Reclaiming pueraria-based improved fallows

Testing herbicide response to reclaim and manage pueraria based cover crop systems in southern Cameroon

J. Duindam[1], S. Hauser[2], [1] International Institute of Tropical Agriculture, Cameroon, [2] International Institute of Tropical Agriculture, DR Congo

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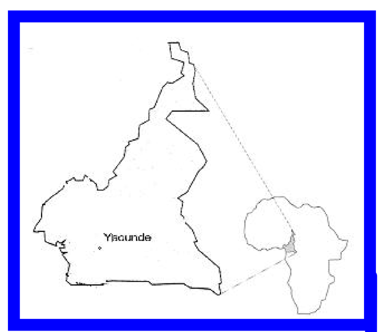

1.Introduction

Intensified food crop production on low activity clay soils (Ultisols and Oxisols) observed in the humid forest zone of southern Cameroon are a result of increased food demand concentrated around urban centers. As a response, farmers no longer respect traditional fallow periods which has resulted declining productivity due to insufficient soil fertility replenishment and arable weed infestation.

Improved rotational fallow systems based on *Pueraria phaseoloides* (tropical kudzu) is a promoted technology for fast soil fertility restoration and arable weed suppression. In this experiment we tested the application of a single pre-planting herbicide treatment as an alternative to slash and burn. Focus is to retain a protective mulch layer and simultaneously to arrest *P. phaseoloides* growth to avoid early competition with food crops after fallow.

Fig. 1: Climbing behaviour of Pueraria phaseoloides recorded in experimental setup.

Fig. 2: Litter layer illustrating in-situ mulch production of legume cover crop Pueraria phaseoloides.

2.Materials and methods:

In August 2007, an on-farm trial in Mfou (soils: acid Ultisol; rain: 1530 mm, bimodal; 3° 69‘N, 11°69‘E) was established in a two year old *P. phaseolides* dominated fallow field. Herbicide treatments were applied by a Glyphosate (Roundup, Monsanto®) spray at five different doses. All treatment plots (3x3m) were randomized over the field and replicated three times. Plots were visually scored on a weekly basis on relative soil cover. Vine height increments were scored on three long poles placed inside the plot area (see Fig 1). 123 days after treatment (DAT) aboveground biomass was sampled for dry matter determination.

3. Results:

VEGETATION COVER

Control

- *P. phaseoloides* dominance retained
- Good weed suppression

360 g/ha

- Initial 40% reduction of *P. phaseoloides* cover
- Fast recovery
- Good weed suppression

720 g/ha

- Initial 30% reduction of of *P. phaseoloides* cover
- Postponed recovery to 50 DAT
- Low number of escaping weeds

1440 g/ha

- Initial reduction to less than 20% of *P. phaseoloides* cover
- Higher weed incidence
- Presence of wild cocoyam may have affected the results

2880 g/ha

- Initial reduction to less than 10% of *P. phaseoloides* cover
- Slow initial recovery
- Progressive weed infestation

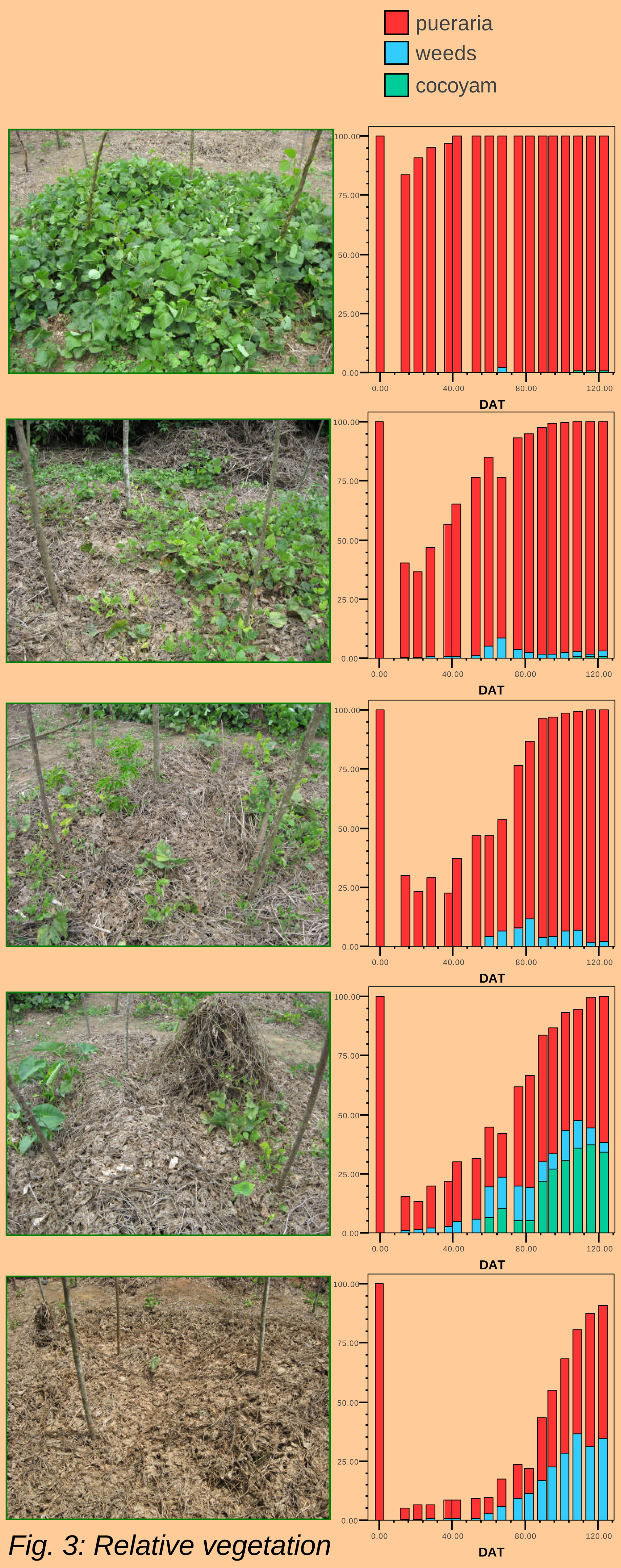

Fig. 3: Relative vegetation cover development during 123 days after pre-planting herbicide treatment (DAT). Pictures illustrate situation at 12 DAT.

VINE CLIMBING ACTIVITY

An effective delay in *P. phaseoloides* climbing activities of around 1 month was realized in the 720 and 1440 g/ha treatments. The lowest dose did not postpone the moment of *P. phaseoloides* climbing although it reduced the growth rate by more than 50%, from 7,2 to 3,4 cm/day (Fig. 4).

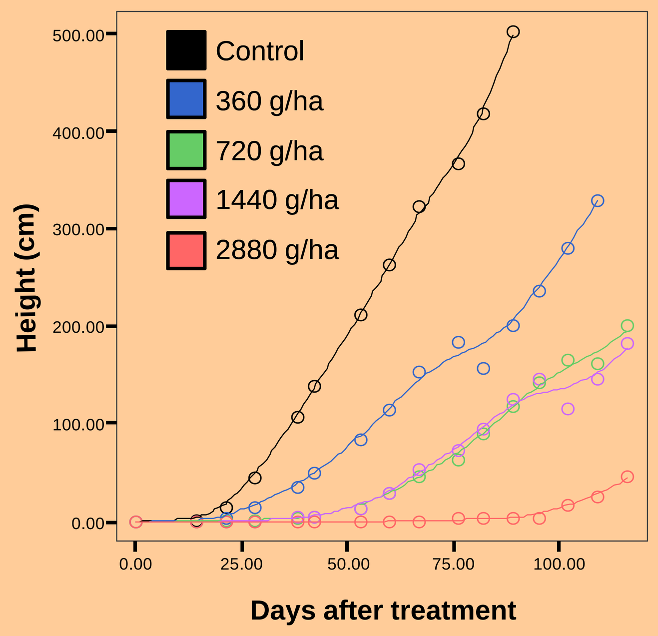

Fig. 4: Cumulative heigth increments of P. phaseoloides vines over time after herbicide treatment.

BIOMASS PARTITIONING

Herbicide treatment did not affect total amount of dry biomass present after 123 days. This was caused by a compensation of more *P. phaseoloides* present in the low dosage treatments by higher weed incidence in higher dosage treatments (see table 1). The litter layer present at 123 DAT was thick (see Fig 2.) and did not differ among treatments. The lower initial quantity of dead plant biomass added by lower herbicide dose had apparently either a lower rate of decomposition or was in due course compensated by in-situ mulch production of the standing or recovering cover crop.

	control		360 g/ha		720 g/ha		1440 g/ha		2880 g/ha	
	Mean	sem	Mean	sem	Mean	sem	Mean	sem	Mean	sem
litter	**7.0**	0.7	**6.7**	0.8	**7.6**	0.2	**7.4**	0.3	**7.5**	1.3
pueraria	**4.0a**	0.6	**3.0ab**	0.3	**3.1ab**	0.3	**2.0bc**	0.2	**1.5c**	0.6
cocoyam	**0**	0	**0**	0	**0**	0	**2.0**	2.0	**0**	0
weeds	**0.03a**	0.03	**0.04a**	0.03	**0.4ab**	0.2	**0.7b**	0.3	**0.9b**	0.1
total	**11.1**	4.1	**9.8**	1.0	**11.1**	0.5	**12.1**	1.7	**9.9**	1.5

Table 1: Dry matter biomass (Mg ha^{-1}) at 123 DAT. Numbers with same symbols are not significantly different.

4. Conclusion

In an environment of increasing urban food demands, improved fallows for crop production can offer an opportunity for resource constrained peri-urban farmers in Cameroon. Our data show that reclamation of *P. phaseoloides* fallow systems by single pre-planting glyphosate application of 720 g/ha is suitable to create closed semi-live mulch layer. Weed suppression and nutrient release from slowly decomposing litter layer make it suitable for direct planting of short-season crops like maize, especially in a labour constrained environment. Additional treatment at 60 DAP is required to avoid crop damage by climbing on long-season crops like cassava.