



Tools for Small Acreage

C. Zesiger

Why Use Tools/Machinery?



SHORTEST TASK
COMPLETION TIME



REDUCE PHYSICAL
EFFORT AND WEAR



INCREASE PRECISION

Opportunity Cost



- Opportunity cost = cost / gains
- Implicit
 - Time spent on intangibles
 - Potential income
- Explicit
 - Affect cashflow

Soil Prep Tools



Tiller

- \$850
- Primary use
 - Secondary tillage



Two-wheel Tractor + Implement

- \$5780
- Primary use
 - Many applications



Tractor (new) + Implement

- ~\$15,000
- Primary use
 - Many applications

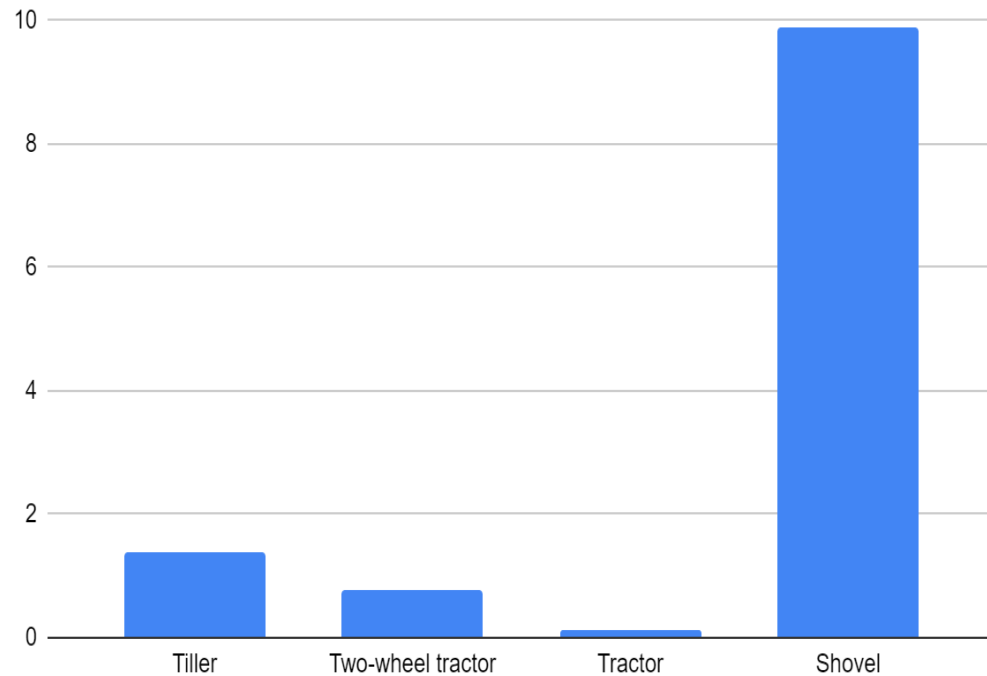






Equipment & Hand Tools vs Time

1/10TH Acre Soil Prep Tools vs Time (hours)



Time (seconds) 10'x4' plots	Soil Prep: tiller (19")	Soil Prep: tractor (two-wheel 32")	Soil Prep: tractor (four-wheel 4')	Soil Prep: by-hand
Rep 1	46	25	4	363
Rep 2	46	25	4	307
Rep 3	46	25	4	310
Average (seconds)	46	25.0	4.1	326.7
Hours/Acre	13.8	7.6	1.2	98.8
Hours/0.5Acre	6.9	3.8	0.6	49.4
Hours/0.25Acre	3.4	1.9	0.3	24.7
Hours/0.1Acre	1.4	0.8	0.1	9.9
Minutes/4'x100'	7.58	4.17	0.68	54.44
Hours/4 successions (1/10 th acre)	5.5	3.0	0.5	39.5
Labor/Job(\$15/hr)	\$82.58	\$45.37	\$7.44	\$592.90
Machine Price	\$850.00	\$5,780.00	\$15,000.00	-
Time to break even (years)/job on 1/10 th acre	1.67	10.6	25.6	-

Soil Prep Tools



Tiller

- \$850
- Break even
 - 1.67 yrs/10th acre
 - .71 yrs/0.25 acres



Two-wheel Tractor + Implement

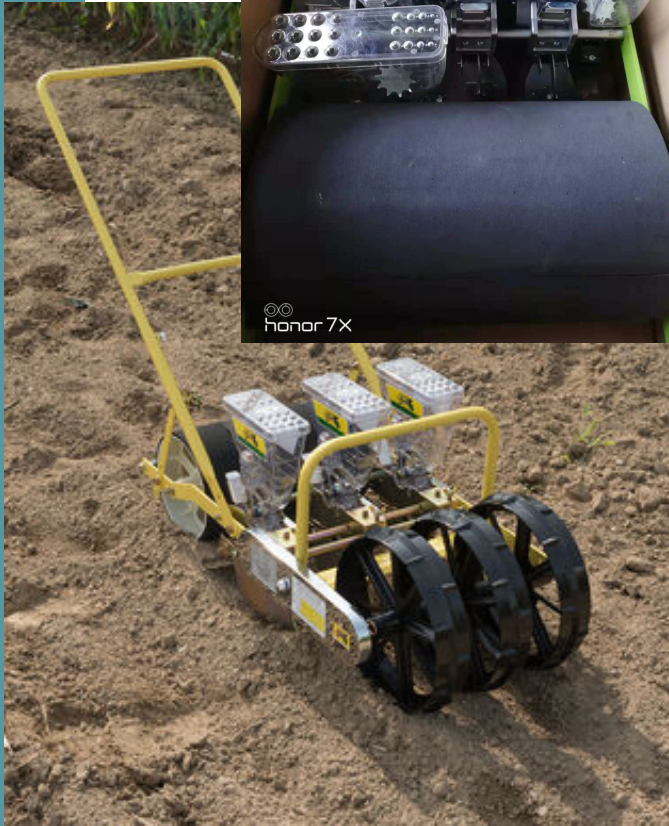
- \$5780
- Break even
 - 10.6 yrs/10th acre
 - 4.2 yrs/0.25 acres
 - 2 yrs/0.5 acres



Tractor (new) + Implement

- ~\$15,000
- Break even
 - 27.3 yrs/10th acre
 - 10.8 yrs/0.25 acres
 - 5.2 yrs/0.5 acres

Planting Tools



- JP-1,3,5
 - \$160-\$1,545.00
- EarthWay Seeder
 - ~\$100
- Johnny's six-row
 - \$650

Time (seconds) 10'x4' plots	Sowing: seeder (8 rows)	Sowing: by-hand (8 rows)
Rep 1	25	832
Rep 2	25	824
Rep 3	25	812
Average (seconds)	25.0	822.6
Hours/Acre	7.6	248.8
Hours/0.5Acre	3.8	124.4
Hours/0.25Acre	1.9	62.2
Hours/0.1Acre	0.8	24.9
Minutes/4'x100'	4.17	137.09
Hours/4 successions	3.0	99.5
Labor/Job(\$15/hr)	\$45.37	\$1,492.96
Machine Price	\$410.00	-
Time to break even (years)/job on 1/10th acre	0.3	-

- JP-3 (china) vs online
- Break even
 - 0.3 yrs (\$410) vs 0.75 yrs (\$1045)
- EarthWay Seeder
 - Break even
 - 0.1 yrs
- Johnny's six-row
 - Break even
 - .4 yrs

Planting Tools Continued

- Paper chain transplanter
 - \$950
 - Proprietary chains and tools are needed
- Off-set drop or vacuum seeders
 - ~\$500
- Soil blocking tools
 - ~\$30
- Are retail prices worth it?



Planting Tools by Time

Time (seconds) 10'x4' plots	Sowing: seeder (8 rows)	Sowing: by-hand (8 rows)	Transplanting: by-hand w/ dibbler	Transplanting: paper pot (8 rows)
Rep 1	25	832	754	96
Rep 2		824		
Rep 3		812		
Average (seconds)	25.0	822.6	754.0	96.0
Hours/Acre	7.6	248.8	228.1	29.0
Hours/0.5Acre	3.8	124.4	114.0	14.5
Hours/0.25Acre	1.9	62.2	57.0	7.3
Hours/0.1Acre	0.8	24.9	22.8	2.9
Minutes/4'x100'	4.17	137.09	125.67	16.00
Hours/4 successions	3.0	99.5	91.2	11.6
Labor/Job(\$15/hr)	\$45.37	\$1,492.96	\$1,368.51	\$174.24
Machine Price	\$650.00	-		\$950.00
Time to break even (years)/job on 1/10th acre	0.4	-		0.8

Seed Starting tools by time

Time (seconds)	Soil blocking (50 cells)	Paper pot prep (264 cells)	Seeding: vacuum/drop seeder	Seeding: by-hand
Rep 1	261	45	36	138
Rep 2	281			126.4
Rep 3	298			117.3
Average (seconds)	280	45.0	36.0	127.2
Minutes/Tray	4.7	0.8	0.6	2.1
Hours/10Trays	0.8	0.1	0.1	0.4

Weeding

Plants/sqft	Weeding: by-hand
0.75	87
2	181
2.25	213
3	288.72
4	384.96
2.4	231.0
Hours/Acre	69.9
Hours/0.5Acre	34.9
Hours/0.25Acre	17.5
Hours/0.1Acre	7.0
Minutes/4'x100'	38.50
Hours/4 successions	27.9
Labor/Job(\$15/hr)	\$419.22

- What are your goals?
- How are you limiting yourself?
- What is the current situation?

Tools for Weeds



What is going on here?

- Prevention
 - Greatest tool against weeds
- Mechanical
 - Tiller
 - Mower
 - Burner
- Cultural
 - Weed barrier
 - Cover crops
 - Crop rotation
- Chemical
 - Sprayer
 - Spreader



More tools



Photo credit: Hansen et al., 2020

- Hand tools
 - Spade shovel
 - Garden rake
 - Hoe
 - Garden fork
 - Post pounder
 - PVC pipe cutters
 - Loppers
 - Hand pruners
 - Sprayer
- Power tools
 - Good drill
 - Circular saw
 - Sawzall
 - Miter saw