INSTITUTE OF RURAL ECONOMY

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for Agricultural Sciences

Introduction of the technique of mechanical investment micro doses of fertilizer and seed

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Appendix: Technical Manual 8

"Guide for the Management and Natural Resource Conservation"

Contents

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REPUBLIC OF MALI

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Technical sheet

Mechanical placement technique of micro-doses of fertilizer and the seed of millet or sorghum

Type of production: Plant Production

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1. Introduction

The application of binary or tertiary complex fertilizers in micro-doses is a very practical rependue in agricultural lands of Sahelian and Sudano-Sahelian areas of West Africa and Mali in particular. In these areas, farmers' incomes are low and access to subsidized fertilizer if any, is often limited. In manual application, the technique requires human effort to plant and apply fertilizer in 10,000 to 30,000 bunches per hectare. Growers and producers to whom the fertilizer was not a realistic option because of the high cost, are unanimous over the relevance of the art. To remove investment constraints in labor and fertilizer inputs, recent work by the IER, Noragric, DCG mechanization of technique helped to upgrade equipment that has reduced the manual input of micro doses. This equipment, with special discs, is a particularly innovative drill, based on the principle of simultaneous sowing of the seed and fertilizer in microdose in the same planting hole with the mixture of the two products. His performance in real-time working (seedlings and application of micro doses) is a man day per hectare mules or oxen traction against twelve man-days per hectare for manual application. This allows producers to have greater timeliness of farming operations in early winter to climate variability. Furthermore, the technique can: -Make the straightest lines sowing facilitating mechanical crop maintenance; -ensuring vigorous growth and adequate phenological development of plants; -improve the efficiency of use of the fertilizer; -reduce work time; -improving the productivity of dry cereal crops; - and improve the income of producers. Finally, it is associated with this technique, the organic manure as compost to enhance the sustainability of the farming system.

2. Objectives

The purpose of this sheet is to serve as teaching material in the context of strengthening the ability of producers to meet producers and even improve food self-sufficiency in agricultural production units in the Sahelian and Sudano-Sahelian zones.

3. Description of technology

3.1 materials used

The material used is the drill-type SMECMA mounted on the distributor disk No. 10 (10 mm in hole diameter) at the bottom of the hopper (Photos 1 and 2). This disc places the seed and fertilizer in microdoses to the regular spacing of 50 cm between the bunches. The spacing between two crop rows is keyed to 80 cm. The seeding rate of 80 cm x 50 cm gives 25,000 bunches per hectare. The technique allows the regular intake of 0.2 g of cereal complex fertilizers poquet about 5 kg / ha. For the conduct of the sowing operation and provision of micro-doses of fertilizer, the drill is coupled to either a donkey, a pair of oxen, a horse or a camel as a source of motive power.

Photo 1. seeders

Picture 2. Inside the hopper of the drill

3.2 Procedures to implement

The implementation of procedures for millet and sorghum, where the technique of mechanical investment micro-doses of fertilizer is used, are presented below. However, note that the content of the work described here is based on mechanized farming methods based on animal traction practiced in Mali.

Procedure 1: Preparation of seed bed

The seedbed should be well prepared and cleaned branches, shrubs and any crop residue may hinder the progress of the drill. The well-composted manure should be spread in small piles on the entire field (Photo 3). Then proceed to a flat or a ridging plow field after a rain of 20 mm (Photo 4).

Photo 3. Placement of manure organic

Photo 4. ridging

Procedure 2: Preparation of seed and fertilizer mixture

The preparation of the 1: 1 mixture is made of mixing a seed volume (bowl Sada Diallo about 500 ml) to the same volume in fertilizer put into the hopper after mixing (Photos 5 and 6). Before mixing, it is advisable to do a clean seed lot by winnowing, sieving (at wara wara sieve of 2 mm in diameter) and the phytosanitary treatment (red Cayman, the star or Apron the Sidjolan). This work allows to choose the good seeds that will produce vigorous seedlings emergence.

Photo 5. Preparation of the mixture 1: 1, ,

Photo 6. The 1: 1 mixture at the bottom of the hopper.

Procedure 3: Sowing and mechanical investment micro-doses of fertilizer

Sowing or mechanical seed placement and micro-doses of fertilizer occurs after a rainfall of 15 mm on light soils and 20 mm on heavy soil. Seeds and microdoses are mechanically placed with regular spacing of 50 cm in the seed holes using the drill. The spacing between two rows of seedlings may vary between 75 cm and 80 cm depending on the regions (Photos 7 and 8). This spacing is adjustable on the

tracer. For example, the seeding rate of 80 cm x 50 cm gives 25,000 bunches per hectare and that of 75 cm x 50 cm is 26 666 bunches per hectare. The mechanical planting of 1: 1 is used to apply 0.2 g of fertilizer and a dozen cereal seeds per hole is 5 kg / ha of each product.

Photo 7. After mechanical intake of micro-doses of fertilizer.

Photo 8. Sowing online with drill

Procedure 4: weeding, thinning and relining

The first weeding or hoeing is performed 2 to 3 weeks after sowing depending on the level of weed infestation in the field. This work takes place either manually with a hoe (hoe) or mechanically with a bovine tensile multiculteur (Photo 9). The second weeding takes place in the same way 2 to 3 weeks after the first weeding.

As for thinning and relining missing bunches, the two operations are done simultaneously. For thinning, it is advisable to maintain only two plants per hill. (By against, for Sahel which the seeding is 1m x 1m, it is controlled unmarry to 3 seedlings per hill.)

As for relining, the surpluses plants uprooted when thinning redeployed two plants per hill plots for missing 75- density 80 cm x 50 cm and three plants per hill plots for missing the density of 1 x 1m. These two operations derive a stand of 50,000 plants per hectare (Photo 10).

Photo 9. The multiculteur weeding

Photo 10. vigorous vegetative development of young sorghum plants (25 days after sowing)

Procedure 5: Fight against Striga

The damage caused by Striga *Striga hermonthica* a parasitic plant, a major constraint even a threat to the growth of millet in the Sahelian and Sudano-Sahelian zones (Photos 11 and 12). The means to fight against this scourge are among others, fallowing, crop rotation (cereal, cereal, cereal-legume, cereal, cotton, etc.), the uprooting of all the plants before flowering striga, organic fertilizer intake associated with micro-doses of fertilizer placement. Finally, spraying weed killer products including selective herbicides and plant growth regulators is possible to eradicate the parasite during the growth of millet or sorghum.

Photo 11. Flowering Striga, a threat for the next season

Photo 12. Verse millet

Procedure 6: Harvest

The harvest is done manually by reversing all the millet plants of the same line on the same side. This technique allows the producer to easily harvest all ears. The harvested ears are then exposed to the sun for drying.

3.3 Conditions for Success

- The use of the drill requires animal traction, which requires a suitable number of livestock animals (cattle and asin).
- The risk of burning the seed is great if microdose fertilizer placed in dry soil. It is therefore recommended that the placement of the mixture after precipitation of 15 mm for light soils and 20 mm for heavy soils. Also research has shown that after the first rain of 10 mm or more at the beginning of the growing season, it is advisable to wait a second rain in the next week before sowing.

- To prevent weeds roll up in the wheels of the seed drill, it recommend to make a good tillage or ridging covering all weeds before sowing.

- The fertilizer recommended for mechanical micro-dosing are: cereal complex 16 16 16; complex cereal 15 15 15 (new formulation from Morocco); complex cereal June 20, 10 (if not).

it is found that the ears are shelled easily. After this operation, the grains are kept in warehouses.

- Support technicians is essential for the technique of mechanical placement of fertilizer micro doses is well assimilated. The IER can provide an excellent training program for farmers interested in this technology (Photo 11).

Picture 11. Course given by researchers and training technicians Threshing intervenes only when

4. Application technology

This technology applies to producers and producers of food crops millet and sorghum in the Sahelian and Sudano-Sahelian zones of Mali and neighboring countries .

5.Budget partial and marginal rate of technology cost

The analysis of on-farm data collected indicates that the technique of mechanical placement shows the highest net profit regardless of culture (Table 1) with a marginal return rate of 23 francs to 11 francs sorghum and millet for every franc invested in the implementation of technology (Table 2). Finally, the analyzes also indicate the practical manual is dominated because it involves higher production costs with lower net profits than the mechanical placement of 1: 1.

Table 1: Partial Budget seed placement technologies and micro doses

fertilizer on sorghum mid p at Ysan for one hectare (FCFA).

Budget items	**Sorghum**			**Mil**		
	practical Manual	Mechanics Without fertilizer	Mechanics with fertilizer	practical Manual	Mechanics Without fertilizer	Mechanics with fertilizer
Average yields in 2010 and 2011 (kg / ha)	1267	1405	1738	1637	1659	1826
Average adjusted yield (kg / ha)	1140	1265	1564	1473	1493	1643
Field price of millet / sorghum (CFAF / kg)	100	100	100	100	100	100
gross margin field (CFA / ha)	114 030	126 450	156420 147 330		149 310	164 340
Cost of seed (CFA)	500	500	500	500	500	500
Fertilizer cost (FCFA)	0	0	1250	0	0	1250
Cost of labor (FCFA)	40000	25000	25000	40000	25000	25000
Total variable cost (FCFA / ha)	40500	25500	26750	40500	25500	26750
Net (CFA / ha)	**73,530**	**100 950**	**129670 106 830**		**123 810**	**137590**

Source Coulibaly et al., 2012 1 Adjusted Yield: 10% reduction in current efficiency due to weight loss and transportation.

2 Cost of labor: This cost includes planting, crop maintenance harvesting, threshing, the daily rate of the labor force is between 1000 and 1500F CFA.

Table 2. Marginal rate of return than a hectare of sorghum and millet grown by the technique

Mechanical placement s emence and fertilizer in microdo its on-farm.

Terms of the calculation	Sorghum			Mil		
	practical Manual	Mechanics Without fertilizer	Mechanics with fertilizer	practical Manual	Without fertilizer	mechanical with fertilizer
Total variable cost (FCFA / ha)	40500	25500	26750	40500	25500	26750
Net (CFA / ha)	**73,530**	**100 950**	**129670**	**106 830**	**123 810**	**137590**
Dominance	**D**			**D**		
marginal rate			**23**			**11**

Source Coulibaly et al., 2012

D = Dominated: u No treatment is said dominated by another if it involves a higher cost and a net benefit less.

NB: the marginal rate is calculated using the following formula (Delta Net profit / Delta total variable cost) x 100.

6. Effects of micro doses and compost on the yield of millet

These results allow to draw four teachings: -the good yields obtained by the treatments T2, and T4 (Table 3) indicate that the quality of the manure is determining in a organo-mineral fertilizer; -The performance differences between true witness T1 and other treatments namely T2, T3 and T4, highlight poor soils concept; - organic fertilizer improves the efficiency of use of the fertilizer;

Table 3. Effects of seed placement method and organo-mineral fertilization knew r millet yields to Sinzina and Yayabougou, Banamba , Koulikor o , 2011.

Treatment	Straw	Grain	Accrt1	EUE1 - T1
	Kg / ha	Kg / ha	(%) T1	kg / kg
T1 Mechanical Drilling (no fertilizer and compost without)	6720	871	-	
T2 Seedling mechanical compost + FO (5t / ha)	8356	1424	63	
T3 Seedling mécaniquemélange1: 1 (0.2g / pk)	8227	1152	32	56
T4 = T2 + T3	8963	1636	88	153
ES +	989	108	-	

at. Accr1: overall performance increase compared to absolute control; c. EUE1: the fertilizer use efficiency compared to absolute control (cumulation - fertilization and mechanization). The efficiency threshold is 10kg grains per kg of fertilizer used;

7. Performance Technology

- Improved crop yields millet and sorghum 50 to 100% compared to the manual practice;

- Improving the efficiency of fertilizer use from 60 to 150 kg of seeds per kilogram of fertilizer used;
- Reduced time of sowing works and supply of fertilizer in micro doses (12 man-days to a man-day per hectare) compared to the manual practice;

- Improved net income of producers.

8. Acknowledgments

Photo 12 Producers villages Boidiewere (A), Siakabougou (B) of Yayabougou (C) and Sinzina (D) who worked during verification testing.

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