



CANADA
4-H Ontario

www.4-hontario.ca

4-H ONTARIO PROJECT



Plowing

REFERENCE MANUAL

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CANADA
4-H Ontario

THE 4-H PLEDGE

I pledge my Head to clearer thinking,
my Heart to greater loyalty,
my Hands to larger service,
my Health to better living,
for my club, my community, my country and my world.

THE 4-H MOTTO

Learn To Do By Doing

PROJECT RESOURCE INFORMATION

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Thank you to the 4-H Plowing Advisory Committee members who assisted with the creation of this resource:

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4-H Ontario grants permission to 4-H Volunteers to photocopy this 4-H project resource for use in their local 4-H program.

All information presented in this Project Resource was accurate at the time of printing.

The development of this project resource was made possible through the support of funding provided by TSC Stores (Peavey Industries LP).

4-H Ontario is pleased to be able to provide project resource reference manuals for use by volunteers in clubs. 4-H Ontario screens and trains volunteers to equip them with the tools to serve as positive role models for youth. With so many topics to choose from, 4-H volunteers are trusted to use these resources to provide safe and quality programming while using their judgement to assess the appropriateness of activities for their particular group of youth. By downloading any 4-H resource, you agree to use it for 4-H purposes and give credit to the original creators. Your provincial 4-H organization may have restrictions on the types of 4-H projects or activities which can be completed in your region.



4-H Inclusion Statement

4-H in Canada is open to all* without discrimination based on race, national or ethnic origin, colour, religion, sex, age or, mental or physical disability.**

4-H is dedicated to providing a safe and inclusive environment that allows for universal access and participation. Where barriers to participation are identified, 4-H will, with reasonable accommodation, adapt programs, rules, policies, or expectations to reduce or remove the barriers.

Any accommodations, changes or exceptions will be assessed on an individual basis, taking into account the individual experience of the member and their family. The physical safety and emotional well-being of members, leaders, staff and volunteers is 4-H's highest priority, and is the ultimate consideration in final decisions.

4-H Canada and local 4-H organizations consider inclusion a priority. Leaders are encouraged to work with individuals and their families to identify and discuss accommodations as required, and to reach out to provincial or national office staff for help with unresolved concerns.

**This applies to youth members (ages 6 to 21), volunteers, leaders, staff and professionals.*

***Definition of discrimination as per Canadian Charter of Rights and Freedoms.*

Déclaration sur l'inclusion des 4-H

L'adhésion aux 4-H au Canada est ouverte à tous les jeunes* sans discrimination fondée sur la race, l'origine nationale ou ethnique, la couleur de la peau, la religion, le sexe, l'âge ou le handicap mental ou physique.**

Les 4-H ont pour mission d'offrir un environnement sécuritaire et inclusif qui permet l'accès et la participation de tous. Lorsque des obstacles à la participation sont décelés, les 4-H adapteront, à l'aide de mesures d'adaptation raisonnables, les programmes, les règles, les politiques ou les attentes afin de réduire ou d'éliminer ces obstacles.

Toute mesure d'adaptation, modification ou exception sera évaluée au cas par cas, en tenant compte de l'expérience personnelle du membre et de sa famille. La sécurité physique et le bien-être émotionnel des membres, des animateurs et des animatrices, des membres du personnel et des bénévoles sont la priorité absolue des 4-H et constituent le facteur ultime à considérer lors de la prise des décisions définitives.

Les 4-H du Canada et les organisations locales des 4-H considèrent l'inclusion comme étant une priorité. Les animateurs et les animatrices sont encouragés à collaborer avec les personnes et leurs familles afin de définir et d'examiner les mesures d'adaptation, selon les besoins, et de communiquer avec le personnel du bureau provincial ou national pour obtenir de l'aide en cas de préoccupations non résolues.

**Ceci s'applique aux jeunes membres (âgés de 6 à 21 ans), aux bénévoles, aux animateurs, aux membres du personnel et aux professionnels.*

***Selon la définition de discrimination en vertu de la Charte canadienne des droits et libertés*

Introduction

WELCOME TO 4-H ONTARIO'S 'PLOWING PROJECT!'

This project focuses on plowing. As farming methods change, this material has also included information on soil basics and modern tillage.

This material is intended as a reference point of information for youth learning to plow.

OBJECTIVES

1. Expand your knowledge of the reasons why we plow.
2. Become more familiar with the different ways of properly managing soils to reduce soil loss and deterioration.
3. Develop your ability to operate a plow.
4. Gain experience working co-operatively as a member of a group by participating in club activities.
5. Further develop communication, judging and public speaking skills.
6. Have fun, dig in the soil, and "Learn To Do By Doing!"

HOW TO USE THIS MANUAL

4-H Ontario's Plowing project is made up of two parts:

1. The Reference Book

The reference book is laid out into six meetings to be followed by an Achievement Day program:

Meeting 1 – Getting To Know You

Meeting 2 – Getting Hitched

Meeting 3 – Getting Down to Business

Meeting 4 – To Plow or Not To Plow?

Meeting 5 – Getting to the Next Level

Meeting 6 – Getting Ready to Show What You Know

Achievement Day – Held at a local plowing match, agricultural event or demonstration day

Each meeting has been broken down into an Introduction with Sample Meeting Agendas, References and Resources, Topic Information and Activities.

Sample Meeting Agendas – are at the beginning of each meeting. The agendas give suggestions for topic information, activities and judging and/or communications activities along with suggested times for each section. These are only suggestions – you will know your group best

and will know the skill and attention level of your members. There is more topic information and activities than what can be completed in a two hour meeting. Be creative!

Resources, Topic Information and References – this supporting material is included to enhance your knowledge of the topics covered in each meeting.

Activities – should be used in combination with the discussion of topic information to teach members in a hands-on, interactive learning environment.

2. **The Record Book**

This booklet is designed to make it easier for members to record information throughout the club. Members are to record their expectations and goals for the project in addition to contact information, meeting dates, roll calls and records of activities completed at the meetings and at home. Print or photocopy pages from the Reference Book that you think will benefit the members either as a resource or an activity. Answers for the Activity Pages can be found at the back of the Record Book.

The Record Book should be given to each member at the beginning of the first meeting.

Ask members to keep it in a binder or duotang so they can add to it easily.

Go through the Record Book with the members and explain the charts and forms.

Encourage them to use their Record Books at every meeting and record as much information as possible. As an added incentive, a prize could be given at the end of the project for the best Record Book.

INCLUDING STEM IN THE 4-H REAL DIRT ON FARMING PROJECT

WHAT IS STEM AND WHY IS IT IMPORTANT?

Since 1915, 4-H in Ontario has engaged youth in science, technology, engineering, and math (STEM). This has traditionally meant a solid focus on agricultural science, mechanics, entrepreneurship, natural sciences and household science. Today, 4-H has grown to include rocketry, robotics, computer science, environmental sciences, and more. 4-H provides hands-on learning experiences to encourage learning about the world around us. Our lives are completely immersed in science and technology.

Understanding how science, engineering, and technology impact our lives, solve problems and create new ones makes it easier to navigate our modern world.

In school, science classes need to cover a broad range of topics in a limited amount of time while STEM in 4-H allows members and leaders time to dig deeper into ideas and concepts and to spend as much time as desired to work on projects based on personal interests, questions, and skills.

STEM in 4-H allows a person to work on their own questions, design their own tests, create their own models, build their understanding, and share their work with others – learn to do by doing. That’s what science and engineering are, trying to understand the natural universe and develop solutions to the problems faced in our world today. Science is inquiry that uses a specific approaches and skills. But all learning is an inquiry process so working with science helps develop your learning skills and strategies.

Within 4-H, the STEM process can go even further to include the Arts, thus changing the acronym to STEAM – Science, Technology, Engineering, Art & Math.

STEAM IN 4-H ONTARIO PROJECTS

As you work through the Plowing Project, you will see STEAM integrated throughout the project within almost all of the activities provided. Examples of activities include Activity 7 - Practicing Attaching and Unhooking a Plow, Activity 13 – What’s Your Soil?, and Activity 19 – Make Your Own Erosion, along with many others.

STEAM can be challenging but it can also be fun! Be sure to try out the activities. Observe what works and what doesn’t and how activities can be changed slightly to get different results. It’s all a part of the STEAM learning process!

PLANNING A MEETING

Plan your meetings well. Review all the information well in advance so you are prepared and ready!

BEFORE EACH MEETING:

- Read the topic information and activities and photocopy any relevant resources for the members' Record Books.
- Be familiar with the topic information for each meeting. Think of imaginative ways to present the information to the members. Do not rely on just reading the information out loud. Review available resources, plan the meetings and choose activities and themes that complement the ages and interests of your members. The Record Book contains extra activities that can be used if you need to fill in time or if one of the suggested meeting activities does not suit your group of members.
- Gather any equipment and/or resources that will be needed to complete the meeting.
- At least 12 hours of club meeting time is required for every project; including club business, specific project information and social recreation. The delivery format for that material is left to the discretion of the leaders. Before each meeting, create a timeline to ensure that you are providing an adequate amount of instructional time for club completion. Note: the best practice recommendation is that a club have multiple meeting times for each project.

LEADER'S PLANNING CHART

Included on the following page is a Leader's Planning Chart to help with the planning of meetings. In addition to the chart, keep track of what went well and what should be changed next time. That way, each time this project is run, the content of the meetings can be different.

When planning each meeting, a typical 4-H meeting agenda should include the following:

- Welcome & Call to Order
- 4-H Pledge
- Roll Call
- Parliamentary Procedure:
 - o Secretary's Report
 - o Treasurer's Report (if any)
 - o Press Report
 - o New Business: local and provincial 4-H activities/opportunities, upcoming club activities
- Meeting content and activities
- Refreshments and additional plowing practice time
- Clean-up
- Adjournment

LEADER'S PLANNING CHART

Meeting #	Date/Place/ Time	Topics Covered	Activities	Materials Needed

JUDGING AND COMMUNICATIONS

Each meeting must include either a judging or public speaking activity.

- Judging gives the members an opportunity to use judging techniques as part of the learning process. Through judging, members learn to evaluate, make decisions and communicate with others. Experience with the process of judging also helps develop critical thinking skills, confidence and self-esteem.
- Many examples are used in this reference book but use your imagination. As long as members are setting criteria and critically thinking about where items fit within that set of criteria, they are learning the basic skills of judging.
- A communications activity has been provided for each meeting but can be included in the Roll Call or social recreation time. These activities do not need to involve the topic of plowing as the outcome is more about understanding the concepts of effective communication.

AS A CLUB VOLUNTEER YOUR RESPONSIBILITIES ARE TO:

- Complete the volunteer screening process and attend a volunteer training session.
- Notify the local association of the club, arrange a meeting schedule and participate in club meetings, activities and the Achievement program.
- Review the project material in the Reference and Record books to familiarize yourself with the information and adapt it to fit your group. Be well organized and teach the material based on your group's age, interest and experience level.
- Organize the club so members gain parliamentary procedure, judging and communication skills.
- Have membership lists completed and submitted along with fee collected (if applicable) by the end of the second meeting.
- Have members fill out a Participant Agreement Form and identify any health concerns. Ensure that all members, leaders and parent helpers know the appropriate actions during any emergency. Check with members for any food allergies or dietary restrictions and plan snacks accordingly.

AS A CLUB MEMBER YOUR RESPONSIBILITIES ARE TO:

- Participate in at least 2/3 of his/her own club meeting time. Clubs must have a minimum of 12 hours of meeting time.
- Complete the project requirement to the satisfaction of the club leaders.
- Take part in the project Achievement Program.
- Fill in and complete the Record Book.
- Complete any other project as required by the club leaders.

ACHIEVEMENT PROGRAM IDEAS/SUGGESTIONS

- Compete or provide a demonstration at your local plowing match.
- Attend a local crop supplier’s field crop day or farm show.
- Make a display for a local fair, school or community event about a topic found in this project.
- Have members make a presentation at school about what plowing is and how it is done.

SPECIAL PROJECTS

Individual clubs will decide if junior and/or senior members will be required to complete a special activity. These projects are often done outside of meeting time, but could be used during a meeting, and are for members interested in doing more – often senior members. It’s up to you as the leader to decide if you will require members to complete a Special Project for club completion.

Here are some activities to get you started, but feel free to think of more!

1. Plant a plot of cover crops and observe the plant growth. Estimate the ground cover and compare between different cover crops. Dig up and look at the roots to compare.
2. Be a myth buster. Put common myths and urban legends to the test to find out which farming/plowing myths are true and which are not. Here are a few examples:
 - a. One type of tillage will work for all crops
 - b. The type of tillage that my neighbour uses is the best choice for me
 - c. Plowing matches are for “old timers”
3. Create a video showing the parts of the plow and their purpose, or another aspect of plowing. Post on social media.
4. Have members draw a map of their farm indicating field boundaries. Ask them to mark the various methods that are used for plowing, tillage and soil conservation.
5. Plan a trip to plow at your local match. What equipment will you use? Do you have access to it on your own farm or do you need to borrow equipment? How will the equipment be transported to the match? Prepare a timeline, a checklist of actions that need to happen, and a budget for the whole process. Be sure to have members state all of his/her assumptions such as projected fuel prices, how long certain tasks take, directions from the home of the equipment to the plowing match and back. This could be a group project.
6. Create a photographic essay or video of the evolution of plowing. Using photos and/or video clips to document how things have changed and evolved to meet the developing needs of farmers. This could be a group project.
7. Make a display of different tillage practices. Show the differences between conventional moldboard plowing, minimum till and no-till. Show the equipment used, number of passes required in a field, residue cover, etc. Prepare a presentation. This could be a group project.
8. Create a tool kit that would be helpful when attending a plowing match. Research sources and prices and provide an explanation as to why you included each item in the kit.
9. Compare the yields of the same crop cultivated with two different tillage practices. The crops should be grown in the same type of soil and under the same conditions. Assistance could be sought from a local crops inputs supplier for help setting up this side-by-side demonstration. This could be a group project.
10. Any other project approved by the leaders of the club.

TOUR & GUEST SPEAKER IDEAS

- Visit a local farm inputs supply company/store.
- Tour area farms, preferably with different soil management styles – plowing, tillage, cover crops, others.
- Visit a large scale cash crop farming operation.
- Attend a plowing match in your area.
- Have guest speakers attend meetings to supplement the material in the Reference Manual. Speakers could include a farmer, local historian with a background in agriculture, conservation authority staff member, agronomist, researcher, college or university professor, or owner of a farm supply company.
- Tour a machinery dealership that has various types of tillage equipment.

ADDITIONAL REFERENCES AND RESOURCES

Agriculture and Agri-Food Canada (Soil Health) [https://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/epw16322/\\$FILE/01-Newton-Lupwayi.pdf](https://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/epw16322/$FILE/01-Newton-Lupwayi.pdf)

Agriculture in the Classroom Canada (AITC-C) <https://aitc-canada.ca/en-ca/for-educators/agriculture-careers>

British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development (Estimating Soil Texture in the Field) <https://www.for.gov.bc.ca/isb/forms/lib/fs238.pdf>

Canadian Plowmen's Association (History) <http://canadianplowing.ca/sample-page-2/>

Conservation Ontario (Conservation Authorities) <https://conservationontario.ca/conservation-authorities/about-conservation-authorities/>

Dan Gingell and Rachel Gingell Channel (YouTube - How to hook up a 3-point hitch implement to a tractor) <https://youtu.be/bzgXMpjmguY>

Deere & Company (Tillage) <https://www.deere.ca/en/tillage/>

Farm Equipment (Disc Chisels) <https://www.farm-equipment.com/articles/14026-disc-chisels-vs-hybrid-disc-chisels-there-is-a-difference>

Kansas State University Cooperative Extension Service (Plowing Safety) <http://nasdonline.org/946/d000787/agricultural-engineering-safety-lesson-plan-operator-safety-tillage.html>
Leaf Group Media, It Still Runs (Draft Control) <https://itstillruns.com/set-draft-control-tractor-12119925.html>

Lexico (Manual) <https://www.lexico.com/en/definition/manual>

Ogden Publications, Inc., Farm Collector (Coulter) <https://www.farmcollector.com/equipment/implements/plow-coulter-zm0z17augzhur>

Ontario Ministry of Agriculture, Food and Rural Affairs, Best Management Practices: Erosion Control Structure, AF165

Ontario Ministry of Agriculture, Food and Rural Affairs – Best Management Practices: Field Crop Production, BMP02E

Ontario Ministry of Agriculture, Food and Rural Affairs – Best Management Practices: Mulch Tillage, AF171

Ontario Ministry of Agriculture, Food and Rural Affairs - Best Management Practices: No-Till for Soil Health, AF173

Ontario Ministry of Agriculture, Food and Rural Affairs, Best Management Practices: Soil Erosion by Water, AF191 <http://www.omafra.gov.on.ca/english/environment/bmp/AF191.pdf>

Ontario Ministry of Agriculture, Food & Rural Affairs – Best Management Practices: Soil Management, AF151 (1997)

Ontario Ministry of Agriculture, Food and Rural Affairs (Soil Health) <http://www.omafra.gov.on.ca/english/environment/bmp/soil-health.htm>

Ontario Plowmen’s Association (History) <https://www.plowingmatch.org/about-us/in-the-beginning>

Ontario Plowmen’s Association (Score Card) <https://www.plowingmatch.org/images/pdfs/PlowingScoreSheetsBasic2014.pdf>

Pacific Northwest Direct Seed Association (Direct Seed) <http://www.directseed.org/about/why-direct-seed/>

Science Direct (Soil Profile) <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/soil-profile>

SciShow Kids Channel (YouTube - Make Your Own Erosion) <https://youtu.be/YETdZyZl6es>

Stephen Speller, Plowing 101 – The Basics on Judging Competitive Plowing (PowerPoint Presentation)

Tractor Mike Channel (YouTube - Hooking up a Three Point Implement) <https://youtu.be/bSatF4Qoqml>

Tractor Mike Channel (YouTube - What is Draft Control?) <https://youtu.be/7jwcwLWGXWI>

Wikipedia (Agronomy) <https://en.wikipedia.org/wiki/Agronomy>

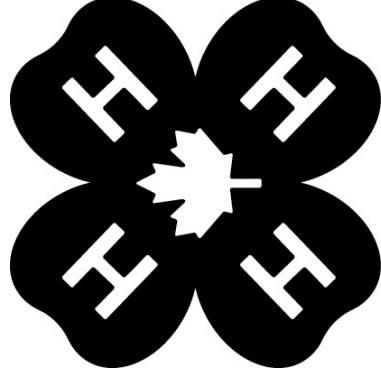
Workplace Safety & Prevention Services (Stop Think Act) <https://www.wsps.ca/Farm-Safety-Resources/Stop-Think-Act.aspx#>

World Ploughing Association (History) http://worldploughing.org/?page_id=1146

Yesterday's Tractors (Rolling Coulter Yoke) <https://www.yesterdaystractors.com/cgi-bin/viewit.cgi?bd=farmall&th=385359>

Yesterday's Tractors (Planning a Field Layout) <https://www.yesterdaystractors.com/cgi-bin/viewit.cgi?bd=using&th=37674>

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Meeting 1 – Getting To Know You

OBJECTIVES

This meeting should introduce members to the concept of plowing, safety regarding plowing, and the basic vocabulary connected to plowing.

Be sure to take into account the current level of knowledge of the club members who you will be working with for this project.

Suggested Lesson Outcomes

- Members will be familiar with the 4-H club process (pledge, parliamentary procedure, electing an executive, judging, communications)
- Members are introduced to what will be happening during the Plowing Club meetings and events.
- Members are able to recognize and become comfortable identifying the parts of the plowing machinery.
- Members will have an understanding of safety around plowing machinery.

REFERENCE MATERIAL IN THIS SECTION

- Electing Your Executive
- Parliamentary Procedure – Steps in Making a Motion
- Parts of the Plow
- Being Safe Around Plowing Equipment – Stop Think Act
- Judging: Giving Reasons

REFERENCES

Plowing Safety <http://nasdonline.org/946/d000787/agricultural-engineering-safety-lesson-plan-operator-safety-tillage.html>

Stop Think Act <https://www.wsps.ca/Farm-Safety-Resources/Stop-Think-Act.aspx#>

ACTIVITIES

- Activity 1: This or That?
- Activity 2: Electing Our Executive
- Activity 3: Parts of the Plow
- Activity 4: Safe Practices and Procedures – Stop Think Act
- Activity 5: Judging Footwear for Plowing

SAMPLE MEETING AGENDA TOTAL LENGTH OF TIME: 2 HOURS 10 MINUTES

Welcome, Call to Order & Pledge	Welcome the club members to the project. Call the meeting to order or lead the members through reciting the 4-H Pledge.	5 min
Introduction	Get to know each other a bit better by doing the interactive energizer Activity 1 - This or That?	5 min
Roll call	After the group is warmed up with the icebreaker hand out the Record Books. Direct members to page 3 and ask them to fill in the Member Expectations and Goals. Give the group time to complete their answers and then introduce the concept of Roll Call by inviting each member to share their name and one of their responses from this page.	5 min
Topic Information Discussion	Parliamentary Procedure and Electing Our Executive. Introduce or review parliamentary procedure and the election process by going over the points provided in the Resources section.	5 min
Activities Related to Topic	Elect executive following procedure in Activity 2 – Electing Our Executive.	15 min

Topic Information Discussion	<p>Outline of Club Project and discuss project objectives/club requirements.</p> <p>Encourage members to wear work clothes and a sturdy pair of shoes or work boots to future meetings.</p> <p>Fill out club and member information in Record Books on page 2.</p> <p>Highlight what you plan to cover at each meeting and the expectations of club members for club completion: meeting attendance, judging throughout the meetings, achievement event, meeting dates, etc.</p> <p>Encourage members to fill in the meeting dates and notes in their Record Book on page 2 as you highlight them.</p>	15 min
Topic Information Discussion	Demonstration of Parts of the Plow - Provide a thorough overview of the parts of the plow following the process outlined in the Resources section.	10 min
Activities Related to Topic	Encourage members to label the parts of the plow on the worksheet for Activity 3 - Getting to Know Your Plow as you provide your overview.	20 min
Topic Information Discussion	Highlight Safe Practices and Procedures when using a Plow	10 min
Activities Related to Topic	Activity 4 –Stop Think Act	20 min
Judging and Public Speaking	Activity 5 – Judging Footwear for Plowing	15 min
Wrap Up, Adjournment & Social Time	Recap topics covered in this meeting and review the At Home Challenge	5 min
At Home Challenge	<p>Choose the At Home Activity found in the meeting or come up with one of your own and share the activity with the members.</p> <p>Let them know that they will be expected to report out on their activity during Roll Call in Meeting 2.</p>	

MEETING 1 – REFERENCE MATERIAL

ELECTING YOUR EXECUTIVE

The club executive are decided on by all club members.

Review each of the roles and responsibilities with the members.

PRESIDENT

The club president works closely with the Club leaders to plan meetings and other activities. He/she acts as chairperson of all club meetings and ensures that the meetings start and end on time.

VICE PRESIDENT

The vice president helps the president when the president when needed and takes over the duties of the president if necessary.

SECRETARY

The secretary is responsible for keeping minutes of meetings, attendance records and handling the club's mail. If the club has money, the secretary may become the secretary-treasurer.

TREASURER

The treasurer is responsible for keeping a record of the club money which is received or paid out. A report is usually given after the reading of the minutes.

PRESS REPORTER

The press reporter is responsible for letting the community know about the activities of your club through social media, local newspapers, radio, or 4-H newsletters.

Talk About It!

What other organizations use these positions? Have you ever been part of a group that has these roles?

PARLIAMENTARY PROCEDURE - STEPS IN MAKING A MOTION

The motion is a very important key to having good meetings. Motions are a way of introducing topics for discussion and allowing each member to speak and vote. Any member can make a motion.

STEPS IN MAKING A MOTION:

1. Address the chairperson (i.e. raise your hand).
2. Wait for the chairperson to acknowledge you.
3. Make the motion: "I move that..."
4. Another person seconds the motion: "I second the motion."
5. Chairperson states the motion.
6. Chairperson calls for discussion of the motion.
7. Chairperson restates the motion.
8. Chairperson calls the vote: "All in favour? Opposed?"
9. Chairperson announces the result of the vote: "Motion carried" or "Motion defeated."

The secretary should record the motion that is made, who made and seconded the motion, and the result of the vote.

Look It Up!

How is parliamentary procedure used in Canadian government?

PARTS OF THE PLOW

MOLDBOARD PLOW

The moldboard plow has been a major tillage machine in Ontario for several generations. The plow was first used to break sod by the early settlers. The plow has evolved from the basic horse drawn unit to what we see today.

The moldboard plow remains the most important primary tillage implement despite the fact that for certain crops and conditions no advantages can be gained by plowing.

Purpose of the Moldboard Plow

- Aerates the soil
- Incorporates organic and chemical fertilizer into the soil
- Buries crop residue and weeds
- Limits the amount of crop residue on the soil surface
- Assists in the control of weeds, insects and crop diseases

Different moldboards are available depending on your crops and soil conditions.

Examples include the High Speed Corn Stalk Bottom and Long Moldboard Sod Bottom

COULTERS

Purpose of the Coultter

Cuts through trash residue and provide a uniform width of cut to open the soil ahead of the moldboard for each plow bottom to turn leaving a clean-cut furrow.

Designs of Coultters

Yoke Type Coultter – The yoke holds the coultter on the plow and can be adjusted up and down.

Spring Cushion Coultter - spring mechanism ensures constant down pressure and cushions the assembly to prevent damage from rocks, etc.

Shear Bolt Coultter - Shear-bolt coultters suited for areas without rocks

Purpose of the Trip Mechanism

A trip mechanism permits a plow to raise up, move rearward and pivot upon striking a buried object and which mechanism returns the plow to operative position after the object has been cleared. The mechanism helps reduce the risk of damage from obstructions (e.g. rocks, tree roots, etc.). There are various types of plow trip mechanisms to accomplish this.

Automatic Spring Reset – Allows the operator to plow non-stop. The mechanical spring reset automatically returns the plow bottom into the ground after it has tripped over an obstruction.

Automatic Hydraulic Reset – Performs the same duties as the automatic spring reset. However the trip mechanism is hydraulically, rather than mechanically, activated.

Toggle Trip – Is a mechanical trip where the operator must stop and raise the plow. As the plow clears the obstruction the bottom returns to its plowing position. The operator can then resume plowing. Note the operator is not required to back up and reset the bottom.

Mechanical Trip – The operator must stop, raise the plow and reset the bottom by backing up.

Clearance Measurement of a Plow

Trash clearance is critical in a plow to allow crop residue to move through the machine without plugging.

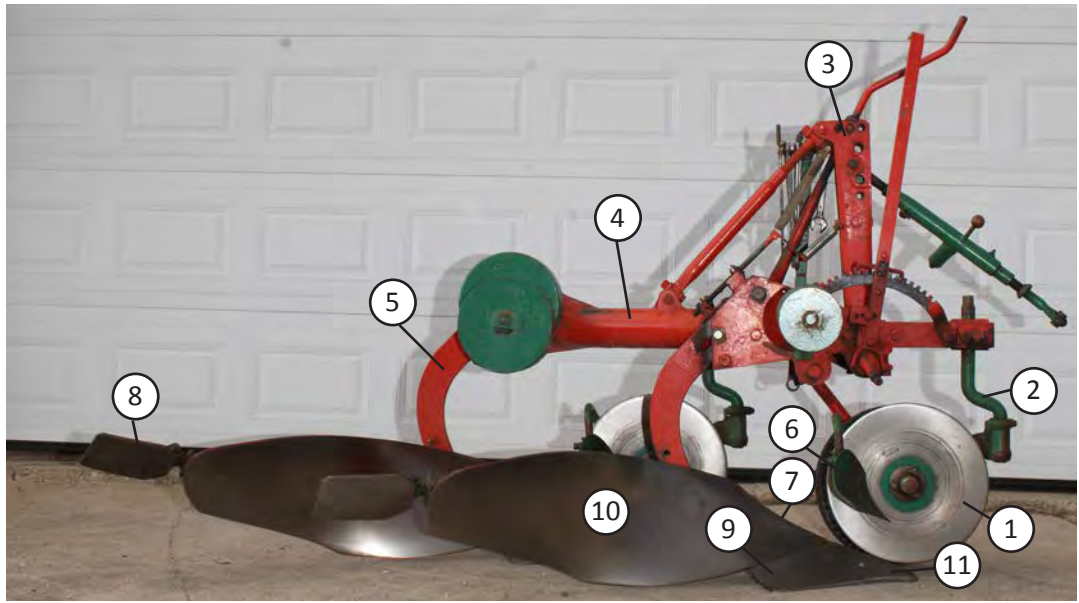
The distance from the plow point to the frame or plow beam is called the vertical clearance.

The horizontal clearance from one bottom to the next is called the fore and aft clearance.

The distance the share cuts in the ground between one bottom and another is called the furrow width or width of cut.

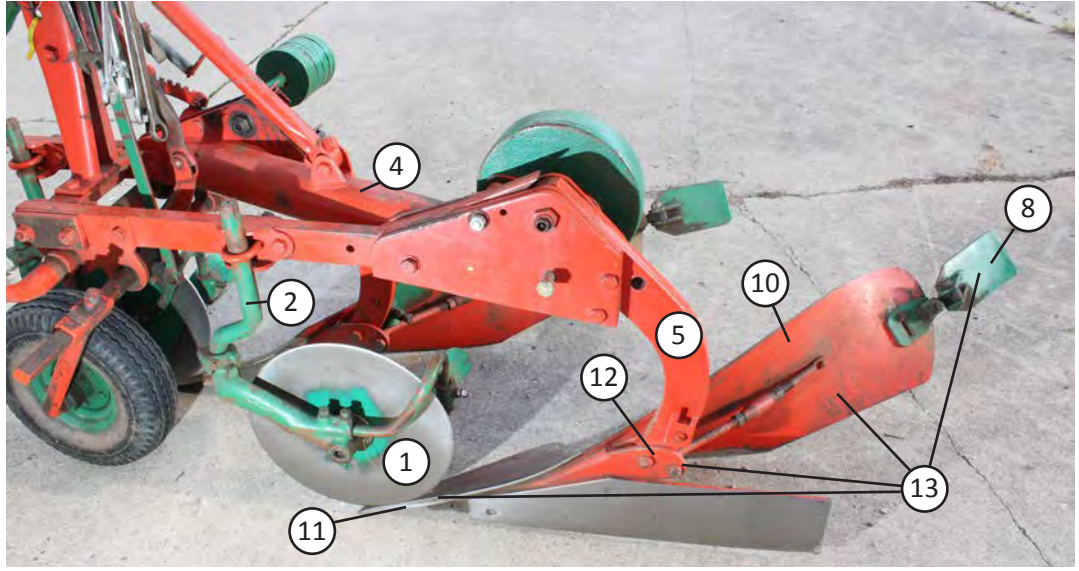
TYPES OF PLOWS

- **Pull-Type Moldboard Plows** – Pull –Type plows are self-contained units that depend on the tractor for locomotion only. It is attached and drawn by the tractor drawbar. They are not as maneuverable as mounted types and very little weight is transferred from plow to tractor.
- **Fully-Mounted Plows** – Plows that are fully mounted on the three point hydraulic linkage. They are coupled rigidly to the tractor and are easily maneuvered. In transport, the entire weight of the plow is carried by the tractor. Steering control may be a problem while plowing because of the weight transfer. Sometimes front-end weights are added to the tractor to improve steering. The fully-mounted plow is easy to operate. It has the least number of adjustments and because of its simplicity its initial cost is usually lowest.
- **Semi-Mounted Plows** – Semi-mounted plows have only one wheel which is located at the rear to support and steer the rear of the plow in the furrow. In addition it may have a wheel to control depth which runs on the land. The front of the plow is mounted on the lower arms of the three point hydraulic linkage. They depend on the tractor for most of their support. Semi-mounted plows allow for a very large number of furrows, as the weight of the plow is not entirely supported by the three point hitch. They are also very suitable for operating in soil conditions where many obstructions (stones, roots) may be encountered, because it is free to raise at either front or rear as it passes over an obstruction.



Source: Stephen Speller, Private Collection.

Plows may be modified. This plow has mouldboard extensions, a front beam that may be lifted when making the crown and finish as well as additional weights. After plowing, the plow should be cleaned of all soil, and oiled to prevent rust and pitting of the metal.



Source: Stephen Speller, Private Collection.

The turnbuckles on the back of the mouldboards allow the amount of pressure to be adjusted. If each furrow measures the same depth and width, the same amount of skimming is taking place, and the furrows still look different, adjustment of the turnbuckles is necessary. These may be adjusted differently from regular plowing to make the crown and finish furrows as well. A small amount of adjustment can make a big difference.

Parts of the Plow

Function of Plow Parts

1. Disc Coulter – disc or knife which cuts through trash and forms the furrow wall
2. Cross Shaft – front furrow width adjustment
3. Top Link Attachment Point
4. Coulter Stem
5. Beam – plow framework
6. Skimmers or Thrash Boards - cuts out and turns trash under furrow slice
7. Shin – leading edge of the moldboard. The sliding action of the soil generates a great deal of heat and wear on the skim.
8. Landside – runs along furrow wall helping to absorb the side forces from the turning furrow slice, steadies the plow and helps to keep the plow straight behind the tractor
9. Wing – cutting point of plow body
10. Moldboard – lifts, fractures and turns furrow slice which has been cut by share. A wide variety of moldboard shapes are available. It is important that the proper moldboard design be selected for plowing in a given set of conditions.
11. Share or Point – cutting point of plow body. It gives suction and penetration and cuts the furrow slice loose. Many types are available.
12. Frog – foundation of a plow bottom. It serves as a base onto which the share, the moldboard and the landside are fastened and also acts as a connector between the plow bottom and plow beam.
13. Plow Bottom – it consists of a frog, a share, a moldboard and a landside

Try It Out At Home!

Ask your family or a local farmer what kind of plowing equipment they use and if you can see it. Take photos of the plow, print the photo out on a piece of paper and try to label as many of the parts as you can using the list on your worksheet. Be prepared to share your experience at the next meeting.

BEING SAFE AROUND PLOWING EQUIPMENT

There are certain hazards that are particular to plowing with moldboard plows including the following:

- Provide adequate front-end weight for tractor stability in transport and operation. Never pull from any point higher on the tractor than the recommended hitch point.
- Use extreme caution and reduce speed when transporting the plow and the tractor over rough ground.
- Avoid sharp turns at high speeds, especially on slopes.
- On tight turns, avoid swinging rear of plow into fences or other obstacles.
- Turning stops on some plows limit turning radius. Shorter turns may severely damage plow frame and tractor hitch.
- Never carry passengers on the tractor or permit others to ride on the plow -- particularly plows with automatic reset.
- Always lower the plow when not in use or left unattended.
- Lower the plow and securely pin the parking stand before detaching the plow from the tractor.
- Always use proper lighting, reflectors, Slow Moving Vehicle emblem, and other safety devices for road travel as required by provincial and local laws.
- When hitching drawn plows, always use a hitch pin with adequate strength for the tractor-plow combination.

Source: adapted from <http://nasdonline.org/946/d000787/agricultural-engineering-safety-lesson-plan-operator-safety-tillage.html>

Look It Up!

What kinds of farm equipment accidents have happened in your area? Use the internet to search for examples and review the circumstances that resulted in the accident. What suggestions or recommendations could you make to help prevent a similar accident in the future? Be prepared to share your findings at the next meeting.

JUDGING: GIVING REASONS

Giving reasons can be the most rewarding part of the judging process but it takes practice and confidence. The ability to give a good set of reasons depends on knowing what you're looking at, knowing the right words to use, knowing the right way to give your reasons and being able to convince everyone that you're right.

HOW TO GIVE REASONS

1. Reasons should be short, clear and convincing. They shouldn't take more than two minutes to give.
2. Stand straight and look right at the person to whom you are speaking.
3. Start by naming the class and giving the order of placement.
4. Explain why you placed the first over the second, the second over the third, and the third over the last.
5. Never go back. Say everything you want to say about one placing and then move on to the next one.
6. Keep a clear picture in your mind of what you are judging.
7. Be positive. Talk about the important points that were better in each exhibit.
8. Don't be too hard on the exhibit that was the last. Talk about two or three things that were wrong and then quit.
9. Speak loudly enough for the judge to hear you and with confidence.
10. Know the right words to use and use them correctly. Don't get stuck using the same words over and over.
11. Always do your best.

DIGGING DEEPER FOR SENIOR MEMBERS

MOLDBOARD PLOWS

Working independently or in small groups, research the different kinds of moldboard plows and the benefits of each. Create a PowerPoint presentation that can be shared with the club members or a display that could be shown at the Achievement Program.

ACTIVITY 1– THIS OR THAT?

DO

Time: 5 minutes

Materials/Resources:

- List of This or That Questions
- Enough space for members to move around and form groups

Instructions:

- Divide meeting space into two sides and indicate the two sides to the group
- Ask members to choose between the two options you provide and move to the side that reflects their choice
- As you read each pairing use your hand to indicate where to stand for each choice
- Check with group to make sure instructions are clear
- Read from list of ideas provided and/or add in your own pairings

Pairings:

- Chocolate or Vanilla
- Summer or Winter
- Water or Mountains
- Cats or Dogs
- Work in a Team or Work By Yourself
- Toronto Maple Leafs or Montreal Canadiens
- Scary or Funny
- Crops or Animals
- Getting Up Early or Sleeping In
- Dinner or Dessert
- Rock or Country
- John Deere or Anything But
- Rain or Snow
- Hockey Night in Canada or Letterkenny
- Ketchup on Fries or No Ketchup
- Sweet or Salty
- Shower or Tub

<p style="text-align: center; font-size: 24pt; font-weight: bold;">DO</p>	<ul style="list-style-type: none"> - Online Shopping or In-Person Shopping - Scooby Doo or Sponge Bob - Hide-and-Seek or Dodgeball - Wizard or Superhero - Be Five Years Older or Be Five Years Younger <p>... feel free to add to the list and/or add local flavour like sports teams, local restaurants, events, the possibilities are endless!</p> <p>Additional Activity Options:</p> <ul style="list-style-type: none"> - Have one of the senior members run this activity as their Dig Deeper project. - Ask members to come up with the pairings and write them down on a slip of paper and then the leader draws the slip out and reads the pairing.
<p style="text-align: center; font-size: 24pt; font-weight: bold;">REFLECT</p>	<p>Learning Outcomes:</p> <p>To get the members connecting and learning more about each other.</p>
<p style="text-align: center; font-size: 24pt; font-weight: bold;">APPLY</p>	<p>Processing Prompts:</p> <ul style="list-style-type: none"> - Was this easy or hard? - How do you feel now versus before we did the activity? - Did you learn anything interesting about the club members? - What did you like about this activity?

ACTIVITY 2: ELECTING OUR EXECUTIVE

DO

Time: 15 minutes

Materials/Resources:

- Slips of paper (used if the group decides to vote by ballot)
- Pens or pencils
- Bowl or basket to put ballots into

Instructions:

Share that any member may nominate another member. Nominations do not require a seconder.

Elections can be chaired by a youth leader, senior member or club leader. The person chairing the elections is not eligible for any positions.

Procedure:

1. All positions are declared vacant by the chairperson, who indicates this by saying "I'd like to declare all positions vacant."
2. The group decides on the method of voting.
 - By show of hands
 - By secret ballot
 - By standing
 - By saying "Yea" or "Nay"
3. The chairperson accepts nomination from members for each position being filled. Nominations do not require a seconder. Nominations are closed by motion or declaration by the chairperson.
4. Each member nominated is asked if he/she will stand for the position. Names of members who decline are crossed off.
5. Voting takes place by selected method and majority rules (i.e. member with most votes).

<p>DO</p>	<p>6. Announce the name of the successful member. Offer congratulations and thank all others that ran for the position.</p> <p>7. If ballots are used, a motion to destroy the ballots is required and voted on.</p>
<p>REFLECT</p>	<p>Learning Outcomes: To allow members to elect an executive while applying the concept of voting from parliamentary procedure.</p>
<p>APPLY</p>	<p>Processing Prompts:</p> <ul style="list-style-type: none"> - Why is it important to vote? - Was it easy or hard to make your choice? - How did it feel for the members who were chosen to represent the club?

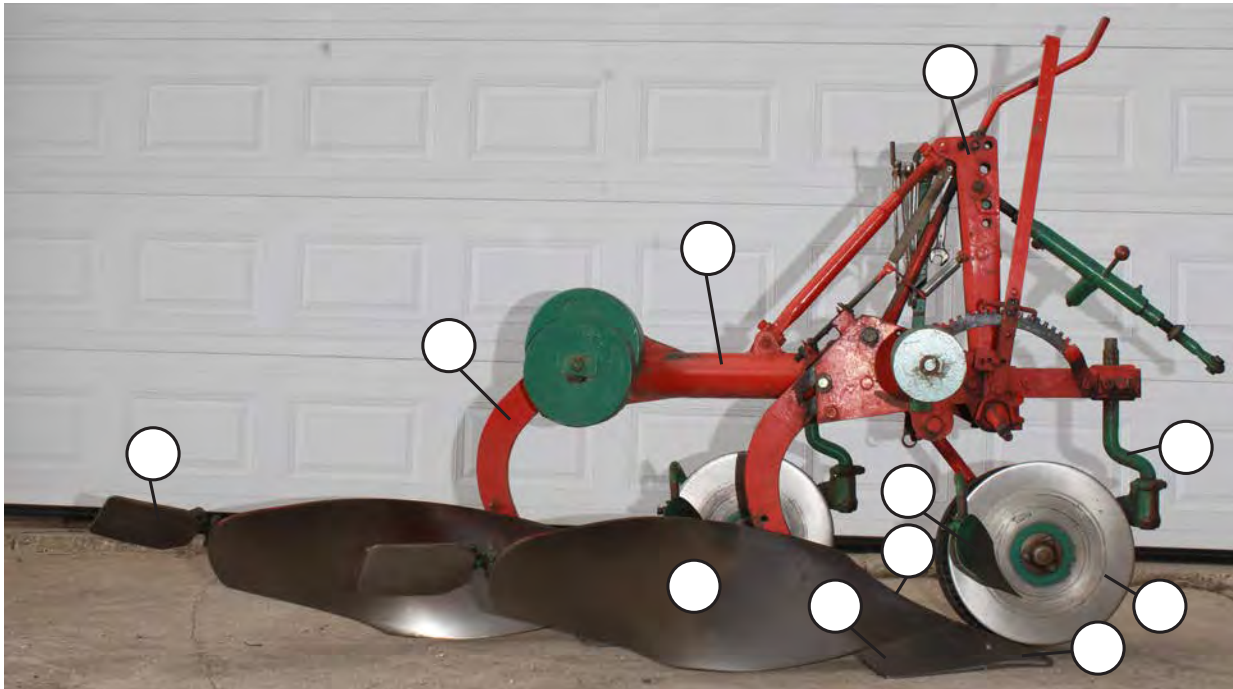
ACTIVITY 3: GETTING TO KNOW YOUR PLOW

DO	<p>Time: 20 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">- A moldboard plow- Parts of the Plow Worksheet <p>Instructions:</p> <ol style="list-style-type: none">1. Ask members to label the parts of the plow on the worksheet as you provide your overview2. Be sure to point out parts that can become a hazard during operation and any other safety tips
REFLECT	<p>Learning Outcomes:</p> <p>Members will become more knowledgeable about the parts of the plow and being able to identify them.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none">- Was the easiest part to remember?- Did you have any strategies for remembering the names of the plow parts?- Why is it important to know the proper names of the parts of the plow?

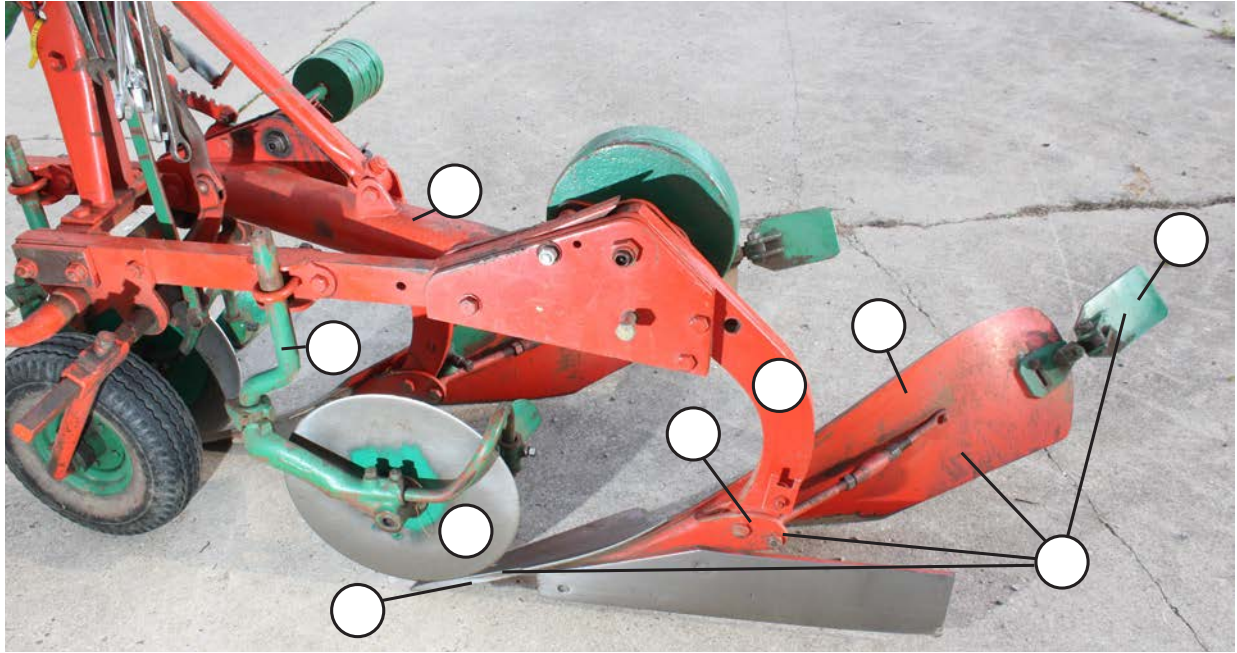
WORKSHEET: GETTING TO KNOW YOUR PLOW

Label the following parts of a plow in the images below:

1. Disc Coulter
2. Cross Shaft
3. Top Link Attachment Point
4. Coulter Stem
5. Beam
6. Skimmers or Thrash Boards
7. Shin
8. Landside
9. Wing
10. Moldboard
11. Share or Point
12. Frog
13. Plow Bottom



Source: Stephen Speller, Private Collection.



Source: Stephen Speller, Private Collection.

ACTIVITY 4: SAFE PRACTICES AND PROCEDURES STOP THINK ACT

DO

Time: 20 minutes

Materials/Resources:

- Television monitor and/or laptop connected to internet
- Copy of Stop Think Act questions

Instructions:

Introduce the topic of safe practices and procedures when plowing with the members.

View the Introductory Video from Workplace Safety & Prevention Services with a simple strategy that can help you make safe decisions when working around plowing equipment.

<https://www.wsps.ca/Farm-Safety-Resources/Stop-Think-Act.aspx#>

or view on YouTube at
Stop Think Act – YouTube Channel – Workplace Safety & Prevention Services –
https://youtu.be/od_joSsTxE

Review the questions using the handout.

Ask the group to share any experiences they may have had where they feel this strategy may have been useful.

Additional Activities:

- Stop the video when they get to the portion with the examples using the questions.
- Have the members practice using the questions to determine how to handle the scenarios.
- Compare their answers to the responses offered in the video.

REFLECT	Learning Outcomes: Members will be equipped with a strategy for assessing situations to keep themselves safe.
APPLY	Processing Prompts: <ul style="list-style-type: none">- Will using this strategy be easy or hard?- How can you use this strategy related to cell phone use around plowing equipment?- What can you do to remind yourself to Stop-Think-Act when you are working with plowing equipment?- Are there any other methods that you use to keep yourself safe when using equipment?

WORKSHEET: STOP-THINK-ACT

BEFORE AND DURING A TASK

Stop

- What could go wrong?
- How bad could it be?
- Has anything changed?

Think

- Do I clearly understand the task?
- Am I physically and mentally ready?
- Do I have the right tools and equipment?

Act

- Make it safe
- Use the right tools and procedures
- Reduce risks

Stop if it can't be done safely!

Source: <https://www.wsps.ca/Farm-Safety-Resources/Stop-Think-Act.aspx#>

ACTIVITY 5: JUDGING FOOTWEAR FOR PLOWING

DO	<p>Time: 15 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Three or four different types of footwear that farmers might use (e.g. work boots, steel toe boots, rubber boots, running shoes)– Judging Worksheet <p>Instructions:</p> <ol style="list-style-type: none">1. Distribute Worksheet to members or get members to turn to page 5 of their Record Book2. Place different footwear in front of members and ask them to rank the options giving reasons for their reasons for their placings.3. Give the members time to complete the judging.4. Ask for 2-3 volunteers to share their responses.5. Ask for any additional responses from the group that either add to or differ from the points already given. <p>Additional Activity:</p> <ul style="list-style-type: none">– Allow Senior Members to prepare the items to be judged and/or come up with another safety-related material to be judged.
REFLECT	<p>Learning Outcomes:</p> <p>Members will apply the concepts learned related to judging and giving reasons for placements.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none">– Was this easy or hard?– What did you like about this activity?– How did you come up with your reasons?– When could you use this process in the future?

WORKSHEET: JUDGING

Subject Being Judged: _____

Qualities you are looking for: _____

Item Being Judged/ Item Number/ Identifier	Placing	Reasons for Placing

THINGS TO REMEMBER WHEN JUDGING

1. Reasons should be short, clear and convincing.
2. Stand straight and look right at the person to whom you are speaking.
3. Start by naming the class and giving the order of placement.
4. Explain why you placed the first over the second, the second over the third, and the third over the last.
5. Never go back. Say everything you want to say about one placing and then move on to the next one.
6. Keep a clear picture in your mind of what you are judging.
7. Be positive. Talk about the important points that were better in each exhibit.
8. Don't be too hard on the exhibit that was the last. Talk about two or three things that were wrong and then quit.
9. Speak loudly enough for the judge to hear you and with confidence.
10. Know the right words to use and use them correctly. Don't get stuck using the same words over and over.
11. Always do your best.

Meeting 2 – Getting Hitched

OBJECTIVES

This meeting will work at developing comfort in members with plowing equipment and making an open split.

Suggested Lesson Outcomes

- Members learn how to attach a plow using a 3-point hitch.
- Members learn how to make an Open Split.
- Members can recognize how to make adjustments to the plow and understand what the adjustments change.

REFERENCE MATERIAL

- Glossary of Plowing Terms
- How to Attach a Plow Using a 3-Point Hitch
- What is Draft Control?
- Beginning to Plow
- Plow Adjustments and What They Do

REFERENCES

How to hook up a 3-point hitch implement to a tractor <https://youtu.be/bzgXMpimguY>

Hooking up a Three Point Implement <https://youtu.be/bSatF4Qoqml>

What is Draft Control? <https://youtu.be/7jwcwLWGxWI>

Plowing 101 – The Basics on Judging Competitive Plowing by Stephen Speller (PowerPoint Presentation)

Agronomy <https://en.wikipedia.org/wiki/Agronomy>

Coulter <https://www.farmcollector.com/equipment/implements/plow-coulter-zm0z17augzhur>

Direct Seed <http://www.directseed.org/about/why-direct-seed/>

Disc Chisels <https://www.farm-equipment.com/articles/14026-disc-chisels-vs-hybrid-disc-chisels-there-is-a-difference>

Draft Control <https://itstillruns.com/set-draft-control-tractor-12119925.html>

Manual <https://www.lexico.com/en/definition/manual>

Min-Till https://en.m.wikipedia.org/wiki/Minimum_tillage

Moldboard Plow <https://www.deere.ca/en/tillage/3710-moldboard-plow/>
<https://www.merriam-webster.com/dictionary/moldboard%20plow>

Reversible Plow https://en.wikipedia.org/wiki/Plough#Reversible_plough

Rolling Coulter Yoke <https://www.yesterdaystractors.com/cgi-bin/viewit.cgi?bd=farmall&th=385359>

Soil Health [https://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/epw16322/\\$FILE/01-Newton-Lupwayi.pdf](https://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/epw16322/$FILE/01-Newton-Lupwayi.pdf)

Soil Health <http://www.omafra.gov.on.ca/english/environment/bmp/soil-health.htm>

Soil Profile <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/soil-profile>

Tillage - <https://www.deere.ca/en/tillage/>

Walking Plow <https://www.thefreedictionary.com/Walking+plow>

Ontario Plowmen’s Association Score Card <https://www.plowingmatch.org/images/pdfs/PlowingScoreSheetsBasic2014.pdf>

ACTIVITIES

- Activity 6 - Do You Know What I Mean By ...?
- Activity 7 – Judging Open Splits (using the OPA Score Card)
- Activity 8 – Practicing Open Splits
- Activity 9 – Judging Open Splits

SAMPLE MEETING AGENDA TOTAL LENGTH OF TIME: 2 HOURS 5 MINUTES

Welcome, Call to Order & Pledge		5 min
Roll call	Invite each member to share their name and their response to the At Home Activity that you asked them to do at the end of Meeting 1.	10 min
Topic Information Discussion	Plowing Terms and Concepts Choose ten terms from the Glossary that are most relevant to your group of members (can be tailored to their understanding of plowing, e.g. beginner, more experienced) and use a plow or other visual reference (e.g. YouTube video, photo) to illustrate the meaning or concept	10 min

Activities Related to Topic	Activity 6: Do You Know What I Mean By ...?	10 min
Topic Information Discussion	Demonstrate to the members how to attach a plow using a 3-point hitch. Explain what draft control is and when it is used.	10 min
Activities Related to Topic	Activity 7: Practicing Attaching and Unhooking a Plow Provide time for members to practice attaching and unhooking the plow from the tractor using the 3-point hitch.	10 min
Topic Information Discussion	Demonstrate the points in the Plowing for Home and Competition section and model an Open Split. Introduce the points on the Ontario Plowmen's Association Score Card.	10 min
Activities Related to Topic	Activity 8: Practicing Open Splits Provide time for members to practice making an open split and give feedback.	30 min (depending on size of group)
Judging	Activity 9: Judging Open Splits (using the OPA Score Card)	15 min
Topic Information Discussion	Plow adjustments and what they do	10 min
Wrap Up, Adjournment & Social Time	Recap topics covered in this meeting and review the At Home Challenge	5 min
At Home Challenge	Choose the At Home Activity found in the meeting or come up with one of your own	

MEETING 2 – REFERENCE MATERIAL

GLOSSARY OF PLOWING TERMS

Terms that are useful for people who are learning to plow.

3-point hitch plow – Suited for a variety of primary tillage operations on land previously used for growing grasses, grains, vegetables, and other crops. It buries the crop residue and leaves a clean soil seedbed on top.

A horizon - The natural surface layer of mineral soil.

acre - An area of 2.471 ha., 4047 sq.m., or 43560 sq. ft.

aeration, soil - The process by which air in the soil is replaced by air from the atmosphere

aggregate, soil - A group of soil particles sticking together to act as a unit.

agronomy - The science and technology of producing and using plants in agriculture for food, fuel, fiber, and land restoration. It is both a humanitarian career and a scientific one. Agronomy has come to encompass work in the areas of plant genetics, plant physiology, meteorology, and soil science.

B horizon – Subsoil horizon lying below the A horizon.

bedrock – The solid rock underlying soils.

C horizon – Less developed soil lying below the A and/or B horizon(s).

cast off – A term that refers to the piece of land that a contestant finished between his crown and the next contestant's crown.

clay – A soil consisting of particles less than 0.002 mm in diameter. Also, a textural class of soil.

coarse texture – The texture exhibited by sands, loamy sands and sandy loams.

compaction – A reduction in volume resulting from applied force as that due to machinery or animals.

compost – A combination of organic matter, soil, nutrients, moisture and lime, which when allowed to rot can be returned to the soil as a fertilizer and conditioner.

conformity - Each furrow in the land looks the same side by side.

contour cropping – Tilling and planting across a slope rather than with the slope to reduce the risk of erosion.

crown - Consists of four heavy rounds for two furrow plows and three heavy rounds for three or more furrow plows after which the contestant shall commence to cast off.

cultivation – A tillage operation used in preparing land for seeding or transplanting, or later, for weed control and for loosening the soil.

decomposition – The chemical breakdown of mineral or organic matter.

direct seeding practices - Farming systems that fertilize and plant directly into undisturbed

soil in one field operation, or two separate operations of fertilizing and planting. Only narrow strips of soil are disturbed by the equipment openers used to place fertilizer and seed in the soil without full width tillage.

disc chisel - A disc chisel is tool for primary tillage. Disc chisels are often designed with one row of disc blades followed by several disc chisels or shanks.

draft control - Draft control senses the extra strain on the hitch and allows the plow to raise just enough to get through the hard spot, immediately returning to the desired depth.

drain tile – Concrete or ceramic pipe used to conduct water from the soil.

erosion – Detachment and movement of soil or rock by water, wind, ice or gravity.

fertility, soil – The status of a soil with respect to the amount and availability to plants of elements necessary for plant growth.

fertilizer – Any material that is added to the soil by people to supply plants with more nutrients.

fine texture – The texture exhibited by soils having “clay” as a part of the textural class name.

finish - Includes the last 12 furrows - 6 furrows on the throw out or cast off side of the finish and 5 furrows and the sole furrow on the crown side.

frost line – The depth to which freezing occurs in the soil.

furrow – A channel worked into the surface of the soil by an implement such as a plow or hoe.

grassed waterway – areas of water flow within a field, planted with a grass cover in order to reduce the risk of erosion.

green manure – A growing crop that is plowed under and mixed with the soil to enrich it with organic matter.

ground water – That portion of the total precipitation which at any particular time is either passing through or standing in the soil.

gully – a channel resulting from water erosion that is deep enough to interfere with (and cannot be removed by) normal tillage operations.

hectare – An area of 10,000 sq.m. and equal to 0.405 acres.

horizon – Horizontal layers of soil of varying thickness, colour, texture and structure.

hydraulic – Something that is operated by a liquid moving in a confined space under pressure

infiltration – The downward entry of water into the soil.

irrigation – The artificial application of water to the soil for the benefit of growing crops.

judging card – The form used to score plowing in competition.

land classification – The arrangement of land units into various categories based upon the properties of the land or its suitability for some particular purpose.

landscape – All the natural features, such as fields, hills, forests, water, etc.,

manual – Related to something that is done with your hands versus with a machine.

manure – The excreta of animals, with or without bedding litter, added to soil to improve it with respect to crop production.

min-till - Minimum tillage, also called conservation tillage, is a soil conservation system with the goal of minimum soil manipulation necessary for a successful crop production. It is a tillage method that does not turn the soil over. It is contrary to intensive tillage, which changes the soil

structure using ploughs. In min-till primary tillage is completely avoided and only secondary tillage is practiced to a small extent.

moldboard plow - a general-purpose plow having a moldboard

muck soil – An organic soil in which the organic matter is well decomposed.

mulch – A layer of material spread over the soil surface to protect it and plant roots from erosion, crusting, freezing and drying.

nutrient – A chemical element essential for the growth and development of an organism.

open split - The first strip cut by the plow. The strip is to be well cut through so that no land is left uncut.

particle size – The effective diameter of a particle.

peat soil – An organic soil consisting largely of undecomposed or slightly decomposed, organic matter accumulated under conditions of excessive moisture.

physical properties (of soils) – Those characteristics, processes or reactions of a soil which are caused by physical forces and which can be described by or expressed in physical terms.

plow - A large farming implement with one or more blades fixed in a frame, drawn by a tractor or by animals and used for cutting furrows in the soil and turning it over, especially to prepare for the planting of seeds.

pore space – Space in the soil not occupied by solid particles.

porosity – The total volume or pore space, usually expressed as a percentage of the total soil volume.

precipitation – Rainfall or snowfall plus minor amounts of dewfall and fog drip.

productivity, soil – The capacity of a soil, in its normal environment, for producing, a specified plan or sequence of plans under a specified system of management.

profile, soil – A vertical section of the soil through all its horizons and extending into the parent material.

residue – Plant material left on the field after the crop is harvested.

reversible plow - The reversible plough (or “rollover plow”) has two mouldboard ploughs mounted back-to-back, one turning to the right, the other to the left. While one is working the land, the other is carried upside-down in the air. At the end of each row, the paired ploughs are turned over, so the other can be used. This returns along the next furrow, again working the field in a consistent direction.

ridge till – An alternative to no-till. This system is more adaptable to poorly drained soils than no-till. A cultivator forms a ridge during early summer and the following year’s crop is planted onto the ridge. The permanent ridges limits traffic to specific areas which reduces soil compaction but requires wheel spacing modifications.

rill – A small channel, such as a furrow prepared to conduct irrigation water across a field, or that is caused by erosion runoff. Where the cause is erosion, the term rill is limited to small channels that are only a few centimeters deep and therefore no obstacle to tillage operations.

roll over plow – see “reversible plow”

rotation – The planting of different crops on a field from year to year in order to reduce the risk

of erosion.

runoff – That portion of the precipitation of an area which is discharged from the area through stream channels.

sand – A soil component consisting of relatively large particles (between 0.05 and 2.0 mm). Also, a soil textural class.

silt – A soil component consisting of particles between 0.002 and 0.05 mm in diameter. Also, a soil textural class.

slope – Deviation of a plane surface from the horizontal (usually expressed in degrees).

soil – A naturally occurring body of mineral and organic materials on the earth's surface which acts as a medium of plant growth.

soil classification – The systematic arrangement of soils into groups or categories based on their characteristics.

soil finisher – Is a one-pass disc cultivator.

soil-formation factors – The variable, interrelated natural agencies or soil formation, namely: parent material, climate, living matter, topography and time.

soil health - The continued capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, maintain the quality of air and water environments, and promote plant, animal, and human health.

soil management – The sum total of all tillage operations, cropping practices, fertilizer, lime and other treatments conducted on or applied to a soil for the production of plants.

soil organic matter – The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the living organisms within the soil.

soil profile - A soil profile is a vertical cross section of the soil that can be viewed by excavating a rectangular pit or sampling the soil layer by layer.

soil saver – see “Disc Chisel”

soil structure – The confirmation or arrangement of individual soil particles into definable aggregates which are characterized and classified on the basis of size, shape, and degree of distinctness.

soil texture – The relative proportions in a soil of the three soil separates; sand, silt and clay.

strip cropping – The practices of growing crops which require different types of tillage, such as row and sod, in the alternate strips along contours or across the prevailing direction of the wind.

stubble – Root systems and some stalk left in the field after the crop is harvested; roots are actually still “planted” in the soil.

subsoil – That part of the soil below the depth of plowing.

tile drain – Concrete, clay or plastic pipe placed at suitable depths and spacing in the soil or subsoil to provide water outlets from the soil.

till – To plow and prepare for seeding; to see or cultivate the soil.

topography – The physical features of the landscape, especially its relief and slope.

topsoil – The layer of soil moved in cultivation; the A horizon.

walking plow - A turning plow having two handles and pulled by a team of horses, mules, or oxen. The plow was held in an upright position by a person walking behind it holding the handles.

water table – That level in saturated soil where the hydraulic pressure is zero.

windbreak – A planting of trees, shrubs or other vegetation, usually perpendicular or nearly so to the principal wind direction to protect soil, crops, homesteads, roads, etc., against the effects of winds (wind erosion, drifting soil and drifting snow).

HOW TO ATTACH A PLOW USING A 3-POINT HITCH

1. Back tractor into plow hitch
2. Attach fixed lower arm first with a lynch pin
3. Attach adjustable lower arm (usually on right side) with a lynch pin
4. Attach top link with a bolt and lynch pin, it is adjustable so you can make it taller or shorter as needed to keep things level
5. If your hitch has stabilizer bars be sure to adjust and secure the stabilizer bars

Have members attach and unhook the plow in order to gain confidence with the process.

Check It Out At Home!

What other equipment uses a 3-point hitch? Do you have any of this equipment at your home/farm? Can you take a photo and/or find one online to share?

Be prepared to share your research at the next meeting.

WHAT IS DRAFT CONTROL?

Draft control is designed to do is keep your plow or tillage equipment in the soil at a consistent depth and not let the implement sink into the ground when you encounter loose soil.

There is a sensor in the top link of your 3-point hitch with plungers that can tell when you encounter soil that lets the plow sink into the ground.

The sensor in the top link will sense the implement sinking and bring it back up to keep the plow level.

If your tractor is equipped with draft control you should always read your Owner's Manual for the manufacturer's recommendations.

If you have draft control on our tractor instead of just having a position lever for your 3-Point Hitch to raise and lower your equipment you will have a second draft control lever that goes with it.

BEGINNING TO PLOW

As we introduce the various stages of plowing we will be referring to the definitions provided to by the Ontario Plowmen's Association (OPA) for the various stages. To guide us in the best practices assigned to each stage we will be referring to the attributes evaluated when taking part in competitive plowing. These attributes are provided on the OPA Score Card.

WHAT IS A SCORE CARD?

This is a systematic approach for evaluating the quality of plowing.

The Score Card is a tool for the consistent scoring of many types of plowing including horse walking and sulky plows, antique drag and hydraulic plows.

The Score Card is also used for conventional and reversible plows (with a slight variation).

The same Score Card system is used for a beginner class at a local match up right up to the Ontario Championship Plowing competition.

Each aspect of the plowing has its own column on the score sheet and is evaluated for each competitor using a scale of 1-to-10. This scale provides an easy and consistent way for the judge to think about scoring a land.

How do judges learn to come up with their scores? Through mentoring, training, Judges School, meetings, and experience.

When judges are determining the mark they will assign they look at plowing and consider the following questions:

- Is it perfect?
- How can it be better or improved on?
- Did they do a complete job?
- What number do we assign that attribute?

Source: Plowing 101 – The Basics on Judging Competitive Plowing by Stephen Speller

PLOWING FOR HOME AND COMPETITION

The following remarks refer to competitive plowing using a two furrow hydraulic plow.

1. Plow Adjustments:

- Tractor should be matched to plow. Rear tires must not be wider than width of furrow being plowed.
- Width inside rear tires should be three times the width of furrow plus 10 centimetres.
- Top link of 3-point hitch should be at a 10 degree angle to lift arms.

2. The Plow:

- Distance from point to shear to the bottom of beam must be the same for both furrows.
- Points of both shears must be the same distance across beam.
- Distance between mouldboards must be the same at front and back.
- Coulters must be same distance above and out from shear.
- Skimmers must be same height and at the same angle to coulters.

3. Procedures in Competitive Plowing

The association sponsoring the match will have the field prepared, with headland scratches and short stakes with numbers on them. Lands will be drawn by number, so locate your land with the corresponding number at each end. The original position of the stake is normally where the centre of your land will be.

WHAT IS AN OPEN SPLIT?

The initial row of plowing. According to the Ontario Plowmen's Association, "The strip is to be well cut through so that no land is left uncut. First the split shall be turned out and then gathered in completing the crown. One round will be permitted in making open split before judging. All sod, weeds, etc., cut so that no uncut area remains under crown furrows."

- Back coulter down alongside shear
- Front plow out of the ground, back plow just deep enough to cut all grass (5-7.5 cm)
- Coming back, plow with the front plow, running edge of front shear just inside the edge of the first furrow. Back furrow with scratch in.
- Rolling of split is not allowed in championship classes.



Source: Plowing 101, Slide 10
The Open Split is evaluated on its straightness, cut and uniformity.



Source: Plowing 101, Slide 11
Each individual furrow is to be uniform from end to end. They do not have to be identical to one another. These furrows are uniform from end to end but not identical to each other.



Source: Plowing 101, Slide 12

The centre furrow starts out small and gets larger half way along.

The front furrows are more uniform from end to end.



Source: Plowing 101, Slide 13

Uncut grass or roots will lower the score for Cut & Uniformity.

Uneven or lack of furrows will also lower the score for Cut & Uniformity.



Source: Plowing 101, Slide 14

The split should have no grass or stubble anywhere inside of the split, either loose or still rooted in the soil.



Source: Plowing 101, Slide 15

Splits may look different from the middle of the field than they do from the ends, it is important to look at the entire length of the split to evaluate it.



Source: *Plowing 101, Slide 17*
Very uniform Open furrow.



Source: *Plowing 101, Slide 18*
Straightness is important. This is what this split looked like from both ends of the field.

PLOW ADJUSTMENTS AND WHAT THEY DO

BENEFITS OF DIFFERENT HITCH DESIGNS

Infurrow Hitch

- Draft is reduced
- Driving is easier
- Easier to maintain uniform cut width
- Weight transfer is better



Source: Stephen Speller, Private Collection.

Example of Infurrow hitch



Onland Hitch

- Reduces soil compaction
- Allows for use of dual tires
- Increases tractor pull and tire life
- Improves operator comfort

Source: Stephen Speller, Private Collection.

Example of Onland hitch

ADJUSTMENT OF FULLY-MOUNTED PLOWS

Correct adjustments are essential if one is to obtain satisfactory performance from a mouldboard plow. In principle, the hitches and adjustments for all fully-mounted plows are the same but each manufacturer has a slightly different type of hitch and different methods of and location of adjustments for the particular model. Therefore, it is important that you read the Operator's Manual for specific adjustments for a particular plow. The following is a generalization of the adjustments found on common fully-mounted plows.

1. Properly attach the plow to the tractor. Check all connections between the tractor and the plow to be sure that they have been properly made and secured.
2. The width of the cut of the front bottom must be the same as that of the other bottoms of the plow. On some tractors it may be necessary to adjust the wheel tread so that the front bottom will cut a proper width of furrow.
3. Pitch of the Plow: In plowing on a level surface the pitch of the plow is correct only when the plow is horizontal from the front to rear. The degree of pitch affects the penetration of the plow.
4. Tilt of the Plow: The tilt of the plow is controlled by the tractor link levelling the crank. If the tilt of the plow is correct, the frame of the plow will be horizontal from side to side when plowing. Maintaining proper tilt will make the plow run straight ahead since the depth of the cut of the front bottom will be the same as that of the rear. It also equalizes draft, reduces landside wear, prevents ridging, and results in a more desirable furrow wall.
5. Alignment of Plow Bottom: Bottoms must be aligned in both the vertical and horizontal planes.
 - Vertical Plane Alignment: The landside of the plow bottoms must be parallel to each other and must not toe-in or toe-out.
 - Horizontal Plane Alignment: All bottoms must be in the same horizontal plane when plowing. Horizontal alignment may be checked quickly by lowering the plow onto a level floor. All bottoms should then be in contact with the floor at the points of their shares.
6. Rolling Landside or Rear Wheel Alignment:
 - Vertical Clearance: Lower the plow onto a level floor and adjust the rolling landside or rear wheel until the heel of the rear landside is between 1/3 cm and 1.3 cm above the floor.
 - Side Clearance: With the plow in lowered position, lay a straight edge along the side of the rolling landside and the share point. Adjust the rolling landside until the rear end of the sliding landside is 1.0 cm to 2.0 cm from the straight edge.
7. Adjustment of Disc Coulters:
 - Setting Coulter to Land: To get a clean-cut furrow wall and longer wear from the plow landside, the coulter must be set between 1.0 cm and 2.0 cm from the landside of the plow.
 - Setting Coulter in Relation to the Share Point: Under normal plowing conditions set the centre (bearing) of the coulter so that it runs directly over the point of the share. Some plows do not have the provision for moving the coulter ahead or back.
 - Setting the Coulter for Depth: Because the coulter has a sharp cutting edge, it should be set as deep as possible. In general, a 2.5 to 5.0 cm clearance between the coulter blade and the point of the share is satisfactory.

SETTING THE PLOW IN THE FIELD

Please note: The following adjustments relate to a semi-mounted plow. Mounted or trail plows could differ somewhat. Refer to the operator's manual for your plow type.

Tractor wheel width is critical with mounted and semi-mounted plows. Front tire and rear tire widths should be approximately the same for plowing in the furrow. Check your operator's manual for rear wheel settings.

The tractor tire settings are important because it impacts how the plow pulls. This establishes the correct line of draft. The correct line of draft has been accomplished when the tractor's lower links have the same angle in the field operating position.

COULTER ADJUSTMENT

To set the coultter blade side adjustment hold the blade parallel to the landside and adjust by rotating the shank until the blade will run approximately 1.3 cms towards the land and parallel to the landside. It is important that all blades are adjusted to cut equally. Adjust the coultter, lock to allow equal swing each way.

To set the coultter depth adjustment move the shank up or down so that the bottom of the coultter is 5-7.5 cms above the level the point will be cutting.

Fore and aft adjustments of the coultter relative to the plow point is available for increased trash clearance. On the cushion spring coultters, spring pressure can be adjusted to increase the coultter down pressure.

Setting the working depth of the plow can be accomplished by:

1. Setting the stop on the 3-point hitch control for front furrow depth control. Refer to your owner's manual to accomplish this.
2. Rear plow depth adjustment is accomplished by the adjustment of the land wheel or hydraulic cylinder stop adjustment on the tail wheel. If you have a mounted or trail plow, the depth adjustment will vary slightly.

Once you have the depth set properly, you want to have the machine plowing level. Once the right hand tractor wheels are in the furrow (after you have struck out) you adjust the lower links of the 3-point hitch so that the plow beam is at right angles to the unplowed ground.

The front furrow should be cutting the same width as the remainder of the furrows. Front furrow width adjustment is accomplished by moving the plow relative to the furrow wall. This is done by adjusting the crossbar or turnbuckle depending on the manufacturer. Check your owner's manual.

DIGGING DEEPER FOR SENIOR MEMBERS

WORKING WITH 3 AND 4 FURROW PLOWS

Working independently or in small groups research the advantages and challenges with using 3 and 4 Furrow Plows. Be prepared to share your findings with the Club Members at the next meeting.

PREPARING THE LAND

Senior members can be responsible for setting up the headland scratches and short stakes for plowing areas for members to use during their practice of making an Open split. This responsibility can also be extended to the later times when members are practicing the other aspects of plowing.

SOIL HEALTH

Working independently or in small groups research what Soil Health is and be prepared to share their research at a club meeting and/or as part of the achievement program. OMAFRA has some excellent resources available to support this research. Visit <http://www.omafra.gov.on.ca/english/environment/bmp/soil-health.htm>.

ACTIVITY 6: DO YOU KNOW WHAT I MEAN BY ...?

DO

Time: 10 minutes

Materials/Resources:

- Each term that you reviewed in the Plowing Terms and Concepts topic discussion written on an individual slip of paper, folded in half to hide the word
- Bowl or basket to put the slips in

Instructions:

- Depending on the number of members in your club either have them work individually or in pairs.
- Have each individual/pair choose a slip from the bowl/basket
- Give the members 5 minutes to come up with their explanation of what the word or term means
- Circulate around the group and make sure that no one is stuck with their answer
- After 5 minutes ask for members to volunteer to go first to share their explanation
- Have the members take turns providing their explanation
- The member/members who go first get to choose the group/individual that goes next, and so on
- If the information shared needs some support or clarification you can either, a) provide the additional information yourself, or b) ask a senior member to provide the additional information if they are knowledgeable
- The activity is done when all of the terms are explained by the members

Additional Activity:

- If there are more terms than members you can have members/groups take two turns

REFLECT

Learning Outcomes:

- Members will have a better understanding of common terms and concepts related to plowing
- Members will practice their public speaking skills
- Members will learn teamwork skills as they prepare their responses

APPLY

Processing Prompts:

- Was this easy or hard?
- Was there a term or concept that you heard today that you did not know about before this activity?
- What was the easiest term or concept to remember?
Why?
- What was the hardest term or concept to remember?
Why?

WORKSHEET: DO YOU KNOW WHAT I MEAN BY...?

Write your explanations below and be prepared to share your answers with the group.

ACTIVITY 7: JUDGING OUR OPEN SPLITS

DO	<p>Time: 15 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– 4 examples of Open Splits from the group– Judging Worksheet <p>Instructions:</p> <ol style="list-style-type: none">1. Distribute Worksheet to members or get members to turn to page 10 of their Record Book2. Review the OPA Judges Score Card headings for “Split”3. Give the members time to complete the judging by assigning a score out of 10 to each of the 4 examples of Open Splits.4. Ask for 2-3 volunteers to share their responses.5. Ask for any additional responses from the group that either add to or differ from the scores already given. <p>Additional Activity: Allow Senior Members to prepare the headland scratches and short stakes for the splits.</p>
REFLECT	<p>Learning Outcomes: Members will apply the concepts learned related to judging and giving reasons for scores.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none">– Was this easy or hard?– How did you come up with your scores?– What will you keep in mind when you are plowing in the future?

WORKSHEET: JUDGING OPEN SPLITS

One round shall be plowed to form the open split. Furrow slices are turned out such that when the crown is completed all land under the crown is moved. The open split is judged from twenty points in two categories -

STRAIGHTNESS (10 POINTS)

- All furrow slices and cut line shall be straight.

CUT & UNIFORMITY (10 POINTS)

- All sod/stubble shall be cut throughout the length and width of open split so that no uncut area will remain under crown furrow slices
- Each furrow slice shall (individually) be uniform throughout the length of the open split
- Neatness shall be considered a factor of uniformity

Lot No.	Straightness (10)	Cut & Uniformity (10)

Meeting 3 – Getting Down to Business

SETTING OBJECTIVES

This meeting focuses on understanding how to prepare for plowing and care for plowing equipment.

Suggested Lesson Outcomes

- For members to learn how to maintain plowing equipment.
- Members should have the knowledge to prepare a field for plowing.
- Members can recognize how to make a crown and cast off.

REFERENCE MATERIAL

- Taking Care of Business – How to Maintain your Plowing Equipment
- Setting Up a Field for Plowing
- Modeling How to Make a Crown
- Modeling How to Cast Off

REFERENCES

Planning a Field Layout - <https://www.yesterdaystractors.com/cgi-bin/viewit.cgi?bd=using&th=37674>

Plowing 101 – Stephen Speller – PowerPoint Presentation

ACTIVITIES

- Activity 10 – Changing the Oil in Your Tractor
- Activity 11 – Practicing Crowns
- Activity 12 – Judging Crowns

SAMPLE MEETING AGENDA TOTAL LENGTH OF TIME: 1 HOUR 55 MINUTES

Welcome, Call to Order & Pledge		5 min
Roll call	Invite each member to share their name and their response to the At Home Activity that you asked them to do at the end of Meeting 2.	10 min
Topic Information Discussion	Taking Care of Business – How to maintain your plowing equipment	10 min
Activities Related to Topic	Activity 10 – Changing the Oil in Your Tractor	15 min
Topic Information Discussion	Setting up a field for plowing and squaring up a field for plowing	10 min
Topic Information Discussion	Model how to make a crown and illustrate using the points on the Ontario Plowmen’s Association Score Card.	15 min
Activities Related to Topic	Activity 11 – Practicing Crowns Provide time for members to practice making a crown.	30 min (depending on size of group)
Judging	Activity 12 - Judging Crowns (using the OPA Score Card)	15 min
Wrap Up, Adjournment & Social Time	Recap topics covered in this meeting and review the At Home Challenge	5 min
At Home Challenge	Members bring a jar of soil from their property to the next meeting	

MEETING 3 - REFERENCE MATERIAL

TAKING CARE OF BUSINESS – HOW TO MAINTAIN YOUR PLOWING EQUIPMENT

A little extra care in maintaining a plow in good working order can be time well spent. A properly cared for plow can save time and fuel in the field, reduce downtime for repairs and do a better plowing job. The following is a list of area to be checked:

REGULAR MAINTENANCE

- Lubricate according to instructions in your operator’s manual, e.g. bearings of the coulters and rolling landside, hub of the depth wheel, threat part and bearing on the adjusting handle of the depth wheel. Clean grease fittings to avoid forcing dirt into bearings. Bearings work under extreme pressure and frequent greasing reduces friction and wear as well as forces out old grease and dirt. Note: Some safety-tip standards should not be lubricated.
- Inflate tires to the recommended pressure. Under inflation damages tires and throws off adjustments.
- Clean, inspect, lubricate and tighten wheel and coulter bearings. Replace as needed.
- Remove any rust, paint or other protective coatings from moldboards, shares and landsides to assist scoring.
- Replace dull or broken shares and sharpen coulters if necessary. After replacing shares, always retighten bolts again after one or two rounds.
- Check all bolts for tightness, especially on bottoms and standards. Replace badly worn or broken parts.
- Check bottom alignment – shares pointing up or down, to left or right. Measure vertical distance from share point to frame on all bottoms; distance between top corners of moldboards and between moldboard tips; also measure the distance from share point to share point. Each of these measurements should be essentially equal for all bottoms. If any measurement is off more than 1.25 cms consult your plow manual for proper corrective action.
- Replace bent or cracked frogs, standards or beams.
- Hand-release each safety-trip standard to be sure it functions freely.

MAINTENANCE BEFORE STORAGE AT THE END OF THE SEASON

- Clean soil, trash and accumulation of grease from the plow and repaint spots which are scratched or worn.
- Protect bottoms and coulters from rust with heavy grease or plow-bottom with rust-

preventive paint.

- List any parts or repairs needed. Buy and install them prior to the next plowing season.
- Relieve pressure in hydraulic reset system.
- Store plow inside and remove weight from tires.
- Place boards under bottoms to prevent ground contact and rusting.
- Remove hydraulic cylinders or fully retract cylinders to protect cylinder rods from rust.

POWER REQUIREMENTS

It is important to match the power requirements of your plow to the available power of your tractor in order to make optimum use of time, fuel, and capital investment. Factors such as soil type, depth of plowing, width of furrow, and number of furrows may affect the power requirements of your plow.

The basic capacity of a tractor is that it will pull up to 70% of its own weight under optimum conditions. If you don't overload your tractor capacity, it will have a longer lifetime, better fuel efficiency and that extra performance will be there for you when you need it.

Talk About It!

How much does an oil change cost on your vehicle? You may already know or you can ask your family for the answer.

Does your family do its own oil changes or do you use the services of a garage?

Do you think that it would be more expensive to do an oil change on a passenger vehicle or a tractor? Provide reasons to support your answer.

If you live on or have access to a farm determine how many vehicles would require an oil change and then calculate how much it would cost to change the oil for the entire farming operation.

Be prepared to share your research at the next meeting.

SETTING UP A FIELD FOR PLOWING

USING STAKES

Stakes aligned properly provide the basis for good plowing and can help guide you for your opening split. Their purpose is to be a guide for straight plowing.

In competition, each land is numbered with 2 “land number” stakes which are aligned at either end of your land. Be sure that the numbers on these stakes are the same at each end. These stakes will line up with the centre of your crown. The size of the land to be plowed will vary depending on the class.

Offset the “land number stakes” with 2 plow stakes in line with the first 2 plow stakes approximately 8-12 metres past the headland.

A fourth stake may be placed in line with the first 2 stakes in the centre of your land.

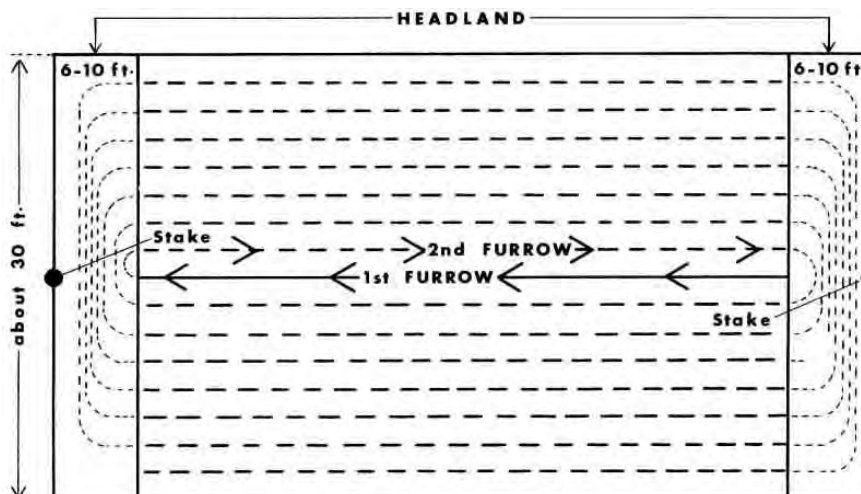
Remove stakes as you do your opening split.

Upon completion of your crown replace the “land number” stakes at each end to identify your land.

PLANNING FIELD LAYOUT

The best plowing pattern for any particular field must be consistent with good soil-conservation goals and avoid excessive travel on the ends. The pattern should also avoid extra turning and unnecessary point rows or dead furrows.

A typical plowing pattern used for a rectangular field is shown below.



Source: <https://www.yesterdaystractors.com/cgi-bin/viewit.cgi?bd=using&th=37674>

1. Mark scratch furrows across each headland parallel to field boundaries and far enough into the field for easy turning. Make the headland a multiple of the plow width and at least as wide as one-half the total length of the tractor and plow. Mark headlands using rear bottom only.
2. Lay out the first back furrow (B) and continue to plow on each side of it (C) until the land is plowed to the field boundary.
3. Start a new back furrow (D) and plow a new land (E) equal in width (L) to the first land. When the unplowed strip between lands equals the width of the plowed lands, plow out the strip (F) leaving a dead furrow (G) in the centre of the field. After this land is finished, set the plow shallow and turn some soil back into the dead furrow to help level the field.
4. Finish the field by plowing headlands.

There are different patterns used to plow a field depending on the shape and topography of the field, pattern used in previous years, etc.

HOW TO MAKE A CROWN



Source: Slide 21 – Plowing 101
Horse crown consists of six heavy rounds for both walking plows and sulky.



Source: Slide 22– Plowing 101
For Reversible Plows the crown consists of eight heavy furrows and is scored for straightness (10 points) and cut and uniformity (10 points) for a total of 20 points.



Source: Slide 23– Plowing 101

Uniform furrows of the same depth and width. Grass is being covered as well.

WHEN TO USE A THREE OR FOUR FURROW CROWN

A three furrow crown may work better in loose soil or stubble.

A four furrow crown may work better in heavier soil or sod.

Practice both types of crowns to see what works best for the conditions. You will have one less furrow in your crown when doing a three furrow crown.

1. Three Furrow Crown

- Front plow plows a very light scratch.
- Back plow plows the first heavy furrow about 10 cms deep and lays turned furrow about half-way on opening split. Knowing where to drive the tractor comes with practice.
- Coming back, plow two heavy furrows, front furrow should match the first heavy furrow and be layed up close so that there is no opening left between crown furrows.
- All three furrows should be level across the top.
- Five more rounds are then plowed at required depth and width so that all furrows are level and uniform and you will end up with eleven furrows on one side and twelve furrows on the other side.

2. Four Furrow Crown

- Plow two heavy furrows across the field, front furrow about 9-10 cms deep and back plow about 13 cms deep.
- Drive so that turned furrow covers about half of the opening split.

- Coming back, plow so that the front furrow lays up close and not opening is left between crown furrows.
- All furrows should be level and the same size.
- Five more rounds are then plowed so that there are twelve furrows on each side.

HOW TO EVALUATE YOUR CROWN

In competition conventional crowns are judged on straightness, closeness and conformity, burying grass and stubble, and soil available with a maximum of 10 points for each quality for a possible total of 40 points.

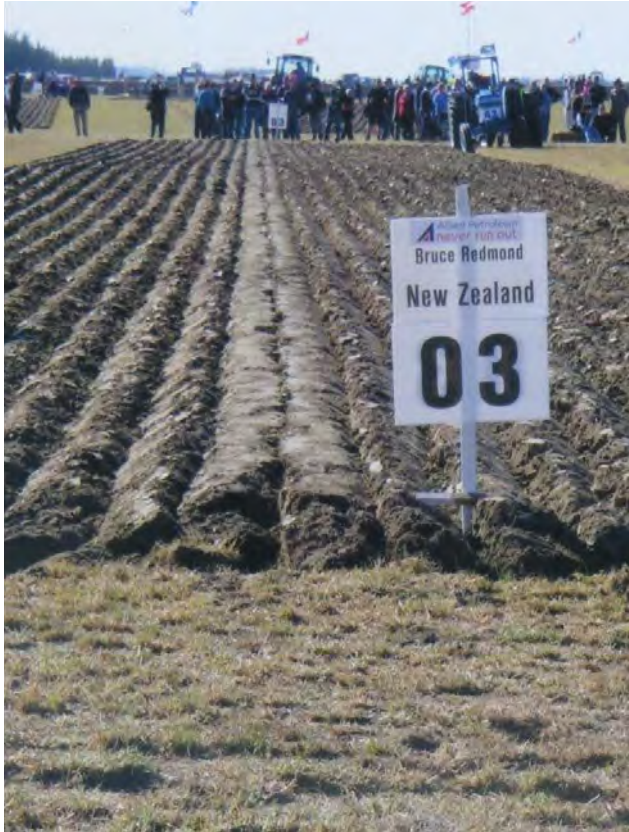


Source: Slide 24– Plowing 101

Closeness and Conformity – Front two furrows must meet and close so there is no open area between them. Conformity means that each furrow in the land looks the same side by side.

All furrows should appear to have the same depth and width, and blend in well with the other plowing.

You should be able to lay a plowing stake over a crown and all the top edges touch.



Source: Slide 25– Plowing 101

In this photo do the front two furrows conform to the other furrows? They appear a little wider and flatter than the next furrows.

Burying Grass and Stubble – No grass or stubble are visible in this picture

Soil Available – Proper depth and body to make enough soil available that if a set of harrows were taken across on a 30 degree angle, would create a level seed bed.



Source: Slide 26– Plowing 101

Closeness and Conformity – The first two furrows are closed in but are too high. Second furrow on each side are too low.

Soil Available – There is not as much soil either side of the first two furrows. Plowing is somewhat flat looking without enough soil to make a good seedbed.

GENERAL WORK

Competitive plowing is also judged for the General Work which includes Covering Grass, Closeness and Packing (no holes), Firmness, and Soil Available with a maximum of 10 points being awarded for each category for a total of 40 points.



Source: Slide 29– Plowing 101

General Work is judged by walking across the land.



Source: Slide 30– Plowing 101

Covering Grass and Stubble – “All grass, stubble and weeds must be completely buried.”



Source: Slide 31– Plowing 101

Closeness and Packing – “The furrows should be well packed and closed with no openings (holes) between furrows”



Source: Slide 34– Plowing 101

Firmness – “The furrows should be firm against one another so that they do not break down or collapse”

Sometimes it will surprise you how firm or soft plowing is until you walk across it!

Soil available – Proper depth and body to make enough soil available that if a set of harrows were taken across on a 30 degree angle, would create a level seed bed.



Source: Slide 35– Plowing 101

With reversible plowing the scoring is evaluated including the Connecting Furrow to a maximum of 10 points and the Butts to a maximum of 10 points.



Source: Slide 36– Plowing 101

Connecting Furrow – should be level with the balance of the plowing. There should be no dips or holes. All soil must be plowed. The Connecting Furrow should be visible the whole length of the land.



Source: Slide 37– Plowing 101

Butts – are scored for “Visibility, Uniform, No wheel marks”



Source: Slide 39– Plowing 101

Reversible is a real challenge! You have to be skilled at connecting furrows and butts. From butts to finish you must have 19 or 20 furrows.

DIGGING DEEPER FOR SENIOR MEMBERS

OIL CHANGE

Members work to determine the cost of the equipment you would need to perform an oil change on a tractor providing an itemized list with sources.

PLANNING A FIELD FOR PLOWING

Map a field on your farm or a local farm and explain how you would set it up for plowing.

ACTIVITY 10: CHANGING THE OIL IN YOUR TRACTOR

DO	<p>Time: 15 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Tractor– Wrench, correct size for your tractor– Oil filter wrench– Pan to catch the old oil– New oil– New oil filter <p>Instructions:</p> <ol style="list-style-type: none">1. Drain the Oil – use the wrench to remove the drain plug and drain the oil into the pan.2. Remove the Oil Filter – Use a special oil filter wrench to remove the filter and be careful to catch any oil that may leak out3. Replace the Oil Filter – Use a small amount of the new oil to apply a thin film to the gasket around the filter, spin the filter into the housing and tighten it to the manufacturer’s specifications (usually found on filter, but also found in the owner’s manual)4. Add Oil – Reinstall the drain plug but do not over tighten it. Add the oil recommended by your manufacturer. Never add more oil than is recommended. Check the oil level using a clean dip stick. <p>Additional Activity:</p> <ul style="list-style-type: none">– Members can also learn how to change the fuel filter.
REFLECT	<p>Learning Outcomes:</p> <p>Members have a working knowledge of how to change the oil in a tractor.</p>

APPLY

Processing Prompts:

- Why is it important to keep up-to-date with your oil changes?
- Was this the first time you changed the oil in a vehicle? If so what did you find most interesting? If not what other type of vehicle have you performed an oil change on? Who did you do it with? Was the process the same or a little different? If it was different, in what way?

ACTIVITY 12: JUDGING CROWNS

DO	<p>Time: 15 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Four examples of Crowns from the group– Judging Worksheet <p>Instructions:</p> <ol style="list-style-type: none">1. Distribute Worksheet to members or get members to turn to page 11 of their Record Book2. Ask members to record the faults they see in each example (open crowns, wheel marks, furrows not matching, no body to furrows)3. Review the OPA Judges Score Card headings for “Crowns”4. Direct members to the four examples of crowns from the group.5. Give the members time to complete the judging.6. Ask for 2-3 volunteers to share their responses.7. Ask for any additional responses from the group that either add to or differ from the points already given. <p>Additional Activity: Allow Senior Members to prepare the headland scratches and short stakes for the splits.</p>
REFLECT	<p>Learning Outcomes: Members will apply the concepts learned related to judging and giving reasons for placements.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none">– Was this easy or hard?– How did you come up with your reasons?– What will you keep in mind when you are plowing in the future?

WORKSHEET: JUDGING CROWNS

After completion of the open split, the next:

- 6 rounds, (one furrow plows)
- 4 rounds, (two furrow plows)
- 3 rounds, (three or more furrow plows)

constitute the crown. The complete crown is judged from forty point in four categories:

STRAIGHTNESS (10 POINTS)

- All furrow slices of crown shall be straight.

CLOSENESS & CONFORMITY (10 POINTS)

- All furrow slices shall fit tightly together with no openings (holes), particular attention paid to closeness of the first furrow slice on each side
- All furrow slices shall conform (match one another) as to height, width, shape, size and appearance
- Marking or distortion of furrow slice(s) caused by extensive paddle use shall adversely affect conformity score
- No tractor wheel mark
- Furrows shall start and end at scratch

BURYING GRASS & STUBBLE (10 POINTS)

- All grass, stubble and surface trash shall be completely covered

SOIL AVAILABILITY (10 POINTS)

- Shall be enough soil to produce seed bed with minimal secondary tillage
- Stipulated minimal depth shall be achieved by the sixth furrow
- Soil availability shall be affected by shallow furrows, open furrows, lack of conformity and or uniformity, and uncovered grass or stubble

Lot No.	Straightness (10)	Closeness & Conformity (10)	Burying Grass & Stubble (10)	Soil Availability (10)

Meeting 4 – To Plow or Not to Plow?

OBJECTIVES

Members will understand when it is suitable to plow and when other options may be better choices for the desired outcome.

Suggested Lesson Outcomes

- Members learn how to identify types of soil.
- Members should have strategies for determining when it is best to plow a field.
- Members can recognize the characteristics of a proper plow finish.

REFERENCE MATERIAL

- How to Identify Soil Composition and Conditions
- To Plow or Not to Plow? How Do You Know?
- What Type of Tillage Should I Use?
- Problems with Conventional Tillage
- How Mulch Tillage Works
- How to Cast Off
- How to Finish

REFERENCES

Estimating Soil Texture in the Field by the British Columbia Forestry Service - <https://www.for.gov.bc.ca/isb/forms/lib/fs238.pdf>

Ontario Ministry of Agriculture, Food and Rural Affairs – Best Management Practices: Field Crop Production, BMP02E

Ontario Ministry of Agriculture, Food and Rural Affairs – Best Management Practices: Mulch Tillage, AF171

Ontario Ministry of Agriculture, Food and Rural Affairs - Best Management Practices: No-Till for Soil Health, AF173

ACTIVITIES

- Activity 13 - What's Your Soil?
- Activity 14 – Types of Tillage
- Activity 15 - Practicing Casting Off and Finishing
- Activity 16 – Judging Finishes

SAMPLE MEETING AGENDA TOTAL LENGTH OF TIME: 2 HOURS 20 MINUTES

Welcome, Call to Order & Pledge		5 min
Roll call	Invite each member to share their soil sample collected as part of the At Home Activity that you asked them to do at the end of Meeting 3. Ask them to provide their best guess as to what kind of soil it is.	10 min
Topic Information Discussion	How to Identify Soil Composition and Conditions	10 min
Activities Related to Topic	Activity 13 – What's Your Soil?	15 min
Topic Information Discussion	To Plow or Not To Plow? Conventional Tillage and Mulch Tillage	15 min
Activities Related to Topic	Activity 14 – Types of Tillage Equipment	20 min
Topic Information Discussion	Review Open Split, Crowns, General Work, Cast Off and Finish Model Cast Off and Finish and illustrate using the points on the Ontario Plowmen's Association Score Card.	15 min
Activities Related to Topic	Activity 15 – Practicing Casting Off and Finishing Provide time for members to practice making a casting off and finishes	30 min (depending on size of group)
Judging	Activity 16 - Judging Finishes and General Appearance (using the OPA Score Card)	15 min
Wrap Up, Adjournment & Social Time	Recap topics covered in this meeting and review the At Home Challenge	5 min
At Home Challenge	Choose the At Home Activity found in the meeting or come up with one of your own.	

Meeting 4 - Reference Material

HOW TO IDENTIFY SOIL COMPOSITION AND CONDITIONS

Most soils are a mixture of sand, silt and clay, so the graininess, slipperiness or stickiness will vary depending upon how much of each particle size is present. As the amount of clay increases, soil particles bind together better, form stronger casts and longer, stronger worms or ribbons. As sand and silt increase, the soil binding strength decreases, and only weak to moderately strong casts and worms can be formed. The various classes of soil texture (defined in Figure 1) are named by a combination of the dominant particle size, the term loam meaning a relatively even mix of the three.

Determining soil texture is subjective and can only be done consistently with training and experience. The field tests, outlined below, are used in sequence with the accompanying flow chart to assist in the field determination of soil texture.

1. **Graininess Test** – Rub the soil between your fingers. If sand is present, it will feel “grainy”. Determine whether sand comprises more than 50% of the sample.



The Graininess Test

2. **Moist Cast Test** – Compress some moist soil by clenching it in your hand. If the soil holds together (i.e. forms a “cast”), then test the durability of the cast by tossing it from hand to hand. The more durable it is, the more clay is present.



The Moist Cast Test

3. **Stickiness Test** – Wet the soil thoroughly and compress between thumb and forefinger. Degree of stickiness is determined by noting how strongly the soil adheres to the thumb and forefinger upon the release of pressure, and how much it stretches. Stickiness increases with clay content.



The Stickiness Test

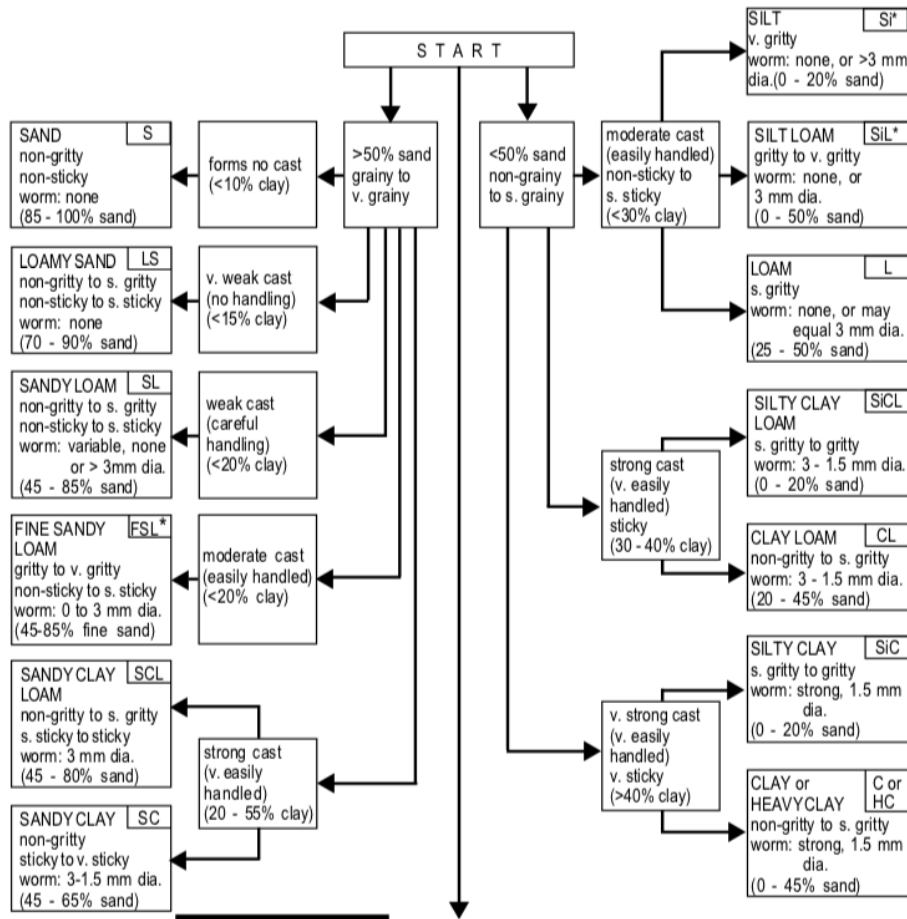
4. **Worm Test** – Roll some moist soil between the palms of your hands to form the longest, thinnest worm possible. The more clay there is in the soil, the longer, thinner and more durable the worm will be.



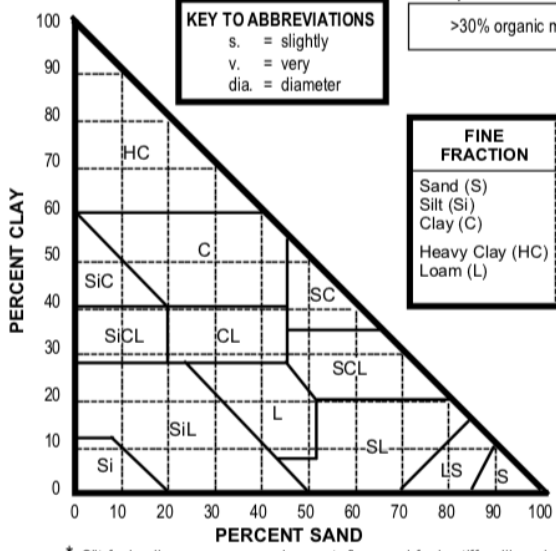
The Worm Test

*Image Credit: Ontario Ministry of Agriculture, Food & Rural Affairs – Best Management Practices: Soil Management (1997) © Queen's Printer for Ontario, ** Reproduced by permission*

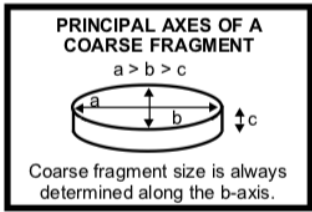
TASTE TEST STICKINESS TEST WORM TEST	MOIST CAST TEST	GRAININESS TEST (ORGANIC MATTER TEST)	MOIST CAST, STICKINESS TESTS	TASTE TEST WORM TEST
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KEY TO ABBREVIATIONS
 s. = slightly
 v. = very
 dia. = diameter



FINE FRACTION	PARTICLE DIAMETER	COARSE FRAGMENTS	PARTICLE DIAMETER
Sand (S)	2 - .05 mm	Stones	>250 mm
Silt (Si)	.05 - .002 mm	Cobbles	250 - 75 mm
Clay (C)	<.002 mm	Gravels	75 - 2 mm
Heavy Clay (HC) Loam (L)	>60% clay Mix of sand, silt and clay		



* Silt feels slippery or soapy when wet; fine sand feels stiffer, like grinding compound or fine sandpaper.

Source: Estimating Soil Texture in the Field by the British Columbia Forest Service FS238 HRE 01/01
<https://www.for.gov.bc.ca/isb/forms/lib/fs238.pdf>

TO PLOW OR NOT TO PLOW? HOW DO YOU KNOW?

The purpose of plowing is to break up plant material left after the harvest, work nutrients into the soil and break up clods of soil to prepare the field for planting. Plowing should be done a few weeks prior to planting, although you can plow anytime between harvesting old crops and planting new crops. Consideration must also be given to the precipitation, wind and other climatic conditions which can vary from year to year. Ideally, conditions will allow for the optimum addition of nutrients to the soil without losing topsoil to wind or compaction.

Choose a calm day without wind because you do not want the topsoil to blow away. Wind erosion results in loss of nutrients and organic matter because they are in the lightest soil material.

Precipitation will also determine when to plow because heavy rains in fall or spring create conditions where it is impossible to plow. Soil should be moist but not saturated because wet soil compacts when plowing. Ideally, plowing between rains on days when the soil surface is dry to at least a few inches deep will improve your result.

Tillage involves plowing, harrowing and cultivating. It is the mechanical modification of soil structure.

Over the last 70 years, cropland agriculture has undergone a period of unprecedented agronomic improvements. While yield gains have been remarkable, recently the long-term effects on soil health, structure and fertility have come into focus.

A decline in cropland soil health and surface water quality in regions of intensive agriculture are evidence that conventional cropping and tillage systems are not sustainable.

Conservation cropping and tillage systems have been developed and refined over the last 40 years to help keep precious topsoil in place and promote soil health. These systems adjust management, inputs and hardware to grow crops while conserving soil and water – an achievable goal.

THE PURPOSE OF TILLAGE

1. To prepare a seedbed and an environment suitable for plant root growth.
 - Provides good seed-soil contact - Fall plowing first helps to loosen soils especially clay. Then the frost action breaks clods into smaller aggregates. When there is a close contact between the seed and the aggregate, it permits moisture to move into the seed and start germination. A finer tillage (smaller soil aggregates) is required for smaller seeds, e.g. grass seeds, and a coarser tillage is suitable for the

- larger seeds, e.g. beans and corn.
- Soil aeration
- Moisture management - Tillage helps to loosen the soil surface for good moisture infiltration. This reduces surface evaporation during the growing season and provides drainage in heavy rainfall areas, as well as a uniform surface to avoid ponding. Frequent and deep stirring of soil may in fact speed up water losses by exposing fresh amounts of moist soil.
- Prepare surface for other operations – Eliminates tracks or ruts and crop residues from previous harvest.

One of the main purposes of tillage is to prepare the seedbed, that is, to make a comfortable place for seeds to germinate and grow. What do we mean by “comfortable”?

- **A Fine, Shallow Seedbed**
 - o Fine particles of soil (like clay) will hold moisture. The moisture is needed to help seeds germinate. The smaller the seeds (small alfalfa seeds versus larger soybean seeds), the finer and more shallow the seedbed should be.
 - o Tillage will break large aggregates into smaller ones. This gives more “pore space” or room, for the roots to grow quickly and easily between aggregates.
- **Hard Packed Soil**
 - o Untilled soil will tend to settle into a blocky soil structure after the spring thaw. Without some tillage action beforehand, most planters cannot loosen the soil enough to get fine aggregates around the seed. This may result in delayed

2. To Manage Plant Residues

- Complete incorporation of organic debris from previous crops increases organic matter decomposition and thus the release of nutrients to the plants. But frequent tillage will soon deplete organic matter which will affect the soil structure and water-holding capacity of the soil. Addition of organic matter to a soil is a feature of good soil management.
- Helps to control certain overwintering insects by burying residue e.g. European Cornborer.
- Helps to facilitate precision seeding and inter-row cultivation of certain crops.

3. To Control Weeds

- Buries weed seeds.
- Checks the growth of perennial weeds.

4. To Provide Maximum Mixing and Incorporation of Fertilizers, Pesticides or Soil Amendments

5. To Improve the Physical Conditions (decrease bulk, density, increase porosity).

6. To Conserve Moisture Conservation

FACTORS WHICH DETERMINE TILLAGE PRACTICES

- Texture of soil
- Topography
- Previous treatment of soil
- Growth habits of the crops
- Type of tillage equipment available
- Soil moisture conditions
- Time allotments
- Weather conditions

TYPES OF TILLAGE

1. **Primary Tillage** – moldboard plow, chisel plow, subsoilers, offset discs, rotary tillers

The moldboard plow is the most common method of primary tillage. Chisel plows are becoming more widely used because they leave more residue on the soil surface. This will reduce soil loss due to erosion. Both of these plows should not be used deeper than six inches.

Primary Tillage is used to initially loosen the soil and terminate existing growth in preparation for a succeeding crop. Primary tillage is the most intensive operation, and unless the field has been subsoiled, the deepest tillage treatment. Its main purposes are to loosen the soil, incorporate residues, and rearrange aggregates.

2. **Secondary Tillage** – disc, cultivator, harrow

The main purpose of secondary tillage is to work the soil just enough to make a fine, smooth seedbed. This tillage should be no more than 3 inches deep.

Its main purpose is to break large fragments (clods) into aggregates, fine enough to insure adequate germination and root growth. To produce a fine, smooth seedbed. Other objectives include soil levelling to facilitate precision planting and improve surface drainage, herbicide incorporation, weed control and moisture conservation. Secondary tillage involves implements such as disc-harrows, field cultivators, smoothing harrows and compacting implements.

With conventional tillage, primary tillage (plowing) is generally done in the fall. This is followed in the spring with two or three secondary tillage operations (discing, cultivating, harrowing).

MINIMUM TILLAGE AND NO-TILL

Because of soil erosion concerns, many farmers have become interested in minimum tillage and

no-till practices. Minimum tillage is the reduction of the number of tillage operations done. For example, one pass of the cultivator in the spring rather than two or three. No-till, as you may have guessed, is when the crop is planted with no tillage being done at all.

Both of these practices leave residue (crop cover) on the soil and keep soil particles larger enough that they are not eroded. Soil quality, density, aggregate stability and drainage improve with time. The table below shows that reduced tillage works better on some soils than others.

Types of No-Till

There are several types of no-till.

- **Zone-Till** – Planters and drills are set up with one or more coulters per see row and sometimes row cleaners to prepare narrow strips of soil that optimize seed-to-soil contact.
- **Strip-Till** – A narrow strip is tilled with one of a variety of implements. The tillage is usually preformed in the fall but may also be done in the spring. Sometimes the strips are “refreshed” with another pass in the spring. The process encourages the loosening and decomposition of residue over winter and speeds up drying in the spring.
- **Slot Planting** – A slot is opened in untilled soil and a seed is inserted. Several combinations of seed-firming devices and press wheels are used to close the slot, helping to achieve soil-seed contact. This is the purest form of no-till, especially suited for soybeans, wheat and other grains. Slot planting doesn’t work well in heavy residue and moist, fine-textured soils.
- **Vertical Tillage** – Many growers successfully no-till corn but other find corn performance is improved if cereal residue receives some tillage (minimum or vertical till) prior to planting.

Source: Best Management Practices: No-Till for Soil Health, Ontario Ministry of Agriculture, Food and Rural Affairs, AF173

Effect of Tillage Treatment on Grain Corn Yield (bu./ac.)

Tillage	Soil Texture	
	Sandy Loam	Clay Loam
No-Till/Zero tillage	116	102
Fall moldboard plow	132	124
Fall plow/spring disc/harrow	124	128

Source: T. Daynard, Crop Sci., University of Guelph, 1986.

WHAT TYPE OF TILLAGE SHOULD I USE?

Every farm is different and therefore requires different tillage practices. There are probably other members in your club with the same crop who used different tillage equipment than you used. When should we use primary tillage? Spring? Fall? Maybe we don't need to do primary tillage. When determining the type and amount of tillage to be used for a specific field in a particular season, consideration must be given to soil texture, crop to be grown, drainage, topography and previous crops.

Soil texture exerts a major influence on selection of tillage practices.

TILLAGE FOR SOIL TEXTURE

Coarse-textured soils	sands, loamy sands	little or no requirement for tillage
Tillage is only necessary to control weeds and facilitate precision planting and you can usually get by with spring primary tillage to minimize off-season erosion. Surface residues left over the winter will help prevent surface evaporation, wind erosion and water erosion. There is no yield gains from fall tillage.		
On these soils, spring secondary tillage may be the only tillage necessary.		
Medium-textured soils	loams, silt loams	somewhat more loosening and shattering to produce an acceptable seedbed
Erosion can be a serious problem on silt soils, if the surface is left unprotected in a finely aggregated state.		
Fine-textured soils	clay loams and clay	proper loosening and a major reduction in mean aggregate size before spring-sown crops can be planted
These soils must have fall primary tillage to derive maximum benefit from the action of over winter and early spring frosts. Frost action is necessary and very effective at breaking up this soil into smaller pieces.		
Secondary tillage in the spring will level and firm the soil to finish the job of producing a fine firm seedbed.		

PREVIOUS CROP GROWN

Many crops are beneficial to the soil because they add organic matter. The increased organic matter improves soil structure. Crops such as grasses, legumes, forages and grain may improve soil structure. Tillage practices need not be so intensive following these crops.

CROP TO BE GROWN

How fine and shallow you work the seedbed depends on the seed size of the crop to be grown. Small seeds such as alfalfa need a finer seedbed and therefore require more tillage.

For example, if you were going to grow clover in a field that had corn for a previous crop with clay loam soil texture you would plow it in the fall to derive the maximum benefit of the action over the winter and the early spring frosts.

For example, if you were going to grow corn in a field that had corn for a previous crop with sandy loam soil texture you would plow it in the spring to avoid erosion.

ENERGY REQUIREMENTS FOR TILLAGE

Energy input requirements for tillage operations vary depending on -

1. Soil type
2. Crop sequence
3. Soil moisture content
4. Design of tillage implements
5. Land topography
6. Depth of tillage
7. Speed of tillage

Consideration must be given to each of these above factors when selecting tillage operations. Once tillage operations have been selected energy input may be reduced by –

1. Avoid excessive speed
2. Minimize unnecessary drive-wheel slippage
3. Combine tillage operations where possible
4. Reduce tillage depth
5. Perform tillage operations under optimal soil conditions when possible

WATER HAZARD

Soil should not be tilled when wet. Heavy equipment on wet soil compacts the soil and the subsoil. This results in impaired drainage, increased erosion during heavy rains and reduced root growth. Crop yields will be reduced.

Check It Out At Home!

What kind of tillage does your family use on your farm? If you don't live on a farm reach out to a local farmer and ask them what kinds of tillage they use.

Be prepared to share your research at the next meeting.

PROBLEMS WITH CONVENTIONAL TILLAGE

Conventional tillage is any system that attempts to incorporate most of the residue (crop remains), leaving less than 30% of the soil surface covered with residue after planting. Usually, the plow is used along with a variety of other tillage tools in a conventional system.

Conventional tillage and other production practices that boosted productivity have compromised soil quality in several ways.

- While soil productivity improved for a time, it levelled out as inherent fertility and tilth (physical condition) were depleted.
- Soils were worked to bury trash, incorporate inputs and create fine seedbeds, which worked reasonably well until the reservoir of organic matter from past forage crops and pasture was used up.
- Lower soil organic matter levels translated into poorer soil structure, increased compaction and surface crusting, and reduced water-holding capacity.
- Lower quality soil conditions led to increased rates of wind, water and tillage erosion.
- Soil materials and the inputs (fertilizer, pesticides) they carried contributed to the pollution of adjacent surface waters.

OTHER ISSUES INCLUDE

- **Tillage Erosion** – When gravity pulls the soil downhill when it is disturbed.
- **Structural Degradation** - In conventional tillage systems, with minimal inputs of organic amendments, every pass breaks clods, exposes soil organic matter to decomposition by soil microbes, and weakens structural integrity and resilience.
- **Sedimentation and Runoff** - Detached soils can be deposited in depressional or level slope conditions downslope. Where concentrated flow persists, eroded soil (sediments) will be carried off-site to surface water bodies such as rivers and lakes.
- **Smearing and Compaction** - The weight and shearing action of conventional tillage implements on moist to wet soil can cause smearing of soil at the depth of tillage.
- **Soil Loss** – Soil plowed in the fall, left with little or no residue, loses more soil to erosion than soil managed with any other type of tillage system.
- **Carbon Loss** – Years of conventional tillage and no additions of organic amendments will deplete organic carbon levels.
- **Wind Erosion** - Excessively tilled sandy soils are the most prone to wind erosion.
- **Buried Trash** - Moldboard plows can bury a lot of corn residue. Deep plowing can bury it so completely that the residue can form a distinct layer in the soil below the seedbed.

HOW MULCH TILLAGE WORKS

In mulch tillage systems, more than 30% of the soil surface is left covered with residue after planting. Chisel plows, offset discs or modified moldboard plows are the common implements. Other terms that you may hear to describe this system are reduced tillage, minimum till or conservation tillage.

Mulch tillage systems can work under field conditions that do not work well for no-till. Mulch tillage is better suited to heavier soils, high crop residues, cover crops, plow downs, and additions of organic amendments such as manure and compost. It can also be used as a way of transitioning to no-till.

Mulch tillage can be achieved with many different tillage tools that leave varying amounts of residue.

METHODS OF MULCH TILLAGE

- **Chisel Plows** - Chisel points are straight and move through the soil doing very little mixing. They can be used to open up shallow soil compaction.
- **Discs** - Discs are concave, circular steel disks arranged in rows, usually on an angle, that cut and pitch the soil in a way somewhat similar to a moldboard plow. Discs are used for both primary and secondary tillage. Residue is mixed into the soil about three-quarters of the depth of tillage.
- **Rotary Till Implements** - A rotary till implement (e.g., Aerway) is a primary/secondary mulch tillage implement for lighter soils.

BENEFITS OF MULCH TILLAGE

Mulch tillage systems are sustainable: they can produce similar yields using fewer inputs than conventional systems, with minimal environmental impact.

- Less disturbance
- Residue cover
- Comparable yields
- Increased flexibility
- Reduced runoff
- Carbon management
- Diverse pest control methods

CHALLENGES WITH MULCH TILLAGE

- Adjust planting and application equipment to handle higher residue.
- Move residue off the planting row if residue cover is high. This will improve seedbed moisture and temperature conditions for germinating seeds.

- Rotate crops to reduce pest pressures as some residue is left at or near the soil surface.
- Manage weeds more carefully. Less cultivation means more scouting and fewer tools.
- Use starter fertilizer. Mulch-tilled soils can be cooler than and not as mixed as conventionally tilled soils.
- Monitor soils for compaction and smearing. Discs can smear soils if moisture conditions are not ideal for tillage.
- Monitor effectiveness of equipment modifications and cultural practices.

With excerpts from the Mulch Tillage publication available at www.omafra.gov.on.ca

Source - <http://www.omafra.gov.on.ca/english/environment/bmp/AF171.pdf>

ADVANTAGES AND DISADVANTAGES OF TILLAGE SYSTEMS

	Advantages	Disadvantages
Conventional Tillage	<ul style="list-style-type: none"> – Familiar to most farmers and machinery is widely available. – Incorporates manure without specialized equipment. – Soil warms faster in the spring than with less tillage. – Allows maximum frost action on soil. This breaks the soil into smaller clumps. – Low levels of water evaporation. This allows earlier planting and is a plus for poorly-drained soils. 	<ul style="list-style-type: none"> – More equipment is needed than in reduced tillage systems. – Low residue levels make soil vulnerable to crusting and erosion by wind and water. – Tillage stimulates weed growth and reduces levels of organic matter. – Working wet soil may cause compaction and the development of plow pans. – During the growing season, high evaporation resulting from lack of residue can reduce crop yields.
Mulch Tillage	<ul style="list-style-type: none"> – Most of the same advantages as conventional tillage. – Residue left on soil surface reduces erosion and water runoff. – Labour inputs are lower than in conventional tillage. – Fewer trips over the field reduce costs. – Management skill levels required similar to conventional tillage. 	<ul style="list-style-type: none"> – Tillage stimulates weed growth. – High residue levels can slow soil warm-up in the spring. – Primary tillage will not be effective under wet soil conditions. – High residue levels require attachments on the planter.

No-Till/Ridge Till	<ul style="list-style-type: none"> - Lower input and capital expenses. - Labour inputs per acre are greatly reduced. - More organic matter is located near the surface, which improves soil structure. - High levels of residue drastically reduce soil erosion. - Increased biological activity in soil, which improves structure and increases the speed of pesticide breakdown. 	<ul style="list-style-type: none"> - High residue levels can slow soil warm-up. - Success depends on the characteristics of the soil. - Fewer options are available to work in manure. - Above-average management skills are required.
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Source: Ontario Ministry of Agriculture, Food and Rural Affairs – Best Management Practices: Field Crop Production, BMP02E

CASTING OFF

Casting off refers to the piece of land that a contestant finishes between his crown and the next contestant's crown.

HOW TO CAST OFF:

- Measure land, it must be the same width throughout and equal to an odd number of furrows.
- Corrections in width are made on the first time across on the cast off side of the land. These corrections must be done without any damage being done to the neighbour's plowing.
- While plowing the cast off, it is important to maintain the correct width.
- Plow until width is equal to seven furrows.

GENERAL APPEARANCE



Source: Slide 40– Plowing 101

The General Appearance includes all of the furrows you have plowed. The classifications include Straightness, Conformity, Distinctness of Furrow, Uniformity and Shape of Furrow, Shape of Land, Ins and Outs – 10 points each for a total of 60 points.



Source: Slide 41– Plowing 101

Conformity – Same depth and width of furrow. Furrows should appear to be the same all across the land. No paring.



Source: Slide 42– Plowing 101

Distinctness of furrow – Furrows will appear to be well defined and distinct from each other. 10 points



Source: Slide 42– Plowing 101

Uniformity, Shape of Furrow – Furrows should be the same shape, depth and width the length of the furrow. 10 points



Source: Slide 43– Plowing 101

Shape of Land – The proper relationship of crown to body of land to finish



Source: Slide 45– Plowing 101

The General Appearance includes all of the furrows you have plowed. The classifications include Straightness, Conformity, Distinctness of Furrow, Uniformity and Shape of Furrow, Shape of Land, Ins and Outs – 10 points each for a total of 60 points.



Source: Slide 44– Plowing 101

Shape of Land – level crown with the balance of the land.



Source: Slide 46– Plowing 101

Ins and Outs - All soil inside the scratch furrows should be turned with a minimum amount of headland being disturbed by the plow. The plow should be to plow depth as quickly as possible. All furrows must start and finish at the headland scratch. Different coulter and moldboard settings can be used in order to produce uniformity in crown and finish.



Source: Slide 47– Plowing 101

Ins and Outs - There are 10 points for Ins and Outs. Both ends of field are looked at for scoring.

HOW TO FINISH



Source: Slide 48– Plowing 101

- Shallow out about 2.5 cm off cast off side and 1.3 cm on crown side on next round.
- With land wheel in furrow on crown side, back coulter down alongside shear, plow back furrow 6-7.5 cm deep, leaving about 30 cm of green or unplowed land. The front plow should be as deep as possible in order to fill up wheel track.
- Last time across field plow all green with front plow at a depth which makes the furrow read in with the rest of the land or uniform with the rest of the land.
- Back furrow or sole furrow should be plowed so that it is about 2/3 the size of the last green furrow leaving a clean straight edge in sole furrow.



Source: Slide 49– Plowing 101

Finish - Includes the last 12 furrows (6 furrows on the throw out or cast off) side of the finish and 5 furrows and the sole furrow on the crown side. There is a misconception that it is only the last round of the plow. Finish is evaluated based on Straightness, Grass and Neatness, Shallowness and Narrowness and Soil Available – 10 points each for a total of 40 points.

- Back furrow or sole furrow should be plowed so that it is about 2/3 the size of the last green furrow leaving a clean straight edge in sole furrow.



Source: Slide 50– Plowing 101

Straightness – Not only must the furrows be straight, they must be parallel. Note that the tire track crosses over one complete furrow instead of staying true all the way across the field. This lowers the score for straightness.



Source: Slide 51– Plowing 101

Grass and Neatness – Finish should be free from loose soil, weeds, etc.

Shallowness and Narrowness – Depth should not exceed the average depth of plowing in the field. The final or sole furrow should be at the same height as other furrows.

Soil Available – Is there enough soil available to fill in the finish? Is the tire track up or looks like another finish?



Source: Slide 53– Plowing 101

Good Finish Example – Straight, no grass or soil in bottom, not too deep or wide, lots of soil to fill in the finish, sole furrow up as high as other furrows in the finish and no step at the base of the finish.



Source: Slide 54– Plowing 101

These were tough conditions but.... sub soil was plowed up, tire track not parallel and deep.

Sole furrow uneven and too small, front furrow too deep and wide, looking over last 12 furrows they do not match up. All of these factors make for a wide finish with not enough soil to fill in.



Source: Slide 58– Plowing 101

Reversible Finish – It is evaluated on Straightness, Neatness and Weed Control, Final Furrow Level with Crown, No Unplowed or Re-plowed Soil at 10 points each for a total of 40 points.



Source: Slide 59– Plowing 101

Reversible Finish has the Finish right beside the Crown. The Open Furrow is under the first Crown furrow.



Source: Slide 60– Plowing 101
Back coulters should cut the last of the unplowed soil but not cut the Crown furrow.



Source: Slide 61– Plowing 101
Reversible Finish includes the final furrow level with Crown. Nineteen or twenty furrows must be in place from Connecting Furrow to Finish.

DIGGING DEEPER FOR SENIOR MEMBERS

THREE FURROW VERSUS FOUR FURROW FINISHES

Research the benefits and reasons for using the various different finishes. Present your findings back to the club members at the next meeting.

HYDRAULIC SETTINGS USED FOR PLOWING

Learn more about what hydraulic settings are used in plowing. Dig into when they are used, what effects the settings and share your research with the club members or during the achievement program.

TILLAGE PRACTICES

Make a display of different tillage practices. Show the differences between conventional moldboard plowing, minimum till and no-till. Show the equipment used, number of passes required in a field, residue cover, etc. Prepare a presentation. This could be a group project.

SOIL TYPES

Prepare a display of different soil types. Explain their makeup and how the type of soil affects the crops that are planted, tillage practices a farmer would use and drainage installations that might be needed.

YIELD COMPARISON

Compare the yields of the same crop cultivated with two different tillage practices. The crops should be grown in the same type of soil and under the same conditions. Assistance could be sought from a local crops inputs supplier for help setting up this side-by-side demonstration. This could be a group project.

ACTIVITY 13: WHAT'S YOUR SOIL?

<p>DO</p>	<p>Time: 15 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Jars of soil– A drop sheet, plastic table cloth or tarp to work on– Spray bottle with water in it to dampen the soil <p>Instructions:</p> <p>Invite members to open their jars of soil and try each of these tests.</p> <ol style="list-style-type: none">1. Graininess Test – Rub the soil between your fingers. If sand is present, it will feel “grainy”. Determine whether sand comprises more than 50% of the sample.2. Moist Cast Test – Compress some moist soil by clenching it in your hand. If the soil holds together (i.e. forms a “cast”), then test the durability of the cast by tossing it from hand to hand. The more durable it is, the more clay is present.3. Stickiness Test – Wet the soil thoroughly and compress between thumb and forefinger. Degree of stickiness is determined by noting how strongly the soil adheres to the thumb and forefinger upon the release of pressure, and how much it stretches. Stickiness increases with clay content.4. Worm Test – Roll some moist soil between the palms of your hands to form the longest, thinnest worm possible. The more clay there is in the soil, the longer, thinner and more durable the worm will be.5. Use the flow chart on the handout to identify what kind of soil you have at home. <p>Additional Activity:</p> <p>Compare your soil with another member and determine whether your soils are the same or different from each other and be prepared to share your observations with the group.</p>
<p>REFLECT</p>	<p>Learning Outcomes:</p> <p>Members will be able to identify the type of soil they have at their home. Members will also be aware of the different qualities of the various types of soils.</p>

APPLY

Processing Prompts:

- Did you have the same soil as the other members in your club? If so, what kind is it? If not, what were the different kinds?
- How can knowing what type of soil you have at home make a difference in the choices you make?

WORKSHEET: WHAT'S YOUR SOIL?

1. **Graininess Test** – Rub the soil between your fingers. If sand is present, it will feel “grainy”. Determine whether sand comprises more than 50% of the sample.

2. **Moist Cast Test** – Compress some moist soil by clenching it in your hand. If the soil holds together (i.e. forms a “cast”), then test the durability of the cast by tossing it from hand to hand. The more durable it is, the more clay is present.

3. **Stickiness Test** – Wet the soil thoroughly and compress between thumb and forefinger. Degree of stickiness is determined by noting how strongly the soil adheres to the thumb and forefinger upon the release of pressure, and how much it stretches. Stickiness increases with clay content.

4. **Worm Test** – Roll some moist soil between the palms of your hands to form the longest, thinnest worm possible. The more clay there is in the soil, the longer, thinner and more durable the worm will be.

Use the flow chart on the handout to identify what kind of soil you have at home.

ACTIVITY 14: TYPES OF TILLAGE

DO	<p>Time: 20 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Laptop or television monitor connected to a laptop with access to the internet <p>Instructions:</p> <ul style="list-style-type: none">– View the Spring Seed Bed Tillage video (14:38) - https://youtu.be/DEC8ofL0PtY– Discuss the different kinds of tillage equipment shown.– Possible questions –<ul style="list-style-type: none">o What kind of tillage equipment do you use on your farm?o What kinds of equipment can you recall seeing in your community?o How can knowing what type of soil you are working with make a difference in the choice of tillage equipment you make? <p>Additional Activity: Ask a local farmer to join your group and share the types of tillage equipment they use and their reasons for using it.</p>
REFLECT	<p>Learning Outcomes: Members will be able to identify the different types of tillage equipment used and the purpose of each.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none">– Was there a type of tillage equipment that you learned about today that you did not know about before watching this video?

ACTIVITY 15: JUDGING FINISHES & GENERAL APPEARANCE

DO	<p>Time: 15 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Four examples of Finishes from the group– Judging Worksheet <p>Instructions:</p> <ol style="list-style-type: none">1. Distribute Worksheet to members or get members to turn to page 14 of their Record Book2. Review the OPA Judges Score Card headings for “Finish”3. Direct members to the four examples of crowns from the group.4. Give the members time to complete the judging.5. Ask for 2-3 volunteers to share their responses.6. Ask for any additional responses from the group that either add to or differ from the points already given. <p>Additional Activity: Allow Senior Members to prepare the headland scratches and short stakes for the finishes.</p>
REFLECT	<p>Learning Outcomes: Members will apply the concepts learned related to judging and giving reasons for placements.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none">– Was this easy or hard?– How did you come up with your reasons?– What will you keep in mind when you are plowing in the future?

WORKSHEET: JUDGING FINISHES & GENERAL APPEARANCE

FINISH

The finish consists of the last 12 furrows (i.e. 6 furrows of the cast-off side and 5 furrows plus the sole furrow on the crown side. The finish is judged from forty points in four categories:

Straightness (10 points)

- All furrows shall be straight.

Grass & Neatness (10 points)

- All grass, stubble and surface trash shall be completely covered
- Shall be no loose soil or trash in bottom of sole furrow
- Only one tire mark shall be allowed. Shall have neat appearance.

Shallowness & Narrowness (10 points)

- No step in tractor classes
- 4" step in horse classes
- Stipulated minimal depth shall be maintained until the last two rounds
- The final pass depth shall conform to average depth to complete land
- The allowed tire track shall carry on top of the furrow slice

Soil Availability & Conformity (10 points)

- Shall be enough soil to produce seed bed with minimal secondary tillage
- Sole furrow slice shall be $\frac{3}{4}$ to $\frac{7}{8}$ the height of previous furrows
- The allowed tire track shall carry on top of the furrow slice
- Soil availability shall be affected by shallow furrows, deep tractor track, open furrows, lack of conformity and/or uniformity, and uncovered grass or stubble

Lot No.	Straightness (10)	Grass & Neatness (10)	Shallowness & Narrowness (10)	Soil Availability & Conformity (10)

GENERAL APPEARANCE

After the judging of each of the areas is completed, the complete land is judged as to General Appearance. General appearance is judged from sixty points in six categories:

Straightness (10 points)

- All furrows shall be straight

Conformity (10 points)

- All furrow slices shall conform (match one another) as to height, width, shape, size and appearance, from scratch to scratch, across the complete plowed land
- No pairing

Distinctness of Furrow (10 points)

- Each furrow slice shall be clearly defined.

Uniformity and Shape of Furrow (10 points)

- Each furrow slice shall be neat, uniform in height, width, shape, size and appearance for the entire length of the plot
- Furrows shall start and end at scratch
- Furrow slices in stubble shall be well turned over with rounded top to provide sufficient soil availability
- Furrow slices in sod shall be turned through 135 degrees. In this position both the side and bottom of the furrow slice will lay 45 degrees to vertical

Shape of Land (10 points)

- Complete land shall have a clean, sharp, pleasing appearance
- Complete land shall show proper relationships to crown, to body of land, to finish

Ins and Outs (10 points)

- All soil inside of scratch furrows shall be turned within a minimum amount of head land being disturbed
- No furrow slice shall be turned outside the scratch
- Ins and outs shall be neat and clean
- No tire marks inside scratch

Lot No.	Straightness (10)	Conformity (10)	Distinctness of Furrow (10)	Uniformity and Shape of Furrow (10)	Shape of Land (10)	Ins and Outs (10)

Meeting 5 – Getting to the Next Level

OBJECTIVES

Creating awareness of how to apply plowing knowledge in careers and in competitions.

Suggested Lesson Outcomes

- Members understand the evolution of plowing
- Members understand the importance of drainage and the effects of erosion
- Members feel comfortable operating a plow to create an Opening Split, Crown, Cast Off and Finish

REFERENCE MATERIAL

- The History of Plowing
- Understanding Drainage
- What is Erosion?
- Changing Tillage Practices

REFERENCES

Ontario Plowmen’s Association – History - <https://www.plowingmatch.org/about-us/in-the-beginning>

World Ploughing Association – History - http://worldploughing.org/?page_id=1146

Canadian Plowmen’s Association – History - <http://canadianplowing.ca/sample-page-2/>

Make Your Own Erosion – SciShow Kids on YouTube at <https://youtu.be/YETdZyZl6es>

Ontario Ministry of Agriculture, Food and Rural Affairs, Best Management Practices – Soil Erosion by Water, AF191 <http://www.omafra.gov.on.ca/english/environment/bmp/AF191.pdf>

Ontario Ministry of Agriculture, Food and Rural Affairs, Best Management Practices – Erosion Control Structure, AF165

Conservation Authorities - <https://conservationontario.ca/conservation-authorities/about-conservation-authorities/>

ACTIVITIES

- Activity 17 – The Role of Plowing Competitions and Associations
- Activity 18 – Land Drainage on Your Farm
- Activity 19 – Make Your Own Erosion
- Activity 20 – Practicing Our Plowing Skills

SAMPLE MEETING AGENDA TOTAL LENGTH OF TIME: 2 HOURS 25 MINUTES

Welcome, Call to Order & Pledge		5 min
Roll call	Invite each member to share their name and their response to the At Home Activity that you asked them to do at the end of Meeting 4.	10 min
Topic Information Discussion	The History of Plowing	20 min
Activities Related to Topic	Activity 17 – The Role of Plowing Competitions and Associations	10 min
Topic Information Discussion	Understanding Drainage	5 min
Activities Related to Topic	Activity 18 – Land Drainage on Your Farm	10 min
Topic Information Discussion	What is Erosion?	15 min
Activities Related to Topic	Activity 19 – Make Your Own Erosion	10 min
Topic Information Discussion	Changing Tillage Practices	10 min
Judging	Activity 20 - Practicing Our Plowing Skills Provide time for members to practice their plowing skills.	30 min (depending on size of group)
Wrap Up, Adjournment & Social Time	Recap topics covered in this meeting and review the At Home Challenge	15 min
At Home Challenge	Choose the At Home Activity found in the meeting or come up with one of your own.	5 min

Meeting 5 - Reference Material

THE HISTORY OF PLOWING

The Ontario Plowmen's Association has prepared this History of Plowing that provides a great overview of the early evolution of plowing. This document provides a review of many of the concepts we have discussed so far in this club.

The History Of PLOWING

Agriculture employs 440,000 Canadians who add \$27.9 billion to the Canadian economy. Here is the story of one invention which makes this possible - the plow.



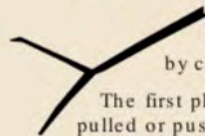
THE BEGINNING OF FARMING



Before there were farms, early people lived as nomads. They travelled from place to place killing animals and gathering plants, berries and fruits for their food, clothing and other necessities.

Later, people settled in permanent homes. Their meat was provided by animals which they kept in nearby fields and in pens. To provide for their other food needs, they collected seeds and planted them in fields. Thus, people became farmers, and agriculture was born.

THE FIRST PLOWS



Farmers need to till the soil before they plant seeds for their crops. The plow, one of mankind's oldest tools, prepares soil for planting by cutting it and turning it over.

The first plow was probably a forked digging stick. One branch of the stick was pulled or pushed through the ground while the other branch or branches served as the handle.

Another early plow was the stone adze. One side of a stone was sharpened, and then the stone was tied to a wooden handle by a strap made of reeds or animal fibres. This adze was pulled or pushed through the soil by the farmer, or perhaps the farmer tied the handle of the adze to an animal which then pulled the stone plow through the ground.

The ancient Romans invented a light iron cutting blade called a share. This blade was tied to a harness, and was pulled through the soil by hand or by using a team of oxen. This wheel-less plow worked well in the light soils of Southern Europe, but proved to be not strong enough for the heavier soil of Northern Europe. In Northern Europe the plow was attached to wheels, and it was pulled first by oxen and later horses.



PARTS OF THE SIMPLE PLOW

There are four parts to a simple (or Mouldboard) plow:

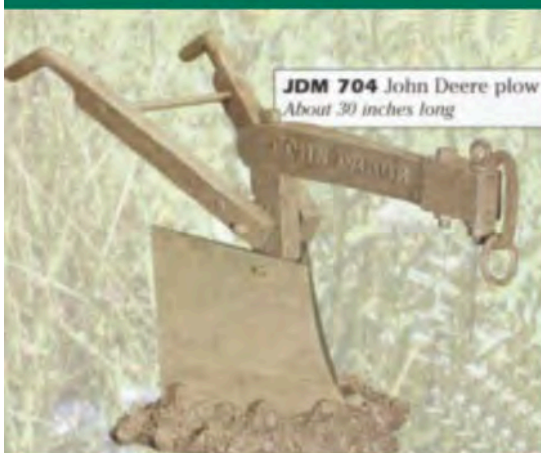
Diagram of a mouldboard plow showing all the components.



1. The coulter: a sharp pointed knife or rolling disc which cuts the soil vertically.
2. The share (or plowshare): a sharp pointed knife which cuts flat underneath the ground, loosening the soil cut by the coulter.
3. The mouldboard: a curved blade which pushes the slice of earth to the side and turns it upside down. This slice of earth is called the furrow.
4. The landslide: a plate located on the opposite side of the plow from the mouldboard, which stops the furrow from pushing the plow off course.

John Deere: North America's Plow maker

Immigrants from all over Europe came to North America in the 19th Century looking for a new way of life. Many of these homesteaders decided to settle in the Canadian and American West, and to build their future on the fertile soils of the Prairies. They brought with them the plows they had used in Europe, which were made entirely of wood, except for the share, which was cast iron.



John Deere (1804 - 1886) was born in Vermont and became a blacksmith at the age of 17. In 1837, he headed west and eventually settled in Illinois where he set up a blacksmith shop.

In his work, Deere repaired many of the cast iron and wood plows that immigrants had brought. These plows were breaking in the heavy, black soil of the prairies. He patented a plow that was made entirely of steel. The share and mouldboard were fashioned from one piece of steel and shaped over a wooden form. This made the plow much stronger. Because it was light and very sharp, Deere's plow required much less animal power to turn the soil.

John Deere first patented his new plow in 1838. By 1857, Deere's company was manufacturing 10,000 plows each year.

*...and they shall beat their swords into plowshares, and their spears into pruning hooks:
Nation shall not lift up sword against nation, neither shall they learn war any more.*

*The Bible
Isaiah 2:4*



The United Nations garden in New York City contains several sculptures and statues that have been donated by different countries. This one is called "Let Us Beat Swords into Plowshares" and was a gift from the then Soviet Union presented in 1959. Made by Evgeniy Vuchetich, the bronze statue represents the figure of a man holding a hammer in one hand and, in the other, a sword which he is making into a plowshare, symbolizing man's desire to put an end to war and convert the means of destruction into creative tools for the benefit of all mankind.

PLOWING TODAY

The mouldboard plow, pulled by horses or a tractor, is still in common use today. However, other types of plows have been developed for specific purposes or to till particular types of soil.

The last few years have seen major changes in soil preparation practices, and plowing fields is no exception. But modern plowing methods continue to promote good land stewardship:

- ◆ Plowing loosens soil compacted by heavy machines, making the soil porous;
- ◆ Burying weeds by plowing is an effective way to eliminate weeds without the use of toxic chemicals;
- ◆ A furrow made up of definite ridges and troughs will trap rainwater, which will sink through the slits between each furrow;
- ◆ Corn stalks, grain stubble and other products left over after the field has been harvested and plowed will prevent the soil from being blown away during the fall and winter seasons.



VOCABULARY

Adze: *n.* a tool for cutting, which resembles an axe, but has a curved blade with its cutting edge set across the end of the handle.

Agriculture: *n.* farming; the raising of crops and livestock; the science or art of cultivating the ground.

Compact: *v.* put firmly together; compress.

Coulter: *n.* a sharp, pointed knife or rolling disc which cuts the soil vertically.

Furrow: *n.* a long, narrow groove or track cut into the ground by a plow.

Homesteader: *n.* a person who settled on a parcel of land in the Canadian West during the 19th Century.

Landslide: *n.* a plate located on the side of a plow opposite the mouldboard. Its purpose is to stop the furrow from pushing the plow off course.

Mouldboard: *n.* a curved blade, part of a plow, which pushes a slice of earth to the side and turns it upside down.

Nomad: *n.* a person who moves from place to place to find pasture for cattle, and a supply of food and water.

Plow: *n.* a farm implement used for cutting the soil and turning it over.

(Plow)share: *n.* a sharp, pointed knife, part of a plow, which cuts flat underneath the ground, loosening the soil cut by the coulter.

Porous: *adj.* Allowing water and/ or air to pass through.

Ridge: *n.* a raised, narrow strip of plowed ground.

Stewardship: *n.* taking responsibility for carefully managing the resources of the earth.

Till: *v.* prepare for planting by plowing.

Trough: *n.* a long hollow between two ridges.

Windbreak: *n.* growth planted to prevent soil erosion.

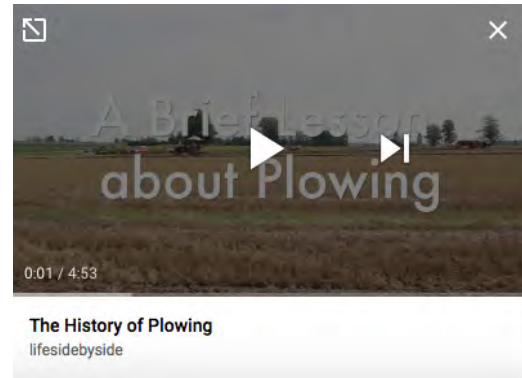


This document is a legacy of Rural Expo 2003



Source: *The History of Plowing* - <https://www.plowingmatch.org/education-2017/history-of-plowing>

This video provides an overview of the evolution of plowing equipment and plowing matches. As Canada grew, plowmen came together to organize, learn more from each other, and take part in competitions. It was prepared in 2012 to promote the International Plowing Match in Waterloo County (4:53) <https://youtu.be/iBw7uKa5Glg>



IN THE BEGINNING – THE ONTARIO PLOWMEN’S ASSOCIATION

In the fall of 1910 a meeting of members of the local York plowmen’s association was held in the Richmond Hill Hotel to discuss the possibility of organizing a provincial plowmen’s organization. This initial meeting was followed by sixty-four enthusiastic plowmen met in the Walker House Hotel in Toronto on January 6th, 1911.

After much discussion it was moved by Mr. T. A. Patterson and seconded by Mr. W. H. Pugsley, “that we form an Ontario Plowmen’s Association.”

Carried.” This account is taken from an excerpt from the book ‘God Speed the Plow’, a history of the Ontario Plowmen’s Association by John Fennell.



This video allows you to see the International Plowing Match in action and how it showcases the business of plowing and the skills for the plowing competitors. (2:48) <https://youtu.be/xT9f6KYhftg>

HISTORY OF THE WORLD PLOUGHING ORGANIZATION

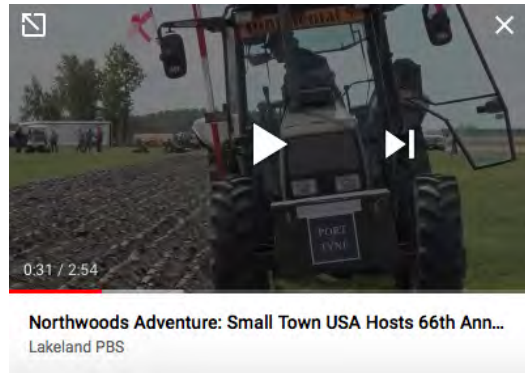
The first international provisional Governing Board was set up at Workington, Cumberland, England, on the 5th of February, 1952.

The Objects of the World Ploughing Organization include –

- To foster and preserve the art and improve the skill of ploughing the land.
- To promote World Championship Ploughing contests.
- To provide for demonstration work and trade displays.
- To urge the development and adoption of improved techniques and aids to man in all branches of agriculture.
- To foster a vigorous spirit of co-operation an enterprise in producing food for an increasing world population.
- By these means to encourage fellowship and understanding amongst the people of all nations.

- To support and co-operate with other bodies or associations in the furtherance of these objects.

This video allows you to see the World Plowing Match in action. (2:54) <https://youtu.be/GvkfUqSFJjk>



CANADIAN PLOWMEN’S ASSOCIATION HISTORY

Canada has a long and proud tradition in the world of plowing. Although the Canadian Plowing Organization was not founded until 1955, three years after the World Ploughing Organization, Canada was strongly involved with the creation of the World Organization. In fact, Mr. Jack Carroll from Ontario was the first Chairman and the first World Competition was held at Cobourg, Ontario in 1953. Jim Eccles, a Canadian, was the first winner.

Since then, six of the sixty world championships have been held in Canada. Canada hosted the 60th world championship plowing contests at Olds College, Olds, Alberta in 2013. This account is taken from the Canadian Plowmen’s Association website.

Sources –

Ontario Plowmen’s Association – History - <https://www.plowingmatch.org/about-us/in-the-beginning>

World Ploughing Association – History - http://worldploughing.org/?page_id=1146

Canadian Plowmen’s Association – History - <http://canadianplowing.ca/sample-page-2/>

UNDERSTANDING DRAINAGE

Drainage has many benefits, all of which add up to increased agricultural productivity. These benefits are –

- Excess water which is harmful to the plant is drained off.
- When this water is removed the soil warms up. The soil can be tilled and seed germination occurs more rapidly.
- Larger soil pores are emptied out, encouraging root growth.
- The growing season is lengthened.
- More vigorous plants are produced.
- More efficient use of machinery is possible in the spring and fall.
- Better management is allowed if all fields can be used in rotation.

You know that drainage removes water from the soil, but did you know that drainage actually increases the amount of usable water for crops? This is due to improved physical condition of the soil which allow a greater rooting system to develop.

TYPES OF DRAINAGE SYSTEMS

- **Open Ditches** – Ditches which are often dug with a backhoe and usually act as outlets for other types of drains. These ditches may be difficult to maintain, especially in course textured soils and they encourage weed growth.
- **Surface Drains** – A century ago this method was the sole means of controlling excess ground water. It is a system of parallel shallow ditches to direct water to a collecting ditch. It is mainly used today to supplement tile drainage systems or used where tile drainage is not possible.
- **Tile Drains** – This type of drain is the most common type of drainage in Ontario. The water moves down through the soil by gravity and enters the tile at joints or perforations and then flows toward the outlet. These drains are a minimum of 10 cm in inside diameter and are made of clay, concrete or plastic. There are many different patterns of tile drainage. The one used will depend on the topography of the land.

WHAT IS EROSION?

Erosion takes place in two stages.

1. Loosening the soil where the soil particles are dislodged.
2. Transporting the soil where the loosened soil particles are moved from one location to another.

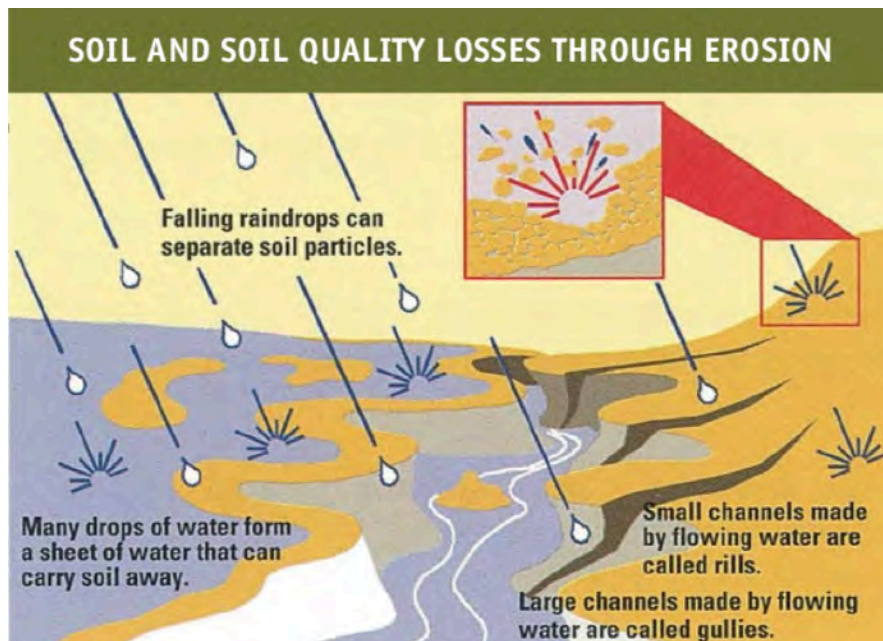
TYPES OF EROSION

There are also two types of erosion depending on how soil is transported. They are water and wind.

WATER EROSION

Water is responsible for 98% of the erosion found in Ontario. You may wonder just how powerful water can be in the process of soil erosion. Well, even raindrops falling on loosened soil can prove to be quite an erosion hazard.

WHAT SORT OF DAMAGE CAN WATER DO?



Source - *Best Management Practices – Soil Erosion by Water*, Ontario Ministry of Agriculture, Food and Rural Affairs AF191

There are three types of water-caused erosion.



Source: Best Management Practices – Soil Erosion by Water, Ontario Ministry of Agriculture, Food and Rural Affairs AF191
Example of sheet erosion.

Sheet Erosion – Sheet erosion is the uniform movement of soil over a slope. Because of its uniformity, it may go unnoticed until most of the topsoil is removed.

Rill Erosion – Rill erosion results when the surface runoff concentrates in depressions, removing enough soil to form small but well-defined channels. These channels are called rills when they are not large enough to interfere with normal tillage operations.



Source: Best Management Practices – Soil Erosion by Water, Ontario Ministry of Agriculture, Food and Rural Affairs AF191
Example of rill erosion.

Gully Erosion – Gully erosion may develop further downslope of where sheet and rill erosion is happening and where runoff waters begin to concentrate.

You have gully erosion when –

- rills (eroded channels in field) are so large and deep (i.e. 30–60 cm or 1–2 ft) that you cannot cross them with your tractor and most implements
- eroded channels have to be filled in with tractor (and bucket or blade) or heavy equipment

Source: Best Management Practices – Soil Erosion by Water, Ontario Ministry of Agriculture, Food and Rural Affairs AF191
Example of gully erosion.



WIND EROSION

Just as water erosion is soil transported by water, wind erosion is soil transported by wind. This type of erosion is a greater problem in the Canadian Prairie Provinces than it is in Ontario, but it still accounts for about 2% of our erosion problems here.

The extent of wind erosion depends on three things – the wind speed, the soil moisture, and the characteristics of the soil surface. The higher the wind speed, the drier the soil, and the smoother the soil surface, the higher the chance of wind erosion.

FACTORS AFFECTING EROSION

- **Climate** – including rainfall (frequency and intensity), frost and wind
- **Soil** – including particle size (texture), cover and condition (structure)
- **Topography** – steepness of slope and length of slope
- **Management Principles** – tillage practices, cropping practices, conservation practices, and placement of fence rows.

Of all of the factors affecting erosion, management practices are the only ones which we can control.

WHY SHOULD YOU TRY TO CONTROL EROSION?

Yes, it is possible to control erosion to some extent, but why would farmers do this?

- **Environmental Reasons** – Eroded soil may cause environmental problems. When soil is washed into streams and waterways, the pesticides and nutrients applied to the soil may also be washed in. Fish and birds which live in or near these waterways may be harmed by this type of run-off.
- **Economic Reasons** – Soil erosion costs farmers money. In fact it is estimated that Ontario farmers incur losses of \$30 million annually because of lost yields, and increased nutrient and pesticide costs.
- **Stewardship Reasons** – Many people believe that the soil is a “borrowed resource”. What this means is that it is our duty to preserve the soil resource for the generations of farmers which will follow.
- **Aesthetic Reasons** – The sight of eroded land is an unpleasant one. Both passers-by and the farmer who must work the land can feel better about the country scenery and state of agriculture when there are no visible “scars” caused by erosion.

CONTROL OF EROSION

There are three important factors in controlling soil erosion adequately –

1. **Maintaining Good Soil Structure**
 - Regular use of soil improving crops such as growing forage crops
 - Frequent return of organic matter to the soil through the incorporation of crop residues and manure
 - Tillage practices that don't “over-work” the soil and break down its structure
2. **Protecting the Soil Surface**
 - Leaving crop residues on the soil surface over winter
3. **Using Good Management in Mechanical Procedures**
 - **Contour Cropping** – tilling and planting the crop across rather than with the slope
 - **Strip Cropping** – planting alternating hay/forage and grain strips, can be combined with contour cropping

- **Tillage Practices** – help to reduce soil losses by using various methods including Spring plowing, Spring chisel, Fall moldboard, Disc-planting, No-till planting
- **Special Practices – Grassed Waterways** – areas of the water flow planted with a grass cover so that the water does not erode the soil, planting trees for windbreaks, tile drainage so that water is drained from the soil more easily, buffer zones of grass along the banks of drainage ditches so that streambank erosion does not become a problem

CHANGING TILLAGE PRACTICES

Note to Leader: Ideally you would be able to have a piece of each type of equipment on-site for this portion of the meeting. Consider reaching out to a local farm implement dealer or large local farm that has these types of equipment to arrange for the club members to visit.

In recent years there has been increasing interest in changing tilling practices. This has occurred for two reasons – the concern for high levels of soil erosion and the need to reduce production costs.

The following definitions will help you to understand the different types of tillage practices.

Primary Tillage – Normally the first pass over the field after harvest. Accomplishes two objectives – 1) loosens and fractures the soil structure, and 2) mixes residues or fertilizer into the tilled layer.

Secondary Tillage – Used to kill weeds, cut and cover crop residues, incorporate chemicals and prepare a level seed bed.

Conservation Tillage – Accomplishes the same objectives as primary or secondary tillage while maintaining a minimum of 20% residue cover. This reduces the potential for soil movement (wind and/or water erosion).

Note to Leader: If leaders or members want to go into further depth on the topic of tillage practices refer to the 4-H Ontario **Loyal to the Soil** project manual for additional information.

TYPES OF EQUIPMENT

Deep Till – Subsoil Plow



Source: <https://www.he-va.com/en/products/subsoilers/sub-tiller/>

Purpose of Deep Till – Subsoil Plow

- Primary tillage machine
- Break impervious layers (hard pan) below the normal tillage depth

- Deep aeration allows roots to penetrate deep
- Permits water to soak in better
- Rough ground surface resists wind and water erosion

DEEP TILL – SUBSOIL PLOW SHANK DESIGNS

Rigid – This shank design is not protected from obstructions and must therefore be used in areas with no obstructions.

Note – The only difference in appearance between a rigid shank and the shear bolt shank design is the shear bolt itself.

Shear Bolt – This shank is protected by shear bolts. The operator must stop, reset and replace the shear bolt. It is used in areas with few stones.

Auto Reset – Has spring loaded protection to allow the shank to lift and clear obstructions, e.g. stumps, stones. Will automatically reset. Works well in stone infested areas.

CONSERVATION TILLAGE PLOW



Source: <https://www.vaderstad.com/en/know-how/tillage-practices/minimum-tillage/>

PURPOSE OF CONSERVATION TILLAGE PLOW

- Used as a primary tillage tool, rather than mouldboard plowing
- Leaves more residue on top and leaves soil texture rougher to resist erosion and enhance water absorption

SPECIAL FEATURES OF THE CONSERVATION TILLAGE PLOW

- A row of disk blades (disk gang) on the front are adjustable to increase/decrease amount of trash being out. This will directly affect the amount of trash left on top.

Adjustable Disk Gangs

- Disk gang penetration can be adjusted for higher levels of trash
- Manual adjust allows down pressure and depth setting to be changed manually with the use of hand tools
- Hydraulic adjust allow down pressure and depth setting to be changed from the tractor seat with the use of the tractor hydraulics

Non-Adjustable Disk Gangs (more economical to purchase)

- Front disk gang is pre-set at the factory and cannot be changed to a different down pressure or depth setting
- Different teeth are available too. These are twisted sweep and wide sweep.
 - o **Twisted Sweep** – has tendency to turn some trash down into the top layer of soil. Also leaves some soil undisturbed.
 - o **Wide Sweep** – disturbs almost all of the soil and severs all roots. Leaves a high percentage of trash on top. Does not turn any trash down.

CHISEL PLOW



Source: [http://landoll.com/home/products/farm-equipment/brillion-farm-equipment/chisel-plow/#iLightbox\[image_carousel_1\]/4](http://landoll.com/home/products/farm-equipment/brillion-farm-equipment/chisel-plow/#iLightbox[image_carousel_1]/4)

PURPOSE OF CHISEL PLOW

- Primary or secondary tillage
- Weed control, chemical incorporation
- Leaves most residue on top or mixes it into the upper few inches of soil
- Roughens field up to increase moisture absorption and assists in controlling wind and water erosion

Check It Out At Home!

What actions do your family take to help prevent erosion at home/on your farm? If you don't live on a farm reach out to a local farmer and ask them what actions they take.

Be prepared to share your research at the next meeting.

DIGGING DEEPER FOR SENIOR MEMBERS

THE HISTORY OF PLOWING

Dig deeper into an aspect of the evolution of plowing, the history of plowing in Ontario or internationally and prepare a presentation to share with the club and/or at the achievement day program.

LOCAL EFFORTS TO ADDRESS EROSION

Connect with your local conservation authority and learn more about what efforts are being made in your community to address erosion. Are there practices that farmers and other residents can do to help reduce erosion? Create an awareness campaign to share the information with your community through social media or in a face-to-face opportunity (local fair, achievement day program, plowing match).

You can find your local conservation authority by visiting - <https://conservationontario.ca/conservation-authorities/find-a-conservation-authority/>

ACTIVITY 17: THE ROLE OF PLOWING COMPETITIONS AND ASSOCIATIONS

DO	<p>Time: 10 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none"> – A piece of paper, chart paper or white board to record responses <p>Instructions:</p> <ul style="list-style-type: none"> – After viewing the video clips from the different associations facilitate a discussion with the club members. – Here are some prompts to stimulate the conversation – – [indented bullet point list] – What role do you think plowing associations have to preserve and education people about plowing? – Are you aware of any other activities that associations take part in other than the plowing matches? – What other activities could the associations take part in to promote plowing outside of the match? <p>Additional Activity:</p> <ul style="list-style-type: none"> – Invite a local plowing association official to attend the meeting and share their experience in place of viewing the video clips. – Share the ideas that the club members generate with your local plowing association.
REFLECT	<p>Learning Outcomes:</p> <p>Members will understand the role of plowing associations and the potential for their involvement with the associations.</p>

APPLY

Processing Prompts:

- Why is it important to promote plowing skills?
- What efforts can plowing associations make to advance plowing?
- Was it easy or hard to find information related to plowing associations?
- What new information did you learn in this activity?

ACTIVITY 18: LAND DRAINAGE ON YOUR FARM

DO	<p>Time: 10 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Laptop or television monitor connected to a laptop to show the video <p>Or</p> <ul style="list-style-type: none">– A plot of land at your meeting site where land drainage is or has been an issue <p>Instructions:</p> <ul style="list-style-type: none">– Show the members an example of where drainage has been an issue and/or dealt with at the site of your meeting– Discuss what has been done or needs to be done to improve the drainage in this location– Discuss how tile drains have an impact on crop growth <p>Or</p> <ul style="list-style-type: none">– If you do not have access to an example you can use a video like this one to illustrate the idea –– Land Drainage on Your Farm (3:03) - https://youtu.be/Q0BNqag8b34
REFLECT	<p>Learning Outcomes:</p> <p>Members understand why proper drainage is important and what can be done to improve the drainage of their farmland.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none">– Why is proper drainage important?– Do you think that you will look at farmland differently because of your new knowledge?– Can you think of any farmland in your area that could benefit from improved drainage?

ACTIVITY 19: MAKE YOUR OWN EROSION

DO

Time: 10 minutes

Materials/Resources:

- Deep pan or tub
- Plastic or paper cup
- Scissors
- Just of water
- Sand or potting soil

Instructions:

- Fill pan halfway full with sand/dirt
- Make sure your landscape has a slope – more sand/dirt on one side gradually sloping down to no sand/dirt at all on the other
- The slope will allow the water to move from place to place to see erosion in action
- Add a couple of mounds in the high part of the slope to make it interesting
- Use the slide of your hand to make a “cliff” or ridge in another location
- Take the cup and poke a hole in the bottom of it with the scissors
- Hold the cup over the side that has the most sand/dirt – the top of the slope
- Pour the water in to the cup and observe what happens when the water runs from the top to the bottom of the slope
- It will take some of the particles with it moving them from the top to the bottom
- Ask the group -
 - o Does the landscape look different that it did before you poured the water over it?
 - o In what ways does it look different? Does not turn any trash down.
 - o Does the landscape look different that it did before you poured the water over it?
 - o In what ways does it look different?

<p style="text-align: center; font-size: 24pt; font-weight: bold;">DO</p>	<ul style="list-style-type: none"> o Is there more sand/dirt at the bottom than when you started? o What has changed about the sand/dirt at the top? In between? o Can you see where the water travelled over the sand/dirt? o When you look closely at the water what do you notice about it? o Is it a different colour than when it was in the jug? <p>Additional Activity: Try the same activity using sand in a tub. This time add two cups of water to the end of the tub with no sand in it. Use a plastic sheet to mimic the motion of waves and observe what happens to the sand. This is what happens to shorelines with wave erosion.</p> <p>Try the same activity using sand in the tub only this time blow over the sand using a straw from the high side toward the lower side and observe what happens to the particles of sand. This is what happens to landscapes with wind erosion.</p>
<p style="text-align: center; font-size: 24pt; font-weight: bold;">REFLECT</p>	<p>Learning Outcomes: Members will understand the concept of erosion and the effect that it has on landscapes.</p>
<p style="text-align: center; font-size: 24pt; font-weight: bold;">APPLY</p>	<p>Processing Prompts:</p> <ul style="list-style-type: none"> - Why is it important to understand erosion when you are preparing a field? - What did you like about this activity?

To view a video of this activity visit – SciShow Kids on YouTube at <https://youtu.be/YETdZyZl6es>

Meeting 6 – Getting Ready to Show What You Know

OBJECTIVES

To create awareness of how to apply plowing knowledge in careers and prepare the members to participate in their achievement program.

Suggested Lesson Outcomes

- Members are aware of careers that utilize plowing knowledge.
- Members feel comfortable operating a plow to create an opening split, crown, cast off and finish.
- Members actively participate the preparations for hosting a plowing match, demonstration day or other related event being held as their achievement program.

REFERENCE MATERIAL

- Careers Related to Plowing
- Competitive Plowing Hints
- Becoming a Judge
- The Duties of a Steward
- Hints for Competitive Plowing

REFERENCES

Ontario Plowmen's Association - www.plowingmatch.org

Plowing 101 – PowerPoint Presentation by Stephen Speller

Agriculture in the Classroom Canada <https://aitc-canada.ca/en-ca/for-educators/agriculture-careers>

ACTIVITIES

- Activity 21 – Planning To Host a Plowing Event
- Activity 22 – What Would It Be? Communications Activity
- Activity 23 – Careers Related to Plowing
- Activity 24 – Guest Speaker in a Career Related to Plowing
- Activity 25 – Practicing Plowing
- Activity 26 - Reflection

SAMPLE MEETING AGENDA TOTAL LENGTH OF TIME: 2 HOURS 35 MINUTES

Welcome, Call to Order & Pledge		5 min
Roll call	Invite each member to share their name and their response to the At Home Activity that you asked them to do at the end of Meeting 5.	10 min
Topic Information Discussion	Hosting a Plowing Event	5 min
Activities Related to Topic	Activity 21 - Planning to Host a Plowing Event	15 min
Communications	Activity 22 – What Would It Be? Communications Activity	10 min
Topic Information Discussion	Becoming a Judge Steward’s Duties and Objectives	10 min
Topic Information Discussion	Careers Related to Plowing - STEAM	5 min
Activities Related to Topic	Activity 23 – Careers Related to Plowing	15 min
Activities Related to Topic	Activity 24 - Guest Speaker in a Career Related to Plowing	30 min
Topic Information Discussion	Hints for Competitive Plowing	5 min
Activities Related to Topic	Activity 25 – Practicing Our Plowing Skills Provide time for members to practice their plowing skills.	30 min (depending on size of group)
Wrap Up, Adjournment & Social Time	Activity 26 – Reflection Be sure to review the date, time, location and your expectations of the members for the Achievement Day before you close the meeting.	10 min
At Home Challenge	Prepare for Achievement Day	5 min

Meeting 6 - Reference Material

HOSTING A PLOWING EVENT

Opportunities to plow competitively are not as common-place as they may have been in the past. Local associations in Ontario host over forty matches yearly in addition to other junior matches and coaching days. None of these events happen can happen without the support of hundreds of local volunteers actively working behind the scenes.

Encouraging the next generation to take part in the hosting of a local plowing match, demonstration day or display to create awareness as part of another event (like a local fair) is one of the ways that you can help spread the word about plowing.

CONNECT WITH YOUR LOCAL ASSOCIATION

Local contacts for the association in your area can be found on the Ontario Plowmen's Association website at www.plowingmatch.org. Reach out to the association and offer to participate in the planning and hosting of the match as well as generating awareness of the event in the community.

It is likely that they have experienced volunteers who would appreciate sharing their knowledge related to the various aspects of hosting a plowing event including –

- Plowing classes
- Training and developing coaches, stewards and judges
- Managing the match site
- Setting up the headlands and lots for plowing
- Reporting the results
- Promoting the events
- Activities related to the event (e.g. banquet, Ambassador Competition, displays, meals)

BECOMING A JUDGE

WHAT IS A JUDGE?

- A person appointed to determine the result of a contest or competition
- A person who is able and qualified to give an opinion
- To form an opinion or conclusion about something
- To appraise critically
- A plowing Judge is a person who by observing the land plowed, will in an unbiased and fair manner, judge a class of competitors in the proper order from 1st to last place using an IPM scorecard.

HOW TO BECOME A JUDGE

If you are interested in becoming a judge reach out to your local plowing association and speak with the Judge-in-Chief to learn more. The name and number can be found on the OPA website. www.plowingmatch.org

Talk to a local judge. They will be more than willing to have you follow them during judging at a local match if time permits. You should have a blank score card and judge a class on your own to see how it compares.

To become a Branch Judge you must judge at six branch matches in Ontario and be accompanied by a qualified judge and with assistance, help score different classes. This must be fully documented with who the qualified judge was and what branch match you attended. The qualified judge who accompanied you would sign the scorecard as well. A photocopy or photo of your scorecards would have to be submitted to the Judge-in-Chief after the six matches are completed.

The final selection of the Branch Judge is at the discretion of the Judge-in-Chief and Assistant Judge-in-Chief and the names will be forwarded to the OPA Board of Directors for approval.

Things to keep in mind –

- Judging Guidelines are on the OPA website (great for plowing competitors too!)
- A person who is a judge should have plowing or coaching experience
- Be physically fit to walk the fields and across the plowing
- Have good vision!
- Be able to be impartial and treat everyone fairly

Source: Plowing 101 by Stephen Speller

STEWARDS DUTIES AND OBJECTIVES

The Stewards officiate over the plowing competition and see that it is carried out in a fair manner, enforcing all of the rules and assigning penalties if needed.

Other responsibilities include –

- Attending all information meetings prior to the start of competition.
- Reading and understanding the rules of the competition as set out in the Official Handbook (prize list) and be in a position and prepared to act on them.
- Steward should proceed to the plowing field of the Class, either before or at the same time as the contestants.
- Checking to see that there is a lot for each contestant in your class, and that all lots are plowable. Reporting immediately to the Chief Steward and presiding Judge of any changes that are made to a lot location or number.
- Knowing your class lot numbers and locations and directing competitors to them.
- When all stakes are set by competitors, the Steward shall signal them to commence plowing.
- Recording the time, watching for and recording any competitor who goes over the 20 min for split. Recording any penalty on the time sheet.
- After the Judges have completed the scoring of the opening splits in Tractor Classes, the Steward will signal the contestants to commence plowing. It is a good idea to be at the end of the field where the Judge finishes to move things along quickly.
- Recording start time and calculate finish time. The total time should not exceed 2 hours and 40 minutes.
- Informing each contestant of the finish time and the current time on the Steward's watch.
- Monitoring closely the class during the competition to ensure that everyone is following the rules. Infractions include coaching, dismounting on wrong side of tractors, tramping headlands, etc.
- Recording any time taken for breakdowns and allow time for repairs according to the OPA rules.
- Stewards should not travel together in order to cover a broader number of competitors at any one time.
- Monitoring the time closely as you near the end of allotted time and recording any competitor who is over the time limit and recording the penalty.
- Signing and leaving the time sheet with the Judge.

Source: Plowing 101 by Stephen Speller

CAREERS RELATED TO PLOWING - STEAM

What is your future? Do you dream of owning your own business? Maybe you are the creative type, eager to make your mark with graphic design? Or perhaps you get excited by the idea of a career in STEAM (Science, Technology, Engineering, Arts and Math)? Would you be surprised to learn that all of those (and more!) are career options within the agri-food sector? Careers in agriculture and food are incredibly diverse... and they aren't all on the farm.

The agriculture and food sector is at the leading edge of research and innovation to address global challenges. There are endless opportunities which will allow you to make a difference: feed the growing population, protect the environment, care for animals, or help people.

Source: Agriculture in the Classroom Canada <https://aitc-canada.ca/en-ca/for-educators/agriculture-careers>

In addition to farming there are careers in communications, sales, public service, agri-business, technology and innovation, math and finance, engineering and mechanics, and science where you can use the knowledge you have gained in this project.

COMPETITIVE PLOWING HINTS

CROWN

- Four plow stakes are necessary to set up in a straight line to start your open split. With a three or more furrow plow set your plow stakes over to one side, so the centre of the crown will be in line with the small land stake placed by the association. This distance will be determined by the size and width of your plow.
- The open split consists of a small furrow plowed one way and another one back, about 7.5 -9 cms deep, making sure everything in the bottom is cut cleanly. Upon completion, wait for the judge to come and score it.
- Now you proceed to put up your crown. Plow your first furrow 10 cm deep, the second about 13 cm, then 15 cm in order to keep level with your first furrows. This applies to two, three, four or more furrow plows.
- On the second round level your plow, proceed to plow your average depth and as straight and even as possible. With a two furrow plow you may have to go slightly deeper in order to keep up to the first round as the judges do not like to see the first round standing up high above the rest.
- The “Crown” consists of a total of 12 furrows after which you gather an additional 12 furrows before you begin to cast off.

SEEDBED

- Check the prize list for required depth as it varies at different plowing matches.
- All furrows must be firm and closed tightly so that when you step on them they do not collapse.
- Furrows should be all the same size – not a large one and then a small one. This can be accomplished by setting of coulter, mouldboards and moving straightening levers.
- The directors of the association will tell you which way you are to turn toward or “Cast Off” to your neighbour, whether it is to the high or low number. This section of land should be measured at both ends before you start to plow as sometimes there is variance in the width. This is the time to find out so you can get the proper width for your finish. If your remaining land is not a suitable width for making a finish you can improve it by plowing narrower or wider once or twice across the field on the neighbour’s side.
- Do not disturb your neighbour’s plowing or leave any land unplowed.
- On some plows, bottoms can be turned up.

FINISH

- Keep on plowing straight and uniform down to your finish, but shallow up on your cast off side, so that the last time across the field on that side you are only plowing 7.5-10 cm deep. By doing this when you make your final trip across on your finish, you are not

making your sole furrow deeper than your average depth of your plowing.

- The “sole” furrow is a clean out furrow in the bottom of your finish which will come up about 2/3 of the height of the last stubble furrow.
- Be sure you turn your finish toward your crown.

GENERAL APPEARANCE

- Burying of grass and stubble is very important. To achieve this, skimmers and thrash boards must be set, taking the corner off the furrows throughout your land.
- It is most important to plow straight and keep the furrows uniform. Thirty points are allotted for this.
- The complete land should blend from crown to finish, not a high crown and not a deep finish.
- Make sure all furrows start and end at the headland scratch. This is known as “Ins and Outs”.

PENALTIES

A contestant may be penalized for any of the following infractions:

- Finishing the wrong way – penalty 10 points
- Not completing the land allotted for plowing – penalty maximum of 10 points
- Damaging neighbouring contestant’s plowing – penalty maximum of 10 points
- Two wheel marks on the land – penalty two to five points

If possible, beginners should attend a Junior Coaching Day and see where the stakes are set and how the plows are adjusted.

Source: Plowing 101 by Stephen Speller

DIGGING DEEPER FOR SENIOR MEMBERS

PROFESSIONS THAT USE PLOWING KNOWLEDGE

Pick a profession related to plowing and explore what the educational and experience requirements are as well as the potential income and any opportunities available locally.

ACTIVITY 21: PLANNING TO HOST A PLOWING EVENT

DO

Time: 15 minutes

Materials/Resources:

- Post-It Notes
- Pens or pencils
- Marker or white board marker
- Large piece of paper, chart paper or white board

Instructions:

- Ask the group what is the best event that you have ever attended?
- Ask for volunteers to share their responses with the group
- Hand out 2-3 Post-It Notes to each club member and make sure that they have something to write with
- Ask the members to write one thing per Post-It Note that made it the best event to you
- Ask the members to keep their responses to themselves until the next step
- Give the group 3-4 minutes to think and write their responses
- Get the members to pair up and share their responses with their partner
- Ask each pair to decide on 3-4 responses to share with the large group
- Give the pairs 2-3 minutes to determine what responses they will share
- Ask for volunteers to share their responses and stick the Post-It Note to the wall as they do
- Once the whole group has had a chance to share their responses ask the group if there are any additional responses/ideas that were missed
- Then ask the group to look for answers that are similar
- Group the Post-It Notes with similar responses together
- Once all of the Post-It Notes have been grouped, write "Elements of a Successful Event" across the top of the paper or white board

<p style="text-align: center; font-size: 24pt; font-weight: bold;">DO</p>	<ul style="list-style-type: none"> – Ask the group to name each grouping, e.g. food was provided, information was easy to find – Record the names the group comes up with on the large piece of paper/white board – Invite the members to think about a plowing event and ask them to refine the names based on hosting a plowing event – Ask the members to record the headings on their worksheet – Share that these aspects are all things to keep in mind when planning a successful event. <p>Additional Activity: Ask the members to create a template that can be used for planning an event based on their responses. Encourage them to research event planning online to find other templates that are available.</p>
<p style="text-align: center; font-size: 24pt; font-weight: bold;">REFLECT</p>	<p>Learning Outcomes: Members will be able to identify the elements of a successful event and be mindful of these elements when planning future events.</p>
<p style="text-align: center; font-size: 24pt; font-weight: bold;">APPLY</p>	<p>Processing Prompts:</p> <ul style="list-style-type: none"> – Did each of you have a lot of different things to say or were the responses pretty similar? Why do you think that is? – Will you be considering any new/different elements when you plan an event in the future? – Was there an element mentioned that you had never considered before? – How can you use this information in the future?

ACTIVITY 22: WHAT WOULD IT BE? COMMUNICATIONS ACTIVITY

DO	<p>Time: 10 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none"> - Paper - Pen or pencil <p>Instructions:</p> <ul style="list-style-type: none"> - Ask the members to answer the following question - If you could only go to one event a year what would that event be? - Give members one minute to think about their answer - Give members one minute to share with the group their answer with reasons - Remind members that an important part of critical thinking is learning to give reasons. It is their chance to explain why they made their choice. They don't have to agree with everyone else, but they do have to have an organized and thoughtful explanation of their choice. <p>Additional Activity: Allow other club members to ask one question of the speaker and ask the speaker to respond giving reasons to support their answer.</p>
REFLECT	<p>Learning Outcomes: Members will practice the skills needed to deliver a short speech sharing their opinion supported by reasons.</p>
APPLY	<p>Processing Prompts:</p> <ul style="list-style-type: none"> - Was this easy or hard? - Why can this skill be really helpful in the workplace?

ACTIVITY 23: CAREERS RELATED TO PLOWING

DO	<p>Time: 15 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– Laptop or television monitor connected to a laptop with access to the internet <p>And/or</p> <ul style="list-style-type: none">– Phones with access to the internet <p>Instructions:</p> <ul style="list-style-type: none">– Choose 2-3 profiles from the options available at https://aitc-canada.ca/en-ca/for-educators/agriculture-careers (or from any other source you may have access to for videos/resources on careers in agriculture)– Ask the club members to work in small groups to review the profiles and think about which career appeals most to them– Give the group time to review the profiles– Ask the group for some responses to the following prompts –<ul style="list-style-type: none">o Which career appealed the most to you?o How do you think that you could use your plowing knowledge in these careers?o What kind of post-secondary training would you need for these careers?o Are you or anyone you know currently pursuing a career in any of these areas? <p>Additional Activity:</p> <p>Follow up with one of the careers and reach out to someone locally who has that role. Ask them questions about their experience and for recommendations if you are interested in that career. Report back to the club.</p>
REFLECT	<p>Learning Outcomes:</p> <p>Members will have an understanding of potential careers that utilize plowing knowledge and the path needed to pursue this type of career.</p>

APPLY

Processing Prompts:

- Why is it important to research potential careers?
- Was it easy or hard to choose a profession?
- Will this activity have any influence on your future career exploration?
- Are there a lot of opportunities in your local area to pursue careers in agriculture?

ACTIVITY 24: CAREERS RELATED TO PLOWING – GUEST SPEAKER

DO

Time: 30 minutes

Materials/Resources:

- Guest Speaker
- Thank You Gift

Instructions:

- Invite someone from your local community who has pursued a career that utilizes knowledge of plowing
- Confirm with the speaker at least one week prior to the club meeting and be sure to provide the location of the meeting, the time that you would like them to arrive, the length of presentation that you would like them to provide, any key areas that you would like them to highlight in their presentation, and to check with them if they have any special mobility or audio/visual requirements
- On the night of the meeting be sure to ask one of the members to meet the speaker when they arrive and host them during their visit
- The same member could also provide the introduction of the speaker
- Ask 2-5 other club members to think of a question to ask the speaker based on what they hear in the presentation
- After the guest speaker has provided their presentation, ask for questions from the club
- After the guest speaker has responded to the questions, the member who is hosting the speaker can make a few courtesy remarks and present the thank you gift on behalf of the club
- After the club meeting ask the club secretary to send a thank you note to the speaker on behalf of the club

<p style="text-align: center; font-weight: bold; color: white;">DO</p>	<p>Additional Activity:</p> <ul style="list-style-type: none"> - If suitable, arrange for the club to visit the speaker at work - If you have access to a number of potential speakers consider making a panel of guests where the club comes up with three questions that can be asked of all of the speakers and they have 2 minutes each to respond to each question, be sure to thank the panel accordingly following the steps above
<p style="text-align: center; font-weight: bold; color: white;">REFLECT</p>	<p>Learning Outcomes:</p> <p>Members will be aware of a career(s) that utilize(s) plowing knowledge as well as good practice at hosting a guest speaker.</p>
<p style="text-align: center; font-weight: bold; color: white;">APPLY</p>	<p>Processing Prompts:</p> <ul style="list-style-type: none"> - What do you remember most about the presentation? Why is that? - Why is it important to reach out to local people who work in a career that you are interested in? - Was it easy or hard to come up with questions for the speaker? - What was new information for you in the speaker’s presentation? - What did you like about the speaker’s presentation?

ACTIVITY 26: REFLECTING ON THE PLOWING CLUB

DO	<p>Time: 10 minutes</p> <p>Materials/Resources:</p> <ul style="list-style-type: none">– None <p>Instructions:</p> <ul style="list-style-type: none">– Ask members to reflect on their experience in this club– Ask them to complete the following sentences (aloud) and record the answers to help plan for future projects<ul style="list-style-type: none">I joined this club because...o I really enjoyed ...o I didn't enjoy ...o I had a hard time ...o My favourite activity was ...o If I was to take this project again, I would ...o I learned ...o I've changed ...o I'm glad ...– Thank the group for their participation and point out a few personal highlights from the club experience that you have– Ask the group to complete the Project Summary pages in their Record Book with their family and bring the completed summary to the Achievement Day Program. <p>Additional Activity:</p> <p>Record the responses and share them with your fellow Leaders or local committee.</p>
REFLECT	<p>Learning Outcomes:</p> <p>Members will reflect on their experience with this project and the potential impact it will have on their future decisions.</p>