Prairie Agricultural Machinery Institute

DETERMINING OPTIONS TO LOWER MECHANICAL OVERLAP IN SINUOUS RIPARIAN AREAS

Perimeter Obstacles

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Introduction

Riparian areas and wetlands provide many benefits that work towards a balanced and healthy landscape, including water quality, biodiversity, reduced erosion, and wildlife habitat. Efficient agricultural crop production means effective use of time and resources to minimize overapplication of seed, pesticides, and fertilizers while also reducing fuel use. Environmental stewardship retains and properly manages riparian areas and wetlands in order to maintain their natural function.

Irregular shapes of a farmable area increase overlap (the amount of turning required during field operations) and can result in overapplication of seed, pesticides and fertilizers, increased fuel consumption (and thus emissions), and increased work time.

To aid professional staff and producers in selecting ways to minimize overlap without removing or reconfiguring critical natural elements, fact sheets were created. In this fact sheet, a production area with perimeter obstacles is discussed and, to aid in overlap illustrations, a specific example is used.

Glossary of Terms

PERIMETER OVERLAP – Mechanical overlap experienced on the headlands of cropland.

OBSTACLE OVERLAP – Mechanical overlap experienced as an implement traverses around an obstacle in its pass of travel.

THEORETICAL OVERLAP – The best case scenario for mechanical overlap on a parcel of land by assuming "**no**" overlap is seen per pass traveled on the land, and all overlap is associated with perimeter (headland) overlap.

Site Description

The agricultural cropland was two quarter sections with perimeter obstacles on one quarter. The land in the lower right-hand corner of **Figure 1** represents the control field in discussion.

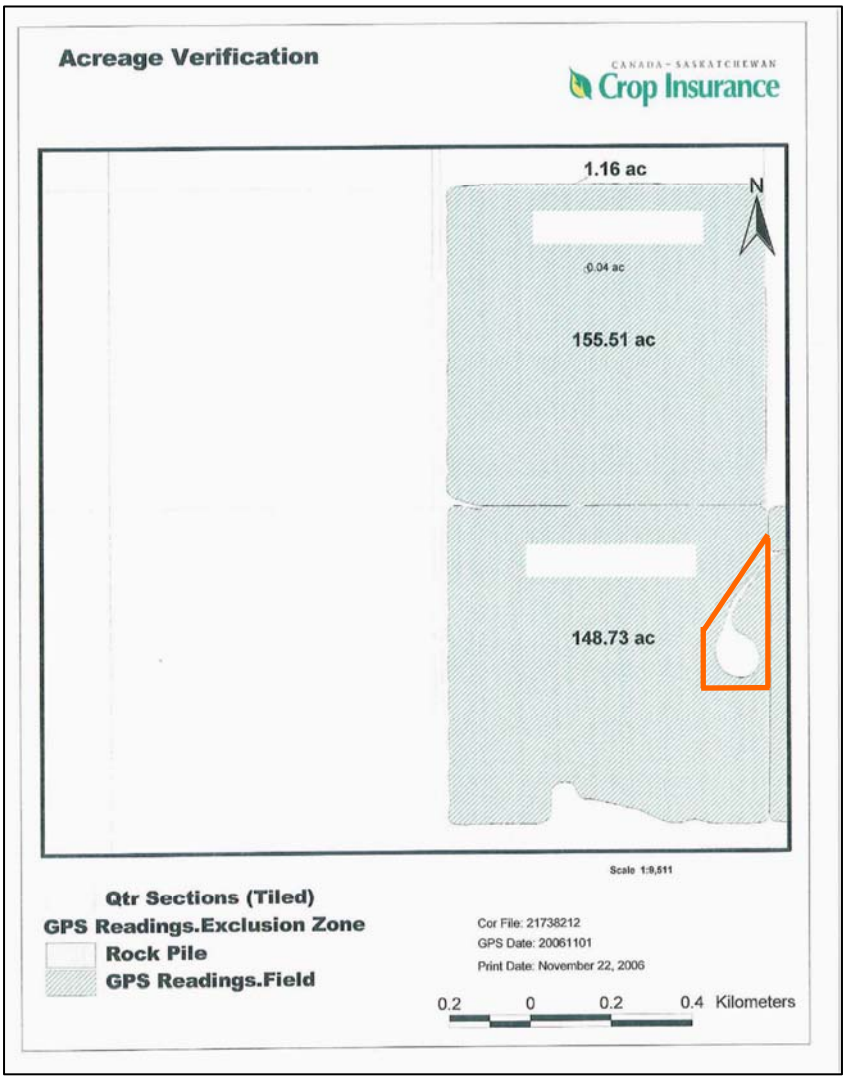

Figure 1. Perimeter Obstacles.

Factors to note when calculating overlap and respective information regarding this study:

Farmable acres — 148.73

Equipment — 52 foot air seeder

Operation — no assisted tracking or auto steer

Recorded acres traveled — 172.28

Overlap acres — 23.55 (15.84%)

Overlap-Reduction Options

1. Auto Steer

It was assumed that the use of a GPS unit with an auto steer system could be set to eliminate the overlap along each pass in the field, which would then equal the theoretical overlap calculation. The theoretical overlap utilizing a 52 foot implement on a quarter section of land with two large edge obstacles with 148.73 farmable acres is 6.00%. Achieving the theoretical overlap would decrease overlap by 9.84% or 14.64 acres. Using an average production cost of $95/acre, then an overlap reduction of 14.64 acres would result in a direct savings of $1,391 without loss of any seeded acres.

2. Equipment Size

The utilization of smaller equipment to reduce mechanical overlap, and as such reduce the overlap of seed, fertilizer, and chemical applications, introduces a time-management factor into the operation. The use of smaller equipment correlates to more time spent in the field; therefore, a balance is required between time, equipment cost, and potential variable cost savings associated with cropping the land.

The theoretical overlap utilizing implements of various widths anticipated through the use of auto steer technology on a quarter section of land with two perimeter obstacles is shown in **Table 1**.

Table 1. Implement Width vs Theoretical Overlap.

Implement Width (ft)	Theoretical Overlap (%)
52	6
48	5.54
42	4.84
38	4.37
26	2.98

The information in this table indicates that reducing the implement width by half also reduces the theoretical overlap by half. Using a 26 foot wide implement would theoretically decrease overlap by 12.86% or 19.13 acres. An overlap reduction of 19.13 acres yields a direct savings of $1,817 without a loss of seeded acres using an average variable production cost of $95/acre.

3. Isolation of Obstacles

A third option is to square off the east side of the field as the perimeter obstacle on the east side extends into the field and isolates a portion of the farmable area. The result of discontinuing farming the area outlined in red is a loss of approximately 30 acres; however, it may yield a minor improvement in overlap and a variable production cost savings in excess of $2,850. The risk of the water in the area outlined expanding during wet years is the reasoning behind isolating the area.

Seeding the estimated 30 acres down to grasses and baling during years with favourable weather conditions has the potential of generating some revenue for the producer as well as responsibly minimizing the introduction of excess nutrients and foreign elements into the riparian zone. The detraction to this option is the potential crop yield loss associated with isolating the 30 acres. Individual farming practices and business operations would be required to weigh the pros and cons associated with isolating the 30 acres of wetland area.

4. Integration

A fourth option in this particular example is to integrate the farmable area of the obstructed quarter section into a land parcel with the adjoining quarter section to make a single half section production area. Cropping the half section reduces the headland requirements by eliminating the border separating the land parcel into two separate quarters. In this case, this land allocation was viable since the same producer managed the adjoining quarter sections with no grid road separating the quarters.

The theoretical overlap utilizing a 52 foot implement on a half section field with two large edge obstacles

and a minor interior obstacle was calculated to be 4.10% or 12.5 acres of the 305.4 farmable acres. Farming the two quarters separately offered an overlap of eight acres on the NW quarter and 24 acres on the SW quarter for a total of 32 acres. The overall theoretical overlap improvement was 19.5 acres. For an average variable production cost of $95/acre, the 19.5 acre reduction in overlap could yield a direct saving of $1,852 without a decrease in seeded acres.

Conclusion

Each producer will need to tailor these options to reduce overlap in his/her particular situation. In this example, however, the most viable option for a producer to achieve as close to theoretical overlap as possible on a quarter section with two large perimeter obstacles would be to employ GPS tracking technology with auto steer ability on the existing equipment owned for the following reasons:

- It allows for integration seamlessly into the existing business unit.
- It requires no investment into new cropping equipment by implementing a smaller equipment strategy.
- It is a technology investment that can be used on equipment at each stage of the cropping process so there is an option to compound its impact.
- It has the ability to assist in time management during each stage of the cropping process because field time can be extended if field conditions are favourable.
- It is a relatively low-cost investment as compared to converting the land to forage and investing in haying equipment.

To further reduce overlap, the producer managing the agricultural cropland also has the option of farming a half section as a single field while utilizing existing equipment with auto steer technology and isolating approximately 30 acres affected by wetlands for alternative uses within the business unit.

Alternative uses for the 30 acres to provide a return on the land that can be investigated are:

- Forage production.
- Tree production.
- Native fruit production.

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Saskatchewan Watershed Authority

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