

Starter Fertilizer Application System

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The Problem

Starter fertilizer which contains phosphorous and potassium, is important to the early development of the corn plant.

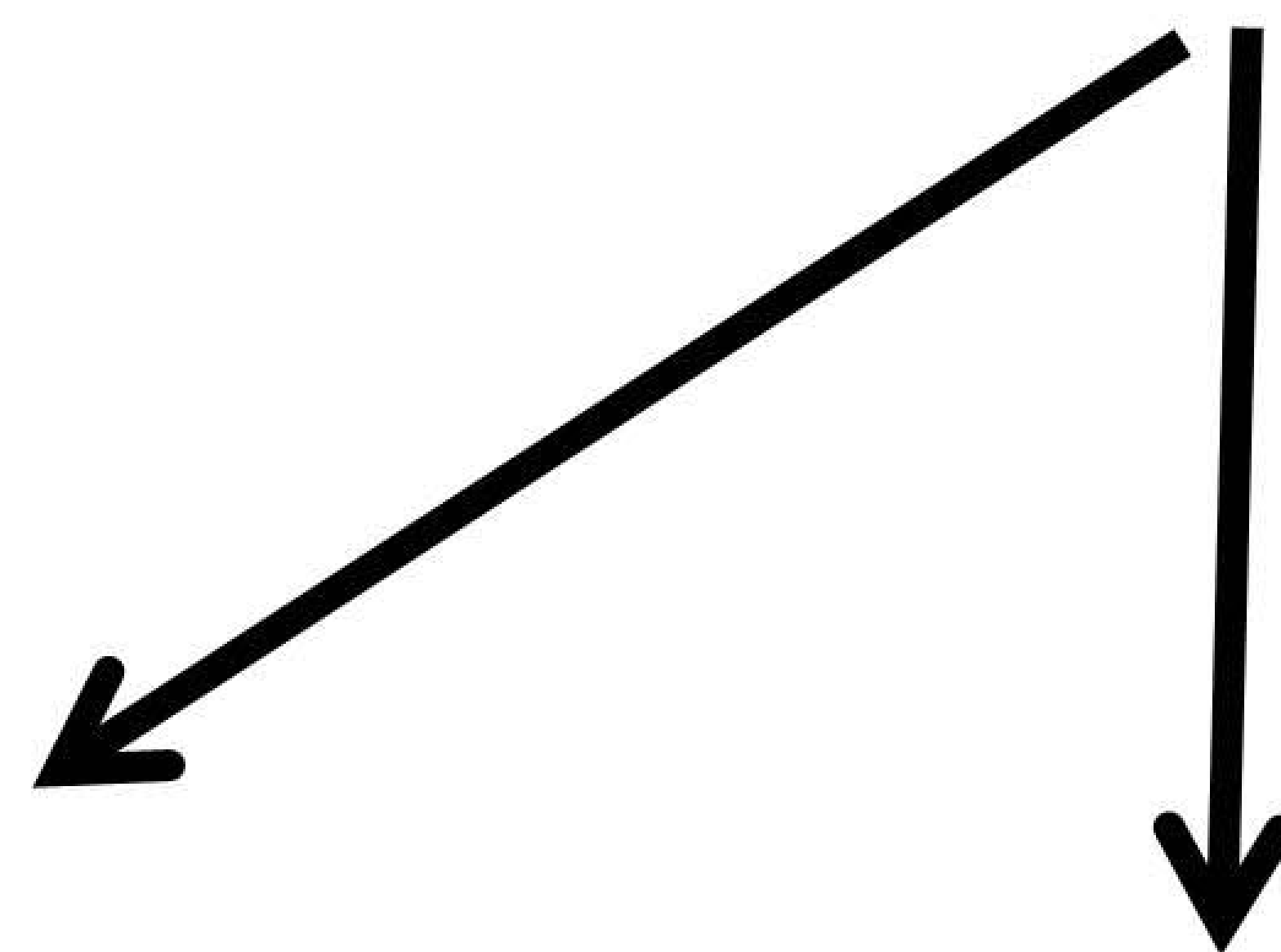
Problems with the current systems:

- Plugging and doesn't prove to be efficient
- Uses one small disc opener to create a slot for the fertilizer to be placed in.
- Fertilizer is placed on top of the soil and then seeps into the furrow made.
- The starter is very sticky and accumulates on the components of the planter.
- Starter can evaporate or result in runoff when placed on the surface.

There is currently no precise way to place starter fertilizer while no-till planting that is efficient and free of malfunctions. Our system is made to address this problem and efficiently incorporate the starter into the soil.

Planter used to make a final design of the starter application system.

24-Row 3200 Kinze



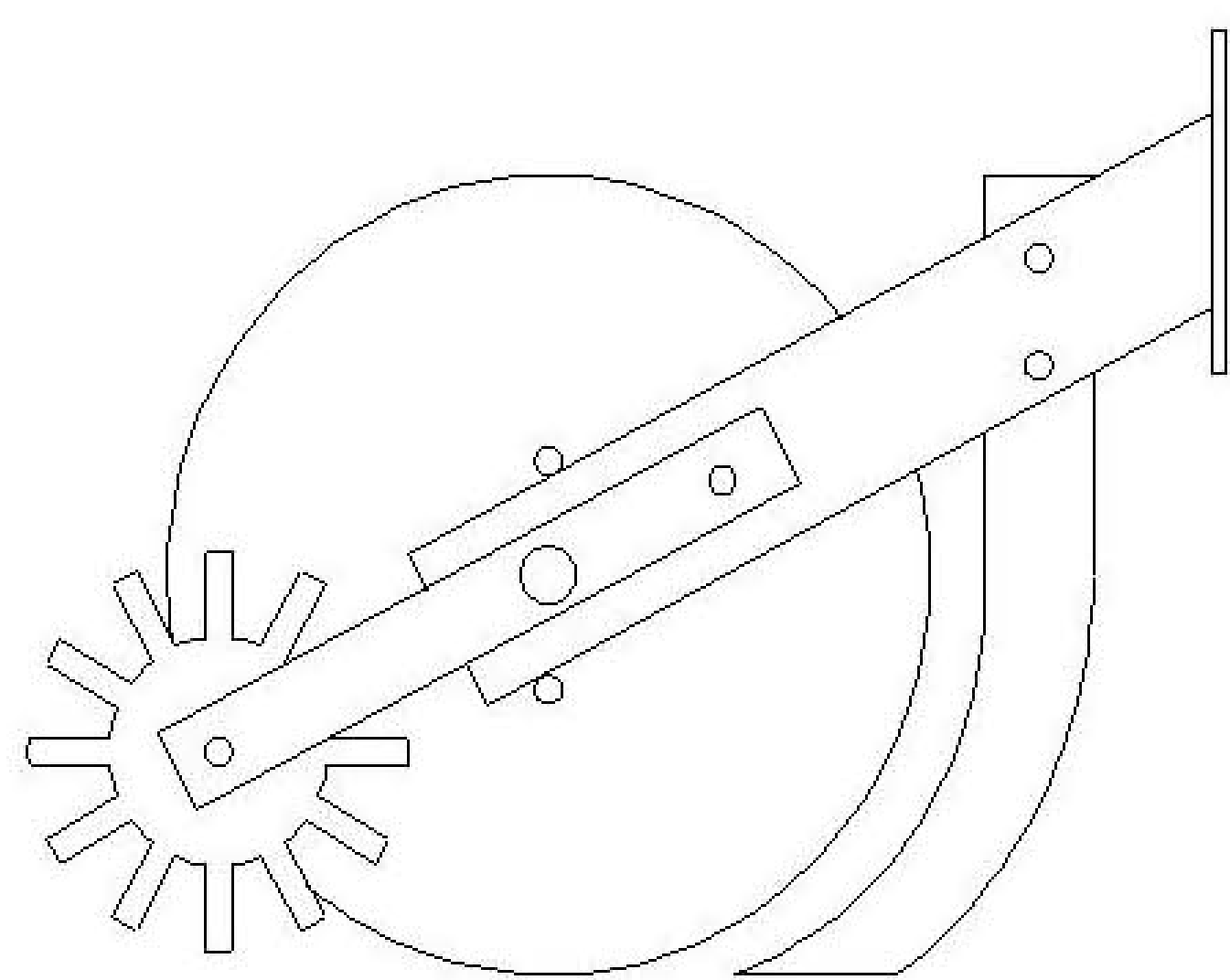
Our Solution

We redesigned the liquid starter application system to effectively apply fertilizer. The system incorporates a knife so that the fertilizer could be placed in front of or behind the seed tube.

The first design was to incorporate a knife in front of the seed. This was difficult to accomplish because extensive modification was needed to make the knife fit into the limited space. We didn't build a prototype once the limitation was discovered.

The second design was to use a knife after the seed was planted. We accomplished this by making a knife mount that bolts on to the planter. This system is a modification that does not alter any seed placement devices. The knife follows a disc opener that mounts behind the closing wheels. This allows for a large amount of space to work with. The knife and opener are on a spring to allow for movement over objects and allows the system to stay on a level plane. The system also allows for depth adjustment by moving bolts to the desired holes. The knife system we used is offset to precisely place the fertilizer where the seed can use it efficiently, which is two inches down and two inches over from the seed. Also knifing in the starter reduces the chances of evaporation and is a much more effective and cleaner method.

Early Developed Designs



Auto CAD drawing of initial design that places starter before the seed.



2 $\frac{1}{2}$ " angle iron design that goes behind the planter.

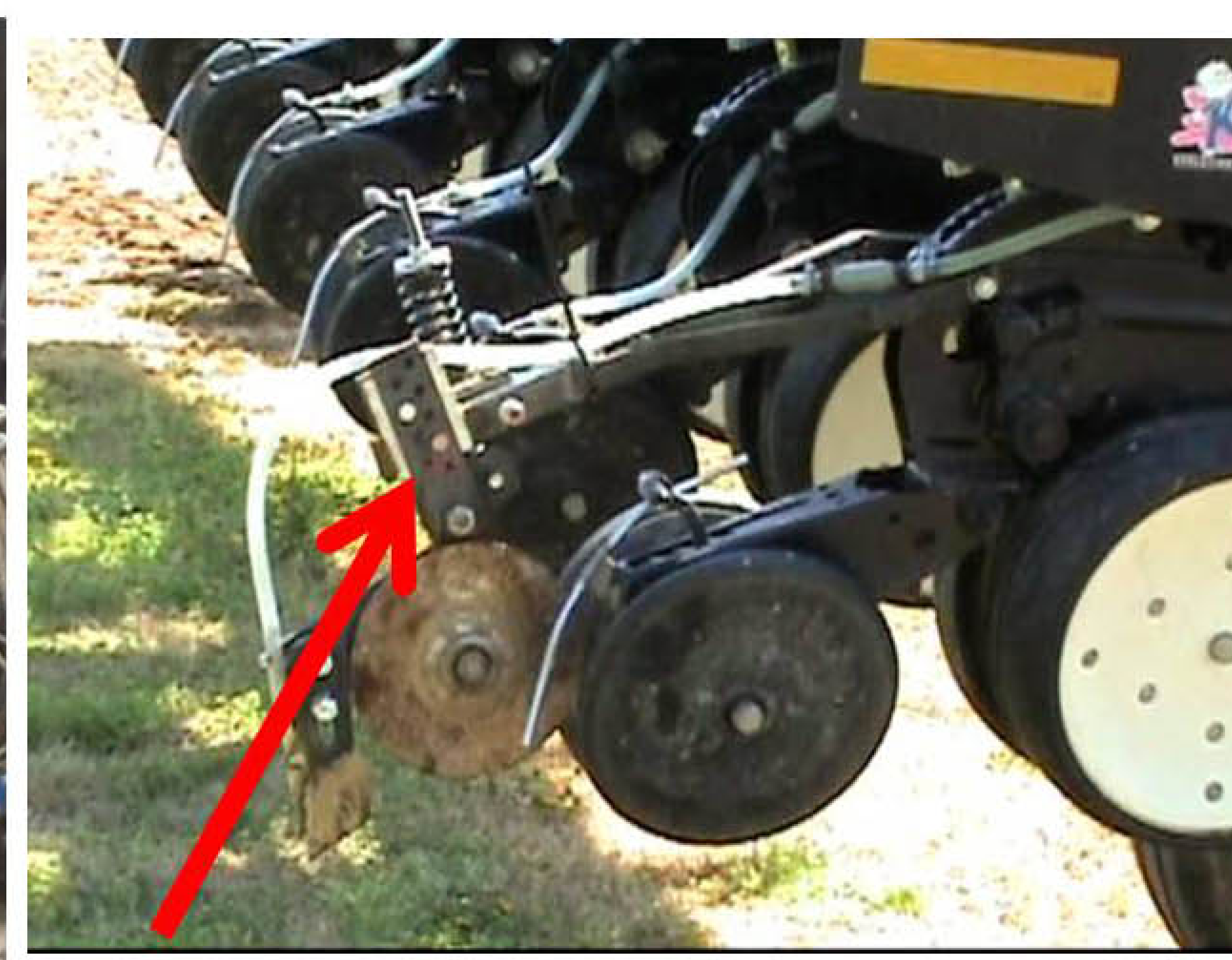
Developing the Final Design



Arched design allowing for full movement of the gauge wheels.



Pivot allows knife to move.



$\frac{1}{2}$ " depth control adjustments for the knife and opener.

The final design incorporates :

- Rigid mounting design that uses steel tubing to provide strength while allowing for no modification to the unit.
- Knife and opener combination that is spring tensioned and doesn't interfere with planter at planting depth.
- Adjustability of the knife and opener that allows for a variety of desired depths.
- No modification to the metering system on the existing fertilizer application pumps.
- Safety stirrup that protects the operator from injury while filling the planter boxes.

Deliverables of Our Solution

A starter application system that:

- Is a working prototype that delivers the fertilizer in an efficient and effective method.
- Includes a cost analysis to replicate the existing prototype.
- Includes CAD drawings of the system and its components.

Analysis of the Prototype

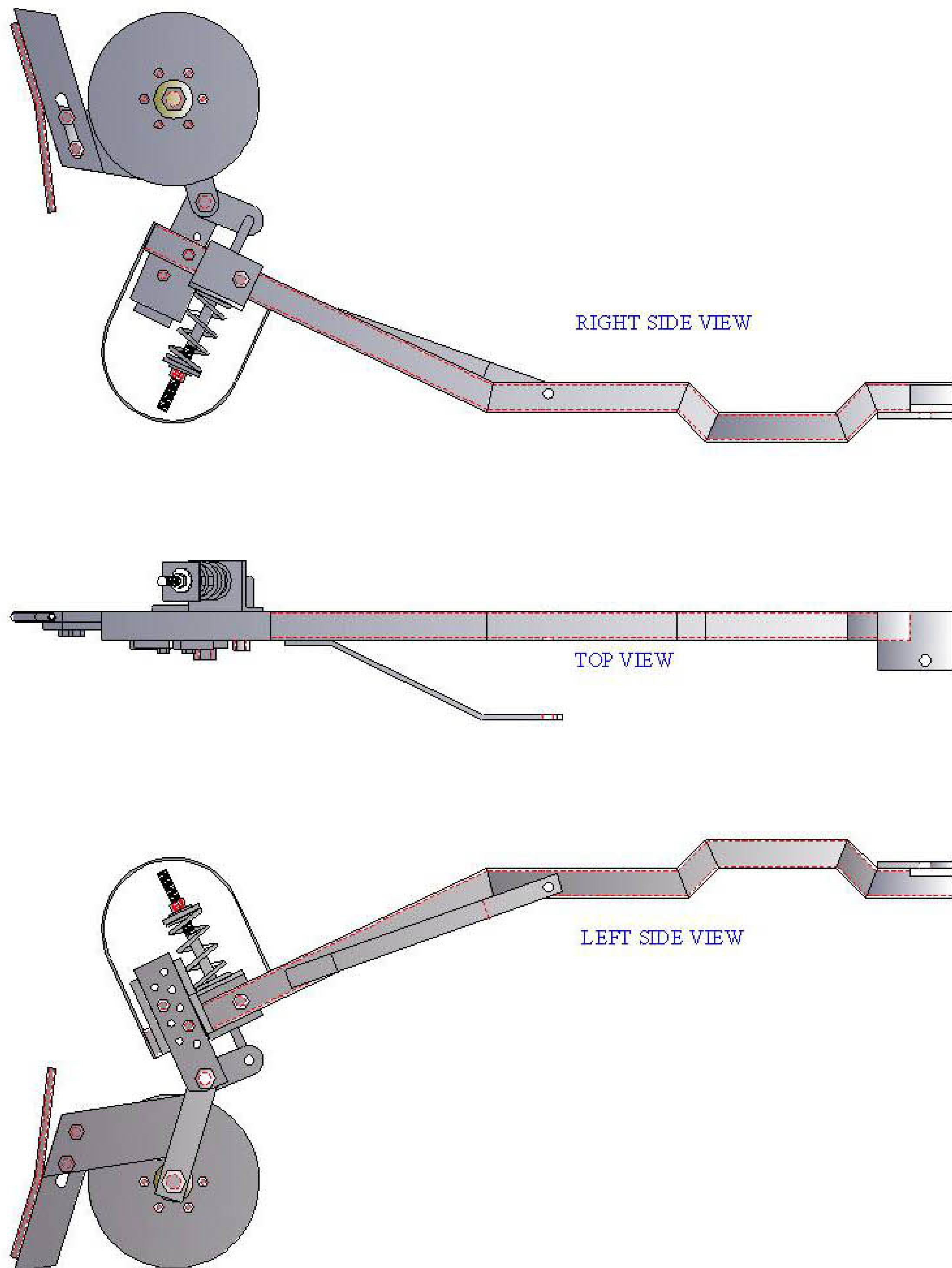


Fertilizer application system mounted to planter unit.

System incorporating fertilizer into the ground.

Seed corn relative to the placement the fertilizer.

CAD Drawings of Final Design



Cost Analysis

Knife	\$15
Disc Opener	\$20
Steel	\$55
Fertilizer Fittings	\$10
Fabrication Expenses	\$140
Miscellaneous	\$30
Total	\$270/unit
*Fabrication expense includes professional welding and fabrication to the knife. Not necessary for final design function.	

Special Thanks to :



Fueger Farms

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Kenny Goldman