

The Zainer

A simple machine supporting conservation agriculture

Zainer

Climate change increases the challenge to ensure food security in Africa. Conservation and regenerative agriculture is vital, but farmers consider it as too labor-intensive. PRACTICA therefore initiated the development of a simple tool to quickly and cheaply produce small basins or pits to support soil conservation. We call this tool the Zainer, as a reference to the traditional West African practice of producing small potholes, called Zaï.

Technical design

General characteristics

The Zainer is a vertical drill, mounted on a two wheeled cart and operated by a small 3hp engine. The drill bit can easily be replaced and be adapted to different soil conditions and desired hole dimensions. A provision can be added to set different line and hole spacings as required.



Different drill bits

Configurations

The present design is for a complete machine including the engine. Redesigning it as a toolbar to be fitted on, for instance, a two wheel tractor is possible. In that case, more power is available and it may be possible to drill 2, 3 or even four holes at the time.

Speed of operation

With a single drill and no extreme hardness of the soil, a speed of 20 holes per minute is possible. With 1.4 holes/m2, 1ha will take 12 hours, 0.5ha 4 hrs etc. If the machine is fitted with four drills, this time will be reduced to only 3 hours.

Soil deposition

The special shroud around the drill serves two purposes: 1) it protects against stones flying away and 2) it can deposit the soil either on one side or another. With the latter, the shroud ensures that the soil is deposited downstream of the pit on a plot with a slope. This has the advantage that when it rains, the contour created around the lower part of the pit will guide the water into the pit. Fertilizer can be applied in the pits to stimulate crop growth even more.

Business case

Local production & capacity building

When engines and V-belt transmission parts can be sourced locally, there is no need to import these components. If not, PRACTICA can assist in establishing necessary procurement channels, support in local design processes and train up enterprises interested in machine production. We can also facilitate the capacity building of other stakeholders, such as government institutes, maintenance technicians and end-users, and provide advisory services in sustainable land and water management practices.

Economics

It is estimated that the Zainer, when produced locally, will cost about USD 1200. The fuel consumption will depend on the hardness of the soil and vary between 0.25 to 0.75l/hr. The maintenance cost are estimated at 0.25 USD/h. This excludes the costs for a possible service provider / operator.

Ownership & management

In case of smallholding farming, the ownership of the Zainer by a service provider or farmer cooperative is deemed the most logical option. In its present design form (a very simple and robust configuration), it may be feasible for farmers to rent the machine and operate it themselves. In case a more sophisticated design is selected, it may be better to have an operator managing the machine.

What is PRACTICA Foundation ?

PRACTICA is a non-profit organization. We work in over 10 countries to support its partners like NGO's, governments, local entrepreneurs and farmer organisations with technical know-how on small scale technologies in the field of water, agriculture and sanitation.
We are not an implementing organization, but guide and train partners in the use, uptake and knowledge of various technologies. Research and development is a core part of our work at our head office in the Netherlands where we develop & test new products that could improve the lives of the poor. As an example, we have developed one of the first solar pumps on the African market, which is now being marketed by one of our partners Futurepump.



Millet growing in a Zaï pit



Field test in Europe



Manual Zaï practice in Burkina Faso



A field in Burkina prepared with Zaï

Click on the link to see the Zainer in action:
https://youtu.be/L-OUZnxhmq4

Development stage - June 2021

PRACTICA has executed field surveys in Burkina Faso and Mauritania to understand the potential interest and willingness-to-pay among farmers. In Burkina Faso, on a location where the hardness of the soil is extreme, a second iteration technical prototype is being tested. This will yield valuable information to feed back into the design process. The requirements in other countries may be different and the design can be adopted to suit those needs.

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