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Intensified Dryland Cropping Systems for Food and Biofuel Feedstock Production

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Extended Abstract

Production of biofuels on fallowed land will benefit farmers and environment without creating any "food versus fuel" crisis [1]. Camelina has potential to be planted in the fallow period in the predominant wheat-fallow (WW-FAL) cropping system in the Northern Great Plains for annual cropping. In a multi-year field study (2008-2015), we evaluated the sustainability of replacing fallow with camelina in WW-FAL rotation with respect to agronomic, economic, and energetic performance [2]. We also examined how to improve the sustainability of camelina production via optimization of agronomic practices. Replacing fallow with camelina resulted in 13.2% reduction in wheat yield, but the annual cropping produced 907 kg ha^{-1} of camelina seed. WW-CAM also outperformed WW-FAL by 30% greater net energy output and similar energy efficiency. Despite agronomic, energetic, and ecological benefits, economic analysis revealed that at existing market prices and production costs, WW-FAL provides greater net returns to growers due to substantially lower variable costs. We found that there is a good potential to curb production costs of camelina through improving nitrogen fertilization use efficiency and reducing herbicide application. Beside lower production cost, higher grain price (the breakeven of \$0.358 kg^{-1}) and/or greater grain yield are still essential to attract producers to plant camelina. Nevertheless, greater and annually biomass production in WW-CAM system is expected to enhance soil organic matter, higher precipitation use efficiency, and protecting soil against erosion, thus resulting in more agronomic sustainability of the system.

References

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