



United States Department of Agriculture

Economic
Research
Service

Economic
Information
Bulletin
Number 125

May 2014

Multi-Cropping Practices: Recent Trends in Double Cropping

Allison Borchers
Elizabeth Truex-Powell
Steven Wallander
Cynthia Nickerson





United States Department of Agriculture

Economic Research Service

www.ers.usda.gov

Access this report online:

www.ers.usda.gov/publications/eib-economic-information-bulletin/eib-125.aspx

Download the charts contained in this report:

- Go to the report's index page www.ers.usda.gov/publications/eib-economic-information-bulletin/eib125.aspx
- Click on the bulleted item "Download eib125.zip"
- Open the chart you want, then save it to your computer

Recommended citation format for this publication:

Borchers, Allison, Elizabeth Truex-Powell, Steven Wallander, and Cynthia Nickerson. *Multi-Cropping Practices: Recent Trends in Double Cropping*, EIB-125. U.S. Department of Agriculture, Economic Research Service, May 2014.

Cover image: Shutterstock

Use of commercial and trade names does not imply approval or constitute endorsement by USDA.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and, where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



**Economic
Research
Service**

Economic
Information
Bulletin
Number 125

May 2014

Multi-Cropping Practices: Recent Trends in Double Cropping

Allison Borchers, Elizabeth Truex-Powell,
Steven Wallander, and Cynthia Nickerson

Abstract

Over the last decade, growing demand for agricultural commodities—for both food and fuel—has increased the incentives for farm operators to increase production. One way to expand production and potentially increase the return to farming is by intensifying the use of existing cropland. One form of intensification is double cropping—the harvest of two crops from the same field in a given year. From 1999 to 2012 double cropping occurred on about 2 percent of total cropland in most years. Soybeans were, on average, the most common crop found on double-cropped acres over this time period, and, in 2012, winter wheat most commonly preceded these soybean plantings. However, regional and temporal variation is apparent in all double-cropping trends, likely indicating farmers' responsiveness to local conditions and changing market incentives. Although double cropping has the potential to limit the environmental consequences associated with cropland expansion (such as increased soil erosion and loss of wildlife habitat or carbon sinks) as U.S. farmers increase production to meet growing global demand, it also may introduce negative environmental consequences of its own. The trends and analysis provided in this report are intended to support future discussion on the factors influencing its use and help inform discussions about the merits of expanding its use.

Keywords: Multi-cropping; double cropping; June Area Survey; crop combinations

Acknowledgments

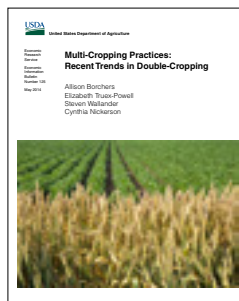
The authors appreciate the reviews by Roger Claassen, USDA, Economic Research Service; Tom Worth, USDA, Risk Management Agency; Art Barnaby, Kansas State University, Agricultural Economics Department; and one anonymous external reviewer. They would also like to thank Maria Williams for editorial input and Cynthia Ray for design support.

About the Authors

Allison Borchers, Steven Wallander, and Cynthia Nickerson are economists in the USDA, Economic Research Service (ERS). Elizabeth Truex-Powell, a former ERS research intern, is currently a PhD candidate in Agricultural, Environmental, and Development Economics at Ohio State University.

Contents

Summary	iii
Introduction	1
Double Cropping As One Type of Multi-Cropping Practice	2
Economic Benefits and Barriers to Double Cropping	4
Double-Cropped Acreage by Region	5
Prevalence of Soybeans in Double-Cropping Combinations	7
Winter Crop Choices by Region	7
Change in Double-Cropped Acreage Over Time	9
Relationship of Programs and Policies to Prevalence of Double Cropping Practices	11
Conclusions	14
References	15



Find the full report at www.ers.usda.gov/publications/eib-economic-information-bulletin/eib125.aspx

Multi-Cropping Practices: Recent Trends in Double-Cropping

Allison Borchers, Elizabeth Truex-Powell, Steven Wallander, and Cynthia Nickerson

What Is the Issue?

Over the last decade, growing demand for agricultural commodities—for both food and fuel—has increased the incentives for farm operators to increase production. One way to expand production is by expanding cropland acres. However, cropland expansion is not without negative environmental consequences. A recent ERS study found that about one-third of the expansion in harvested corn crop acreage represented shifts from hay production, Conservation Reserve Program (CRP) enrollment, or grazing land use—all of which provide important environmental benefits, such as wildlife habitat and carbon reduction.

Another way to expand production and potentially increase the economic returns to farming is to intensify the use of existing cropland. Multi-cropping practices offer various strategies for intensification by allowing multiple uses of a single field during a single time period (such as a calendar year). The four main multi-cropping practices are cover cropping, integrated crop-livestock systems, woodland-based systems (such as woodland pasture and agroforestry), and double cropping.

This report focuses on double cropping, which involves the harvest of two crops from the same field in a given year. Double cropping may substitute for expanding cropland acreage and may have fewer negative environmental consequences. The authors developed a baseline analysis of U.S. double-cropping patterns from 1999 to 2012 and briefly explored the role that farm programs may have in farmers' double-cropping decisions. It is intended to support future discussion on the factors influencing its use and on the merits of expanding its use.

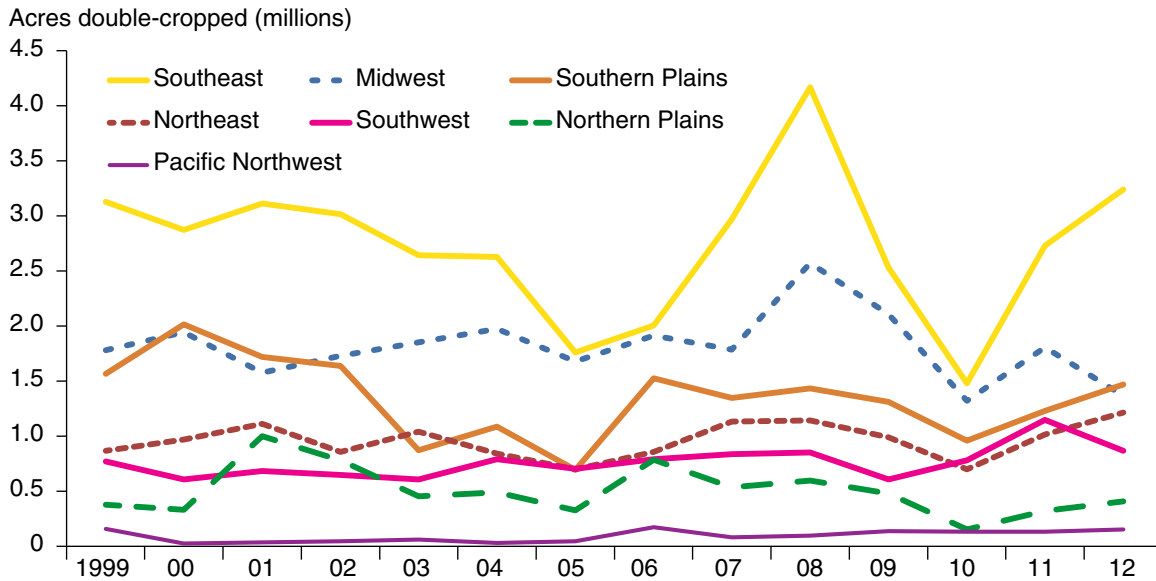
What Did the Study Find?

From 1999 to 2012, double cropping occurred on only about 2 percent of total U.S. cropland in most years, suggesting that relatively few farmers are choosing to adopt this practice. In comparison, from 2006 to 2011, an average of 1 to 2 percent of cropland acres were reported to be cover cropped, and 11 to 26 percent of planted acres for selected crops were grazed following harvest (an example of an integrated crop-livestock system).

The Southeast and Midwest contained the greatest total double-cropped land. The Southeast had about one-third of total U.S. double-cropped acreage (with an average 2.7 million acres), and the Midwest had slightly more than one-fifth (with an average 1.8 million acres). The Pacific Northwest contained the least double-cropped acreage, with an average 92,000 acres. These

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

The Southeast leads the Nation in total double-cropped acreage, 1999-2012



Note: USDA, Economic Research Service calculations of double-cropped acreage using USDA, National Agricultural Statistics Service (NASS) June Area Survey data. Estimates are weighted with NASS-supplied survey weights. Regions were derived from hydrologic unit code boundaries.

regional differences can be partly attributed to factors such as climate. For example, the Southeast's larger acreage share reflects its longer growing season.

Viewed as shares of each region's total cropland, double cropping was most common in the Northeast, Southeast, and Southwest regions. The Northeast had the highest share (with nearly 10 percent of its cropland double cropped, on average), while the Northern Plains had the lowest share (with less than 0.5 percent double cropped, on average). The large Northeast acreage share suggests that the constraints short growing seasons pose to double cropping can be overcome with alternative crop combinations, production practices, or the use of new technologies, such as hybrid seeds.

Changing commodity prices are likely one factor in the decision to double crop. Over time, total double-cropped acreage tracked trends in soybean, winter wheat, and corn prices. When commodity prices were increasing or were relatively high at the time of planting decisions, the total double-cropped acreage also increased.

Slightly more than half of double-cropped acreage included soybeans. Nationally, an average of 53 percent of total double-cropped acres were double cropped with soybeans. Within the Southeast, soybeans represented a much larger share of double-cropped acreage than in other regions.

Crop insurance restrictions—including higher premiums tied to double cropping in some locations, or difficulty obtaining insurance for second crops—may discourage farmers from double cropping. However, if the market or environmental incentives for double cropping change, the crop insurance program has sufficient flexibility to avoid becoming a long-run constraint on double cropping.

How Was the Study Conducted?

The analysis relies primarily on data from the National Agricultural Statistics Service's (NASS) June Area Survey (JAS) to report on these trends. Data were also compiled from the Agricultural Resource Management Survey (ARMS), which is jointly administered by the Economic Research Service (ERS) and NASS, to investigate the double-cropping combinations farmers use. The USDA's Risk Management Agency's (RMA) county-level actuarial master data are explored to discuss the possible impacts of programs and policies on double-cropping decisions.

Multi-Cropping Practices: Recent Trends in Double Cropping

Introduction

Over the last decade, growing demand for agricultural commodities—for both food and fuel—has increased the incentives for farm operators to increase production. One way to expand production is by expanding cropland acres. A recent ERS study found that about one-third of the expansion in harvested corn crop acreage represented shifts from hay production, Conservation Reserve Program (CRP) enrollment, or grazing land use (Wallander et al., 2011). Cropland expansion is not without negative environmental consequences. Land that remains in hay, grazing, and CRP provides important environmental services, such as wildlife habitat (Claassen et al., 2011) and carbon reduction benefits (Horowitz and Gottlieb, 2010).

Another way to expand production and potentially increase the economic returns to farming is by intensifying the use of existing cropland. One form of intensification is double cropping—the harvesting of two crops from the same field in a given year. Increases in double cropping may substitute for expanding cropland acreage and may have fewer negative environmental consequences, although limited evidence exists either to support or refute this claim. In this report, we develop a baseline analysis of regional and temporal variation in double-cropping adoption in the continental United States as a first step to better understand factors influencing its use and help inform discussions about the merits of expanding its use.

Double Cropping As One Type of Multi-Cropping Practice

Double cropping is one practice in a suite of practices known as multi-cropping. Multi-cropping encompasses numerous ways farmers can use one piece of land in a single time period, usually a growing season or calendar year. There are four broad types of multi-cropping: double cropping, cover cropping, integrated crop-livestock systems, and woodland-based systems such as woodland pasture and agroforestry. While all types have financial and environmental implications, they differ in important ways.

Strictly defined “double cropping” refers to the harvesting of two crops or commodities in a calendar year, such as winter wheat in the spring and soybeans in the fall. (See box, “Data and Definitions,” for the more expansive definition used for the analysis in this report.) Some vegetable crops that are sown multiple times per year would count as double cropped, but crops that are sown once and harvested multiple times (such as hay) are generally treated as a single crop with yields reported to account for the multiple harvests. “Cover cropping” involves planting two crops but harvesting only one crop. Among other environmental benefits, cover crops are often used to maintain soil moisture or incorporate organic matter back into the soil. “Integrated crop-livestock systems” involve harvesting one crop and then putting livestock to forage on either residue or a second crop.

“Dual-purpose crops”—a common type of crop-livestock system—are grazed by livestock either before crop maturation or after harvest. Examples of dual-purpose crops are winter wheat and winter rye. “Woodland-based multi-cropping” consists of any system that incorporates trees or tree products. “Agroforestry” is a unique land management approach that intentionally blends agriculture and forestry to enhance productivity, profitability, and environmental stewardship (FS, 2013). “Woodland pasture” is also a common land use that uses woodland for grazing and pasturing livestock while timber products mature. Table 1 shows typical acreages of these multi-cropping systems in the United States.

Table 1

Multi-cropping prevalence varies by practice

	Share of acreage	Estimated acreage
Double cropping ¹	2-3 percent of cropland in a given year	About 6 to 11 million acres in a given year
Cover cropping ²	1-2 percent of cropland	6 to 7.7 million acres
Integrated cropland-livestock systems ²	11-26 percent of planted acreage for selected crops is grazed following harvest	Over 20 million acres based on corn and winter wheat estimates
Woodland-based systems:		
Agroforestry (alley cropping, multi-story cropping, silvopasture) ³	Not available	About 15,000 acres in 2011 (includes acres enrolled in USDA programs only)
Woodland pasture ⁴	38 percent of woodland in farms; varies significantly by region.	About 28 million acres

Sources: ¹USDA, Economic Research Service (ERS) estimates based on 1999-2012 June Area Survey; ²ERS estimates based on 2006-2011 Agricultural Resource Management Survey; ³data provided by the USDA Forest Service; ⁴ERS estimates based on 2007 Census of Agriculture.

Each type of multi-cropping practice has distinct costs and benefits, including adoption incentives arising from policy and market interactions. Each practice also carries unique environmental implications. Because double cropping intensifies production more clearly than do other multi-cropping practices, it is unique from a policy perspective. USDA policies that could influence double cropping (such as crop insurance and commodity programs) tend to be distinct from USDA policies that target cover cropping or agroforestry adoption (such as conservation programs). For that reason, this report focuses on the trends, possible drivers, and policy implications of double cropping.

Data and Definitions

This report mainly relies on data from the National Agricultural Statistics Service (NASS) June Area Survey (JAS), which collects information on acreage and land use from farmers each June. The JAS is based on a probability area frame with an annual sample of about 11,000 “segments” of approximately 1 square mile. The JAS segment-level data identify acres of land use by category—cropland (including by crop type), pasture, woodland, idled land as well as other land. The JAS data also include farm operation information, including land uses, production specialties, farm real estate values, and more. Data are collected from all farmers operating within the sampled segments, and segments are surveyed longitudinally over several consecutive years. This report analyzes data from the years 1999 through 2012.

Farmers are asked about the total acreage on which they double crop. In this report, the term “double cropping” follows the JAS definition. While a more strict definition of double cropping involves *harvesting* two crops or commodities, such as soybeans following wheat, the JAS questionnaire uses a slightly more expansive definition of double cropping: “two crops planted in this field or two uses of the same crop.” It is possible the survey captures a broader definition of double-cropping including harvest and forage systems that are more typically considered crop-livestock systems, as well as cover cropping. To test whether JAS-based numbers reflect actual harvesting of multiple crops, the JAS estimates were compared to estimates based on the 2007 Census of Agriculture. Whereas JAS asks explicitly about double cropping, the census does not. Estimates of double cropping from the census can be inferred only by comparing harvested acreages to total land in production. This method of inferring double-cropped acreage produces a census-based estimate that is 7 percent larger than the 2007 JAS-based estimate, suggesting the JAS data conservatively estimates double-cropping activity.

The JAS also elicits data on the acreage of double-cropped soybeans, which is analyzed in this report, but it does not provide information on the double-cropping combinations farmers use. To close that data gap, this report also analyzes data from the Agricultural Resource Management Survey (ARMS), an annual, nationally representative survey jointly administered by ERS and NASS. ARMS includes a field based, crop-specific survey that captures detailed crop sequence histories. Because different crops are targeted in different years, this report examines the history of prior winter crops for fields that were sown with spring crops of corn in 2010 and soybeans in 2012.

Economic Benefits and Barriers to Double Cropping

In 2012, U.S. farmers double cropped about 2.2 percent of cropland, or 8.7 million acres, slightly more than the average of 8.2 million acres double cropped during the 1999-2012 period. Between years and across regions, the prevalence of double cropping varied considerably as farmers responded to local conditions, such as weather, climate, and market incentives.

Both economic and environmental concerns motivate the recent interest in double cropping (Searchinger et al., 2013; Siebert et al., 2010). Besides avoiding the negative environmental consequences sometimes associated with cropland expansion, increases in double cropping may offer other environmental or economic benefits. For example, in some applications, double cropping can reduce fertilizer requirements (Heggenstaller et al., 2008). Also, by reducing the exposure of soil between harvest periods, double cropping can help protect soil from wind and water erosion. However, in other cases, double cropping may require additional inputs, such as pesticides, herbicides, fertilizer, irrigation water, or use of conventional tillage, which can have negative environmental impacts.

Economic benefits of double cropping include the potential of additional revenue from a second crop on the same land base. Increased returns may derive from selling a second commodity, particularly if fixed costs (such as tractors) can be spread over more production (Beuerlein, 2001). Plus, technological advances such as early maturing seed varieties and no-till equipment may facilitate the adoption of double cropping (Shapiro, Brorsen, and Doster 1992) and make it more economically viable.

However, the fairly low adoption rate for double cropping suggests economic barriers limit its use. Although a second crop can provide additional revenue, it often lowers per-crop yields because of the potentially shortened growing time available for each crop, which can reduce the farm's total annual revenue potential (Egli and Bruening, 2000).

In addition, production costs may increase when adding a second crop, and in some situations, double cropping may be riskier than growing a single crop. For example, double cropping may be more susceptible to moisture and weather variations within the growing season, and therefore, yields might be more variable (Burton et al., 1996). These barriers to double-cropping adoption may be reinforced by Federal crop insurance or commodity program provisions that exempt double-cropped fields from program participation if farms are located in areas where the chosen double-cropped combinations are not widely accepted as a viable practice by local agricultural experts.

Much of the evidence on which farmers double crop (and if so, how often) is anecdotal. Climate differences undoubtedly help explain differences in double cropping where regions with longer growing seasons provide more double-cropping opportunities (Shapiro et al., 1992). Similarly, fluctuations in annual weather may influence differences across years. For example, warmer winters or springs allow more farmers in a given region to follow their winter crops with a spring crop. Commodity prices may also play a role, with higher prices providing larger incentives to double crop (Marra and Carlson, 1990).

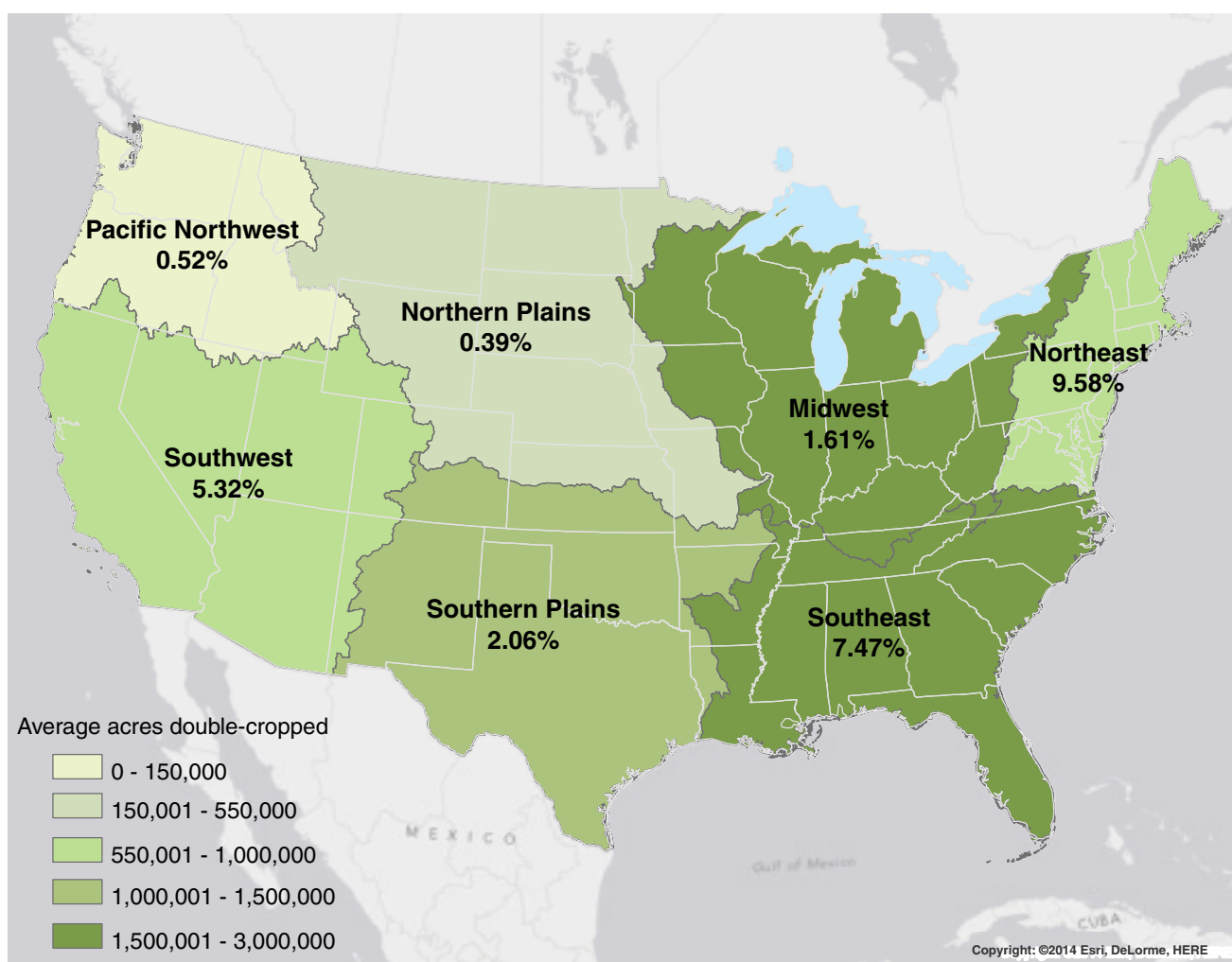
Double-Cropped Acreage by Region

The prevalence of double cropping varies notably by region. In total double-cropped acreage, the Southeast, Midwest, and Southern Plains regions lead the country (fig. 1). On average, about one-third of the total double-cropped acreage over 1999-2012 was in the Southeast (2.7 million acres on average), and slightly more than one-fifth was in the Midwest (1.8 million acres on average).

However, relative to each region's total cropland acreage, the Northeast, Southeast, and Southwest all demonstrate larger shares of cropland use in double cropping than the remaining regions (fig. 1). The Northeast had the largest share of double-cropped acreage (nearly 10 percent, on average, of the region's total cropland), and the Northern Plains had the smallest (less than 0.5 percent on average).

Figure 1

Average double-cropped acreages vary by region, 1999-2012



Note: On the map, the colors correspond to the average acres double cropped, while the labels show average double-cropping acreages as a percent of each region's total cropland acreage. Region boundaries are derived from U.S. Geological Survey hydrologic unit code boundaries.

Source: USDA, Economic Research Service calculations made using USDA, National Agricultural Statistics Service (NASS) June Area Survey data from 1999-2012. Estimates are weighted with NASS-supplied survey weights.

Regional differences could be partly attributed to factors such as climate. The Southeast's larger acreage share may reflect its longer growing season. However, the extent to which shorter growing seasons pose a constraint depends on which crop combinations are considered. Farmers in higher latitudes, which have shorter growing seasons, regularly grow winter crops. Although some common double-cropping combinations might not do well in those regions, the large acreage share in the Northeastern States suggests that growing season constraints can be overcome with alternative combinations or production practices. As research on double-cropping management practices and combinations continues and hybrid seed varieties (such as early maturing varieties that can reduce the negative yield impacts) become more available, more opportunities to double crop could appear throughout the country.

Prevalence of Soybeans in Double-Cropping Combinations

Over 1999-2012, an average of 53 percent of total double-cropped acres were double cropped with soybeans. The Southeast contained a much larger share of acres double cropped with soybeans than did other regions (table 2). From 1999 to 2012, soybeans represented 75 to 91 percent of double-cropped acreage in the Southeast but only 40 to 62 percent in the Northeast.

Table 2

Soybeans form a much greater share of double-cropped acres in the Southeast than in other regions

Region	Percentage of double-cropped acres that include soybeans, 1999-2012		
	Average	Minimum	Maximum
Southeast	83	75	91
Midwest	56	44	74
Northeast	49	40	62
Northern Plains	34	17	54
Southern Plains	31	14	48
Pacific Northwest	N/A	N/A	N/A
Southwest	N/A	N/A	N/A
National	53	44	65

Note: Estimates are weighted with USDA, National Agricultural Statistics Service (NASS)-supplied survey weights. Region definitions are derived from U.S. Geological Survey hydrologic unit code boundaries. N/A = Not available.

Source: USDA, Economic Research Service calculations made using NASS June Area Survey data.

Winter Crop Choices by Region

Soybeans are widely recognized as a common spring crop in double-cropped rotations, particularly in combination with winter wheat. To determine how widely this rotation and other common combinations are used, we examined the Agricultural Resource Management Survey (ARMS) (see box, “Data and Definitions”). Estimates based on the smaller regions (used in table 2) were less reliable because of ARMS’s smaller sample sizes and the limited prevalence of double cropping. Therefore, estimates to consider regional variation in double-cropping combinations were based on two broad regions, Northern and Southern States (as defined in table 3).

Table 3

Winter wheat is the most common winter crop to precede soybeans and corn

Share of double-cropped acreage by prior crop (percent)

Soybeans in 2012				Corn in 2010					
Region	Winter wheat	Rye	Other crops ¹	Winter wheat	Rye	Alfalfa and other hay	Oats	Clover and other grasses	Other crops ¹
Northern ^{2,3}	60.9	19.4	19.7 ⁴	26.0	53.0	4.4	5.5	1.8	9.3 ⁵
Southern ^{6,7}	83.5	2.5	14.0 ⁸	63.3	24.4	1.5	3.0	0.8	6.7 ⁹

Note: Estimates are weighted with USDA, National Agricultural Statistics Service-supplied survey weights.

¹“Other crops” are aggregated due to the limited sample size of farms engaging in double cropping.

²Northern States in the soybean sample are IL, IN, IA, MI, MN, NE, ND, OH, SD, and WI.

³Northern States in the corn sample are IL, IN, IA, MI, MN, NE, NY, ND, PA, OH, SD, and WI.

⁴Includes (in descending order of estimated acreage) alfalfa, other grasses, oats, other hay, triticale, and barley.

⁵Includes (in descending order of estimated acreage) barley, vegetables, triticale, buckwheat, and radishes.

⁶Southern States in the soybean sample are AR, KS, KY, LA, MS, MO, NC, TN, and VA.

⁷Southern States in the corn sample are CO, GA, KS, KY, MO, NC, and TX.

⁸Includes (in descending order of estimated acreage) sorghum, barley, sugarcane, oats, clover, triticale, other hay, alfalfa, and Austrian peas.

⁹Includes (in descending order of estimated acreage) barley, sorghum, triticale, dry peas, and vegetables.

Source: USDA, Economic Research Service calculations based on the Agricultural Resources Management Survey Phase II in 2010 (corn) and 2012 (soybeans).

In both regions, winter wheat is the most common winter crop used in combination with soybeans. An estimated 84 percent of double-cropped soybean acreage in the South and 61 percent in the North followed winter wheat in 2012 (table 3). The pattern is similar when the second crop is corn. In 2010, winter wheat preceded 63 percent of double-cropped corn acreage in the South and 26 percent in the North.

In Northern areas where winter wheat is less attractive for double-cropping, rye is often used instead. Rye-corn is the most common combination for double-cropped corn in the North, representing just over half of total double-cropped corn acres in 2010. In some Northern areas, such as New England, the harvest of rye for silage rather than grain may drive the prevalence of this combination.

Beyond the four most common combinations—winter wheat-corn, winter wheat-soy, rye-corn, and rye-soy—farmers use many other double-cropping combinations. Hay-corn, oats-corn, and clover/other grasses-corn are all observed in the ARMS data, in addition to many other crop combinations (as noted in table 3).

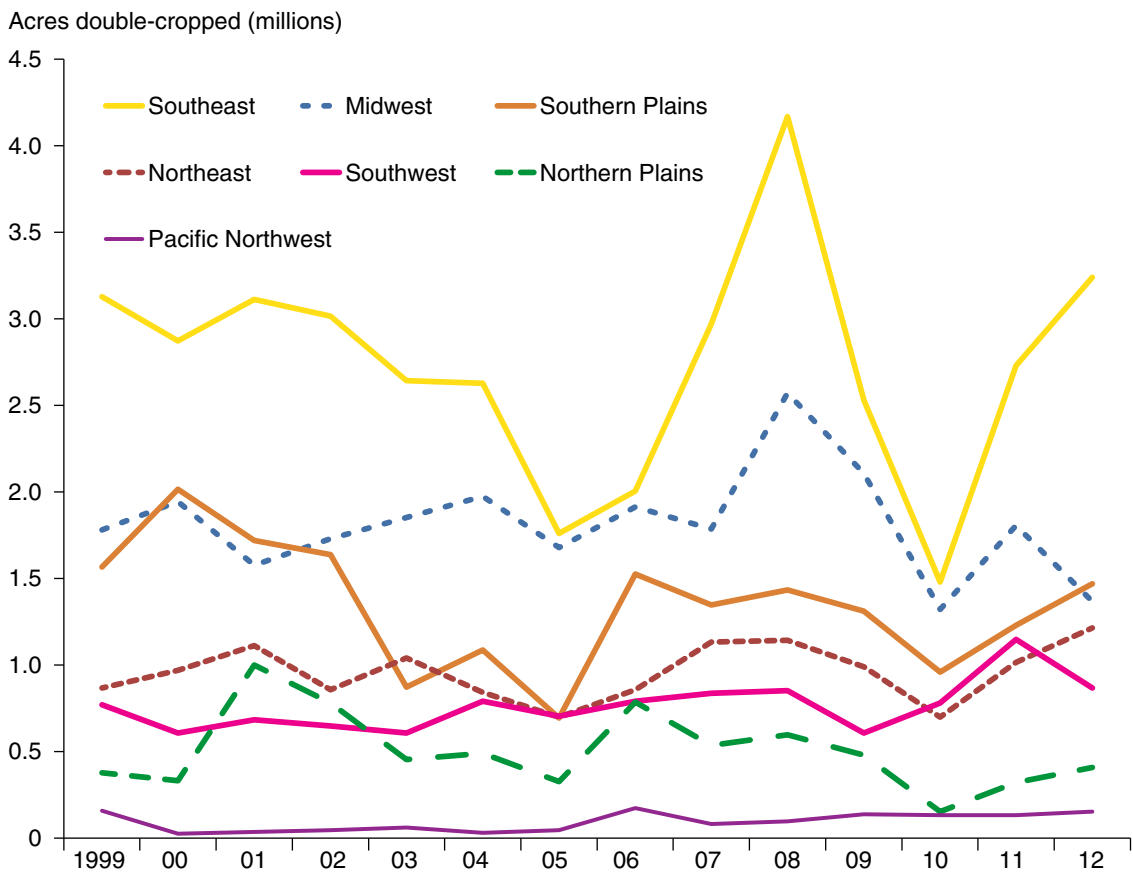
Change in Double-Cropped Acreage Over Time

Double-cropped acreage has varied from year to year. In 2008, almost 10.9 million acres were double cropped nationally, marking the greatest annual double-cropped acreage between 1999 and 2012. In 2010, double-cropped acreage was at its lowest during this time period, with only 5.5 million acres.

Because decisions about double cropping are made annually, fluctuations are likely as farmers respond to changing market and weather conditions. Higher commodity prices, for example, give farmers more incentive to intensify production and could offset revenue shortfalls from lower potential yields when double cropping. From 2004 to 2012, total double-cropped acreage parallels soybean, winter wheat, and corn prices. When commodity prices at the time of planting decisions were increasing or relatively high, total double-cropped acreage also increased. Total double-cropped acreage peaked at 10.9 million acres in 2008, when prices for soybeans, winter wheat, and corn also peaked. In 2005 and 2010, nearly every region witnessed declines in double-cropped acreage (fig. 2) amid commodity price declines (fig. 3).

Figure 2

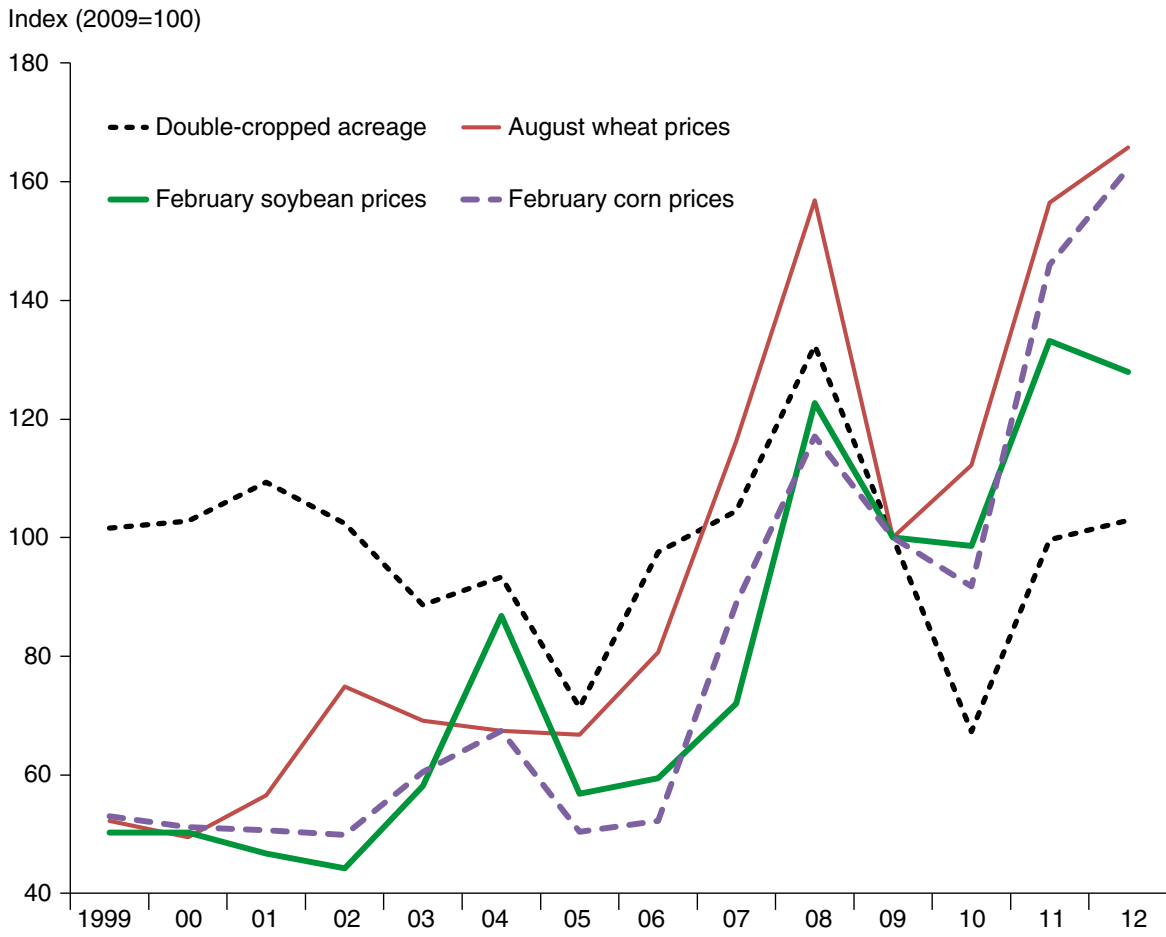
The Southeast leads the Nation in total double-cropped acreage, 1999-2012



Note: Estimates are weighted with USDA, National Agricultural Statistics Service (NASS)-supplied survey weights. Regions are derived from U.S. Geological Survey hydrologic unit code boundaries (see figure 1).

Source: USDA, Economic Research Service calculations of double cropping acreage based on NASS, June Area Survey.

Figure 3
Changes in double-cropped acreage roughly mirror commodity prices



Source: USDA, National Agricultural Statistics Service June Area Survey; USDA, Economic Research Service Historical Forecast Prices.

Relationship of Programs and Policies to Prevalence of Double-Cropping Practices

USDA policies can influence farmer decisions about whether or not to double crop. Agronomic research, supported by Federal funds, may encourage double cropping over the long run by developing crop varieties or production practices that help overcome technological or other barriers. For example, new barley cultivars allow for greater timing flexibility and decreased inputs resulting in improved profitability of double-crop options (USDA, National Institute of Food and Agriculture, 2013). Conversely, Federal commodity programs and farm safety net programs include provisions that may reduce the incentives to double crop by reducing commodity payments, increasing premium costs, or restricting program eligibility. For example, double cropping fruits and vegetables on base acres was eligible for direct and countercyclical program payments only in regions with a history of double cropping (Johnson et al., 2006, p. 3).

Because farm income can vary widely with fluctuating prices, yields, weather, and pests, many farmers use crop insurance to manage these risks. Over 83 percent of planted soybean, corn, and wheat acres were enrolled in some type of Federal crop insurance program in 2012 (FCIC, 2013B; NASS, 2013). Crop insurance coverage related explicitly to double cropping changed from 1999 to 2012. The importance of having crop insurance suggests that changes in Federal insurance coverage will affect double-cropping decisions.

Insurance policies administered by USDA's Risk Management Agency (RMA) are available for specific crops at federally subsidized rates, but RMA insurance programs include provisions that may have implications for double-cropping practices. All RMA insurance provisions are designed under the expertise of agronomists and vary by region to accommodate the significant regional diversity in crop production best practices. For example, RMA's *Crop Insurance Handbook* indicates that, whether or not a first crop is insured, for a second crop to be insured, double cropping must (at a minimum) be "a practice that is recognized by agricultural experts...in the area" where the farm is located (FCIC, 2014, paragraph 611). In addition, both crops must be covered in the county and, subject to a few exceptions, producers must usually provide records demonstrating a history of double cropping. These provisions are in place so that good—and not risky—farming practices are insured. Nevertheless, these provisions may affect double-cropping decisions in two ways.

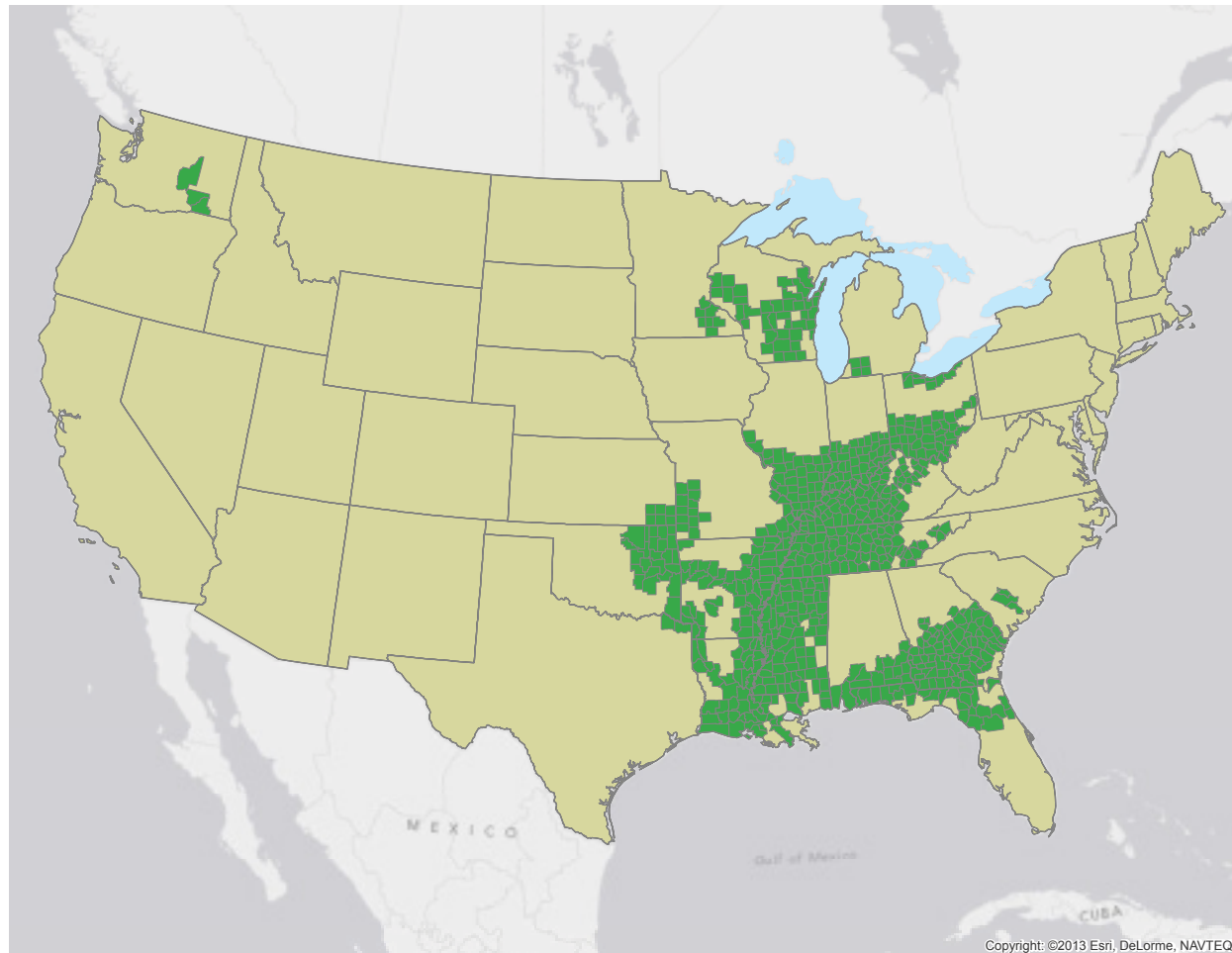
First, where double cropping is insurable, RMA often provides county-specific actuarial ratings based on a double-cropping ("following another crop") practice to account for the differences in expected yield and in production risk. However, county-specific ratings are available in only 689 of the 2,281 counties with any crop insurance ratings (fig. 4). Generally, these ratings result in higher premiums to insure the primary crop when double cropping, a potential disincentive for farmers considering double cropping, but designed to reflect the underlying risk associated with the practice.

Second, in the majority of counties (those not highlighted in figure 4), if a farmer chooses to double crop, the second crop may not be insurable unless it can be insured through written agreement (FCIC, 2013A, paragraph 49), since a standard policy is not available. The non-standardized nature of obtaining insurance for a second crop may make farmers in these counties less responsive to higher commodity prices and weather conditions favorable for double cropping.

Currently, counties without double-cropping insurance coverage tend to have less historical precedent for double cropping. However, the Federal crop insurance programs are flexible enough to evolve as changes in technological, market, or climate conditions support expansion of double crop-

Figure 4

Most counties do not have USDA, Risk Management Agency double-cropping actuarial ratings



Note: Double-cropping ratings are in effect for the following crops: cotton, beans, grain sorghum, soybeans, and buckwheat. Counties with at least one double-cropping actuarial rating in 2012 are shown in dark green.

Source: USDA, Economic Research Service calculations based on Risk Management Agency (RMA) actuarial rating data for 2012 (http://www.rma.usda.gov/ftp/References/actuarial_data_master/).

ping into areas where it was previously uncommon. Indeed, between 1999 and 2012, RMA expanded the number of counties with double-cropping actuarial ratings for dry beans, cotton, and, especially, soybeans, based on recognition by agricultural experts. RMA also reduced the number of counties with ratings for double-cropped sorghum (table 4). A policy challenge for the crop insurance program is to continue to decide whether and when to extend insurance to additional counties to avoid imposing disincentives on farmers wishing to double crop without unintentionally subsidizing risky farming practices through insurance coverage and premium levels that are not actuarially sound. Testing the impact of crop insurance coverage on double-cropping decisions is beyond the scope of this report, which is targeted at developing baseline numbers on adoption rates, but the recent changes in actuarial ratings for double cropping suggest that a lack of flexibility in insurance policy is not a longrun constraint on double cropping.

Table 4

Counties with RMA double-cropping insurance ratings have changed over time*Number of U.S. counties with RMA double-cropping insurance ratings*

Crop	in 1999	Change by 2012
Beans	44	+3
Cotton	125	+1
Soybeans	186	+323
Sorghum	80	-23

Source: USDA, Economic Research Service calculations based on USDA, Risk Management Agency (RMA) actuarial rating data for 1999 and 2012 (http://www.rma.usda.gov/ftp/References/actuarial_data_master/).

Conclusions

From 1999 to 2012, double-cropped acreage did not rise with any discernible long-term trend—nationally, double cropping occurred on about 2 percent of total cropland in most years. However, regional and temporal variation is apparent, likely indicating farmers’ responsiveness to local conditions and market incentives. Higher rates of double cropping in some regions likely stem from longer growing seasons. Changes in commodity prices and weather conditions also likely contribute to variation in double-cropped acreage from year to year. Crop insurance restrictions—including higher premiums tied to double cropping in some locations or difficulty obtaining insurance for second crops—may discourage farmers from double cropping. However, changes over time in actuarial ratings for double cropping demonstrate that the crop insurance program has sufficient flexibility to avoid becoming a longrun constraint on double cropping if the market or environmental incentives for double cropping change.

Although double cropping may introduce negative environmental consequences of its own, double cropping has the potential to limit the environmental consequences associated with cropland expansion (such as increased soil erosion and loss of wildlife habitat or carbon sinks) as U.S. farmers increase production to meet growing global demand. Despite the fact that at least some farmers in every region of the country find double cropping profitable, the majority of cropland acres are not double cropped. Future research may illuminate the barriers to double cropping, further explore the impact of Federal programs and policies on double-cropping decisions, and continue to examine the merits of expanding its use.

References

- Beuerlein, J. 2001. "Relay Cropping Wheat and Soybeans." *Extension Fact Sheet*. Columbus: Ohio State University. (<http://ohioline.osu.edu/agf-fact/0106.html>).
- Burton, R., M. Crisostomo, P. Berends, K. Kelley, and O. Buller. 1996. "Risk/Return Analysis of Double-Cropping and Alternative Crop Rotations With and Without Government Programs." *Review of Agricultural Economics* 18(4): 681-692.
- Claassen, R., F. Carriazo, J. Cooper, D. Hellerstein, and K. Ueda. 2011. *Grassland to Cropland Conversion in the Northern Plains: The Role of Crop Insurance, Commodity, and Disaster Programs*, ERR-120, U.S. Department of Agriculture, Economic Research Service. Available at: <http://www.ers.usda.gov/publications/err-economic-research-report/err120.aspx>
- Dale, B.E., B.D. Bals, S. Kim, and P. Eranki. 2010. "Biofuels Done Right: Land Efficient Animal Feeds Enable Large Environmental and Energy Benefits," *Environmental Science and Technology* 44: 8385-8389.
- Egli, D.B., and W.P. Bruening. 2000. "Potential of Early-Maturing Soybean Cultivars in Late Plantings," *Agronomy Journal* 92: 532-537.
- Heaton, E.A., L.A. Schulte, M. Berti, H. Langeveld, W. Zegada-Lizarazu, D. Parrish, and A. Monti. 2013. "Managing a second-generation crop portfolio through sustainable intensification: Examples from the USA and the EU," *Biofuels, Bioproducts and Biorefining* 7.
- Heggenstaller, A.H., R.P. Anex, M. Liebman, D.N. Sundberg and L.R. Gibson. 2008. "Productivity and Nutrient Dynamics in Bioenergy Double-Cropping Systems," *Agronomy Journal* 100: 1740-1748.
- Horowitz, J., and J. Gottlieb. 2010. *The Role of Agriculture in Reducing Greenhouse Gas Emissions*, EB-15, U.S. Department of Agriculture, Economic Research Service.
- Johnson, D., B. Krissoff, E. Young, L. Hoffman, G. Lucier, and V. Breneman. 2006. *Eliminating Fruit and Vegetable Planting Restrictions: How Would Markets Be Affected?*, ERR-30, U.S. Department of Agriculture, Economic Research Service. <http://www.ers.usda.gov/publications/err-economic-research-report/err30.aspx>
- Marra, M. and G. Carlson. 1990. "The Decision to Double Crop: An Application of Expected Utility Theory Using Stein's Theorem," *American Journal of Agricultural Economics* 72(2): 337-345.
- Searchinger, T., C. Hanson, J. Ranganathan, B. Lipinski, R. Waite, R. Winterbottom, A. Dinshaw, and R. Heimlich. 2013. *Creating a Sustainable Food Future: Interim Findings*. Washington, DC: World Resources Institute. Available at: <http://www.wri.org/publication/creating-sustainable-food-future-interim-findings>
- Shapiro, B., B. Brorsen, and D. Doster. 1992. "Adoption of Double-Cropping Soybeans and Wheat," *Southern Journal of Agricultural Economics* 24(2): 33-40.
- Siebert, S., F.T. Portmann, and P. Doll. 2010. "Global Patterns of Cropland Use Intensity," *Remote Sensing* 2(7): 1625-1643.

- U.S. Department of Agriculture, Risk Management Agency, Federal Crop Insurance Corporation (FCIC). 2014. *Crop Insurance Handbook*. http://www.rma.usda.gov/handbooks/18000/2014/14_18010-1h.pdf
- U.S. Department of Agriculture, Risk Management Agency, FCIC. 2013A. *Loss Adjustment Manual Standards Handbook*. http://www.rma.usda.gov/handbooks/25000/2013/13_25010-2h.pdf
- U.S. Department of Agriculture, Risk Management Agency, FCIC. 2013B. *Summary of Business*. <http://www3.rma.usda.gov/apps/sob/>
- U.S. Department of Agriculture, Forest Service (FS). <http://www.fs.fed.us/research/agroforestry/>
(Last updated March 28, 2013)
- U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). 2013. *Quick Stats Tool*. http://www.nass.usda.gov/Quick_Stats/
- U.S. Department of Agriculture, NASS. 2010. *Field Crops Usual Planting and Harvesting Dates*. <http://usda01.library.cornell.edu/usda/current/planting/planting-10-29-2010.pdf>
- U.S. Department of Agriculture, National Institute of Food and Agriculture (NIFA). 2013. *A Few Examples of Recent High-Impact Outcomes of NIFA Investments*. <http://www.csrees.usda.gov/Impact%20Report%20R7.pdf>
- Wallander, S., R. Claassen, and C.J. Nickerson. 2011. *The Ethanol Decade: An Expansion of U.S. Corn Production, 2000-2009*. U.S. Department of Agriculture, Economic Research Service, Rep. EIB-79.