

Mechanical weeding with animal traction: some prerequisites

by

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Abstract

In the Kara region of Togo few farmers use their triangular toolbars for weeding. Weeds limit the area cultivated and reduce yields. Kara farmers use the early rains to begin plowing. Seeding is delayed until rains become regular. Seeding is in hills to save time and allow for in-row weeding by hoe. Seeding density is low to conserve seed, but requires re-seeding. Fertilizer is applied 15-40 days after emergence at a time of peak activity to minimize leaching in accordance with extension recommendations.

With existing management systems mechanical weeding is not efficient. Delay between plowing and planting allows weeds to flourish. Delayed fertilizer application worsens matters resulting in weeds higher than the crop. Hill planting leads to weeds between plants. Thus with normal ox weeding practices it is difficult to follow rows.

A system is suggested that allows effective use of weeder. Early plowing is followed by harrowing prior to seeding. Fertilizer is placed in bands, prior to seeding when the farmer has more time and when it is needed. Seeding can be by hand or rolling injector seeder. A higher seeding rate reduces weed competition, eliminates re-seeding but uses more seed and requires thinning. The first weeding is an early rapid, superficial cultivation when the weeds are small. An additional weeding is necessary.

Introduction

The Kara region, located in northern Togo, receives approximately 1200 mm of rain from March to November. Though the cropping season runs from May to October (6 months), scattered early and late rains allow numerous

perennial weeds to survive the dry season. Farmers have thus been quick to realize the benefits of animal traction mouldboard plowing for weed suppression. Yet few farmers employ the triangular toolbar with sweeps for weeding. Weeds continue to limit the area cultivated and reduce yields per area. We wish to describe the current mouldboard plow management system, explain why farmers do not mechanically weed, and suggest changes that will enable them to employ their weeding equipment.

Current mouldboard plow management system

Kara farmers use the occasional early rains to begin plowing. Seeding is delayed from one to three weeks until the rains become regular and the soil profile is moist. This reduces the risk of crop failure. Seeding is not done in uniform, straight rows as the use of a rope or a row marker is time-consuming and the farmer does not intend to weed mechanically. In-row spacing for maize and sorghum is in hills spaced 50-60 cm apart. This allows for in-row weeding with the hand hoe. Seeding density is low (3-4 seeds/hill) which conserves seed but requires re-seeding. N-P-K (15-15-15) fertilizer is applied 15-40 days after emergence at a time of peak labour activity. N-P-K is applied post emergence to minimize leaching of an expensive input. The N-stressed young plants respond readily to the applied nitrogen which serves as positive reinforcement for the farmer.

This delayed application is an official extension theme of both the DRDR (Direction Régionale du Développement Rural) and SOTOCO (Société Togolaise de Coton) who maintain that phosphorous and potassium are as readily leached as nitrogen. Weeding is performed with the short handled hoe when weeds are 20-30 cm high. This enables the farmer to manually pull weeds and shake the soil from their roots.

Why the farmer does not mechanically weed

Early efforts to encourage farmers to weed with their animals centred on the obvious: seeding in straight rows of uniform spacing (80 cm). Yet this rarely resulted in farmer adoption of mechanical weeding. When asked why not, the farmers usually responded that their animals were not sufficiently well trained to follow the row, or that they were afraid that their oxen would eat the crops.

We feel that the farmers persists in hand weeding because, given their existing management systems, mechanical weeding is not efficient. The one to three week delay between plowing and planting allows annual weeds to get a good start ahead of the crop. Delayed application of N-P-K fertilizer results in extremely slow initial crop growth. At the time of optimal mechanical weeding the weeds are higher than the crop, making it difficult for the farmer to follow the row. This is further aggravated by the fact that the re-seeded plants may not have yet emerged at the time of first weeding.

Planting in widely spaced hills allows weeds to grow between the plants. Mechanical weeding, coupled with in-row hand weeding is only slightly more efficient than hand weeding *under farmer conditions*. Finally the farmer believes the time for mechanical weeding is the same as for hand weeding. At this stage, weeds quickly collect on the sweeps of the weeder, necessitating frequent stops to clean them off.

Mechanically weeded management system

Using early rains for plowing is encouraged. Weeds, turned under will be partially decomposed by planting time. A final seedbed preparation, just prior to seeding, is necessary. The farmer has the option of purchasing a spike tooth harrow (30 000 CFA) or using the triangular toolbar equipped as a spring tooth harrow (included in the original purchase package). This will eliminate weeds that have germinated since plowing. (When plowing is done later in the season, the farmer has the option of plowing and planting the same day). N-P-K fertilizer is placed in bands, prior to seeding. Fertilizer is applied when the farmer has more time and when it is most needed by the crop. The increased seeding rate will help the crop to compete successfully with in-row weeds and reduce root disturbance by mechanical weeding. The N-P-K can be banded to one side of the rope used to seed, and the seed placed on the other side. Or it can be placed in the furrow made by the rowmaker which can be mounted on the triangular toolbar (3500 CFA). Though fertilizer banding is labour intensive, it is much less so than the point placement method currently used, and it occurs before the period of peak labour activity.

Spacing between plants in the row is reduced in order to achieve in-row cover as quickly as possible. Seeding can be done by hand or with the rolling injector seeder (the 6-hole maize disc places 1 or 2 seeds every 22 cm). The seeder (40 000 CFA) is extremely solid and can successfully seed in fields having stumps, roots and rocks or in fields having surface trash. Though the high seeding rate will eliminate re-seeding, the farmer will use more seed and will need to thin.

The first weeding needs to be done much earlier than for hand weeding. This consists of a rapid, superficial cultivation when the weeds are still small. An additional weeding will

usually be necessary. Use of a single ox is ideal for this operation.

Weeding with animal traction can result in a significantly increased area cultivated and in slight yield increases per unit area. Achieving farmer adoption though is more than seeding

in straight rows or providing additional training for the farmers and their oxen. It requires multiple fine-tuning of the farm management system to ensure the establishment of vigorous seedlings and the suppression of weeds. This will require close, constant supervision of the farmer.