

Final Presentation

Group 2

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Target User Scenario – The Problem

- Pilirani the Malawian farmer
- Has a wife and 5 children
- They plant maize on a 2-hectare farm
- 3 km commute
- Lacks machinery to facilitate farming
- High physical workload
- Farming yields could be improved
- Existing solutions are either too expensive, or perform poorly








Google Gemini (2026)

Mission Statement

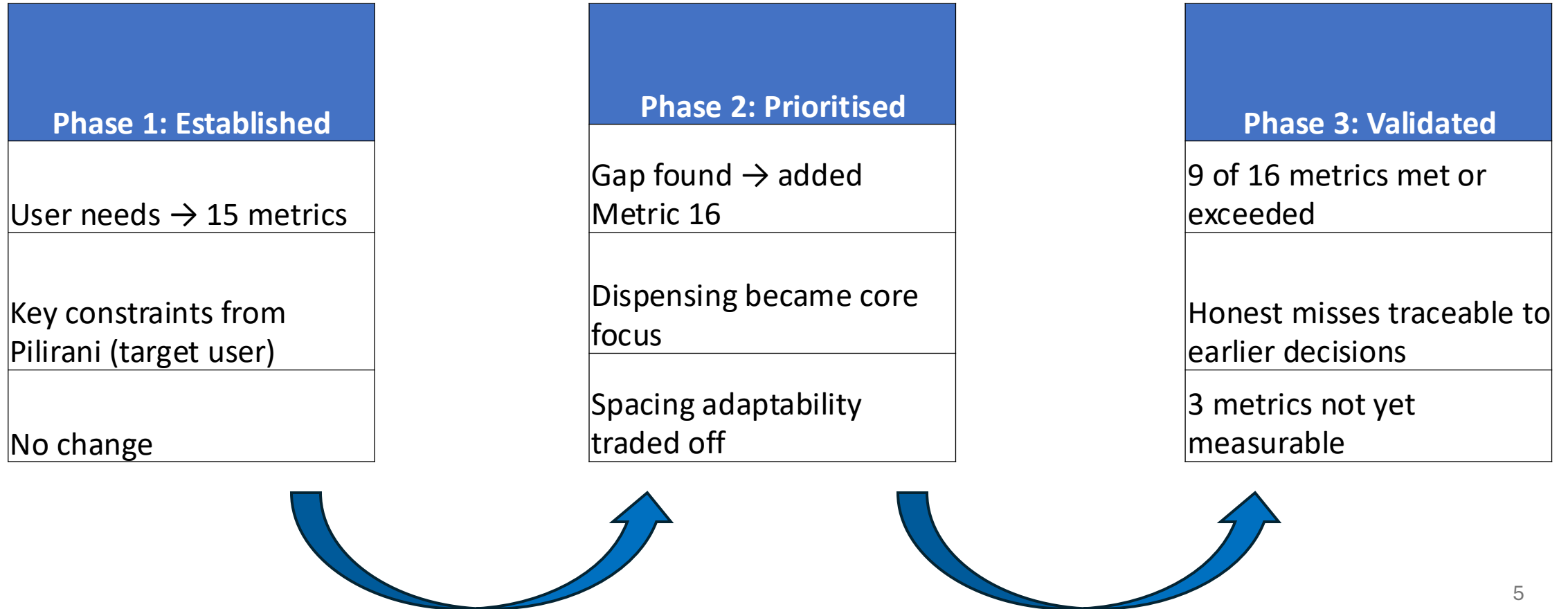
- Opportunity gap: Low cost, easy-to-maintain, precise seeding/fertilizing tool
- Benefit: Increase efficiency, enable income generation, lower risk of famine
- Goal: Design and manufacture working prototype by end of May
- Target market: Poor subsistence farmers in Malawi
- Stakeholders: Users, manufacturers, farm equipment lessors
- Assumptions and constraints: Cheap, manual, portable, easily assembled, repairable

Final Specifications

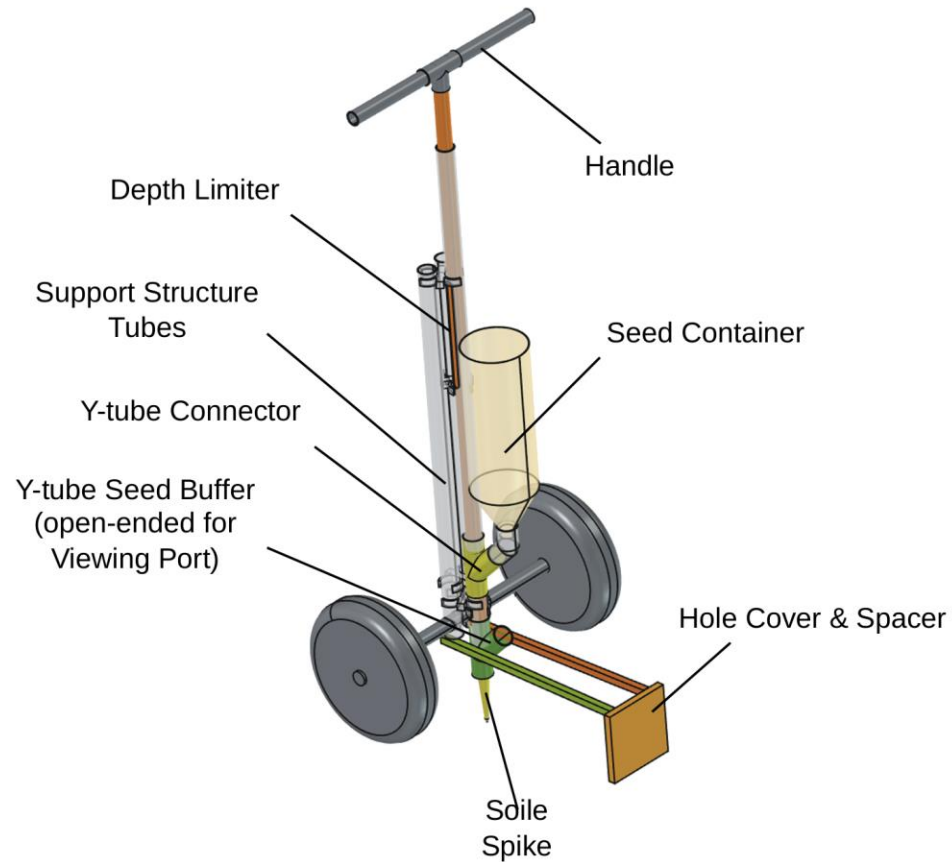






Metric Number	Category	Metric	Importance	Units	Marginal Value	Ideal Value	Final Value
1	Economic	Cost of acquisition	High	USD	<15	< 8	52.73 (CHF)
2	Performance	Speed of seeding/fertilizing	High	s / (seed/fertilizer unit)	< 5	< 2	10s / hole (= 1.53 seeds)
3	Performance	Precision of spacing	Low	% of step size	> 80	> 90	50 ± 10cm (80%)
4	Performance	Soil displacement for cover up	Medium	cm ³	>15	>30	not measurable
5	Physical	Weight of device	Medium	kg	<4.5	<2.0	~3kg
6	Physical	Height	Medium	cm	85-115	95-105	120cm
7	Physical	Depth	Medium	cm	< 40	<20	40cm
8	Ergonomics	Ergonomics rating	Low	Subjective (1-10)	> 6	>9 (?)	7 (highly subjective)
9	Ergonomics	Force required to operate	Medium	N	< 60	<25	not measurable
10	Ergonomics	Number of operators	High	Integer	1	1	1
11	Operational	Adaptability of spacing	Medium	cm	25-35	20-40	none (50cm fixed)
12	Operational	Seeding/fertilizing depth	High	cm	[8, 12]	10	10 ± 2cm
13	Operational	Seed/fertilizer loading capacity	Medium	g	>300	>1000	350-400g
14	Maintenance	Lifespan	High	years	> 2	> 5	not measurable
15	Maintenance	Standard parts used	High	%	> 70	100	~84%
16	Performance	Seed/fertilizer volume dispensed	High	# of seeds / g of fertilizer	[1,3] / [2, 10]	2 / 4	Seeds: 1.53 (mean), 2 (median)

How Our Specifications Evolved

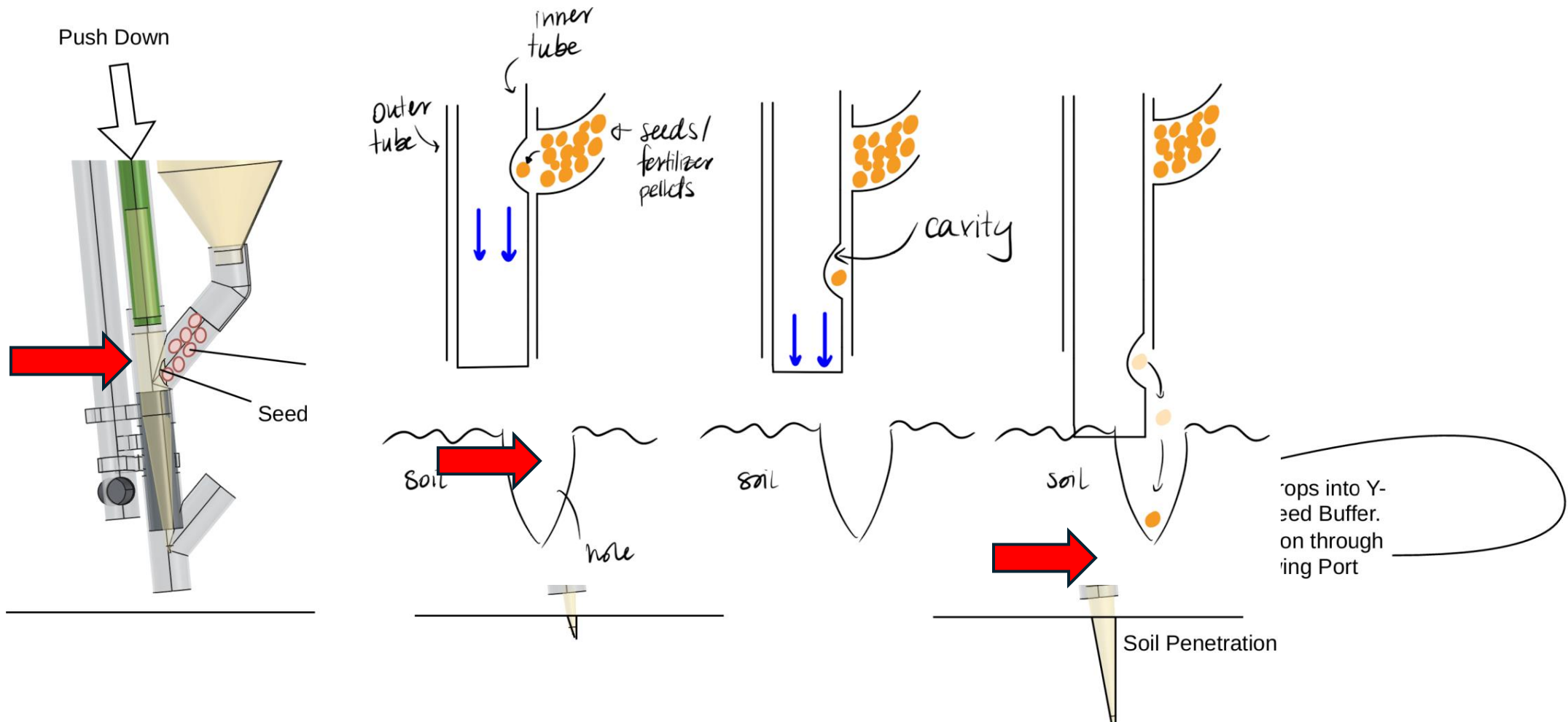


Final Concept & Prototype – Overview



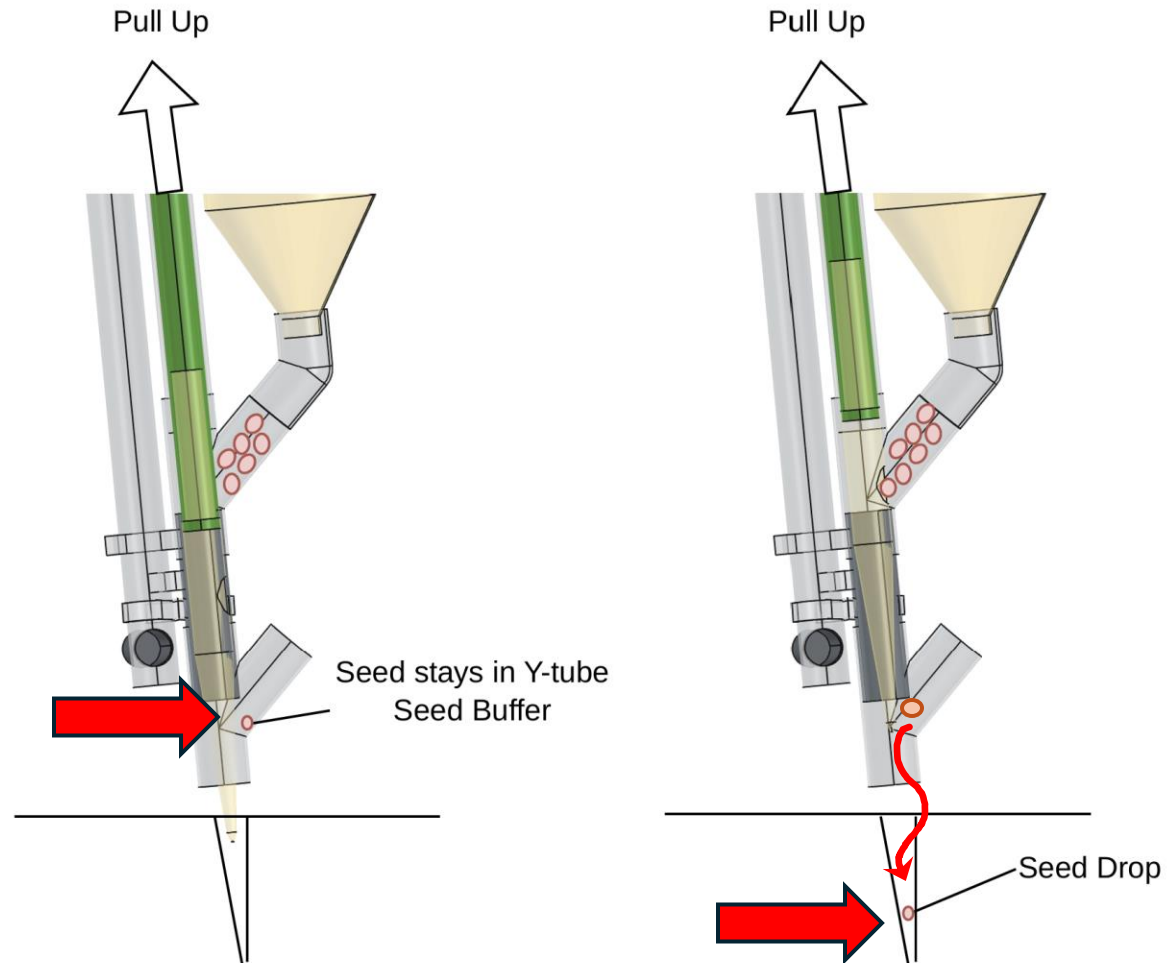
Final Concept & Prototype– Key Mechanisms

- Seed(fertilizer) dispensing & hole punching



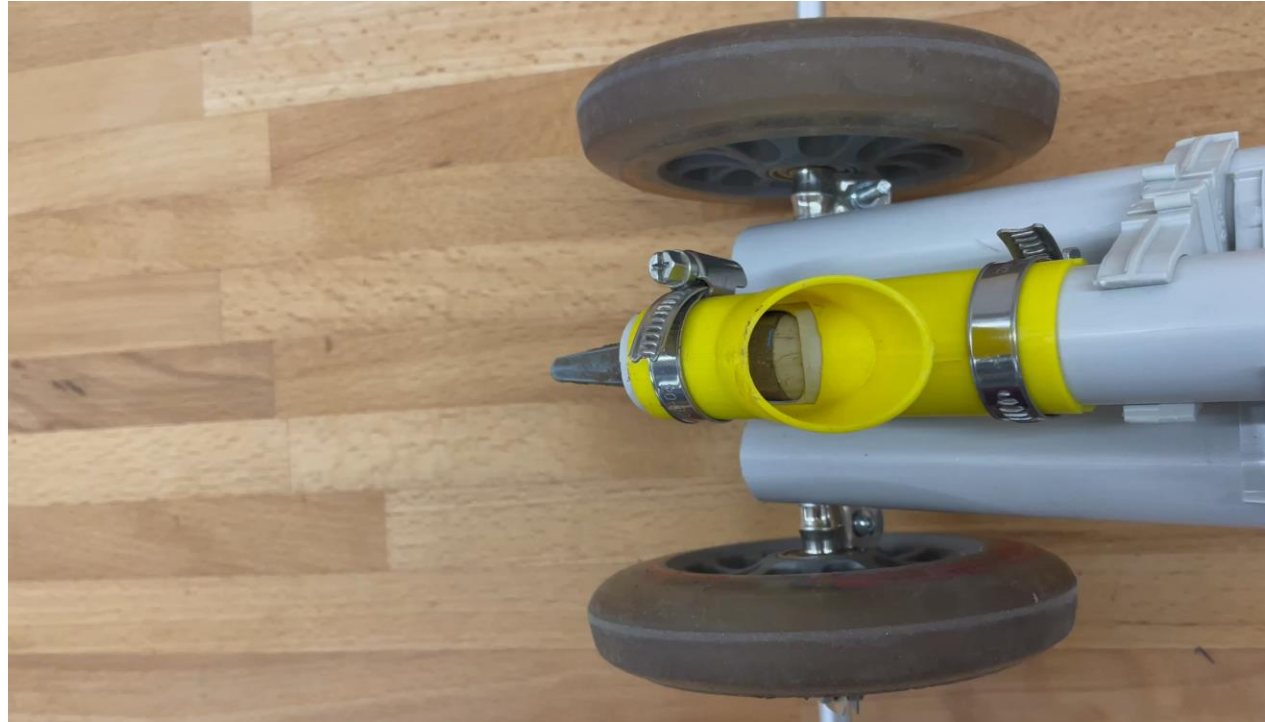
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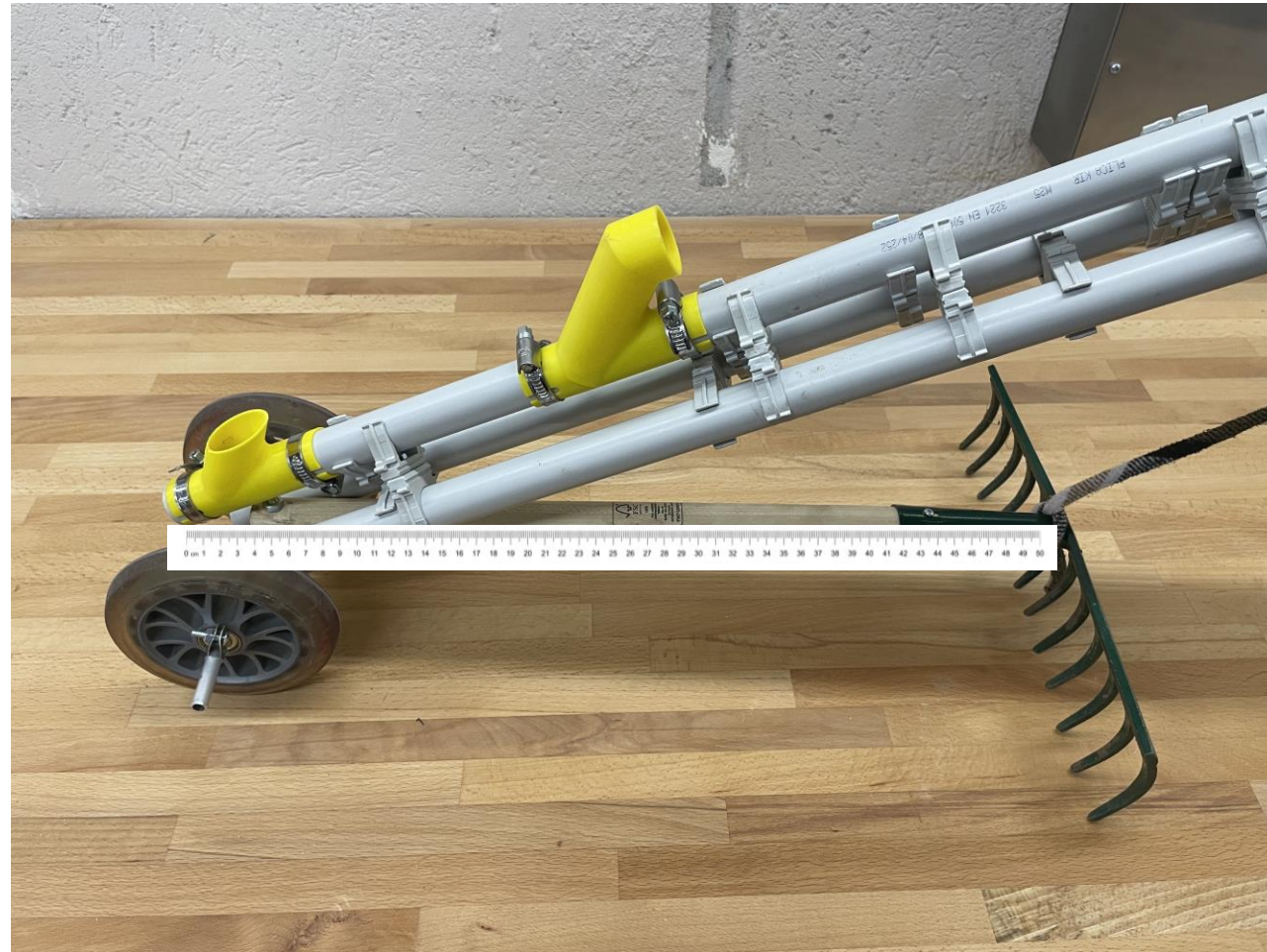
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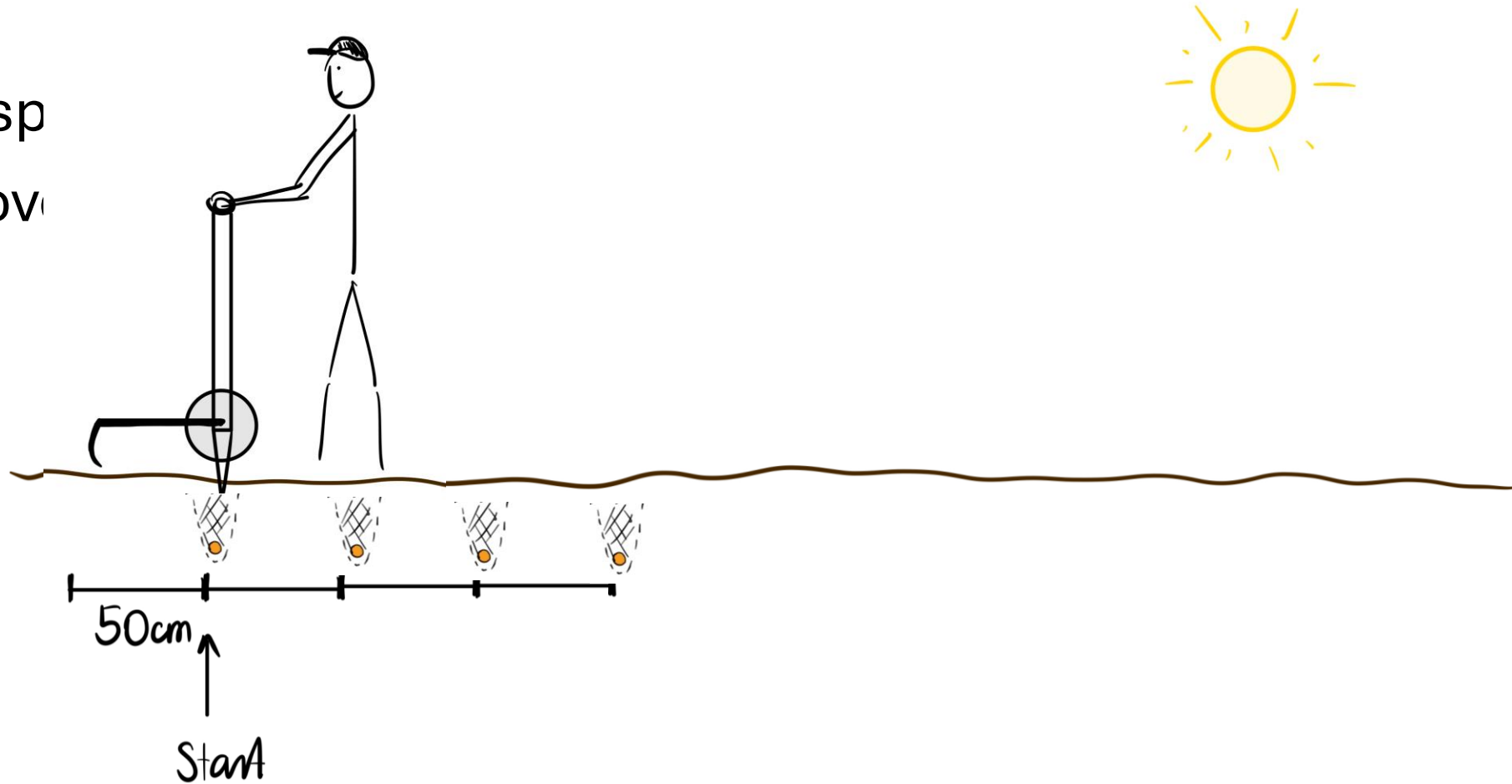
Final Concept & Prototype – Key Mechanisms

- Hole spacing,
Hole covering



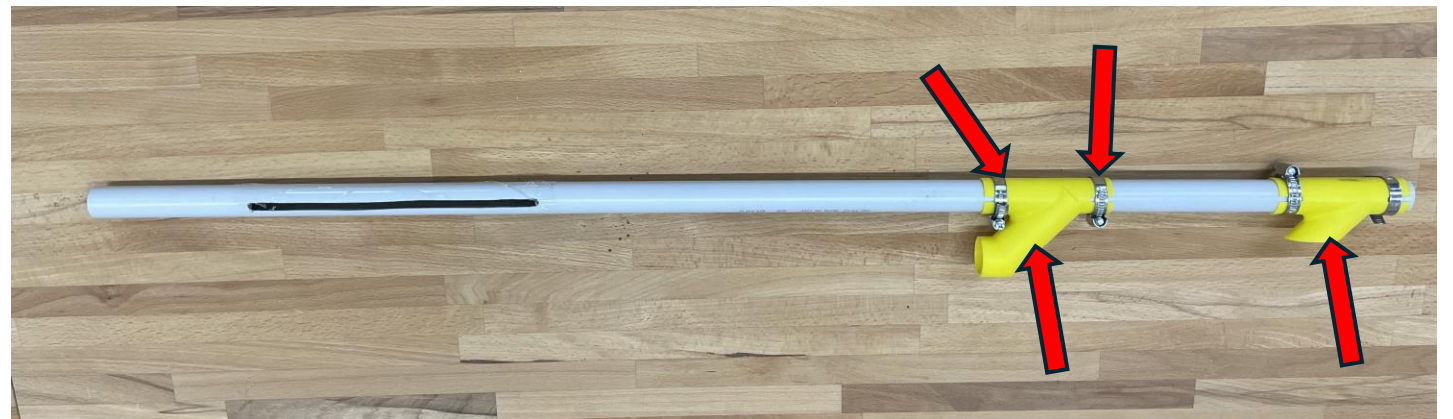
Final Concept & Prototype – Key Mechanisms

- Hole spacing
- Hole cover



Final Prototype - BOM

Component	Material	Total (CHF)
PVC pipes & fittings (20, 25mm)	PVC	25.05
Metal O-ring 20–32mm	Metal	4.25
Rake	Steel	9.95
Used Children's scooter (wheels + handle)	Rubber/Steel	5
Plastic bottle (seed compartment)	PET/HDPE	0
Alu rod 6mm	Aluminum	1.98
3D printed parts	PLA	3.5
Screws/nuts/clips (M4, M6)	Steel	3
Total		52.73



➤ Estimated production cost in Malawi < 30\$

Final Prototype - Why Our Seeder?

- **Built for the field** - every part (except 3D prints) is available at a local hardware store in Malawi
- **~ 50 CHF** - material cost for a fully functional seeder
- **Light enough to carry, simple enough to fix** - no welding, no special tools, no expertise needed



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Prototype Competition



Competition

- What Worked

- **Seed dispensing:** 2 seeds per hole in virtually every actuation; never 0 or 3
- **Hole coverage:** rake so effective the holes were barely visible afterward
- **Ergonomics:** rubber grip comfortable; bottle loads and ejects trivially
- **Transport:** <3kg, wheels make dragging effortless across terrain
- **Depth consistency:** vertical slot mechanism held up, spike penetrated to correct depth every time



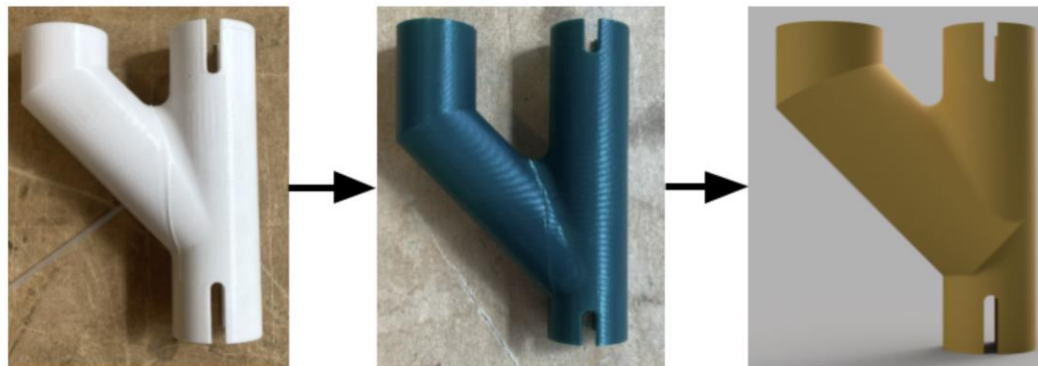
Competition - What Didn't Work

- **PLA spike tip:** vulnerable on stony/unprepared soil; sometimes pulled soil back up on withdrawal, disrupting hole geometry
- **Wheels:** slightly too small for soft or uneven ground
- **No self-standing:** tipped over once unattended, spilling seeds
- **Rake collects weed roots:** occasional manual clearing needed



What did we learn?

- Soil moisture significantly affects spike penetration and seed placement consistency
- Subsystem testing accelerated iteration and reduced overall development time
- Rapid prototyping was essential, performance only becomes visible once you test in real conditions



Next Steps



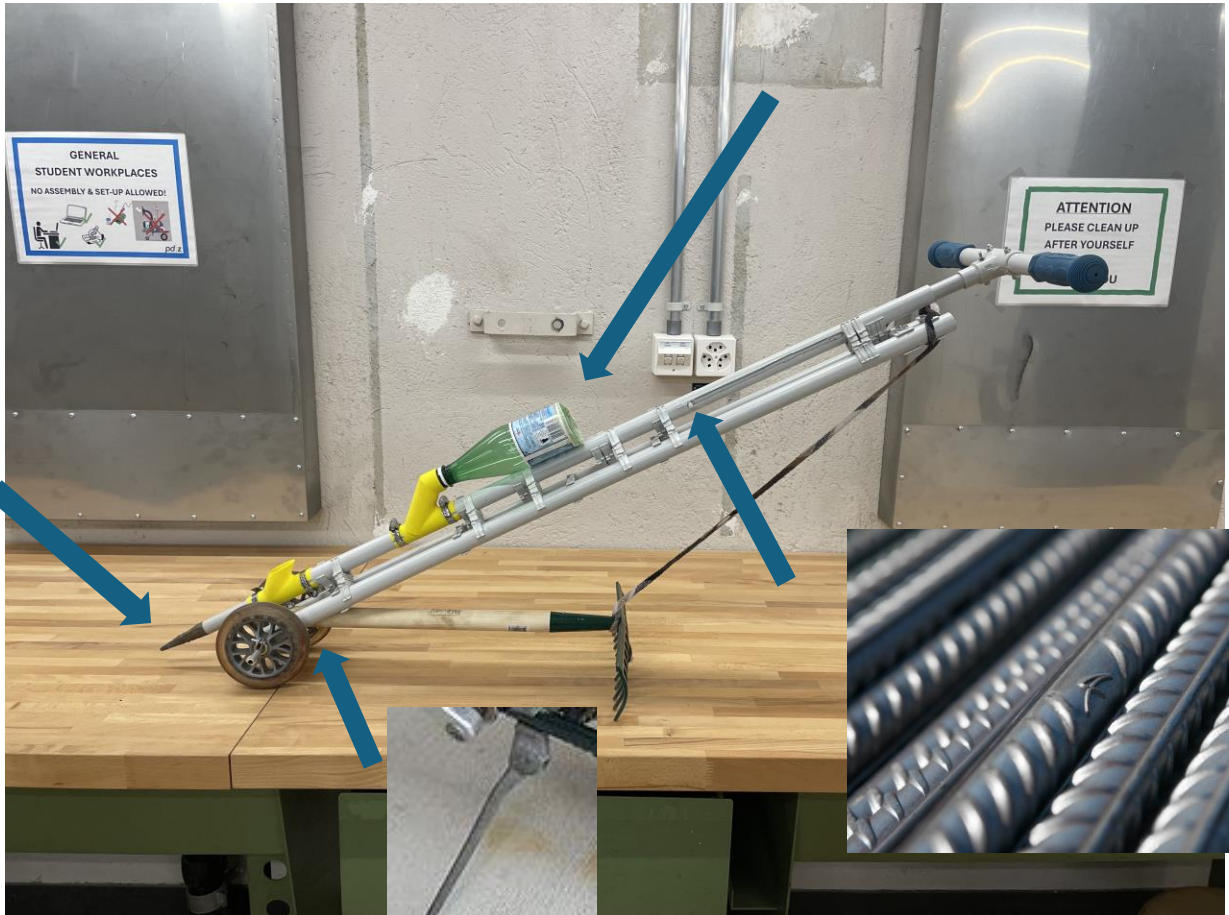
Takeaways from Testing



Sanpellegrino S.p.A. (2026)



Valta et al. (2020)



Andrew Dressel, Wikimedia Commons



ArcelorMittal Kryvyi Rih, Wikimedia Commons

Consider Product Specifications

- Reduce Cost
- Reduce Height
- Increase Usage Speed

Gather Feedback



Google Gemini (2026)

Field Testing



Mvula et al. (2025)

Next Steps



Manufacturing

- Adapt Materials for reduced cost
- Reduce dependency on 3D-printed parts
- Validate local production cost with suppliers
- Develop assembly manual for local production

Next Steps



Thank you for
your attention!
Questions?

