Perceptions, impacts and rewards of row planting of teff

Summary of ESSP Working Paper 65, “Perceptions, impacts and rewards of row planting of teff”

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This study analyzes the perceptions, impacts, and rewards for teff farmers who were exposed to a row planting technology promotion campaign in the Oromia region of Ethiopia. There are three main findings: first, despite a positive attitude towards row planting (and reduced seed rates in general) and a belief in the (large) yield increasing potential of row planting, exposed farmers put a relatively small part of their plots aside for row planting in the next planting season. This suggests concerns with the additional labor requirement and possibly the need for more knowledge and experience with the new planting technique. Second, by adopting row planting, farmers experienced an increase in teff yield in the first year of implementation, but there was also a substantial increase in labor input requirements. A cost-benefit analysis shows that the increase in teff yield outweighs the cost of the extra labor in the first year of adoption. Third, suitable mechanization for row planting would change the cost-benefit picture significantly and suggests this may be an investment with high returns.

Row planting and teff yields

Given the scarcity of suitable arable land and its rapidly growing population, Ethiopia will need to scale up the adoption of yield-increasing technical innovations to ensure continued agricultural growth and to safeguard national food security. We study the case of row planting of teff in Ethiopia to gain more insights into how the promotion of improved technologies can possibly increase farmers’ teff production. Teff (Eragrostis tef) is Ethiopia’s most important staple crop, but national yield levels are low.

Traditionally, teff seed is broadcasted at high seed rates – typically, 30 kg per hectare. However, agricultural researchers believe that teff production is impeded by broadcast sowing due to the resultant uneven seed distribution, difficulty in weeding, and increased competition between seedlings. By planting seed in rows at a low seed rate instead, yields have improved significantly on-station. Field demonstrations of row planting also showed that yields increased on average by 70 percent compared to the national average (ATA 2013). As a consequence, this new teff planting technique has been promoted to Ethiopian teff farmers on a large scale.

Methods and data

The goal of this analysis is to provide evidence on the impact of the promotion of row planting at farm level. We combined quantitative and qualitative data to assess the promotion’s impact on the production practices of teff farmers. During the ‘pre-scale-up’ phase of the promotion campaign in 2012-13, we surveyed almost 1,000 farmers from 36 villages who were exposed to a promotion campaign of improved teff production technologies and techniques, including row planting. The survey was implemented as a large-scale randomized control trial, randomly selecting farmers to implement either row or broadcast planting on an experimental plot. Moreover, the experiment provided farmers with free modern inputs, and, therefore, differs from the package extended to other farmers in the ‘pre-scale-up’ phase. We focus our analysis on the isolated effect of the row planting part of the teff technology package only, controlling in our analysis for confounding effects arising from other elements of the package.

Findings

First, exposed farmers in the first year of the roll-out were found to have positive attitudes towards row planting (and reduced seed rates in general) and believe in the (large) yield increasing potential of row planting. They plan to adopt row planting, but only on a relatively small part of their plots, seemingly indicating that they are concerned with the labor requirements of the planting technique. Furthermore, they expressed a demand for more knowledge and experience in implementing row planting.

Second, by implementing row planting, farmers experienced an increase in teff yield of between 2 and 17 percent, depending on the measure of yield used (Vandercasteelen et al. 2013). While these results are promising, they are in contrast both with larger impacts measured in more controlled settings and with farmers’ expectations. The lower magnitude of the estimated yield effect, in this case, is seemingly related to farmer field conditions and the design of the experiment. The previous high yield benefits were measured at research stations or on demonstration plots, while the yield benefits estimated in this study reflects the effect of the promotion program at farm level. These take into account farm level realities and constraints in implementing row planting. Moreover,

Figure 1– Effect of promotion of row planting on teff production labor requirement (in person-hours per hectare), by operation

![Graph showing labor requirement for different crop activities between broadcasting and row planting.](image-url)

Source: Authors’ calculations
there may be possible deficiencies in the extension program in the first year of the roll-out, resulting in inadequate technical support being provided to the farmers by agricultural extension officers.

Third, we find that there is a substantial increase in labor input when adopting row planting. Figure 1 shows the observed results of the effect of row planting on the labor required for the different operations involved in teff production. As expected, additional labor input is needed for sowing the seeds and applying the fertilizer. In order to plant one hectare of teff, the total person-hours needed for row planting the seed is more than one third higher than for traditional broadcasting.

It is estimated that row planting requires an additional 43 person-days of work per hectare compared to traditional broadcasting. Row planting not only increases total labor requirements, but it significantly decreases labor productivity. This suggests that farmers employing row planting need to invest more labor in the teff production process to achieve the same output in grain as they obtain from broadcasting. This finding is fundamental, as the most important determinant of farmers’ adoption of a new agricultural technology is not the increase in land productivity, but the increase in labor productivity associated with the technology (Moser et al. 2006).

Fourth, we combine both the land and labor productivity effects in a Cost-Benefit Analysis (CBA) in order to compare the adoption of row planting with traditional broadcasting. Figure 2 shows a sensitivity analysis of the rewards (in birr) from changes to row planting from traditional broadcasting for different yield benefits from row planting (measured as a percentage), assuming that learning by doing does not affect the labor productivity. The CBA shows that the increase in teff yield outweighs the cost of the extra labor in the first year of adoption if yields increase by more than 8 percent.

Moreover, these results suggest that the adoption of a suitable and functional mechanized row planter by farmers would have a high return on investment. Those with access to such a row planter would be able to reduce their labor requirements for the implementation of row planting. The use of such a planter possibly may have an additional yield increasing effect as well.

**Policy implications**

This study points to a number of policy recommendations:

First, more effort should be put in into the design and implementation of the promotion campaigns for improved technologies. There is often a large gap between the supply of new technologies and their effective adoption by farmers, since innovations spread slowly and require different management skills. Farmers need time to be allowed to learn. Therefore, continuous efforts in extension centered on the new teff production technologies are called for. Larger yield increases can be expected if the technologies are implemented correctly, as illustrated by the agronomic research results in controlled settings and by the CBA results reported here. But proper implementation and adoption of the technology requires learning and experience over time.

Second, it seems that the extra labor requirements is an important determinant of low adoption or dis-adoption of row planting of teff. We suggest that the development of an adapted mechanical row planter for teff would have high rates of return and lead to higher adoption rates by farmers of the row planting technique.

Third, the constraints that farmers face towards the adoption of row planting should be further assessed with careful monitoring, learning, and evaluation. All of these are required to improve extension approaches in order to successfully scale-up the adoption of the row planting technology for teff.

**References**

