

Effects of land preparation, agricultural activities and the application of nutrients on the regeneration of fallow vegetation and soil properties: Methodologies

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1 Introduction

In the Amazon is the land use system most utilized for the production of food by small-holders alternating regimes of forest and agriculture resulting from slash and burn cultivation. Agroecosystems that are based upon this system of land use are constituted by essentially two consecutive sub-systems: the cultivation phase with the planting of useful crops and the secondary vegetation phase or fallow period. More recently, in addition to slashing and burning, the fields are also prepared with the use of farm machinery.

The development of the vegetation during the fallow period is a function of agronomic practices of the cropping period. The different forms and intensities of land use (mainly the preparation of the fields and the crop system) act as determining factors for the floristic composition and the vitality of fallow vegetation. This fact makes it also possible to manage the fallow vegetation in the planting phase.

The activities normally practiced by the small-holders throughout the whole cycle of the production system are considered as impacts and/or possibilities for interventions regarding the fallow vegetation. The activities selected as impacts to be tested during the preparation of the fields are removal of stumps, disking and ploughing; the cultivation activity that will be tested is fertilizing and as an innovative crop treatment the use of mulch and ground cover. Enrichment with trees of ecological and economic value is also an innovative intervention that may be applied in the cropping phase and/or at the beginning of the next fallow period.

Within this context it is interesting to know what are the nutrients that limit the growth of secondary vegetation.

The objective of the experiments described below is to study the effects of preparing the fields, crop treatments and the application of nutrients on: the vitality of the secondary vegetation and some selected species; and the soil properties during the fallow period.

2 Methodology

The study is composed of three experiments that are situated in the municipalities of Igarapé Açu and Castanhal on small-holders' properties, with four year-old secondary vegetation. In all of the experiments the clearing was done manually.

Experiment 1

The experiment is located in Igarapé Açu, ramal do Prata, Kilometer 8. The experiment following the Latin square design with six treatments and six replicates.

Treatments:

1. Burning + planting (maize and manioc)
2. Burning + planting + recommended fertilizer (NPK)
3. Burning + rock phosphate + NK + planting
4. Burning + manual stump removal + planting
5. Burning + manual stump removal + disking + ploughing + planting
6. Burning + mechanized stump removal + disking + ploughing + planting

After the undertaking of the treatments maize (Cv. 'BR 106') in consortium with manioc (Cv. 'Olho Verde') were planted in all of the plots with a spacing of 1.0m x 0.50m (maize) and 1.0m x 1.0m (manioc). This planting system will be used for only one year.

In treatments No. 2 and 3 the fertilizer recommended by research for the cultivation of maize was used and for the other treatments the fertilizer normally used by the small-holders was applied. The fertilizer recommended by researchers was composed of urea, triple super phosphate and potassium chloride. Small-holders normally use the fertilizer NPK 10-28-20. Rock phosphate was Araxá.

Experiment 2

The experiment is located in Igarapé Açu, Travessa do Cumarú and in Castanhal, Vila Iracema. This experiment also used the Latin square design, with seven treatments and seven repetitions. The planting of this experiment is similar to the first except for treatments No. 1 and 3. The varieties for manioc used in the experiment were "Duquinha" and "Maniva Inha". The fertilizer applied was NPK (10-28-20).

Treatments

1. Secondary Vegetation
2. Burning + planting (maize and manioc)
3. Burning + two year planting (maize, cowpea and manioc)
4. No burning + mulch + planting
5. Burning + planting + ground cover (*Canavalia ensiformis*)
6. Burning + planting + enrichment with *Acacia auriculiformis*
7. Burning + alley-crop system (*Acacia auriculiformis*)

Experiment 3

This experiment ("minus one trial") is located in Igarapé Açu, Travessa de Cumarú, km 5. The layout is randomly spaced blocks with ten treatments and eight repetitions.
Treatments

1. without nutrient applications
2. NPKCaMgSMicro-elements
3. -PKCaMgSMicro-elements
4. N-KCaMgSMicro-elements
5. NP-CaMgSMicro-elements

6. NPK-MgS Micro-elements
7. NPKCa-S Micro-elements
8. NPKCaMg-Micro-elements
9. NPKCaMgS-
10. No burning and no application of nutrients

The nutrients are applied by hand and tilled manually. The quantities of the different elements are: N 60kg/ha; P 26kg/ha; K 33 kg/ha; Ca 60 kg/ha; Mg 20 kg/ha; S 20 kg/ha; and micro-elements as recommended by the manufacturer. There is one planting of maize only to make the area uniform.

3 Studies to be undertaken

| Before clearing/ land preparation | During planting | During regeneration |
|--------------------------------------|--------------------------------|-----------------------------------|
| -floristic survey | -weeds | -increment of phytomass |
| -phytomass and nutrient stocks | -re-sprouting | -increment of selected species |
| -seed bank | -growth/production of crops | -root dynamics (ingrowth bags) |
| -ash | -soil organic matter | -soil organic matter |
| -soil analyses | -enzyme activity | -enzyme activity |
| | -soil analyses | -soil analyses |