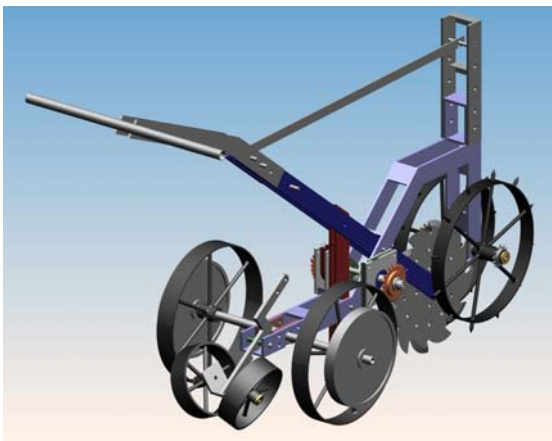


Semi-Annual Report (SANREM Year 4)

Executive Summary

In the first half of year 4, performance tests on the major parts of the animal drawn no-till implement were done. Six coulters were fabricated and tested and three opener geometries were also tested. Among the coulters, the 12 teeth curved and straight tooth coulters were found to require less horizontal draft force. Both coulters were also able to cut the living and dead residue sufficiently. The opener with the larger rake angle required the least horizontal draft force. Wings were added and tested but was found to have a small effect on the soil breakage and down force contribution compared to openers without wings. Soil breakage was also improved when a soil breaking tip and spikes mounted on the side of the opener shoe were used. Mounting plastic on the sides of the opener was also found to reduce the horizontal draft force by 5 kilograms. The rear wheels were set apart to improve stability and a soil compactor were added between them.



The seeder mechanism's metering performance depended on the variation in sizes of the seed. The seeder delivered one to three seeds per position. Also, the seeding depth averaged at 34 mm with a standard deviation of 14 mm, which was too large. The fertilizer dispenser was not yet tested. It was supposed to deposit fertilizer under the soil in between adjacent seeds. A design of engine-powered no-till equipment was explored. It was found that motorcycle scooter parts such as the gear box and centrifugal clutch could be used to build the equipment.

On planting preparation, it was found that a thin spray of Round-up can kill a sufficiently wide strip of *araquis pintio* and local weeds.



Regarding operation, testing had shown that the animal-drawn no-till equipment can be operated by one or two persons. For operation with one person, a handle similar to the conventional plow was suggested. The equipment was run at an average of 1.0 m/s.



Research Strategies and Developmental Activities

In the first half of year 4, a student thesis group was tapped to do the design, fabrication and testing of the functional elements of the animal-drawn no till equipment. The objectives given to the group were: (a) determine the effect of the number and shape of teeth of the coulter and (b) determine the effect of the shoe rake angle and wing size of the opener. Six coulters, 10- 12-, and 14- curved- and straight toothed coulters were tested. Three opener rake angles were tested: 30-, 45-, and 60-degree openers. Three opener edges were also explored: beveled, square and round. Wing attachments to the opener were also explored. There were three variations for the size and angle. Stability was improved by setting the rear wheel farther apart but had to add a soil compactor to ensure sufficient soil contact of the seeds. Metering and deposition of the seed was also tested. Exploration of a feasible design of an engine-driven no-till equipment using motorcycle parts was done. In the second half of year four, the social and economic impact of using the animal-drawn no-till equipment shall be made. Two (2) sites were chosen: one in Lucban, Quezon, wherein a farmer can be hired to take care of the garden and the other in Mindanao in coordination with Dr. Agustin Mercado. Ms. Olive Tiglao shall help gather and

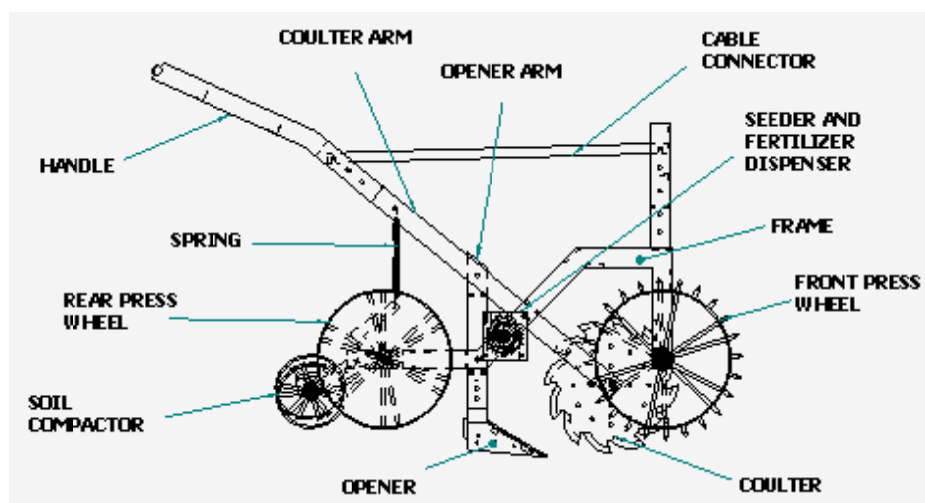
analyze the data from both sites. Comparison between manual seeding and mechanical seeding shall be done likewise. Prior to the farm testing, an equipment demonstration and training shall be done for the participating farmers. In parallel with the farm testing, fabrication and testing of two (2) engine-powered no-till equipment shall be made. Only field and laboratory testing will be done to determine the economic viability of the said concept.

Research Progress by Objective

Objective 1: Develop a practical and economically viable small no-till planter for upland farming

Critical research accomplishments:

- A 12-teeth coulters performed better than coulters with lesser or greater number of teeth.
- Curved-teeth coulters required lesser horizontal draft force than straight-teeth coulters.
- An opener shoe with a larger rake angle required less horizontal draft force.
- Use of the plastic siding on the opener reduced the horizontal draft force and can help control the width of soil opening.
- Use of spikes on the sides of the opener shoe helped break the soil better.



- Motorcycle parts can be retrofitted in the design of the no-till equipment.

System Level:

- Field testing
- Laboratory testing

Development Impact:

- After learning more about the size and geometry of the main working elements;
 - The equipment can be modified and be made to perform better
 - Social and economic studies can have more positive results with better no-till equipment.
 - The development of engine-powered no-till farm equipment can resume.

Challenges and Responses:

- Workload of the project leader was still not conducive for meaningful research and development due to the lack of qualified instructors and professors in his department. The response was to use a student thesis group to do the design, fabrication and testing of the main working components and the project leader takes care of the overall planning and advising.
- In the first half of year 4, the weather still did not permit the group to do meaningful testing in the province. The response was to set-up a testing area within the school. A 1.5 meter wide and 5 meter long soil bin was setup.

Degree and Non-degree Training Activities

None.

Publications, Presentations, and Other SANREM CRSP Products

None.

Networking Activities

None.

Project Highlights

- The best combination of size and geometry of the coulter and opener have been determined.
- Modifications have improved the equipment performance:
 - Addition of plastic siding on the opener reduced the draft force.
 - Addition of spikes on the opener shoe resulted in improved soil breakage.
 - Setting the rear wheel farther apart improved the stability of the equipment.