Soil fertility management demonstration protocol Rainy season 2015

Activity planned in the framework of the PASAM-TAI program

Rainy season 2015

Demonstrations implemented in rainy season 2015; PASAM-TAI CRS

Thematic to be addressed:

Crop-tree-livestock and management options for optimal biomass production

Constraints to agricultural production.

Over exploitation of soil and absence of fallow system expose soil to degradation. In addition climate variability is another threat. Under such conditions use of copping innovation may be the alternative. However in contrast with other continents and regions, farmers in Sub-Saharan Africa and particularly in WCA use almost no production inputs such as inorganic fertilizer, pesticide and improved varieties, which has contributed to low agricultural productivity. For example, average fertilizer input rates in West and Central African region are a mere 8 kg ha^{-1} compared to 100 kg, 120 kg, and 70 kg ha^{-1} for the World, Asia and India, respectively (Bationo, et al., 2006). Decline in soil fertility and the associated low productivity in the region could also be attributed to continuous cropping and monoculture among others.

Agroforestry parkland is a major component of integrated crops-livestock and tree system, where trees and shrubs play key role by providing many useful products and services. Parkland agriculture is common in the West African Sahel sub-saharan. Here trees and shrubs play various socio-economic as well as ecological and cultural roles in many rural communities (Boffa 2000; Nikiema 2005). Trees and shrubs kept and managed by farmers in their farmland are either food plants like Karite (*Vitellaria paradoxa*), fodder and fertilizer trees like *Faidherbia albida* or trees for other uses like fuel wood on which people depend for energy. In this system the presence of trees may compensate for the lack of organic material as due to their longer lifespan, they accumulate organic matter in the soil through their roots but also fallen leaves that not only protect the soil against wind and water erosion but also enhance soil water conservation by reducing evaporation (Bayala *et al.*, 2011). Despite all these potentials agricultural productivity remains low due to the constraints mentioned earlier which put farmers' activities at risk. These constraints need to be addressed from a holistic stand point so that all components of the system are taken into account in our attempt to find options for improvement.

Objective

The objective of this activity is to determination of the combination of crop-tree-livestock and management options that results in optimal biomass production for better benefit to the farmers of the program. This will be done through fitting cropping systems and crop varieties to the farm to identification of best crop/cultivar × location × tree-livestock management combinations

Material and methods

The work location will be the communities of intervention of the PASAM-TAI program, mainly the department of Mayahi located in the KKM transect in the region of Maradi in Niger. A total of 14 farmers were selected to conduct the demonstration activities. Cropping in parland system being the common practice in the study community, we will proceed with the determining trees and shrubs composition of the field of the demonstrations installation.

For the demonstration purpose, in addition monitoring trees and shrubs presence, three other factors will be tested: (i) three options of soil fertility management; (ii) three option of seed treatment and (iii) two millet varieties. Total treatment combinations are expected to be 18. However to a subset of these

treatments will be arranged in an unbalanced design to take into account the interest of the farmer and that of the scientist. As a result a set of 4 treatments from the combination listed in Table 1 will be installed in 4 plots in each famer's field. Plot size will be 10 x 10m. The plots will be separated by 2m alley that will facilitate observation when standing in the middle of the 4 plots.

Les traitements à tester dans la démonstration sont les suivants :

Ainsi donc pour faciliter la gestion des démonstrations nous allons nous limiter seulement a quelques combinaisons que nous jugeons intéressant pour le producteur pour nous même. Ainsi comme indiqué dans le tableau ci-dessous deux variétés seront concernées en combinaison avec 5 options de gestion de fertilité.

Parmi les variétés une sera fournie par l'ICRISAT et sera issue de la collection de l'institut. Elle sera adaptée à la région. La seconde sera la variété du producteur. Le but de la démonstration étant de permettre aux producteurs de tester la performance de sa variété et celle améliorée par rapport au options de gestion en teste.

Serial No	**Variety**
1	Local
2	Improved (ICRISAT to provide)

	Combinations fertility management	**Farm yard manure (FYM)**	**Mineral fertilizer (MF)**	**Seed treatment**
1	0gOA.0gMF.NoSeedTr =	0g FYM	0g mineral	No seed treatment
2	0gOA.0gMF.AP =	0g FYM	0g mineral	Seed treatment with apron star
3	0gOA.6gMF.AP =	0g FYM	6g mineral per hill	Seed treatment with apron star
4	200gOA.0gMF.AP =	200g FYM per hill	0g mineral	Seed treatment with apron star
5	200gOA.6gMF.AP =	200g FYM per hill	6g mineral per hill	Seed treatment with apron star

FYM application will be done as 2 handful per hill each weighing 100g.

Mineral fertilizer will be as microdose at the rate of 6g of NPK per hill – 2 times 3 fingers pinches

Data collection

Soil samples will be collected in each field prior to installation of the demonstrations. We will make sur we collect soil samples around the trees and shrubs

For crop monitoring, all the dates of operations will be recorded

1. Date of sowing

2. Number of hills at ?? day after sowing (date to be indicated)
3. Days to 50% flower
4. Presence of disease (to be scored: 1=absent; 2=not many; 3=too many)
5. Damage of flower insects (to be recorded: 1=absent; 2= not many; 3=too many)
6. Damage of millet head insects (to be recorded: 1=absent; 2= not many; 3=too many)
7. Number of hills harvested
8. Number of heads
9. Head weight
10. Grain weight
11. Stem weight

To monitor rainfall, direct reading rain gauges will be installed if not in, close to the farmers fields

Activity implementation:

By the end of May, demonstration site identification was done.

Following the training workshop organized to assist in the installation of the demonstrations and the farmer field schools in May 2015, all demonstrations were delimited by the end of June 2015

Due to delay in the rainy season, planting of all the demonstrations was done only by mid-July. Some of the plots were replanted due to dry spells following the first planting.

Reference:

Bationo, A., Hartemink, A., Lungu, O., Naimi, M., Okoth, P., E., S., Thiombiano, L., 2006. Africa soils : Their Productivity and Profitability of Fertilizer Use. Background paper prepared for the African Fertilizer Summit, Abuja, Nigeria

Bayala, J., Kalinganire, A., Tchoundjeu, Z., Sinclair, F., Garrity, D., 2011. Conservation agriculture with trees in the West African Sahel - a review. ICRAF Occasional Paper No. 14. Nairobi: World Agroforestry Centre.

Boffa, J.M., 2000. Les parcs agroforestiers en Afrique de l'Ouest: clés de la conservation et d'une gestion durable. Unasylva 51, 11-17.

Nikiema, A., 2005. Agroforestry parkland species diversity: Uses and management in semi-arid West Africa. Wageningen University, 102 pp.