

Scarifier for Deep-Strip Tillage and Fertilization in Localized Bands



Working Group

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About the technology

This agricultural machine is specifically a scarifier for deep-strip tillage and fertilization in localized bands. The fundamental piece is the tillage unit, which has three components: the scarifier assembly, the secondary tillage accessory and the fertilizer accessory.

Problems or needs solved

Traditional management of sugar cane crops causes severe implantation surface disruption. This generates high power demand, a negative impact in the structural stability of soil and equipment damage. During the crop maintenance stage, the areas over which machinery travels are tilled in depth since will face transit from harvesters and heavy trucks later in the process. Hence, soil becomes more vulnerable to surface loads. In this context, fuel consumption exceeds 230 liters per hectare per year, increasing costs and reducing the efficiency of sugar cane as an energy source crop. This management system used during extended monocrop periods affects the physical integrity of soil. The soils in the sugar cane areas feature low levels of organic material, massive structures, low or zero volume of macropores and high mechanical strength profiles. The proposed

technology focuses on optimizing and improving tillage, from the work prior to planting until the end of the sugar cane usage period, while preventing soil compaction processes as a consequence of agricultural machinery transit. One pass of this machine (scarifier) replaces two passes of the subsoiler and two of the eccentric harrows. Since it fertilizes at the same time, the scarifier turns the soil strip and reduces power costs by 25% (Deep-strip tillage scarifier, 42 CVh·ha⁻¹, versus 164.17 CVh·ha⁻¹ of a conventional machine, including furrowing in both cases).

Proposal

The scarifier features an unprecedented spatial layout of the scarifying tools, placed in three vertical planes parallel to the longitudinal axis of the tillage unit and at three different depths, enabling adequate soil removal. This tool increases tillage power efficiency between 60% to 70%, compared with the one obtained with the traditional system. The depth of the last arch is the target tillage depth, in the order of 500 mm. The front and rear tines are located in the center of the machine. The front one works on the surface and the rear one reaches the target depth. The intermediate tines are laterally displaced and not paired, operating at an intermediate depth from the other two. This layout facilitates operations in heavily covered soils without jamming. The secondary tillage accessory is mounted on the rear of the scarifier assembly and has the function of producing small aggregates with minimum jamming risks.

The fertilizer accessory distributes fertilizer in depth and in four different bands, since the guide tubes are fitted on each one of the arches of the scarifier assembly.

Advantages

1. Replaces four passes during sugar cane implantation, which reduces fuel consumption by 45 l/ha. Additionally, it avoids two annual tillage operations normally performed during the crop cycle, which saves an additional 18 l/ha.
2. Simplifies tasks, reduces operating time and improves the economic yield of the crop.
3. Promotes a favorable environment for the radical larger scale development against the traditional system, keeping spaces between furrows unaltered.
4. Contributes to mitigating climate change by reducing emissions and tillage intensity.

Potential market

No similar technology is manufactured or marketed in the agricultural machinery market. This scarifier has been envisioned for sugar cane crops in any type of soil, but could easily adapt to other industrial crops. The commercial scope is very broad, with great potential for foreign markets out of Argentina.

Intellectual Property Status

Invention title: Scarifier for deep strip-tillage. Patent No. US10.028.421B2 granted by the US Office of Patents and Trademarks (USPTO).

Invention title: Scarifier for deep strip-tillage. Application or Patent No. 201410640038.5 Serial No. 2019032600809300 granted by the State Intellectual Property Office of China (SIPO).

Invention title: Scarifier for deep strip-tillage. Patent No. MX 359378 B granted by the Mexican Institute of Industrial Property (IMPI).

Invention title: Scarifier for deep strip-tillage. Patent No. BR 102014028266-1 granted by the Brazilian Patent and Trademark Office (INPI).

Keywords

#sugar cane #tillage #strips #scarifiers #efficiency #energetic #compaction #soil #subsoiler #plow #soil #mechanization #soil loosener #machinery #fertilizer accessory #implantation

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