Conservation Tillage Handbook

Equipment Modifications and Practical Tips For Use

SOIL AND WATER ENVIRONMENTAL ENHANCEMENT PROGRAM

Canada

Ontario
CONSERVATION TILLAGE HANDBOOK: EQUIPMENT MODIFICATIONS AND PRACTICAL TIPS FOR USE

FOREWORD

This handbook provides a pictorial overview of some examples of conservation equipment ‘hardware’ contributing to conservation farming activities in southwestern Ontario. By clearly identifying specific modifications and highlighting practical tips for use, this handbook orients the reader to the terminology and some of the system options available to those beginning or expanding conservation tillage practices.

Having access to appropriate tillage or planting equipment is only one of many management factors to consider when conservation farming. Other factors which must be considered include: weed, insect and disease control; fertilizer types and placement; crop types and rotations; use of livestock manures; and managerial interest and capability. Therefore, it is recommended that the reader contact their local office of the Ontario Ministry of Agriculture and Food, agribusiness personnel or others with experience in conservation farming before beginning the process of deciding which tillage equipment (or modification) will best meet their individual conservation needs.

DISCLAIMER

Conservation tillage equipment or practices highlighted in this handbook are based on user experience. Check with manufacturers for machine use and setup, as modifications may invalidate warranties.

Inclusion of any brand names does not imply endorsement of use by publishers of this handbook, nor does it suggest that other brand names are not effective.

The views contained herein do not necessarily reflect the views of the Government of Canada, the Government of Ontario or the SWEEP Management Committee.

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INTRODUCTION

The term 'Conservation Tillage' applies to many different types of tillage and planting equipment, as well as to the way in which they are used. One of the key goals of conservation tillage is to leave residues of previous crops on or near the surface of the soil. These residues cushion the erosive impact of raindrops on the soil surface, slow surface water flow, facilitate infiltration of precipitation into the soil, and conserve moisture. In Ontario, land is considered to be 'conservation' tilled or planted when at least 20 to 30% of the soil surface remains covered with crop residue after planting.

The equipment described in this handbook can assist the farm operator in achieving these residue targets. The handbook is organized by conservation tillage or planting system as described below:

1. minimum or mulch tillage-any system that includes some form of tillage in fall and/or spring in which crop residues are partially incorporated into the soil. On many soils, 20 to 30% residue cover is effective in controlling erosion.

   In this handbook, the modified moldboard plow, the chisel plow and other types of minimum till equipment are considered part of this tillage system.

2. conservation seed drills-a small slit is opened or a narrow strip of soil is worked by means of a non-powered ripple or fluted coulter running ahead of, or with the seeding units. Chemical weed control generally substitutes for cultivation.

3. conservation row crop planters-no seedbed preparation is required other than that provided by various optional non-powered attachments on the planter itself. The resulting tilled strip of soil in the row area is generally a maximum of 25 cm (10 in) wide and 15 cm (6 in) deep. Chemical weed control generally substitutes for cultivation.

4. ridge tillage planting systems-a ridge of soil is formed when cultivating for weed control in row crops. The succeeding crops are then planted directly onto the top of the ridge after the existing crop residue is removed, usually by non-powered attachments to the planter.

In order to put the equipment photographs into context, the discussion about each system includes the following points: equipment modifications, attachments and costs (when available); field conditions of use; and practical tips for use.
THE MOLDBOARD PLOW AS A CONSERVATION TOOL

PLOW A

Make: Oliver
Model: 3342
Size: 3 furrow - 16" bottoms; fully mounted
Year: 1969
Horsepower required: 50 H.P

Modifications/Attachments
a. half of moldboard cut off
Note: cover boards (trashboards) removed (not showing)

Field Conditions of Use
Corn Heat Units: 2850
Soil Texture: variable
Drainage: good
Stoniness/ Slope: variable/up to 15%
Crop Residue Types: corn, soybeans, wheat, barley
Crops to be Planted: all

Practical Tips for Use
i) Start by removing small portions of the moldboard, cutting off more to get the desired amount of surface residue.

ii) With semi-mounted plows, depth and steering may need to be adjusted so the plow functions properly.
THE MOLDBOARD PLOW AS A CONSERVATION TOOL -cont'd

PLOW B

Make: Kongskilde
Model: 600 series
Size: 6 furrow - 14" bottoms;
Year: 1985
Horsepower required: 110 H.P is ample

Modifications/Attachments
a. furrow widths manually adjusted to 14"
b. note elongated, less curved shape of European-style moldboard

Other
• plow set to work at 6" maximum depth
• removed cover boards (trash boards)

Field Conditions of Use
Corn Heat Units: 2750
Soil Texture: mostly silt loam, some clay, clay loam
Drainage: good to excellent
Stoniness/ Slope: few/gentle, compound slopes
Crop Residue Types: corn stalks, wheat straw and stubble
Crops to be Planted: corn, soybeans, cereals

Practical Tips for Use
i) If possible, plow perpendicular to harvesting direction to help spread out residue between furrows.
ii) Cross slopes with chisel plow after plowing to roughen soil surface and slow surface water movement.
iii) A 'Kongskilde' cultivator or 'Kent' discavator is used for secondary tillage in the spring.
CHISEL PLOWS

PLOW A

Make: Glencoe Soil Saver  
(Coulter Chisel Plow)
Size: 11 shank, 15 foot width
Year: 1985
Horsepower required: 160 H.P

Modifications/Attachments
a. gang of flat coulters (standard equipment)
b. twisted shovel attachment
c. leveling harrow (‘Salford’ Farm Machinery - $500 in 1989)

Field Conditions of Use
Corn Heat Units: 2850
Soil Texture: sandy loam to clay loam
Drainage: good
Stoniness/Slope: yes/up to 15%
Crop Residue Types: corn, wheat, soybeans
Crops to be Planted: corn (where manure applied)

Practical Tips for Use
i) Use to incorporate manure on unplowed ground in the spring.
ii) Attach leveling harrow to minimize secondary tillage.
iii) Secondary tillage is done with a cultivator.
iv) “If it’s too wet to moldboard plow, it’s too wet to chisel plow”.
CHISEL PLOWS - cont’d

PLOW B

Make: Bush Hog Coulter Chisel Plow
Model: SH 1560
Size: 7 shank (15” shank spacing)
Year: 1985
Horsepower required: 140 H.P
(up to 175 H.P in clay)

Modifications/ Attachments

a. 10 foot buster bar leveling harrow ('Midwest')
b. 18” chisel sweep
c. 22” diameter coulter blades ('Hershey') $30/blade
   (16 blades at 7.5” spacing)
d. shank guard-homemade, slightly wider than shank
to reduce shank wear when using sweeps
e. Agri-tech hardened point ('Keho') protects 18”
sweep and assists penetration of soil

Practical Tips for Use

i) Use Agri-Tech points to improve penetration,
maintain uniform tillage depth and break plow pan.

ii) Attach leveling harrow to minimize secondary tillage.

iii) Operate at at least 5 m.p.h. at about 5” deep.
Operate at a 10 to 20° angle to previous crop row.

iv) Use straight edge coulters rather than discs to
 minimize trash coverage. 22” diameter coulters are
 better than 20” coulters to reduce plugging or piling
 of residues on sandy ground.

v) Follow with a high clearance cultivator or a one pass
 tillage tool (e.g. soil finisher).

vi) Avoid herbicides which may be tied up by residue.

vii) Increase seeding rate by 5 to 10% in corn residue.

Field Conditions of Use

Corn Heat Units: 3200
Soil Texture: sand to Brookston clay
Drainage: good on sand, fair on clay
Stoniness/Slope: no/flat to gently sloping
Crop Residue Types: corn, soybeans, wheat
Crops to be Planted: corn, soybeans, wheat
OTHER MINIMUM TILL EQUIPMENT

MACHINE A
Make: Allis Chalmers Plow Frame
Size: 3 furrow - 16" bottoms
Year: (not available)
Horsepower required:
   20 H.P/bottom on heavy clay

Modifications/ Attachments
a. 'Eagle' plow bottom (Eagle Manufacturing - $250/bottom in 1988)
b. Unassembled plow bottom

Field Conditions of Use
Corn Heat Units: 2850
Soil Texture: clay loam
Drainage: good
Stoniness/ Slope: no stones/gently sloping
Crop Residue Types: corn, wheat, soybeans, turnips
Crops to be Planted: corn, wheat, soybeans, turnips

Practical Tips for Use
i) Plow must be moved laterally so that the first bottom is in the right tractor wheel track.
ii) Adjust wings up to reduce residue, or flatten to increase residue.
iii) Works well at 6 to 8" deep; work at greater depth to break compacted soil (e.g. after turnips).
iv) Do not use on green vegetation (e.g. twitchgrass or clover).
v) Follow in spring with land leveler and conservation planter.
OTHER MINIMUM TILL EQUIPMENT - cont’d

MACHINE B - HEAVY TANDEM DISC

Make: Ezee-on
Model: 1490-1500
Size: 18"
Year: 1984
Horsepower required: 150 H.P

Modifications /Attachments
a. weed spray attachment with 'Hardi’ 3 point hitch sprayer (not shown)
b. buster bar leveling device -‘Midwest’ - $600 in 1984
c. 22” diameter disc and
d. 17” diameter disc to prevent soil ridging with standard 26” disc

Field Conditions of Use
Corn Heat Units: 2650
Soil Texture: sandy loam, loam
Drainage: good
Stoniness/Slope: some/gently sloping
Crop Residue Types: corn and soybeans
Crops to be Planted: corn and soybeans

Practical Tips for Use
i) Use disc in spring (one or two passes) on untilled soil.
ii) If buster bar is set too low it will gather residue.
iii) Drive at 4 to 5 m.p.h. for good tilling action.
iv) Before tillage, spot spray for quackgrass.
CONSERVATION SEED DRILLS

DRILL A

Make: Great Plains
Model: Solid Stand 10 (end wheel drive)
Size: 10 foot; 7.5" row spacing
Year: 1988
Horsepower required: 60 H.P

Modifications/Attachments
a. grass seed box
b. double V-configured press wheels for minimum till conditions - $55 /row
c. single 2" x 13" press wheel for no-till conditions
d. bracket for weights
d. 18" diameter 1" bubble coulter staggered (offset) on planter frame running in line with seed opener (standard setup)

Practical Tips for Use
i) 1" bubble coulter chosen instead of 1/2" ripple or 2" fluted. Loosens enough soil for seed opener without throwing soil out of seed trench.
ii) If narrow coulter selected, select a narrow press wheel to ensure press wheels don't just ride up on firm untilled soil.
iii) If broadcasting fertilizer, apply before planting so some is incorporated when planting.
iv) Staggered seeding units assist residue flow.

Field Conditions of Use
Corn Heat Units: 2850
Soil Texture: silty clay to coarse sand
Drainage: good
Stoniness /Slope: variable/gentle to 15%
Crop Residue Types: corn, soybeans, wheat, barley
Crops to be Planted: wheat, barley, soybeans
CONSERVATION SEED DRILLS - cont'd

DRILL B

Make: Tye Stubble Drill
Size: 10 foot, 15 run at 7.5" run spacing
Year: 1985
Horsepower required: 95 H.P (75 H.P on flat land)

Modifications/ Attachments

a. ripple drive coulter
b. brackets for weights (up to 600 lbs total in hard ground)
c. seed hopper; dry fertilizer hopper (removed for repair)
d. ripple coulters (attached to drill frame in front of seed openers)
e. seeding units staggered (offset) on frame
f. press wheels - 'Tye' ($80 per run - 2" x 13" wheel and bracket)

Practical Tips for Use

i) Keep drive coulter as narrow a ripple as possible, as fluted will throw up too much wet soil.

ii) Never straddle a dead furrow. The planter will lose its drive.

iii) For soybeans, replace tillage ripple coulters with 1" fluted coulters and single press wheel with double press wheels.

iv) Remove lower spring on press wheel tightener to relieve excess bouncing.

v) When no-tilling into corn, stalk chop after harvest.

Field Conditions of Use

Corn Heat Units: 2950
Soil Texture: Fox sand to Brookston clay
Drainage: excellent
Stoniness/ Slope: none/up to 20%
Crop Residue Types: soybeans, corn, wheat
Crops to be Planted: wheat, soybeans, corn
CONSERVATION SEED DRILL - cont’d

DRILL C

Make: Best

Model: 1508-A

Size: 15 foot, 24 run at 7.5" run spacing

Year: 1984

Horsepower required: 110 H.P with caddy

Modifications/Attachments

a. caddy unit with no-till coulters on toolbar and tanks for liquid fertilizer or weight (caddy with no-till coulters - $7,000)

b. toolbar on caddy unit

c. 18” diameter 1” fluted no-till coulters running in front of staggered (offset) seeding units

d. 2” x 13” single press wheel

e. adjustable down pressure springs

f. ‘Acra-Plant’ seed openers (2 offset discs with internal shoe to form seed trench)

g. parallel linkage system (helps stabilize seeding unit)
DRILL C - cont’d

h. single press wheels on staggered (offset) seeding units

i. weed spray plumbing and nozzles ‘Tee Jet’ (flood jet type) $50 plus saddle tanks and pump

j. ground driven pump for liquid fertilizer mounted on caddy frame

Field Conditions of Use

Corn Heat Units: 2750
Soil Texture: mostly silt loam
Drainage: poor to excellent
Stoniness/ Slope: few/gently to moderately rolling
Crop Residue Types: corn, wheat, soybeans
Crops to be Planted: canola, small grains, soybeans, white beans

Practical Tips for Use

i) Only run tillage coulters as deep as necessary for planting; if too deep, soil dries out. ii) Do not plant when soil is wet as seed trench may open.

iii) Recommend planting on angle to old corn rows, or residue plugging may occur.

iv) Use more contact herbicides and fewer residual types (more environmentally desirable too!).

v) Weed spraying with drill pass gives good weed control (in a dry year, herbicides are activated by contacting moist soil).
CONSERVATION ROW CROP PLANTERS

PLANTER A

Make: White Farm Equipment
Model: 5100 Seed Boss
Size: 6 row - 30" row spacing
Year: 1982
Horsepower required: 70 H.P.
(12 H.P /row)

Modifications/ Attachments

a. 4 weight brackets ($15 each) plus weights mounted on planter frame
b. tool bar ($90 for materials)
c. 20" diameter ripple coulters (‘White’ - $240 each) in line with fertilizer openers
d. "corn stalk" or "trash" bar ($20 for material)
e. ‘White Trash Tamer’ units (ripple coulter plus notched trash whippers - $320 per unit)
f. depth control wheels on seeding unit (with oscillating depth stops)
PLANTER A - cont'd

g. in-furrow insecticide tube

h. 3 wheel press wheel attachment ('White' - slightly higher cost relative to standard press wheel)

i. notched blades on marker leaves more visible mark

j. 20" hitch extension required when tractor dual wheels used ($80

Field Conditions of Use

Corn Heat Units: 2850
Soil Texture: silty clay to coarse sands
Drainage: good
Stoniness/Slope: yes/gentle to 15%
Crop Residue Types: corn, soybeans, wheat, barley
Crops to be Planted: corn, soybeans

Practical Tips for Use

i) Lead tillage coulter should be run 6 to 7" deep directly in front of fertilizer opener to improve seed and fertilizer placement.

ii) On 'Trash Tamer' units, run coulter 1/2" deeper than seed. Notching the trashwhipper discs helps remove the residue but leaves most of the soil.

iii) Trash bar turns stalks away from drive chains.

iv) Nitrogen should be placed below residue on surface of soil.

v) Herbicides - emphasize treatment of weeds, not of soil. Vegetation should be dead at crop emergence.

vi) Ensure combine spreads residue evenly on ground, to facilitate planting subsequent crops.
CONSERVATION ROW CROP PLANTERS - cont’d

PLANTER B
Make: Deutz-Allis
Model: 385
Size: 6 row - 30" row spacing
Year: 1989
Horsepower required: 120 to 150 H.P
(20 to 25 H.P / row)

Modifications /Attachments

a. saddle tanks - herbicide
b. 3 point hitch toolbar (6" x 6" tube steel/ angle iron - $720) with ballast tanks for weight
c. liquid fertilizer tank - 28% nitrogen
d. planter
e. lengthened tractor tongue (homemade - $50) to pull fertilizer tank
f. 17" diameter 2" fluted tillage coulters 'Rawson' ($315 each x 12 = $3,780)
g. hydraulic liquid fertilizer pump 'Char-Lynn'
CONSERVATION ROW CROP PLANTERS - cont'd

PLANTER B - cont'd

h. liquid fertilizer coulter
i. no-till ripple coulter
j. furrowing discs (trashwhippers)
k. 'Quadra Disk' planting unit
l. press wheel
m. herbicide spray attachment

Field Conditions of Use

Corn Heat Units: 2800
Soil Texture: sandy loam
Drainage: excellent
Stoniness/ Slope: some/moderately sloping
Crop Residue Types: corn, soybeans
Crops to be Planted: soybeans, corn

Practical Tips for Use

i) 'Rawson' coulters set to work soil 4 to 5" on each side of the seed.

ii) Liquid fertilizer coulter lines up with one of the 'Rawson' coulters for good penetration (4" deep for nitrogen placement).

iii) Because soils are high in P, the required K is broadcast following wheat (chisel plowed and disked in spring); 4 years of corn follow.

iv) Use rain drop nozzles for spraying on windy days. Spraying on moist earth when planting is a help in a dry year.

v) Lengthened tongue on tractor and fertilizer wagon so toolbar doesn't hit wagon.

vi) Spot spray twitchgrass before planting.
PLANTER C

Make: New Idea / Kinzie

Model: 900 Series with double frame

Size: 6 row - 38" row spacing

Year: 1987

Horsepower required: 120 H.P

(20 H.P/row)

Modifications/Attachments

a. (front view) toolbar for tillage coulters - c. homemade, 3" x 6" tubular steel ($250 for material)

b. 2" fluted tillage coulters ('Till-Tech') with d. fertilizer injection units - $300/coulter or $600/row

c. liquid fertilizer injection units (one for 28% nitrogen; one for 10-34-0) - complete liquid fertilizer system including tanks and plumbing ($1200, used)

d. hardened tip on bottom of injector point for better wear and to keep dirt out of the end of the fertilizer tube
CONSERVATION ROW CROP PLANTERS - cont'd

PLANTER C - cont'd

- e. finger tines to help incorporate herbicide and cover seed trench
- f. band spray attachment ($2,000 homemade)
- g. rubber press wheels
- h. in-furrow rootworm insecticide tube
- i. 'Depth-A-Matic' (SI Manufacturing) to stabilize depth on planting unit
- j. 'Yetter' 1" x 17" diameter bubble coulter running 1/4" deeper than seed placement

Field Conditions of Use

Corn Heat Units: 3300
Soil Texture: gravel to clay
Drainage: fair to excellent
Stoniness/Slope: some/flat to moderately sloping
Crop Residue Types: corn, wheat, clover
Crops to be Planted: corn

Practical Tips for Use

i) Do enough tillage with coulters so that seeding units can be run normally.
ii) Run fluted tillage coulters 4" deep with 7" between them:
- inject 10-34-0 2 1/2" from row
- inject 28% N 4 1/2" from row (50 lb N/ac)
iii) Chemically kill weeds before planting until system is learned. Do not plant into a lot of green material.
iv) Plant when soil is dry (will crumble in hand).
v) Use wick weeder on early developing perennial weeds.
RIDG TILL SYSTEMS

SYSTEM A

1. RIDGE-TILL PLANTER

Make: Hiniker/New Idea/Kinze
Size: 6 row - 30" row spacing
Year: 1984
Horsepower required: 90 H.P
(15 H.P/row)

Modifications/Attachments
a. smooth coulter with depth control band
b. ridge cleaning unit (horizontal rotating disk with wing deflectors)
c. "Yetter" 1" bubble coulter (17" diameter) with heavy duty down-pressure springs - $300/row
d. 'Depth-A-Matic' depth control wheel on seeding unit - $30/row
e. rubber press wheels
f. band spray attachment
g. ridge-hugging guide wheels

Practical Tips for Use
i) Keep all attachments properly aligned so planter stays on ridge.
ii) Use ridge-hugging guide wheels to keep planter on ridge.
iii) Ridge cleaners work best when residue is dry.
iv) Use burn-down herbicide prior to planting; at planting, band 15" of herbicide until experience is gained, then decrease width of band.
v) Combine and grain buggy wheel spacing must follow row centres.
RIDGE TILL SYSTEMS - cont’d

SYSTEM A - cont’d

2. RIDGE-TILL CULTIVATOR

Make: Hiniker  
Model: Econotil 6307  
Size: 6 row - 30" row spacing  
Year: 1984  
Horsepower required: 15 H.P /row  
(cultivator lift weight determines tractor size requirements)

Modifications /Attachments

a. rotary hoe (function as crop shields)  
b. depth control wheel  
c. weeding discs  
d. ridging sweep blade  
e. ’Agri-Tech’ hardened point ($25 each) mounted on ridging sweep

Practical Tips for Use

i) Add ‘Agri-Tech’ points to get good penetration in firm soil.  
ii) Do not use in wet soil because weeds will not be killed.  
iii) Use of hydraulic cylinder on top 3 point hitch link is very important in varying soils.  
iv) Use rotary hoes as crop shields to protect crop. Run spiders backwards to avoid residue build up.  
v) Do not use weeding discs when building ridges.  
vi) Band spray when cultivating.

Field Conditions of Use (System A)

- Corn Heat Units: 3300  
- Soil Texture: Brookston clay to Berrien sand  
- Drainage: Good  
- Stoniness/Slope: none/flat to gently sloping  
- Crop Residue Types: corn, soybeans, winter wheat  
- Crops to be Planted: corn, soybeans, winter wheat
SYSTEM B

1. POWER MULCHER

Make: Johnson
Model: MC 830
Size: 8 row - 30" row spacing
Year: 1984
Horsepower required: 130 H.P

Modifications/ Attachments
a. Note tooth configuration - stubs only (no teeth) in rotary unit where furrow located
b. Duck feet on S-tines for weed control between rows
c. S-tines
d. Sprayer boom and nozzles (used existing sprayer components - $200)

Practical Tips for Use
i) Tills seedbed 12" wide, 2" deep at 5 m.p.h.; plant seed just below tilled soil.
ii) Use mulcher just ahead of planter so planting is done in moist soil.
iii) Band spray on ridge when power mulching.
iv) Loose soil from mulching prevents seed trench from opening on clay soils.
RIDGE TILL SYSTEMS - cont’d

SYSTEM B - cont’d

2. RIDGE-TILL PLANTER

Make: John Deere
Model: 7000
Size: 8 row - 30" row spacing
Year: 1982
Horsepower required: 120 H.P
(15 H.P/row)

Modifications/Attachments

a. Guide wheels (‘Hiniker’) (2 sets at $1400 / set)
b. Stabilizing coulter (4 installed - $150 each)
c. No-till 1" bubble coulter (John Deere’ - $45 each)
d. Rubber press wheels

Practical Tips for Use

i) Needs guide wheels and guide coulters to keep planter on ridge.
ii) Prefer bubble coulter for tillage ahead of seed opener - more uniform seedbed when compared with fluted coulter.
iii) Planter works best after ridges have been mulched.
iv) Till and plant headlands conventionally.
v) Equipment wheels adjusted to 120" centres.
vi) Band spray 15" on a 30" row. On soybeans, spray entire soil surface with broadleaf herbicide.
RIDGE TILL SYSTEMS - cont’d

SYSTEM B - cont’d

3. RIDGE-TILL CULTIVATOR

Make: Hiniker
Model: 8307
Size: 8 row - 30” row spacing
Year: 1983
Horsepower required: 130 H.P.

Modifications/ Attachments

a. depth control wheels
b. disc hillers (weeding discs)
c. residue cutting disc (stabilizing coulter)
d. ridging sweeps (added penetrating points on sweep - $30/row)
e. row shields - $35/row
f. fertilizer side dress attachment (not shown) - $500 total cost

Practical Tips for Use

i) On hard ground, set disc hillers deeper to loosen enough earth for sweeps to move.
ii) Cultivate at 7 m.p.h. if possible to crumble soil and ensure residue flow.
iii) Row shields necessary to protect crop at high cultivation speeds.
iv) Use cultivator to side dress 28% Nitrogen; one band on each side of row.

Field Conditions of Use (System B)

- Corn Heat Units: 3150
- Soil Texture: Brookston Clay
- Drainage: good
- Stoniness/ Slope: some/flat
- Crop Residue Types: corn, soybeans
- Crops to be Planted: corn, soybeans
RIDGE TILL SYSTEMS - cont’d

SYSTEM C

1. RIDGE-TILL PLANTER

Model: 7100 (3 point hitch)
Size: 6 row - 30" row spacing
Year: 1984
Horsepower required: 90 H.P
(15 H.P/row)

Modifications/Attachments
a. ridge hugging wheels ('Sukup')
b. ridge-cleaning double discs and scraping blade. Note: Cost of ridge-cleaning unit (includes a and b) - $500 /row in 1984)
c. double down pressure spring set on planting unit - $15/row
d. band spraying unit; weighted finger tines
e. side wall breaker for filling seed trench ($35/row) - homemade
f. 28% Nitrogen tube (N applied 4" to the side of seed)

Practical Tips for Use

i) Spray a 10 to 12" band of herbicide (post emerge) and incorporate lightly with finger tines.

ii) Side wall breaker rolls dirt into seed trench to prevent opening in wet soils and/or dry weather.

iii) Hydraulic arm on top point of 3 point hitch for quick adjustment on cultivator and higher lift on planter (for maintenance).

iv) Chop corn stalks in the fall (separate pass with stalk chopper).

v) Spot spray quackgrass with 'Round-up' before planting.

vi) Modify tire spacing and size on grain buggy and combine to accommodate ridges.
SYSTEM C - cont’d

2. RIDGE-TILL CULTIVATOR

Make: ProTech (Landoll)
Size: 6 row - 30” row spacing
Year: 1987
Horsepower required: 100 H.P

Modifications/ Attachments

a. 16” sweep manufactured with downward tilting penetrating angle on point and blade (‘MacKay’, Saskatchewan - $12/sweep)

b. ridging wings

c. (not shown) 28% Nitrogen applicators on both sides of row

Other Equipment Modifications

d. extended fins on combine for better residue distribution

Practical Tips for Use

i) Use a 16” sweep for loosening soil in furrow (see a).

ii) Band spray herbicide when cultivating and sidedress with 28% N.

Field Conditions of Use (System C)

Corn Heat Units: 2850
Soil Texture: Perth Clay Loam
Drainage: fair to good
Stoniness/ Slope: some/gently sloping
Crop Residue Types: corn, soybeans
Crops to be Planted: soybeans and corn
PARTICIPATING FARM OPERATORS

The ideas of many conservation-minded individuals are, in one way or another, represented in this handbook.

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