil erosion by water is also one of the major processes of land degradation. Some conventionally used techniques to reduce soil erosion by water, such as a stone band (*diguette* in French) and a contour ditch, are effective and scientifically rational. They are, however, not accepted and practiced by local people. It's because of a cost, labor requirements and a limited effect for livelihood improvement (e.g. increase of crop yield and income).

Together with local people, we designed an alternative technique as shown in Figure 4. Soil erosion is reduced by intercepting surface runoff water with the lines of local wild perennial grass (*Andropogon gayanus*) which are widely found in the Sahel. The plant is transplanted to the pit, which is known as an indigenous

technique 'Zai', with manure (Figure 5). Manure application to the wild grass is new for local people and increases the harvest of straws.

Figure 4: Lines of Andropogon with its beneficial effects

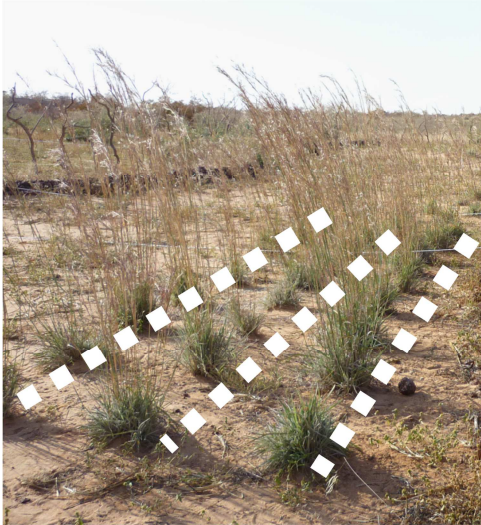


Figure 5: An indigenous technique 'Zai' is used for making planting pit



The straws are sold in local market for the materials of granary. The income from the straws sometimes reached to the pearl millet grains for one to two months household consumption. It is noted that the technique is also helpful for vulnerable people, such as elders and widows, who can't compete with the others to collect wild Andropogon.

3.3 Improvement of extension method incorporated with social-network survey

As previously mentioned in 3.1, the extension of the technique 'fallow-band system' looked successful. Follow-up survey in one commune called Fakara in Niger, however, revealed that the technique was practiced by the limited households, not by the entire commune (Figure 6, circled area). To identify the reasons, we applied social-network survey to visualize the networks of information, the network of confidence, opinion leaders, and vulnerable people. The networks are unevenly distributed and some households are isolated. This fact is explained by the differences in ethnicity and timing of settlement. Even though a technique was introduced through a village chief, who is usually an access point of outsider's intervention and which is commonly practiced in participatory approach for rural development, it is not disseminated to the entire commune. We, however, identified some opinion leaders, as indicated with arrow in Figure 6, may become possible access points for the extension of techniques. Conventional extension method is possibly modified by incorporating a component social network survey to improve the efficiency with feasible cost and labors.

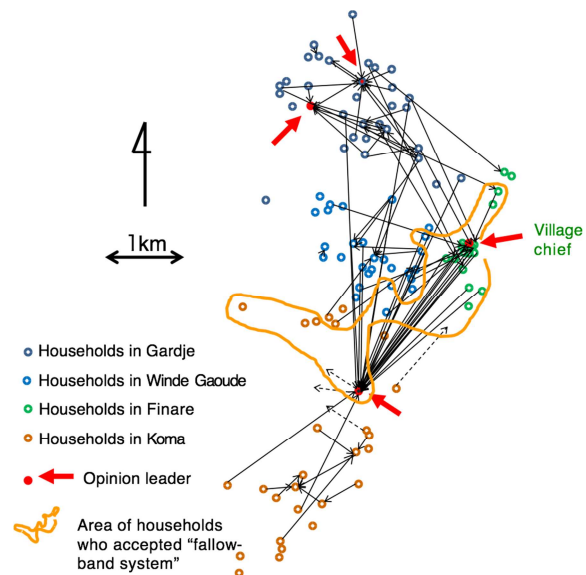


Figure 6: Network of confidence, village chief and opinion leaders, area of households who accepted 'fallow-band system'

4. Concluding remarks

Together with local people, we designed and demonstrated some practical techniques such as 'fallow-band system' and 'lines of Andropogon'. These are effective both for soil erosion control and livelihood improvement, with little input of cost, labor, materials and

time, and with special consideration to vulnerable people. Conventional extension method may be modified by the incorporation of a component of social network survey. Entirely, we showed the possibility of co-design of practical techniques for desertification control and livelihood improvement at local level and human-scale.

5. References

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