

Wheels & Swingarm Actuated

Wheel Actuators (Per row unit)		
Component	Cost	Qty
Brackets, Hardware	\$50	1
Gearmotor	\$100	2
Driveline (Pulley, gears, €	\$80	2
Sensor	\$70	2
Cables	\$10	4
Totals		\$590

Mechanical Prototype		Matl's	Eng. Hrs
Understand basic force requirements			4
Specify Motors			4
Design Driveline			16
Build Prototype (1 row unit)	\$1,650		12
Test & Refine Prototype	\$800		20
Total:		\$6,930	

Swingarm Actuator		
Component	Cost	Qty
Brackets, Hardware	\$50	1
Gearmotor	\$250	1
Driveline (Pulley, gears, €	\$120	1
Sensor	\$70	1
Cables	\$10	2
Totals		\$510

Electrical Prototype		Matl's	Eng. Hrs
Specify Sensors			4
Design & Prototype RCU on Bench	\$435		28
Design & Prototype OI on Bench	\$514		28
Design Enclosures	\$60		8
Build Prototype (1 row unit)	\$547		20
Test & Refine Prototype	\$200		30
Total:		\$11,196	

Row Control Unit (RCU)		
Component	Cost	Qty
Housing	\$10	1
Cables	\$15	2
Connectors	\$4	10
Microcontroller	\$30	1
Motor Controller	\$60	3
Totals		\$290

Preparation for Production		Matl's	Eng. Hrs
Build 3 row unit cultivator	\$6,641		12
Make Electrical Schematics			20
Make Mechanical Drawings			8
Handoff to Electrical Supplier(s)			25
Write Owner's Manual			20
Total:		\$13,441	

Operator Interface (OI)		
Component	Cost	Qty
LCD Panel	\$50	1
Microcontroller	\$100	1
Housing	\$40	1
Connectors	\$4	3
Cables	\$15	3
Switches	\$1	10
Totals		\$257

Production Costs (Materials only - no assy, etc.)			
Base Cost	\$257		
Per-row-unit cost	\$1,390		
# of row units	3	13	25
Total System Cost	\$4,427	\$18,327	\$35,007

Engineering Costs	Rate	\$80	/hr
Total Time	259		hr
Eng. Labor Cost	\$20,720		
Prototyping Materials	\$10,847		
Total Engineering Est.	\$31,567		

Wheels Actuated

Wheel Actuators (Per row unit)		
Component	Cost	Qty
Brackets, Hardware	\$50	1
Gearmotor	\$100	2
Driveline (Pulley, gears, €	\$80	2
Sensor	\$70	2
Cables	\$10	4
Totals		\$590

Mechanical Prototype	Matl's	Eng. Hrs
Understand basic force requirements		3
Specify Motors		3
Design Driveline		8
Build Prototype (1 row unit)	\$885	8
Test & Refine Prototype	\$500	15
Total:		\$4,345

Electrical Prototype	Matl's	Eng. Hrs
Specify Sensors		4
Design & Prototype RCU on Bench	\$345	28
Design & Prototype OI on Bench	\$464	28
Design Enclosures	\$60	8
Build Prototype (1 row unit)	\$462	20
Test & Refine Prototype	\$200	30
Total:		\$10,971

Row Control Unit (RCU)		
Component	Cost	Qty
Housing	\$10	1
Cables	\$15	2
Connectors	\$4	10
Microcontroller	\$30	1
Motor Controller	\$60	2
Totals		\$230

Preparation for Production	Matl's	Eng. Hrs
Build 3 row unit cultivator	\$4,038	12
Make Electrical Schematics		16
Make Mechanical Drawings		8
Handoff to Electrical Supplier(s)		20
Write Owner's Manual		20
Total:		\$10,118

Operator Interface (OI)		
Component	Cost	Qty
LCD Panel	\$50	1
Microcontroller	\$80	1
Housing	\$40	1
Connectors	\$4	3
Cables	\$15	3
Switches	\$1	5
Totals		\$232

Production Costs (Materials only - no assy, etc.)			
Base Cost	\$232		
Per-row-unit cost	\$820		
# of row units	3	13	25
Total System Cost	\$2,692	\$10,892	\$20,732

Engineering Costs	Rate	\$80	/hr
Total Time	231		hr
Eng. Labor Cost	\$18,480		
Prototyping Materials	\$6,954		
Total Engineering Est.	\$25,434		

Wheels Actuated, No Zones

Wheel Actuators (Per row unit)		
Component	Cost	Qty
Brackets, Hardware	\$50	1
Gearmotor	\$100	2
Driveline (Pulley, gears, €	\$80	2
Sensor	\$70	2
Cables	\$10	4
Totals		\$590

Mechanical Prototype		Matl's	Eng. Hrs
Understand basic force requirements			3
Specify Motors			3
Design Driveline			8
Build Prototype (1 row unit)	\$885		8
Test & Refine Prototype	\$500		15
Total:			\$4,345

Electrical Prototype		Matl's	Eng. Hrs
Specify Sensors			4
Design & Prototype RCU on Bench	\$345		25
Design & Prototype OI on Bench	\$458		20
Design Enclosures	\$60		7
Build Prototype (1 row unit)	\$459		18
Test & Refine Prototype	\$200		25
Total:			\$9,442

Row Control Unit (RCU)		
Component	Cost	Qty
Housing	\$10	1
Cables	\$15	2
Connectors	\$4	10
Microcontroller	\$30	1
Motor Controller	\$60	2
Totals		\$230

Preparation for Production		Matl's	Eng. Hrs
Build 3 row unit cultivator	\$4,034		12
Make Electrical Schematics			15
Make Mechanical Drawings			8
Handoff to Electrical Supplier(s)			18
Write Owner's Manual			20
Total:			\$9,874

Operator Interface (OI)		
Component	Cost	Qty
LCD Panel	\$50	1
Microcontroller	\$80	1
Housing	\$40	1
Connectors	\$4	3
Cables	\$15	3
Switches	\$1	2
Totals		\$229

Production Costs (Materials only - no assy, etc.)			
Base Cost	\$229		
Per-row-unit cost	\$820		
# of row units	3	13	25
Total System Cost	\$2,689	\$10,889	\$20,729

Engineering Costs	Rate	\$80	/hr
Total Time	209		hr
Eng. Labor Cost	\$16,720		
Prototyping Materials	\$6,941		
Total Engineering Est.	\$23,661		

Wheels Actuated + Hydraulic Switchover

Wheel Actuators (Per row unit)		
Component	Cost	Qty
Brackets, Hardware	\$50	1
Gearmotor	\$100	2
Driveline (Pulley, gears, €	\$80	2
Sensor	\$70	3
Cables	\$10	4
Totals		\$660

Swingarm Actuator		
Component	Cost	Qty
Brackets, Hardware	\$50	1
Hydraulic Cylinder	\$150	1
Hydraulic Hoses	\$100	1
Totals		\$300

Row Control Unit (RCU)		
Component	Cost	Qty
Housing	\$10	1
Cables	\$15	2
Connectors	\$4	10
Microcontroller	\$30	1
Motor Controller	\$60	2
Totals		\$230

Operator Interface (OI)		
Component	Cost	Qty
LCD Panel	\$50	1
Microcontroller	\$80	1
Housing	\$40	1
Connectors	\$4	3
Cables	\$15	3
Switches	\$1	5
Totals		\$232

Mechanical Prototype		Matl's	Eng. Hrs
Understand basic force requirements			4
Specify Motors			6
Design Driveline			14
Build Prototype (1 row unit)		\$1,440	14
Test & Refine Prototype		\$800	20
Total:			\$6,880

Electrical Prototype		Matl's	Eng. Hrs
Specify Sensors			4
Design & Prototype RCU on Bench		\$345	28
Design & Prototype OI on Bench		\$464	28
Design Enclosures		\$60	8
Build Prototype (1 row unit)		\$462	18
Test & Refine Prototype		\$200	25
Total:			\$10,411

Preparation for Production		Matl's	Eng. Hrs
Build 3 row unit cultivator		\$5,703	12
Make Electrical Schematics			20
Make Mechanical Drawings			8
Handoff to Supplier(s)			25
Write Owner's Manual			20
Total:			\$12,503

Production Costs (Materials only - no assy, etc.)			
Base Cost	\$232		
Per-row-unit cost	\$1,190		
# of row units	3	13	25
Total System Cost	\$3,802	\$15,702	\$29,982

Engineering Costs	Rate	\$80	/hr
Total Time	254		hr
Eng. Labor Cost	\$20,320		
Prototyping Materials	\$9,474		
Total Engineering Est.	\$29,794		