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Evaluation of farm programmes in the 2014 US farm bill

A REVIEW OF THE LITERATURE

OECD

OECD FOOD, AGRICULTURE AND FISHERIES PAPERS

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EVALUATION OF FARM PROGRAMMES IN THE 2014 US FARM BILL: A REVIEW OF THE LITERATURE

OECD

Main changes to US farm programmes under the 2014 Farm Bill aim to strengthen instruments for risk management, both in commodity and in crop insurance programmes. In addition, the 2014 Farm Bill consolidated voluntary conservation programmes supporting agricultural land preservation and the adoption of environmentally friendly production practices. In the literature reviewed, analysts generally acknowledge the reinforced capacity of farm programmes to reduce farm revenue losses and the diversity of options offered to farmers to manage risk. They also discuss farmers' choices of participation in programmes and coverage level in terms of optimisation of their benefits. They also outline the scope for higher budget costs if prices keep falling, but note that some provisions limit the increase. Regarding the impact of programmes on land and markets, the consensus is that by design, the two new crop commodity programmes do not influence current planting decisions, but they could generate small wealth and risk effects. Similarly the new dairy programme could affect the decisions of risk adverse farmers. Support to crop insurance on the other hand is based on current parameters, and unlimited, thus it is expected to encourage higher input use to maximise profit, in addition to the wealth and risk effects. Empirical analyses find very small effects of crop insurance subsidies on total land use, but some suggest a non-negligible impact on crop rotation, and variable input use. Overall, the literature finds that conservation payments seem to have had a positive impact on the environment. In particular, they have encouraged farmers to adopt more environmentally-friendly practices and address a broader set of environmental objectives. Some experts note, however, that some programmes may not necessarily bring additional benefits. Experts consider that cross-compliance mechanisms have partly contributed to reduce soil erosion by encouraging farmers to use less erosive cropping practices (e.g. conservation tillage, conservation crop rotations) and to retire particularly erodible land.

JEL classification: Q18

Keywords: Agricultural policy, risk management, crop insurance, conservation programmes

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Executive summary

Farm programmes that deliver payments directed to farmers for the period 2014-18 are authorised under the 2014 Farm Bill. They are covered under three of the twelve Farm Bill titles: Commodities, Crop insurance and, Conservation. The main changes, which concern individual programmes within the commodity and crop insurance titles, aim to strengthen instruments for risk management.

Changes to the commodity title include the introduction of two new crop commodity programmes under the Commodities title: the price loss coverage program (PLC) and the Agricultural Risk Coverage program (ARC), which make payments to historical base area for main crops, when prices fall below a fixed reference for PLC and when revenues fall below benchmark levels for ARC. Farmers had to choose between ARC and PLC for the duration of the Farm Bill. Most opted for ARC for the maize and soybeans base area. Replacing former dairy price and income support programmes, a new Margin Protection Program for Dairy (MPP-Dairy) delivers payments if the margin between milk prices and feed costs falls below a chosen coverage level. Moreover, four supplemental disaster assistance programmes for orchard and nursery stock and livestock and livestock forage loss are made permanent.

The crop insurance title extends most of the previous crop insurance instruments and offers additional programmes: the Supplemental Coverage Option (SCO) available for a wide variety of crops, as long as producers do not have base acres for that crop enrolled in ARC; and the Stacked Income Protection Plan (STAX) for upland cotton producers. In addition, specific and more favourable conditions are made for beginning farmers and ranchers, i.e. with less than five years of experience, and cross-compliance is extended to crop insurance.

Voluntary conservation programmes support agricultural land preservation and the adoption of environmentally friendly production practices. The 2014 Farm Bill consolidated voluntary conservation programmes into a smaller number, but most previous options remain in place.

The budgetary cost of risk management programmes depends on farmers' election choices and market conditions. The literature reviewed discusses the potential costs for the government budget of new programmes under different market price assumptions. Many analysts outline the scope for higher budget costs if prices keep falling, but note that some provisions limit the increase.

Analysts generally acknowledge the reinforced capacity of farm programmes to reduce farm revenue losses and the diversity of options offered to farmers to manage risk. They also discuss farmers' choices of participation in programmes and coverage level in terms of optimisation of their benefits.

Some studies examine the distribution of benefits across farms and region. The main issue outlined is about high-risk farmers and regions receiving, on average, larger subsidies from crop insurance than low-risk ones. This is because the subsidy is a fixed share of the premium, and increases with the premium level. However, this could encourage them to continue using risky practices and discourage them from adopting more sustainable ones. More generally, the role of the government in crop insurance is also widely debated from a theoretical and practical point of view.

The literature also discusses the impact of programmes on land and markets. The consensus is that by design, the two new crop commodity programmes do not influence current planting decisions, but they could generate small wealth and risk effects. Similarly the new dairy programme could affect the decisions of risk adverse farmers. Support to crop insurance on the other hand is based on current parameters, and unlimited, thus it is expected to encourage higher input use to maximise profit, in addition to the wealth and risk effects. Empirical analyses find very small effects of crop insurance subsidies on total land use, but some suggest a non-negligible impact on crop rotation, and variable input use.

Overall, the literature finds that conservation payments seem to have had a positive impact on the environment. In particular, they have encouraged farmers to adopt more environmentally-friendly practices and address a broader set of environmental objectives. Some experts note, however, that some programmes may not necessarily bring additional benefits. Experts consider that cross-compliance mechanisms have partly contributed to reduce soil erosion by encouraging farmers to use less erosive cropping practices (e.g. conservation tillage, conservation crop rotations) and to retire particularly erodible land.

1. MAIN CHARACTERISTICS OF THE 2014 FARM BILL

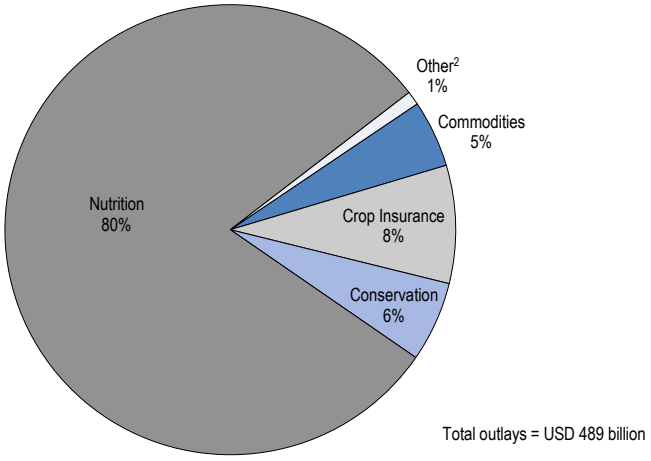
Farm programmes in the 2014 Farm Bill

The current Agricultural Act of 2014 (2014 Farm Bill), which covers the period 2014-18, included 12 titles authorising policies and spending levels for programmes related to commodity support, conservation, trade, nutrition (domestic food assistance), agricultural credit, rural development, research and extension, energy, specialty crops,[1] crop insurance, and miscellaneous administrative and specialised provisions (US Government, 2014). This report focuses on the programmes providing commodity (Title I), conservation (Title II) and crop insurance (Title XI) payments to US farmers (Box 1.1).

According to 2014 Congressional Budget Office (CBO) projections, farm programmes were expected to account for 19% of the total 2014 Farm Bill projected budgetary outlays, most of the remaining corresponding to nutritional programmes (Figure 1.1). Crop insurance programmes were projected to account for 45% of farm programme budget outlays, conservation programmes for 30% and commodity programmes for 25%.[2] More recent projections of budget outlays for farm programmes from January 2017 estimated a higher share for commodity programmes, which include disaster payments (39%), a slightly lower share for conservation programmes (28%) and a much lower share for crop insurance premium (32%) for the period 2014-18, including actual expenditure for 2014-16 (CBO, 2017).

Figure 1.1. Composition of projected 2014 Farm Bill budget outlays

Projected outlays under the 2014 Farm Bill, 2014-18, 2014 estimates[1]



1. Projections are updated at least once a year for nutrition and farm programmes. January 2017 estimates for farm programmes are reported in the text and other graphs.
2. "Other" includes foreign agriculture, credit, rural development, research and extension, food safety, and marketing and regulatory programmes.

Source: USDA Economic Research Service using data from US Congressional Budget Office (2014), Cost estimates for the Agricultural Act of 2014, January 2014, www.cbo.gov/sites/default/files/113th-congress-2013-2014/costestimate/hr2642lucasltr00.pdf.

1. USDA defines specialty crops as "fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture)" (Paggi, 2016).

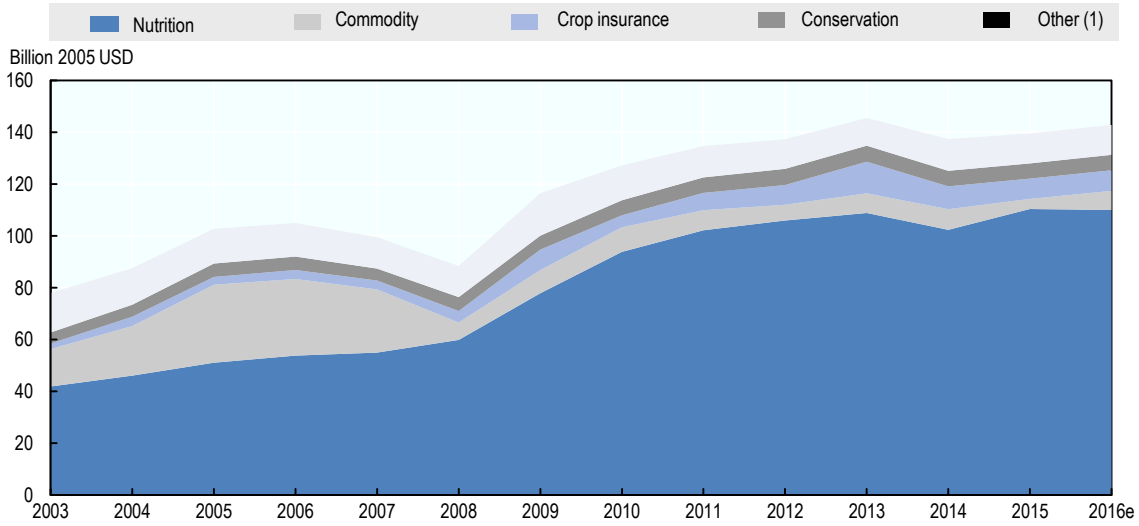
2. These projections were published in January 2014. As farm payments depend on farmers' choices regarding participation in the programmes, and for commodity programmes, on commodity market conditions, actual expenditure and more recent projections (such as CBO, 2017) differ from the 2014 projections.

A slight decline in expected budget expenditure, with some redistribution across programmes, was projected at the time. In 2014 the CBO projected the 2014 Farm Bill would cost USD 16.5 billion less over ten years than an extension of the previous legislation, representing 1.7% of the estimated total outlays. This projected decrease comes mainly from savings in commodity programmes (USD 14.31 billion), while insurance programmes were expected to cost USD 5.72 billion more. Outlays on nutrition were also expected to decrease, although they would still account for 80% of total outlays. Conservation programmes were expected to cost about USD 4 billion less, representing a decline of about 7% compared with a continuation of the previous Farm Bill. Among other expected increases, the main one was for research and extension, with additional USD 1.15 billion bringing new outlays to USD 1.256 (CBO, 2014). However, market developments and the choices made by farmers in their election of the various commodity and crop insurance programmes have since changed the expected budget expenditures, as reported in Section 3.

Trends in Farm Bill expenditure since the 2002 Farm Bill

Overall, USDA outlays in nominal dollars have increased by about 60% since 2003-05, with the largest percentage increases in nutrition and crop insurance programmes (Figure 1.2). Outlays for the nutrition programme increased strongly between 2008 and 2013, reflecting greater needs and temporary programme expansions during the economic recession. Crop insurance outlays increased significantly between 2008 and 2013 due to the occurrence of adverse weather events and changes in crop prices, but declined after 2014. Commodity programme expenditures decreased over the decade, with most of that change as the result of the sustained rise in commodity prices that began in 2008. Conservation spending has remained steady at 5% to 6% of total outlays over the decade. The share of funding provided to programmes authorised under other titles, most of which are subject to annual appropriations, has ranged from 7% to 14%.

Figure 1.2. USDA budget outlays, 2003-16



e: estimate. Does not include outlays for Forest Service or departmental administration.

1. Includes foreign agriculture, credit, rural development, research and extension, food safety, and marketing and regulatory programmes.

Source: Economic Research Service, using USDA (2015), Office of Budget and Policy Analysis, Summary and Annual Performance Plans, 2005-2017, www.obpa.usda.gov/.

Main changes in farm programmes

Farm programmes under commodity (Title I), conservation (Title II) and crop insurance (Title XI) cover close to 97% of payments directed to farmers (Box 1.1). The main changes in the 2014 Farm Bill concerned individual programmes within these titles.

Under the 2014 Farm Bill, administration of the commodity programmes remains with USDA's Farm Service Agency (FSA). Crop insurance programmes include traditional crop insurance and a number of smaller, specific programmes. It is managed by the USDA's Risk Management Agency (RMA). The main changes introduced in the 2014 Farm Bill are outlined below. In addition, Table 1.1 provides a snapshot of changes in commodity and crop insurance programmes.

Box 1.1. Policy coverage of the report[1]

Title I – COMMODITIES

- Section 1116. Price Loss Coverage (PLC) program (23% of Title I outlays).[1]
- Section 1117. Agriculture Risk Coverage (ARC) program (56% of Title I outlays).
- Sections 1401-1410. Margin Protection Program (MPP) for Dairy Producers (2% of Title I outlays).
- Section 1501. Supplemental agricultural disaster assistance (5% of Title I outlays).

Title XI – CROP INSURANCE

The 2014 Farm Bill extends most of the crop insurance instruments from the previous Farm Bill and makes several minor amendments to the Federal Crop Insurance Act in US Code Title 7 (Agriculture), Chapter 36 (Crop insurance).

The 2014 Farm Bill adds two new crop insurance programmes:

- Section 11003. Supplemental coverage option (SCO) (close to 0% of Title XI outlays).
- Section 11017. Stacked income protection plan for producers of upland cotton (STAX) (close to 0% of Title XI outlays).

Title II – CONSERVATION

The conservation title of the 2014 US Farm Bill consolidates historical conservation programmes while merging previously small or regional programmes. In particular, the Regional Conservation Partnership Program is one innovation in the way other conservation programme funds are channelled and coordinated at a local level to address environmental issues that are particularly relevant at a regional level. The five conservation programmes listed below will also be investigated as part of this evaluation:

- Sections 2001-2008. Conservation Reserve Program (CRP) (36% of Title II outlays)
- Section 2101. Conservation Stewardship Program (CSP) (25% of Title II outlays)
- Sections 2201-2208. Environmental Quality Incentives Program (EQIP) (27% of Title II outlays)
- Section 2301. Agricultural Conservation Easement Program (ACEP) (7% of Title II outlays)
- Section 2401. Regional Conservation Partnership Program (RCPP) (2% of Title II outlays)

1. Numbers in parentheses represent the share of the January 2017 estimation of expected 2015-18 budget outlays (CBO, 2017). Data for 2014 are not included because these budgetary outlays largely represent spending related to policy instruments from the previous Farm Bill. The January 2017 CBO budget estimations differ from the 2014 projections of Farm Bill costs as they take account of the choices of commodity programmes made by farmers in 2014, and changes in market outlook.

Source: US Government (2014), *Agricultural Act of 2014* (2014 Farm Bill), available at: www.gpo.gov/fdsys/pkg/BILLS-113hr2642enr/pdf/BILLS-113hr2642enr.pdf; CBO (2017). CBO's January 2017 Baseline for Farm Programs, www.cbo.gov/sites/default/files/51317-2016-03-USDA.pdf.

Two new crop commodity programmes

The Price Loss Coverage (PLC) program, which makes payments to historical base when prices fall below statutory reference prices and the Agriculture Risk Coverage (ARC) program, which makes payments to historical base when revenue falls below benchmark levels, were introduced and fixed Direct Payments to crop producers, in place during 1996-2008, and revenue coverage instruments of the 2008 Farm Bill like the Average Crop Revenue Election Program (ACRE) and the Supplemental Revenue Assistance Payments Program (SURE) were repealed.[3] Producers with historical base area of covered commodities (wheat, feed grains, rice, oilseeds, peanuts and pulses) were given a one-time opportunity to choose between PLC and ARC. Cotton is not a covered commodity under the new programs, but cotton historical base acres were designated "generic base." Under the commodity title, Supplemental Agricultural Disaster Assistance, for products not covered by other programmes, are made permanent.

Some parameters were updated

As part of the implementation of the 2014 Farm Bill, farmers were offered the opportunity to reallocate their base area, which determines payment eligibility for the ARC and PLC programmes for the duration of the Bill. They could also update the base yield that determines the payment rate for the PLC programme.

The reference prices that trigger PLC payments are set in the legislation. They are higher than target prices used for the similar Counter-Cyclical Payment (CCP) program of the previous Farm Bill, which had different implementation criteria and operated in a different market and policy environment (Table 2.2).

Major reform of commodity support for milk and cotton, but not for sugar

Dairy and sugar have traditionally been covered by market price support programmes. While the regime for sugar stays unchanged, reforms of the dairy policy regime have introduced risk management instruments. In the case of dairy, the programme covers the margin between milk and feed prices. Cotton historical base is no longer covered under the commodity title programs, but a new insurance option was provided for cotton producers, with higher subsidy rates than traditional crop insurance.

The crop insurance title offers additional coverage programmes

The 2014 Farm Bill extends most of the crop insurance instruments from the previous Farm Bill and introduces some minor amendments to already existing programmes, described in Chapter 3. In particular, specific and more favourable conditions are made or beginning farmers and ranchers, i.e. with less than five years of experience; and cross-compliance is extended to crop insurance.

Two new programmes are introduced under the crop insurance title: the Supplemental Coverage Option (SCO), which offer an option for area-based protection for commodities for which producers have not enrolled base acres in ARC; and the Stacked Income Protection Plan (STAX) for upland cotton producers.

Minor adjustments to agri-environmental protection programmes

At the federal level, the United States operates two types of agri-environmental programmes: mandatory conservation compliance for participants in most farm programmes, and voluntary conservation programmes that may involve land rental, cost-share for implementation of conservation practices, and incentive payments. Producers may receive technical assistance to implement both types of programmes.

3. The Supplemental Revenue Assistance Payments Program (SURE) was the largest of a group of farm disaster assistance programmes under the 2008 Farm Bill. It was designed to compensate eligible producers when whole farm revenue fell below benchmark levels. Crop insurance and other programme payments were included in the farm revenue calculation.

Cross-compliance extended to crop insurance

Mandatory conservation compliance requires that producers participating in farm programmes have conservation plans in place for highly erodible cropland and refrain from draining wetlands to remain eligible for benefits under both income support and risk management and insurance programmes. For example, under Highly Erodible Land Conservation (HELC) provisions (often referred to as "sodbuster" provisions) farmers who crop highly erodible land must apply an approved soil conservation system. If not, they become ineligible for nearly all agriculture-related farm programme benefits, including farm commodity programmes, crop insurance premium subsidies, conservation programmes, disaster assistance, and farm loan programmes. Under Wetland Conservation provisions (often referred to as "swamp buster"), producers must refrain from draining wetlands or face the same loss of farm programme benefits as under the HELC provisions. Cross compliance requirements have been in place since 1985, but the 2014 Farm Bill reinstated the requirements for producers receiving crop insurance premium subsidies, which were in place from 1985-96.

Conservation programmes maintained and consolidated

Voluntary conservation programmes include both land retirement and programmes on working farmland, including agricultural land preservation and adoption of environmentally friendly production practices. The 2014 Farm Bill consolidated voluntary conservation programmes into a smaller number, but most previous options remain in place. Federal conservation spending includes financial assistance to farmers as well as spending on services provided by federal agencies.

Table 1.1. The farm safety net of the 2014 Farm Bill in a nutshell

Title I: Commodity programmes	
Price Loss Coverage (PLC)	Payment made if price of historically produced commodity is below reference price fixed by Congress (Tables 2.1 and 2.2). No premium paid. Payment covers 85% of base acreage.
Agriculture Risk Coverage (ARC)	Crop revenue programme with two versions: county (ARC-CO) and individual (ARC-IC). Revenue benchmark is rolling 5-year Olympic average of county yield and market price subject to a minimum price (PLC reference price). Payments equal 86% of benchmark revenue minus county or individual crop revenue. Payment covers 85% (county) or 65% (individual) of base acreage. No premium paid.
Marketing Loan (continuing programme)	Crop price programme. Payment made on current output if price is below loan rate fixed by Congress. Loan rates are lower than PLC reference prices. Loan rates are unchanged except cotton's, reduced from a fixed USD 0.52 per pound to a range of USD 0.45-0.52 per pound.
Dairy Margin Protection Program (MPP) (new programme)	Replaces dairy price and income support programmes. Payment made if margin between milk prices and feed costs is below USD 4/quintal or hundredweight (cwt) with payment of administrative fee. Option to pay a premium to insure margin up to USD 8 per cwt for coverage of 25-90% of historic milk production
Sugar (continuing programme)	Largely unchanged; processors can receive a loan from the government, using crop production as loan collateral at a statutory loan rate. Marketing allotments and import restrictions are employed to avoid cost to government of forfeitures under these loans.
Supplemental Agricultural Disaster Assistance (renewed programme)	Four disaster aid programmes first authorised in the 2008 Farm Bill for livestock, farm-raised catfish, honeybees, orchard trees and nursery stock are re-authorised retroactively and made permanent.

Cont.

Table 1.1. The farm safety net of the 2014 Farm Bill in a nutshell *(cont.)*

Title XI: Crop insurance	
Crop yield and revenue insurance (continuing programme)	Yield and revenue insurance at farm enterprise and smaller units as well as at county. Farmer elects coverage and pays a part (current average 38%) of actuarially fair premium. All planted acres of eligible crops can be insured. Feasibility studies required to extend coverage to 13 additional crops (Table 2.8).
Supplemental Coverage Option (SCO) (new programme)	Yield or revenue insurance that makes insurance payment if county yield or revenue is between 86% of benchmark value and the coverage level elected for underlying individual farm insurance contract. Available for commodities not enrolled in ARC. Farmer pays 35% of actuarially fair premium (Table 2.8).
Stacked Income Protection Plan (STAX) (new programme)	Revenue insurance for upland cotton only. Insurance payment received if county revenue is between up to 90% and 70% of benchmark revenue or the coverage level elected for underlying individual insurance, whichever is higher. STAX can be purchased as a stand-alone contract. Farmers pay 20% of actuarially fair premium.

Likely impact on support to producers and budget

In addition to US budget data and Congressional Budget Office (CBO) projections of government outlays, this section discusses the likely impact on support to US farmers using OECD indicators, as published in 2017 (OECD, 2017). The classification of main US farm programmes in the OECD Producer Support Estimate (PSE) is shown in Box 1.2.

Box 1.2. Classification of main US farm programmes in the Producer Support Estimate

Policy measures included in the PSE are classified according to specific implementation criteria. These identify the economic features of policy measures, which have important consequences for the analysis of the potential impacts on production, income, consumption, trade, and the environment. Seven categories are used that identify the transfer basis for the policy, whether the basis is current or non-current, and whether production is required or not.

This box summarises the results of the application of the classification to the measures covered in the report (Box 1.1. and Table 1.1), which relate to the B, C, E and F1 categories of the PSE.

A. Support based on commodity output:

A1. Market Price Support: Transfers from consumers and taxpayers to agricultural producers arising from policy measures that create a gap between domestic market prices and border prices of a specific agricultural commodity, measured at the farm gate level.

- Sugar, dairy products, beef and sheep meat are protected by border measures, including Tariff Rate Quotas, which may create a price gap (Figure 1.7).

A2.Payments based on output: Transfers from taxpayers to agricultural producers from policy measures based on current output

- Marketing loan program.

B. Payments based on input use: Transfers from taxpayers to agricultural producers arising from policy measures based on on-farm use of inputs:

B1. Variable input use: Transfers reducing the on-farm cost of a specific variable input or a mix of variable inputs.

- National and regional Conservation Stewardship Programs (CSP) — 50% of financial assistance.

B.2. Fixed capital formation: Transfers reducing the on-farm investment cost of farm buildings, equipment, plantations, irrigation, drainage and soil improvements.

- National and regional Conservation Stewardship Program (CSP) — 50% of financial assistance.
- Environmental Quality Incentive Program (EQIP) — Cost-share payment.
- Agricultural Conservation Easement Program (ACEP) — Financial assistance.

B.3. On-farm services: Transfers reducing the cost of technical, accounting, commercial, sanitary and phyto-sanitary assistance, and training provided to individual farmers.

- Conservation Reserve Program (CRP) — Technical assistance.
- National and regional Conservation Stewardship Program (CSP) — Technical assistance.
- Environmental Quality Incentive Program (EQIP) — Technical assistance.
- Agricultural Conservation Easement Program (ACEP) — Technical assistance.

C. Payments based on current A/An/R/I, production required: Transfers from taxpayers to agricultural producers arising from policy measures based on current area, animal numbers, receipts or income, and requiring production.

- Crop insurance — payment (premium subsidies) based on area or receipts.
- Supplemental coverage option (SCO) — payment based on area or receipts [Reported with other crop insurance premium subsidies].
- Stacked income protection plan for producers of upland cotton (STAX) — payment based on area or receipts [Reported with other crop insurance premium subsidies].
- Supplemental agricultural disaster assistance — payment based on animal numbers.
- Margin Protection Program (MPP) for Dairy Producers — payment based on income [No payment in 2015-16].

D. Payments based on non-current A/AN/R/I, production required: Transfers from taxpayers to agricultural producers arising from policy measures based on non-current (i.e. historical or fixed) area, animal numbers, receipts or income, with current production of any commodity required.

E. Payments based on non-current A/An/R/I, production not required: Transfers from taxpayers to agricultural producers arising from policy measures based on non-current (i.e. historical or fixed) area, animal numbers, receipts or income, with current production of any commodity not required but optional.

- Price Loss Coverage (PLC) program.
- Agricultural Risk Coverage (ARC) program.

F. Payments based on non-commodity criteria: Transfers from taxpayers to agricultural producers arising from policy measures based on:

F.1. Long-term resource retirement: Transfers for the long-term retirement of factors of production from commodity production. The payments in this subcategory are distinguished from those requiring short-term resource retirement, which are based on commodity production criteria.

- Conservation Reserve Program (CRP): financial assistance.

F.2. Specific non-commodity output:

F.3. Other non-commodity criteria.

G. Miscellaneous payments: Transfers from taxpayers to farmers for which there is insufficient information to allocate them to the appropriate categories.

Source: Based on the OECD PSE Manual (OECD, 2016), www.oecd.org/tad/agricultural-policies/full%20text.pdf.

Increasing support variability

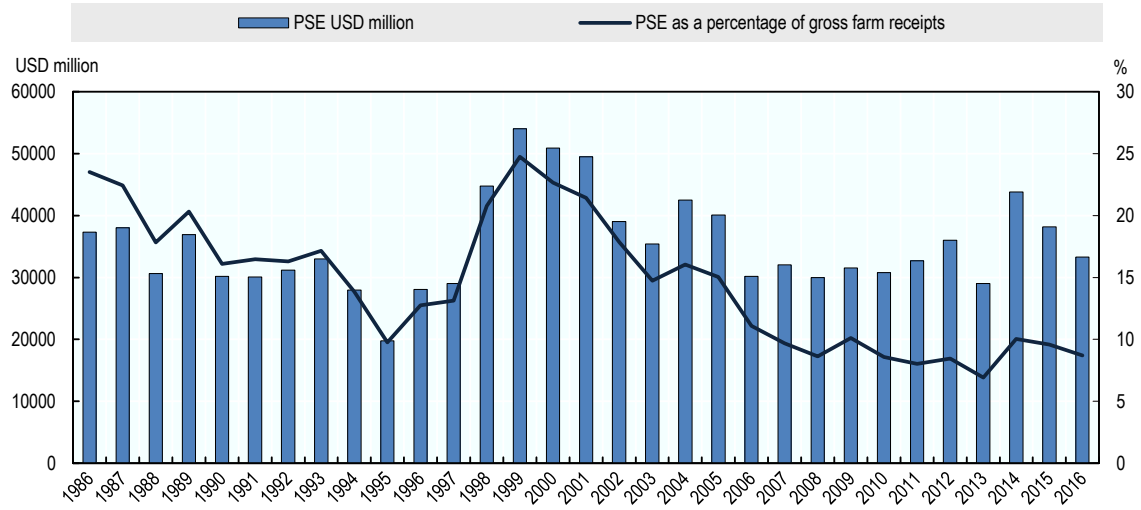
Annual variations in support to producers are not a new feature of US farm policy. Over the period 1986-2015, producer support has accounted for a variable share of gross farm receipts ranging from 10% to 25% (Figure 1.3). These variations reflect mainly changes in prices, yields and revenues that determine a large share of support, and to some extent changes in programmes and budget between successive Farm Bills (Figure 1.2).

With the repeal of fixed Direct Payments and the introduction of programmes with payments on historical base triggered by price and revenue benchmarks, the reinforcement of crop insurance, and the introduction of new risk management programmes for dairy and cotton, payments based on annual price, yield, or revenue triggers are more prominent in the mix of agricultural policy instruments. All payments in

the commodity programmes are now affected by market conditions (Figure 1.4). According to the March 2016 Congressional Budget Office (CBO) projections of government outlays, crop insurance premium subsidies are expected to be fairly stable in constant terms (Figure 1.5). Conservation payments are expected to increase in constant terms until 2020, and then stabilise at a slightly lower level, while commodity payments are expected to vary significantly in the next ten years.

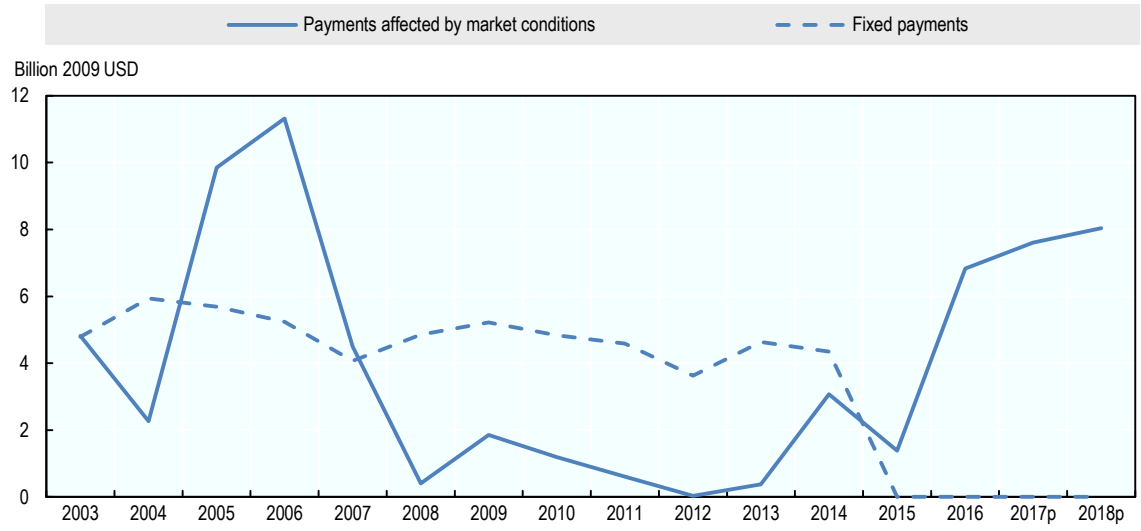
Figure 1.3. Variation of producer support over the period 1986-2016

Producer Support Estimate (PSE) in USD million and as a share of gross farm receipts



Source: OECD (2017), "Producer and consumer support estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

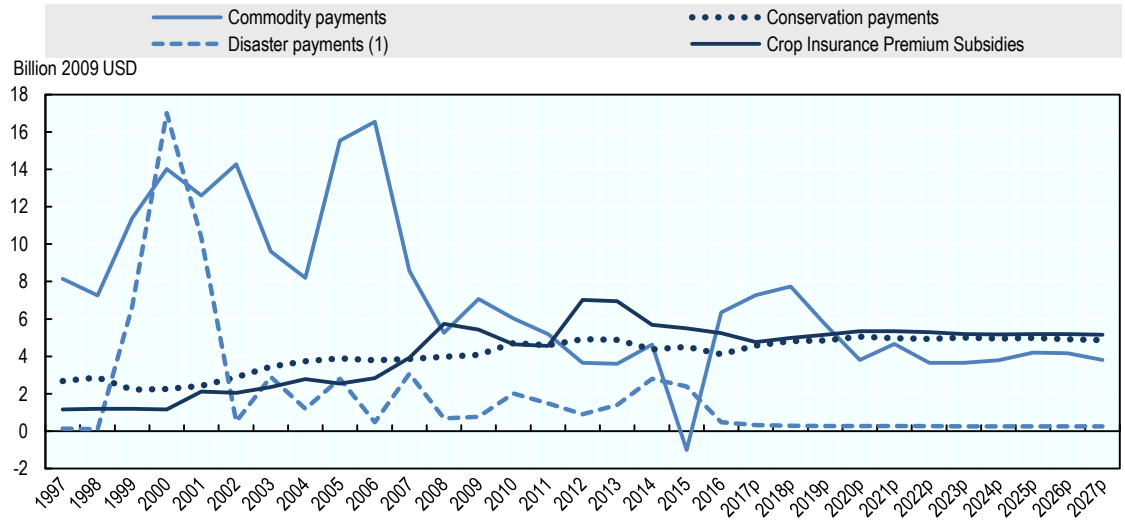
Figure 1.4. Relative developments in commodity payments with fixed and variable rates, 2003-18



p: projected. Fiscal years (FY): 2016 runs from 1 October 2015 to 30 September 2016.
Constant 2009 USD obtained by dividing current values by the GDP deflator published in the November 2016 *OECD Economic Outlook* (OECD, 2016).

Source: USDA, Economic Research Service using USDA, Farm Service Agency CCC Table 35 and CBO (2014, 2015, 2016 and 2017), www.cbo.gov/about/products/baseline-projections-selected-programs#25.

Figure 1.5. Medium-term developments in farm payments, 1997-2027



p: projected. Fiscal years (FY): 2016 runs from 1 October 2015 to 30 September 2016.
Constant 2009 USD obtained by dividing current values by the GDP deflator published in the November 2016 OECD Economic Outlook (OECD, 2016) for 2003-18, then assuming 1% inflation for 2019-27.
1. Disaster payments include Market Loss Assistance until 2007, Noninsured Disaster, Ad Hoc Disaster and SURE until 2012, and Livestock and Tree Assistance.

Source: ERS (2016), *Agricultural Act of 2014: Highlights and Implications*, May 2016, www.ers.usda.gov/agricultural-act-of-2014-highlights-and-implications.aspx; updated using CBO (2014, 2015, 2016 and 2017), www.cbo.gov/about/products/baseline-projections-selected-programs#25.

Long-term support levels and composition marginally affected

The 2014 Farm Bill is not expected to affect levels of producer support fundamentally in the longer-term, as the main changes are in the type of instruments used to deliver support. With the global outlook for agricultural markets still on a decreasing trend (OECD/FAO, 2016), the new crop commodity programmes are likely to sustain the level of support to farmers (CBO, 2016; OECD, 2016b; Schnepf, 2015; Choices article by Westhoff et al., 2015). According to March 2016 CBO forecasts (CBO, 2016), farm payments[4] in 2016 (fiscal year 2015/16) were projected up by 15% from 2015 actual payments as lower commodity prices were expected to trigger substantial payments under the PLC and the ARC programmes (See section 2.2 for more details). A further 21% increase was expected in 2017.

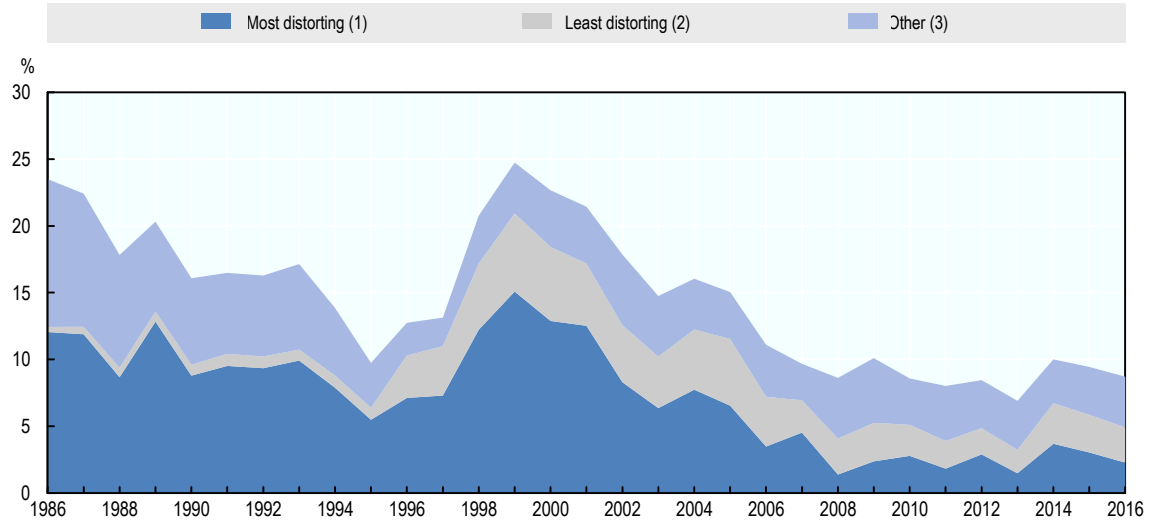
Small share of most distorting support in farm receipts

In the last decade support levels have decreased and accounted for 9% of gross farm receipts in 2013-15. This is mainly due to the reduction in the most distorting type of support, i.e. support based on output and input use without constraints (Figure 1.6). Lower support in recent years is mainly due to the reduction in most distorting support, in particular market price support, and deficiency payments for crops (OECD, 2017). Lower market price support and deficiency payments partly reflect higher world commodity prices. This means that most distorting support could rise again if world market prices were to decrease. In this case, new commodity payments, which are classified as least distorting in Figure 1.6, may also raise support, as payment rates can vary with market prices. It should also be noted that categories of support that are not considered as most distorting, may potentially distort resource allocation between sectors, by maintaining inefficient farmers in business, or within the sector, by influencing farmers' production choices, though to a lesser degree than most distorting support (OECD, 2006, 2016b).

4. Payments from commodity, disaster and conservation programmes and insurance premium subsidies.

Figure 1.6. Most distorting support as a share of farm receipts, 1986-2016

Producer Support Estimate (PSE) as a share of gross farm receipts



1. Payments based on output and payment based on variable input use without input constraints.
2. Other payments based on input use and payments based on current parameters.
3. Payments based on non-current parameters, and payments based on non-commodity outputs.

Source: OECD (2017), "Producer and consumer support estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

Despite commodity reforms, support remains unequal across commodities

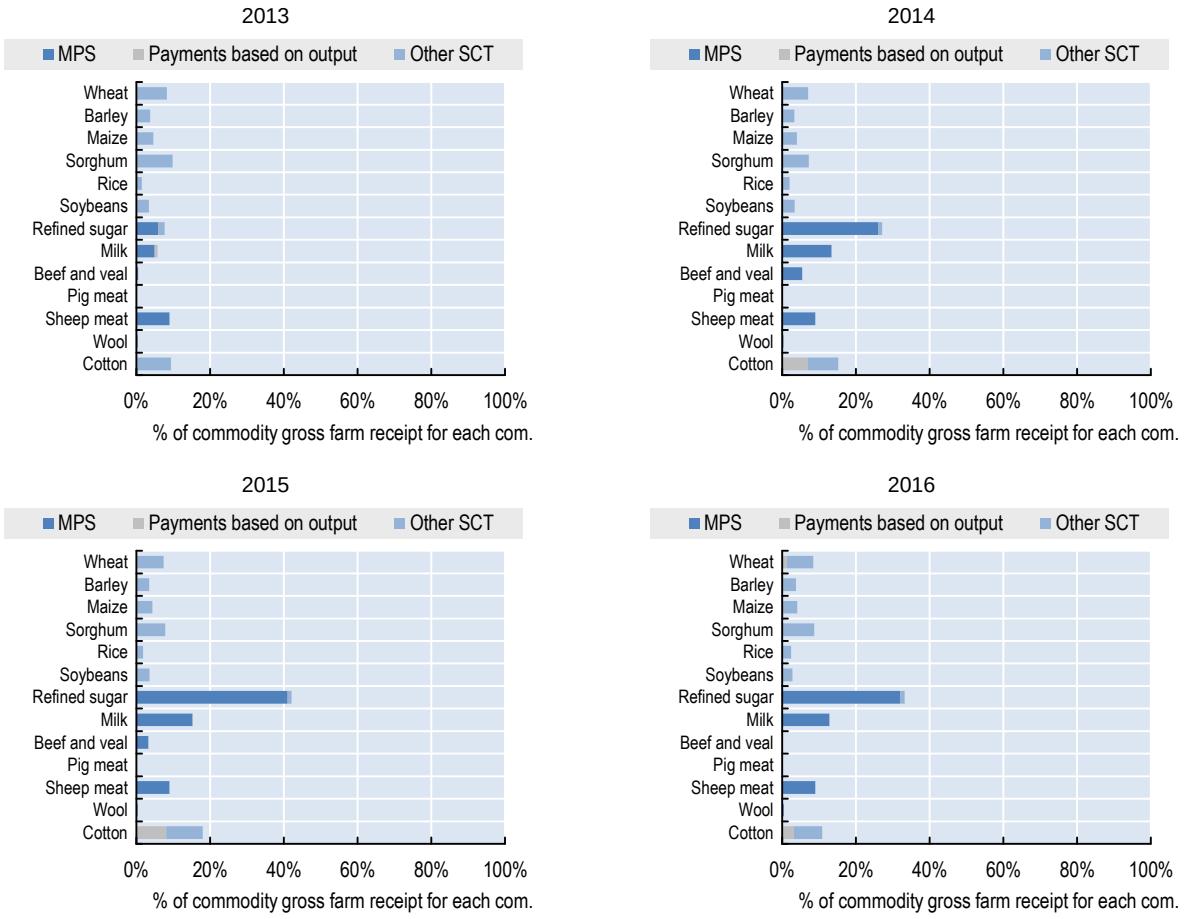
Close to half of support to US agricultural producers is specific to a single commodity (OECD, 2016b). In recent years, sugar, milk, beef and sheep meat have received significant market price support, which is typically commodity-specific (Figure 1.7). In addition, farmers mostly opted for crop insurance products on a commodity by commodity basis. As a result, the share of commodity-specific support in total support to producers, which had decreased from 70% to 50% between the mid-1980s and the mid-1990s with the introduction of the fixed direct payment programme and was at 42% in 2013-15, is likely to increase again.

The reforms of support programmes for milk and cotton production are expected to reduce market distortions, but in 2015 and 2016, these two commodities continued to receive higher support levels than most other crops and livestock products, and the dairy sector continued to receive significant market price support. The unreformed sugar sector continued to receive the highest rate of market price support in 2015 and 2016 (Figure 1.7).

Providing similar conditions for all commodities would reduce distortions across commodities. For example, in a discussion note posted on *farmdoc daily*, [5] Zulauf (2016b) finds no objective rationale to justify all the different insurance premium subsidy rates and recommends moving to a uniform premium subsidy rate. OECD work on risk management suggests a whole farm revenue approach would reduce distortions across commodities, and take advantage of different risk profiles to stabilise income at lower cost (OECD, 2009, 2011c, 2016b).

5. *Farmdoc daily* is a web page of the Department of Agricultural and Consumer Economics of the University of Illinois Urbana-Champaign that published daily blog posts on topics in agricultural economics.

Figure 1.7. Commodity-specific support, 2013-16

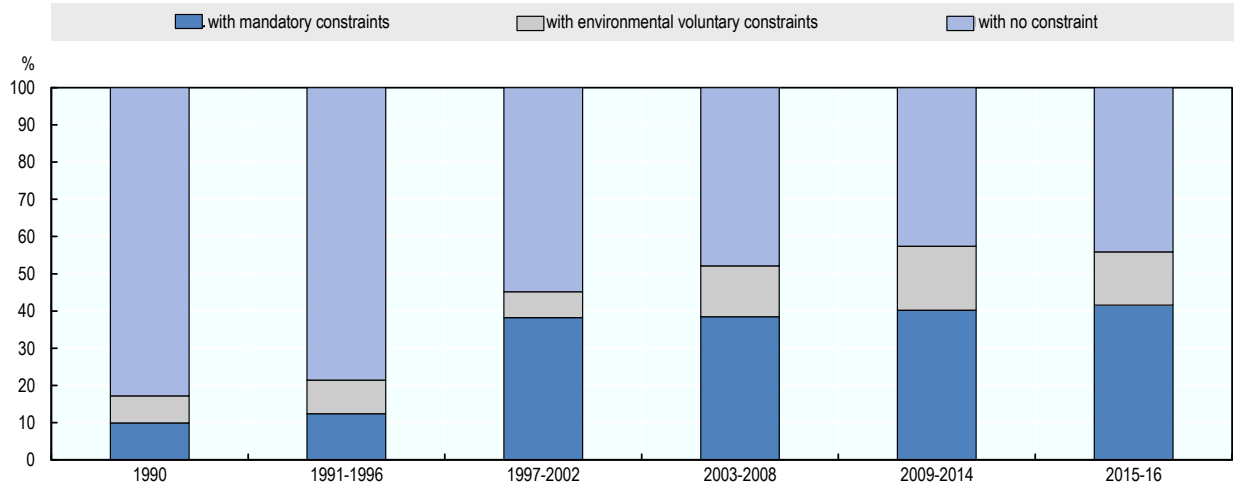


Source: OECD (2017), "Producer and consumer support estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

Increasing share of support tied to environmental constraints over time

Over the long-term, the share of producer support tied to mandatory or voluntary environmental constraints has grown over time to reach 55% of total support to US producers in 2015 (Figure 1.8). The latest Farm Bill reform made crop insurance payments conditional on meeting conservation compliance requirements on their farm, aligning crop insurance payments with the mandatory constraints of the commodity payments. However, crop insurance payments were previously already subject to other types of mandatory constraints like preservation of natural grasslands. As a result, the share of payments subject to mandatory constraints has not changed as shown in Figure 2.8. In addition, spending on conservation programmes fell in 2015-16. The larger share of support with no constraints in 2015-16 reflects higher market price support for beef and milk.

Figure 1.8 Share of US producer support estimate with input constraints, 1990-2015-16



Data for the year of the Farm Bill reform is allocated to the previous Farm Bill cycle.

Source: OECD (2017), "Producer and consumer support estimates", OECD Agriculture Statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

Budget implications

The range of budget expenditures for the 2014 Farm Bill is likely to be more variable than for the previous Farm Bill because of the repeal of the fixed Direct Payments, and the reference prices set higher than former target prices potentially leading to larger payments as market prices decline. In a study posted on *farmdoc daily*, Gerlt et al. (2016) have projected, using the FAPRI-MU model, that although the average total budget expenditure for commodity and crop insurance programmes under the 2014 Farm Bill will be lower than the average total budget expenditure under the 2008 Farm Bill, the range between minimum and maximum possible payments every year is wider under the 2014 policy mix than with the 2008 policy instruments (Figure 1.9). Chapter 2 discusses estimations of budgetary costs of individual programmes.

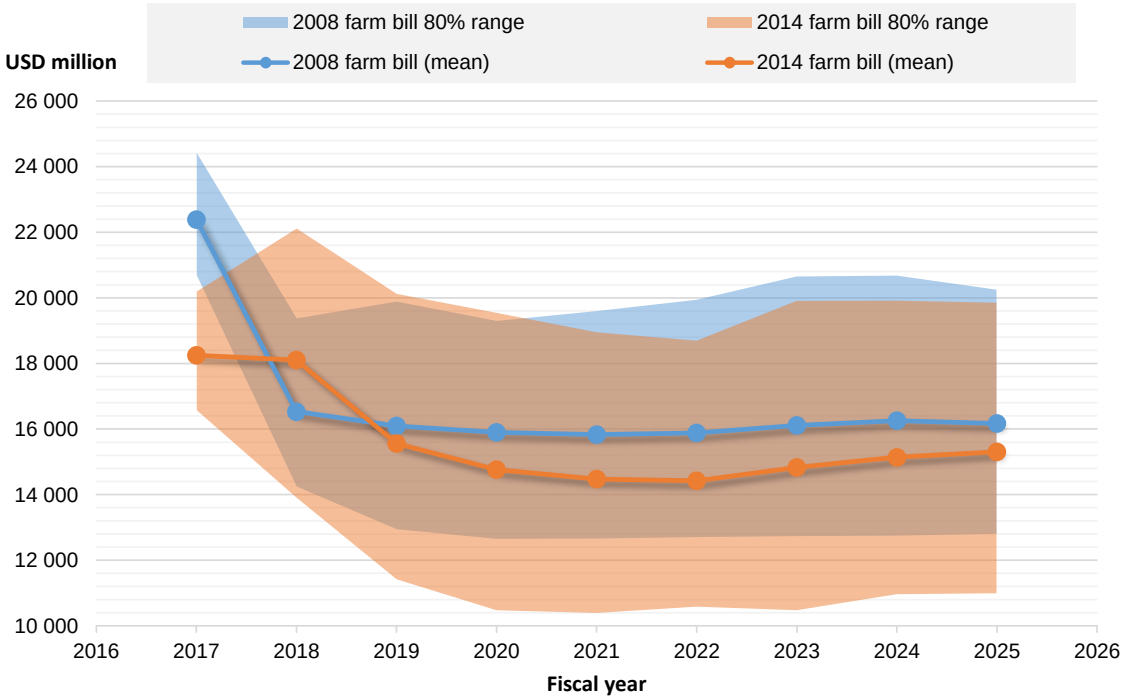
The ceiling on commodity payments per farm may marginally limits government expenditure on those programmes.[6] The ceiling on ARC payment rates — 10% of the commodity benchmark guarantee — has limited ARC total expenditures (Table 2.1). ARC and PLC payments are also limited by the fixed area base.

Overall, the Budget Control Act of 2011, which laid out the size of across-the-board cuts that would occur if an agreement over a budget could not be reached, has imposed automatic budget sequestration requirements that cut authorised spending. These sequestration requirements have reduced mandatory Farm Bill expenditures.

6. Payments from commodity programmes are limited to USD 125 000 for each individual actively engaged in farming, without specific limits for individual programmes. A spouse may receive an additional USD 125 000. The limitation is applied to the total of payments for covered commodities from the PLC and ARC programmes, and marketing loan gains and loan deficiency payments under the marketing assistance loan programme.

Figure 1.9. Potential spread of farm payment expenditures between Farm Bills

Net CCC outlays plus crop insurance under 2008 and 2014 Farm Bill crop programmes



Source: Gerlt, S. et al. (2016), "Now that it's 2016, let's compare 2014 Farm Bill programs to the 2008 Farm Bill", *farmdoc daily*, Vol. 6, No. 128, pp. 1-5, July 8.

2. INCOME SAFETY NET AND RISK MANAGEMENT PROGRAMMES

A large choice of options to limit income losses

A number of programmes offer US producers both income support and risk management options. They include both commodity programmes which cover price or revenue losses, under Title I of the Farm Bill, and crop insurance programmes under Title XI. These cover yield and revenue losses, using privately-delivered insurance products administered as part of a government programme which provides premium subsidies to producers and administrative and operating support to insurers, as well as sharing in underwriting gains and losses with insurers. Most programmes cover crops, although a few insurance and disaster programmes help livestock producers deal with low margins and with forage and animal losses. A new programme offering coverage for milk margins was introduced as part of the reform of dairy support programmes.[7]

In addition, the Marketing Assistance Loan Program continues unchanged under the Commodity title of the 2014 Farm Bill, except for an adjustment in the loan rate for upland cotton.[8] This programme provides a safety net as the loan rate sets a minimum producer price (not a minimum market price) for commodities covered, though loan rates for most commodities have remained well below market prices in recent year. The sugar support programme is also unchanged, but completely separate from other income support and risk management programmes, and is therefore not covered by programmes described in this chapter.

New programmes tied to historical crop area and yields (historical base) were introduced under the commodity title to help farmers when farm revenues are likely to be under stress. They are not linked to individual farm current conditions like traditional crop insurance (O'Donoghue et al., 2016). The Price Loss Coverage (PLC) programme makes payments when prices fall below a fixed reference price. It is paid on a share of fixed historical area base (85%), not on current production. Reference prices for the PLC programme are higher than the target prices set for the similarly designed former CCP. The Agriculture Risk Coverage (ARC) programme makes payments based on a rolling average revenue guarantee based on national prices and either county yields (ARC-CO) or individual farm yields (ARC-IC). This guarantee also applies to a fixed historical base area. Covered commodities under the new programmes include wheat, feed grains, rice, oilseeds, peanuts, and pulses. Compared with the previous Farm Bill, pulses are now eligible for all commodity programmes and upland cotton is no longer eligible for any except the Marketing Assistance Loan Program. Cotton producers can purchase enhanced insurance coverage under a dedicated Stacked Income Protection Plan (STAX) available under the federal crop insurance title.

Crop insurance is available for over 100 products, with increasing coverage of speciality crops, comprising fruits, tree nuts, vegetable and horticulture products. In the 2014 Farm Bill, a special option was introduced for upland cotton (Stacked Income Protection Plan, STAX), as cotton was not included as a covered commodity under Title I commodity programmes. A supplemental coverage option (SCO), with coverage based on county averages for yield or revenue, was introduced in addition to traditional crop insurance. It is available for a wide variety of crops, as long as producers do not have base acres for that crop enrolled in ARC. SCO covers "shallow losses", above the "deep losses" covered by traditional crop insurance and must be purchased in conjunction with an underlying traditional crop insurance product (O'Donoghue et al., 2016).

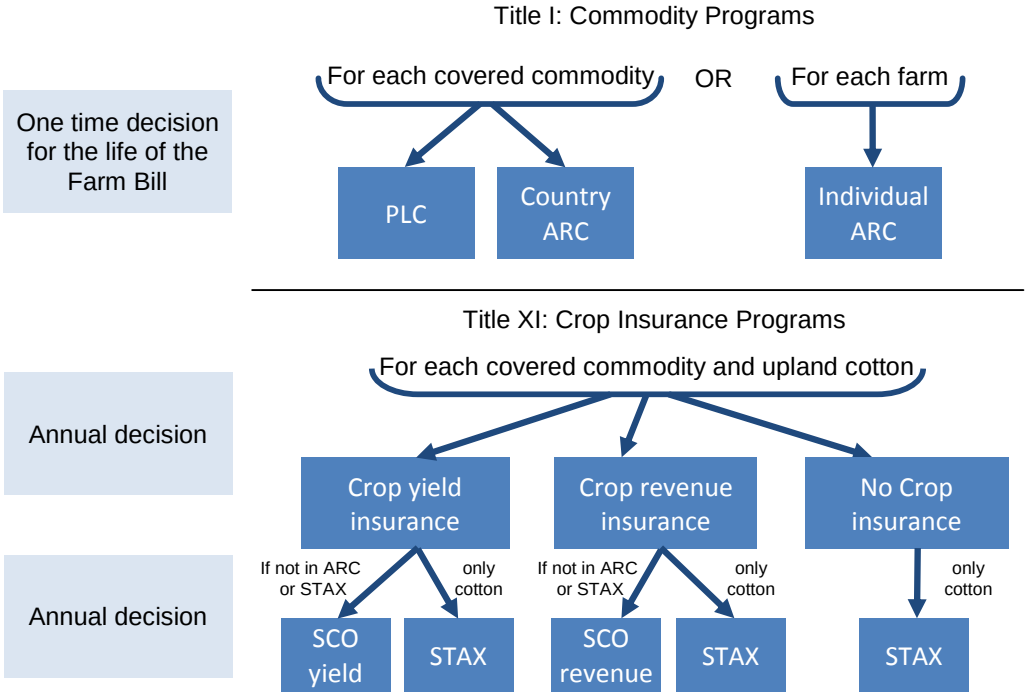
7. Three dairy programmes were repealed by the 2014 Farm Act: Milk Income Loss Contract (MILC) Program; Dairy Product Price Support Program (DPPSP), and Dairy Export Incentive Program (DEIP). Federal Milk Marketing Orders remain in place, although they are not governed by the Farm Act.

8. The 2014 Farm Bill sets the base quality marketing assistance loan rate for upland cotton at the simple average of the adjusted prevailing world price for the two immediately preceding marketing years. The marketing assistance loan rate cannot be less than 45 cents per pound or greater than 52 cents per pound.

Crop producers faced a cascade of choices among programmes and coverage options, as Figure 2.1 illustrates. Producers holding historical base area first faced the choice of whether to elect the PLC or ARC programmes for each of their commodity bases. In a single decision that remains in place for the whole period of the Farm Bill, producers chose either PLC or ARC-CO for each type of historical commodity area base on their farms. Alternatively, producers could choose ARC-IC, which then applied on a whole-farm basis to all covered commodities on the farm. Producers made these choices in 2014 to remain in place through 2018 without any opportunity to make changes in the intervening years. Those choices then affected annual choices they could make regarding purchase of crop insurance coverage. For historical base commodities for which they chose PLC, then they could purchase traditional crop yield or revenue insurance, as well as the new SCO insurance, which offered protection against small losses that would normally fall within the traditional crop insurance deductible. For those historical base commodities for which they chose ARC, however, they were not eligible for the SCO coverage, but could still choose traditional crop yield or revenue insurance coverage. Upland cotton producers could also choose to purchase STAX policies, with or without traditional crop yield or revenue insurance coverage, but could not also purchase SCO to cover areas for which they had already purchased STAX.

Upland cotton is not covered under the PLC and ARC programmes. The Cotton Transition Payment (CTP) programme provided direct payments to holders of historical upland cotton base in 2014 until the new risk management programme for upland cotton, the STAX, could be fully implemented. In addition, former upland cotton base became “generic” base for which owners of that base could choose the PLC or ARC programmes for covered commodities they might produce on that base. Producers are not eligible for PLC or ARC payments on this "generic" base except in years when they cultivate one of the commodities covered by the programmes on it.

Figure 2.1. Income support and risk management options for crop producers



Source: USDA.

New crop commodity programmes offering price loss and agricultural risk coverage

Main programme characteristics

Both PLC and ARC offer direct payments to producers with historical base (fixed area entitled to payments) of wheat, feed grains, rice, oilseeds, peanuts, and pulses (covered commodities) on a commodity-by-commodity basis. Producers may choose under which programme to elect coverage for their covered commodities, but once the election is made, it remains in place for the life of the 2014 Farm Bill.

Different parameters trigger payments and determine payment rates and amounts as explained in Table 2.1. Coverage in PLC and ARC-CO is by individual commodity base, while ARC-IC includes all covered commodities on the farm. For each type of commodity base enrolled, PLC covers the difference between the national average market price and the reference price set in the legislation, which is multiplied by the historical yield of covered base area to determine the payment per acre. Thus, all parameters are fixed except the current price. Conversely, ARC payments depend on a benchmark revenue that changes every year as it depends on a moving average of historical prices and yields. Two factors limit the ARC payment rate: 1) The PLC reference price acts as a minimum price in each of the years in the rolling average used to calculate the payment rate if the national price falls below the reference price; 2) The payment per acre is limited to 10% of the commodity's benchmark guarantee. Given that the payment is activated when the average county revenue for the commodity drops below 86% of the benchmark revenue, ARC payments will be based on realised average county revenue losses between 76% and 86% of the benchmark revenue (O'Donoghue et al., 2016).

Compared with the former Farm Bill, some provisions affect the base area entitled to payment. Producers may also receive PLC or ARC payments on former cotton base acres (termed "generic base acres") that are planted under a covered commodity. A one-time opportunity was offered to reallocate a farm's base area (except generic acres) based on 2009-12 plantings and to update the farm's payment yields for covered commodities to their 2008-12 average yields.

Table 2.1. ARC/PLC payments calculation mode

	Price Loss Coverage (PLC)	County Agriculture Risk Coverage (ARC-CO)	Individual Agriculture Risk Coverage (ARC-IC)
Commodity basis	Individual historical base	Individual historical base	All covered commodities on the farm
Eligible area	85% of base area of the commodity covered	85% of base area of the commodity covered	65% of base area for all commodities
Payment trigger	Market price falls below reference price	County crop revenue drops below 86% of county benchmark revenue	Individual crop revenues summed across all covered commodities on the farm are less than the farm guarantee (86% of the farm's benchmark)
Payment rate	Reference price[1] minus annual national average market price (or marketing assistance loan rate if higher) times farm's historical payment yield[2]	86% of benchmark revenue minus county crop revenue (actual average county yield times national farm price)	Benchmark revenue minus farm revenue (farm revenue of covered commodities — sum of yield times national farm price of all covered commodities on farm)
Benchmark (covered) revenue	Not applicable	5-year Olympic average[3] **county** yield times 5-year Olympic average national price or the PLC reference price, whichever is the higher for each year	5-year Olympic average[3] **individual** yield times 5-year Olympic average of national price or the PLC reference price, whichever is higher for each year, for all covered commodities on farm
Commodity exception	Payments reduced on an acre-by-acre basis for producers who plant fruits, vegetables or wild rice on payment acres (eligible area).		
Subsidy rate[4]	100%	100%	100%

Table 2.1. ARC/PLC payments calculation mode *(cont.)*

Payment amount	Payment rate times eligible area	Payment rate times eligible area	Payment rate times eligible area
Maximum payment per acre	Not applicable	10% of the commodity's benchmark guarantee	10% of the individual farm's benchmark guarantee
Ceiling on payment per farm	Payments from commodity programmes are limited to USD 125 000 for each individual actively engaged in farming, without specific limits for individual programmes. A spouse may receive an additional USD 125 000. The limitation is applied to the total of payments for covered commodities from the PLC and ARC programmes, and marketing loan gains and loan deficiency payments under the marketing assistance loan programme. A separate USD 125 000 limit is provided for payments for peanuts under these programmes.		

1. The PLC reference price is set in the 2014 Farm Bill legislation (Table 2.2).
2. Current historical crop yield registered by Farm Service Agency (FSA) or updated to 90% of FSA average crop yield for 2008-12 crops
3. The five-year Olympic average is the average of the last five years minus the highest and lowest observations.
4. 100% subsidy rate means that producers are not required to pay a fee or premium to participate.

Source: ERS (2016); Agricultural Act of 2014, Title I, www.gpo.gov/fdsys/pkg/BILLS-113hr2642enr/pdf/BILLS-113hr2642enr.pdf.

Reference prices for the new PLC program were set at a higher level than target prices under the repealed counter-cyclical program (CCP), which were effectively further reduced by subtracting direct payment rates in calculating payments (Table 2.2). For most commodities, the national average prices that enter the calculation of the benchmark revenue under the ARC program are expected to be higher than the PLC reference price in 2016. Where that is not the case, the PLC reference price will apply.

Table 2.2. Trigger prices for the new crop commodity programmes

Commodity	Unit USD per[1]	Final CCP[2] target prices[3]	2014-18 PLC[4] reference prices	2014-18 national average commodity loan rate	5-year Olympic average of national price for 2017 (2011/12-2016/17)[5]
Wheat	bushel	4.17	5.50	2.94	3.85
Maize	Bushel	2.63	3.70	1.95	3.40
Grain sorghum	bushel	2.63	3.95	1.95	2.70
Barley	bushel	2.63	4.95	1.95	4.95
Oats	bushel	1.79	2.40	1.39	2.05
Upland cotton	pound	0.71	n.a.	0.45-0.52	n.a.
Long-grain rice	cwt	10.50	14.00	6.50	9.80
Medium-grain rice	cwt	10.50	14.00	6.50	10.00
Peanuts	short ton	495.00	535.00	355.00	390.00
Soybeans	bushel	6.00	8.40	5.00	9.60
Other oilseeds[6]	cwt	12.68	20.15	10.09	17.45
Dry peas	cwt	8.32	11.00	5.40	11.00
Lentils	cwt	12.81	19.97	11.28	28.00
Small chickpeas	cwt	10.36	19.04	7.43	25.00
Large chickpeas	cwt	12.81	21.54	11.28	31.00

Upland cotton is not a covered commodity under ARC or PLC; n.a. = not applicable.
1. cwt: hundredweight = 100 pound = 50.8023 kg; 1 bushel of barley = .021772 metric tonne; 1 bushel of wheat and soybeans = .0272155 metric tonne; 1 bushel of maize and sorghum =.0254 metric tonne; 1 short ton = 0.907185 metric tonne; 5-year Olympic average of national prices: average of national prices without the highest and lowest price.
2. CCP: counter-cyclical program;
3. CCP target prices for some commodities were higher for 2010-12 than for 2008-09.
4. PLC: Price Loss coverage program.
5. www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/arc-plc/pdf/2016_mya.pdf.
6. 5-year olympic average of national price varies by oilseeds. The average for sunflower seeds is shown in the table.

Source: ERS (2016); Agricultural Act of 2014, Title I, www.gpo.gov/fdsys/pkg/BILLS-113hr2642enr/pdf/BILLS-113hr2642enr.pdf; Food, Conservation, and Energy Act of 2008, Title I, www.govtrack.us/congress/bills/110/hr2419; FSA (2016a, 2016b).

US producers' choice of commodity programme for 2014-18

Producers opted widely for ARC, rather than for PLC. Over three-quarters of the total base area is enrolled into ARC, while PLC covers less than a quarter (Table 2.3). Among ARC options, farmers opted widely for ARC-CO and, with 1% of the base area, ARC-IC stands out as least attractive. However, there are distinct differences by historical commodity base in producer elections:

- Producers elected ARC-CO for over 90% of maize and soybean base area, and for more than two-thirds of oats and chickpeas base area.
- Conversely, producers chose PLC for close to 100% of rice, canola and peanut base area, for three-quarters of barley base area, and for around two-thirds of the base acreage for flax seed, sorghum, safflower and sesame.
- Choices are more mixed for other historical commodities, such as wheat and sunflower.
- Farms electing ARC-IC accounted for 6% to 11% of pulse crop base acres.

Table 2.3. US producers' choice of commodity programme, 2014-18

Percentage of base area covered by each programme

	PLC	ARC-CO	ARC-IC	Total
Barley	75%	22%	4%	100%
Canola	97%	2%	1%	100%
Maize	7%	93%	0%	100%
Crambe[1]	65%	34%	1%	100%
Dry peas	44%	50%	6%	100%
Flaxseed	63%	36%	1%	100%
Grain sorghum	66%	33%	0%	100%
Lentils	53%	41%	7%	100%
Large chickpeas	23%	66%	11%	100%
Long grain rice	100%	0%	0%	100%
Medium grain rice (southern)	96%	4%	0%	100%
Mustard	56%	38%	6%	100%
Oats	32%	67%	1%	100%
Peanuts	100%	0%	0%	100%
Rapeseed	44%	54%	2%	100%
Safflower	63%	34%	3%	100%
Sesame	84%	16%	0%	100%
Small chickpeas	23%	68%	9%	100%
Soybeans	3%	97%	0%	100%
Sunflowers	56%	43%	1%	100%
Temperate japonica rice	62%	34%	4%	100%
Wheat	42%	56%	2%	100%
US total	23%	76%	1%	100%

Farms elect ARC-CO and PLC on a commodity-by-commodity basis. A given farm may have elected PLC for some commodities and ARC-CO for other commodities. Thus, calculating percent of farms electing PLC or ARC-CO at the US level is not possible.

1. Crambe is an oilseed, which produces oil mostly for industrial uses.

Source: FSA (2016a), ARC/PLC Program Data, www.fsa.usda.gov/programs-and-services/arcplc_program/index.

When producers had to make their decision, historic commodity prices had been high and future commodity prices were expected to be lower. According to an ERS study comparing producer returns under alternative programme choices, using a statistical model to generate simulated prices and yields, ARC payments, which are based on historical price references, were expected to result in higher risk protection than PLC, in particular for maize and soybeans (O'Donoghue et al., 2016).The study also finds that the situation is more mixed for wheat, as production is less regionally concentrated and risks less correlated than for maize and soybeans.

Using the FAPRI-MU model of agricultural markets and a Monte Carlo simulation of 500 iterations of future production, prices and payments, Westhoff et al. (2015) show, in an article published in Choices, that farmers chose either ARC or PLC depending on the programme that would deliver the highest projected payment over the duration of the Farm Bill or in the first year when projections were more likely to be accurate.

Discussion of programme effectiveness and efficiency in the literature

Budgetary cost

As of February 2016, payments under the ARC and PLC programmes have totalled USD 5.2 billion for crop year 2014, and USD 7.8 billion for crop year 2015, of which three quarters were for ARC-CO (FSA, 2016a). This reflects farmers' choices as well as market conditions. In its March 2016 baseline projections, CBO (2016) estimates that the total value of PLC payments is likely to reach USD 2 billion in the 2017 fiscal year and vary between that USD 2.3 and 3.3 billion in the following 10 years. From a projected peak of USD 6 billion in the 2017 fiscal year, ARC-CO payments are expected to fall gradually and stabilise below USD one billion per year from 2021, reflecting adjustments in the moving average price used to calculate the benchmark revenue.

In a US Congressional Research Service report, Schnepf (2015) discusses the WTO compliance of farm payments. Considering PLC and ARC provisions, he concludes that they can generate large payments during extended periods of low prices. In the case of PLC, this is because the fixed reference prices used to trigger payments and determine their levels ignore market conditions. While at the time they were set, they were mostly below average market prices received by farmers in 2008-12, when compared with the average of a longer period 2000-13, they appear to provide support at levels well above market conditions.

In contrast, ARC payments were initially very high in 2015 because of the high 2010-12 prices which were incorporated into the five-year moving Olympic average for revenues that triggered the payment that year. With lower commodity prices expected, the five-year moving Olympic average for revenues will also decrease, thus lowering the value of future total ARC payments. However, because ARC uses the national PLC reference price in calculating the national crop year average farm price if the crop year price observed goes below the reference price, the relatively high PLC reference price in fact becomes a floor price for ARC and prevents ARC’s trigger from following market prices further down (Schnepf, 2015).

As mentioned in Chapter 1, some provisions limit budget expenditure, including the Budget Control Act of 2011, passed by Congress, which required USDA to reduce 2015 ARC and PLC payments by 6.8% (USDA, 2016b, Press release).

Impact on farm income variability

The question of whether new commodity programmes effectively stabilise farm income needs to be discussed in relation to the whole suite of government programmes available, in particular the marketing assistance loan program and crop insurance programmes, which also contribute to reducing revenue variability and to providing a safety net.

In the chapter of a book discussing the 2014 Farm Bill in historical perspective, Orden and Zulauf (2015a) recognise that the new crop commodity programmes provide support during periods when it is most likely to be needed. In a study of public and private roles in agricultural risk transfer, published on the *AGree*

blog[9] to stimulate policy discussion, Barnett et al. (2016) comment that irrespective of whether farmers have enrolled in crop insurance or not, the new crop commodity programmes are meant to provide support in case of a relatively small revenue loss because of variations in price (PLC) or revenue (ARC); these programmes have thus been termed as covering "shallow loss" compared with average individual, county or national benchmarks. According to Bulut and Collins (2014), the ARC programme covers shallow losses between 14% and 24% of benchmark revenue. Using a model based on certainty equivalent wealth, the authors simulate farmers' choices between crop insurance and supplemental revenue options, including ARC, PLC, SCO and STAX, to identify possible substitution effects. They find that these new options intended to complement crop insurance generally have no effect on crop insurance choices, and that the new ARC and PLC payments are likely to lead to additional revenue coverage per acre on top of crop insurance alone at all levels of coverage. Because there is no premium paid for ARC or PLC, they can be considered as additional insurance coverage with 100% subsidy rate on premiums. They also find that crop insurance supplemental revenue options (SCO and STAX) typically reduce producer purchase of underlying crop insurance coverage at high coverage levels.

Farmdoc daily, a web page of the Department of Agricultural and Consumer Economics of the University of Illinois Urbana-Champaign, publishes a number of notes that contain short analyses of different aspects of the new farm payments. For example, Langemeier M. and M. Boehlje (2016a, 2016b), calculate ARC-CO payments and crop insurance indemnities under different price and yield conditions in a West Central Indiana "model" farm to assess the effectiveness of the safety-net under the 2014 Farm Bill. They find that earnings per acre would be negative in most of the scenarios examined, illustrating gaps in the safety net. They attribute this gap to ARC-CO provisions, such as the capping of payments, and their decline when market prices increase. They also argue that the decline in the crop insurance revenue guarantee since 2012 has contributed to the large decline in the case farm's ability to mitigate downside risks. Paulson et al. (2016) illustrate the variability of ARC-CO payments across counties, which comes from county yields being used as a benchmark to trigger and calculate payments. They argue that although there can be big differences in neighbouring farms belonging to different counties that may raise controversy, the programme design helps to target assistance to the areas and farmers that have experienced more significant revenue losses.

Impact on markets

The new crop commodity payments were designed to remain largely decoupled from current production. The policy design that ties crop payments to historical base without production requirements does not allow producers to affect the level of their payments through planting decisions. In a chapter of a book, Babcock (2015) concludes that as a result, these programmes avoid creating incentives for producers to make production choices to maximise programme payments.

In their study posted on *farmdoc daily*, Gerlt et al. (2016) argue that the impact of the reform of crop programmes on total crop area is likely to be negligible because the payments are much lower than the market returns on crops. Using the FAPRI-MU stochastic model to compute the impacts of 2008 and 2014 Farm Bill programmes for 2017-25, they estimate a 0.1% increase in land under crops resulting from the new crop programmes. However, payment rates could increase significantly if market conditions deteriorate.

Farmers were allowed to reallocate their base area and update their base yield for the 2014 Farm Bill. This has led many producers to allocate their base acres in favour of the historical commodities that would maximise future expected payments (FAPRI-MU, 2015). In particular, maize and rice base areas are significantly higher than the area under maize and rice in recent years. Base area under maize actually increased by 11%. According to FAPRI-MU (2015), most farmers who could update their programme yield also did so, thus increasing the national average programme yields for all the commodities covered by the crop programmes. In a Congressional Research Service report discussing 2014 Farm Bill provisions and WTO compliance, Schnepf (2015) warns that because of the possibility that base areas might be updated again at the

9. *AGree* seeks to drive positive change in the food and agriculture system by connecting and challenging leaders from diverse communities to catalyse action and elevate food and agriculture as a national priority. www.foodandagpolicy.org/.

next Farm Bill, farmers could still be encouraged to keep planting the commodities covered by current crop programmes rather than following market prices.

Schnepf (2015) also argues that because PLC fixed reference prices ignore market conditions, the programme has the potential to distort outcomes by creating incentives to produce more than the market can absorb without additional price declines. As the incentives vary by commodity, depending on actual market prices, PLC could thus affect the allocation of resources between crops. As the PLC reference price acts as a floor price for ARC, the programme can also distort planting incentives for programme crops.

Other provisions may affect the allocation of resources between crops. For example, ARC and PLC payments will be reduced on an acre-by-acre basis for producers who plant fruits, vegetables or wild rice on payment area (85% of base acres for ARC-CO and PLC, 65% of base acres for ARC-IC). This provision may limit product diversification. Using a difference-in-difference estimator, applied to US county-level data from both the 1987 and 1997 US Census of Agriculture, that is, both before and after the initial policy was introduced in 1990, Balagtagas et al. (2014) find that a similar planting restriction introduced in 1990 on the previous Farm Bill's direct payments had had a small but significant negative impact on the area under fruits and vegetables, especially so in the Sunbelt states such as Arizona, California, Florida, New Mexico and Texas, which are traditional locations for horticultural production. They conclude that the removal of the planting restriction may have a nontrivial impact on US fruit and vegetable production. An ERS study discussing the possible market impacts of an elimination of fruit and vegetable planting restrictions in the mid-2000s suggest that if planting restrictions were relaxed, some acreage would most likely shift in regions where the land and climate are suitable for fruit and vegetable production, but only to a limited extent. In Florida for example, nonbase acres are in limited supply (Johnson et al., 2006). According to authors, California, the Upper Midwest, and the coastal plain in the South-eastern States would not necessarily experience large acreage shifts because current restrictions are not always binding for producers. For example, some producers who wish to plant fruits and vegetables lease nonbase land. In other cases, the difficulty of securing sufficient labour for harvesting, the difficulty in establishing a pre-harvest marketing contract with buyers, and other agronomic or economic factors would deter many producers from growing fruit or vegetables.

Through wealth and insurance effects, the programmes may allow producers to purchase additional farm inputs by easing cash flow constraints. In a selected conference paper, Luckstead and Devadoss (2016) analyse the impact of farm programmes on production using a simulation model calibrated to a representative Kansas dryland wheat farm. . They find that in an uncertain, real-life, environment, ARC and PLC are likely to have wealth and insurance effects on production, as they encourage risk-adverse farmers to purchase more farm inputs to maximise profits. County-based ARC (ARC-CO) is estimated to increase farm inputs use by 1.388% over the baseline, resulting in a yield increase from 56 bushels to 56.544 bushels per acre. Previous OECD work on decoupling also suggests wealth and insurance effects on production are very small (OECD, 2006).

Margin Protection Program (MPP) for Dairy Producers

Main programme characteristics

The 2014 Farm Bill introduces the new Margin Protection Program (MPP) for dairy producers. In line with the crop risk management programmes of the Commodity Title, the MPP provides dairy producers a risk management alternative to former price support and income stabilisation programmes.

The MPP makes payments when the margin between the national milk price and a national feed costs formula fall below protected levels. Payments are triggered when the national benchmark margin (called the "actual dairy producer margin" in the legislation) for a consecutive two-month period is less than the USD 4-8 per hundredweight (cwt) threshold margin selected by the farm, for which producers pay escalating premiums for coverage at higher margins. The benchmark margin is the difference between the all-milk price published by the US National Agricultural Statistics Service (NASS) and a national-benchmark feed cost.

On enrolment, which can begin in any year, but once completed lasts for the duration of the Farm Bill, farm operations register their recent milk production history as the basis for coverage.[10] This production quantity is adjusted annually for national average milk production increases. The 2015 adjustment allowed histories established in 2014 to be increased by 0.87% for 2015, providing registered farmers with expanded coverage (MacDonald et al., 2016).

Producers then choose annually the share (25-90%) of that historical production to cover and at what margin level, between USD 4 and 8 per cwt of milk.

Unlike the crop commodity programmes, participation in MPP has a cost for producers, which increases with coverage level and farm production size:

- "Catastrophic coverage" at the lowest margin level (USD 4 per cwt) is available for a USD 100 annual administrative fee.
- Coverage at higher levels requires paying a premium in addition to the administrative fee.
- Premiums range depending on the margin level selected and the amount of production covered: Buy-up coverage is available for 25 to 90% of production history, in 5-percent increments, for margin thresholds ranging from USD 4.50 to USD 8.00 per cwt, in 50-cent increments.
- Premiums are higher for production above 4 million pounds annually.
- The structure of the premiums significantly increases from USD 7 per cwt coverage level (Table 2.4).

The payment equals the difference between the threshold and benchmark margins, times the amount of covered production history, prorated to a two-month period (Table 2.5). Thus, payments are not based on farmers' own margins, but on a national benchmark. Producers' premiums help fund payments; if premiums are insufficient, the difference is met by Government outlays (MacDonald et al., 2016).

Table 2.4. Dairy Margin Protection Program premiums by margin threshold

USD per cwt[1]

Margin threshold	**Tier 1 premium, 2014 and 2015**	**Tier 1 premium, 2016-18**	**Tier 2 premium, 2014-18**
	Covered production history up to 4 million pounds	Covered production history up to 4 million pounds	Covered production history above 4 million pounds
4.00	None	None	None
4.50	0.008	0.010	0.020
5.00	0.019	0.025	0.040
5.50	0.030	0.040	0.100
6.00	0.041	0.055	0.155
6.50	0.068	0.090	0.290
7.00	0.163	0.217	0.830
7.50	0.225	0.300	1.060
8.00	0.475	0.475	1.360

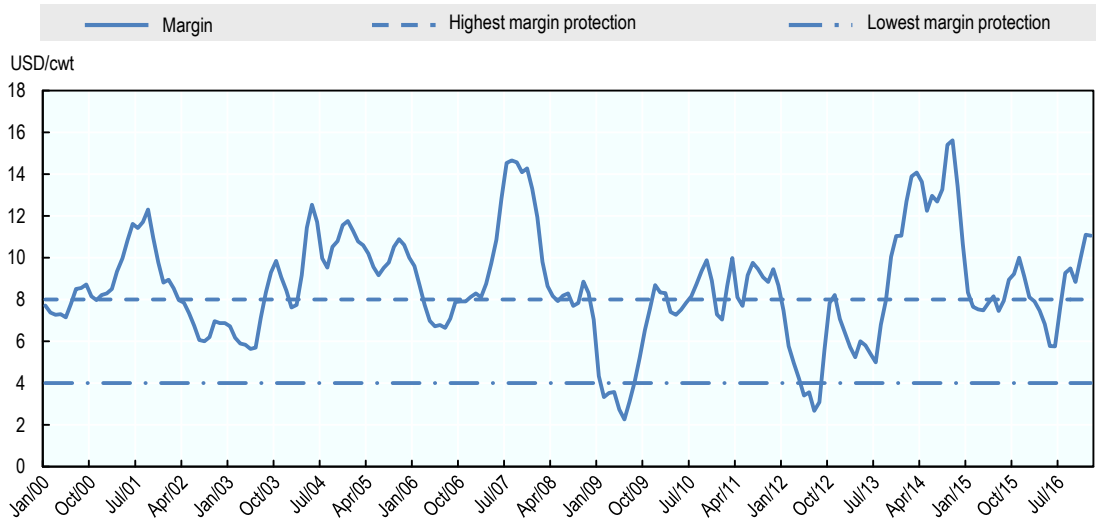
1. cwt: hundredweight = 100 pound = 50.8023 kg.
Source: MacDonald et al. (2016), Table 14, www.ers.usda.gov/publications/err-economic-research-report/err205.aspx.

10. The production history is the highest of the annual quantity of milk marketed by the farm during calendar year 2011, 2012 or 2013, with special provisions for new operations.

Since 2000 milk margins have been more often above the upper protected margin of USD 8 per cwt than below it, and have fallen below the minimum protection margin of USD 4 per cwt only twice (Figure 2.2). The USD 4 per cwt margin coverage has thus started being known as "catastrophic coverage" because it is triggered with a very low probability (MacDonald et al., 2016). In 2015 payments were triggered for only a few months at the USD 8 per cwt margin level, and amounted to about USD 700 000. In 2016, payments were triggered during several months and payments totalled around USD 11 million. However, premiums and fees collected in 2016 totalled more than USD 20 million, resulting in negative net payments as in 2015.

Because registration is for the duration of the Farm Bill, milk producers cannot leave the program once enrolled. However, farmers who did not register for coverage in 2015 can register in any subsequent annual signup period s. For enrolled producers, coverage choices can be adjusted annually. For producers who do not enrol, Livestock Gross Margin Insurance for Dairy Program (LGM-Dairy) remains available under the federal crop insurance program (Box 2.1). Producers may not participate in both MPP and LGM-dairy.

Figure 2.2. Trigger levels of the new dairy margin protection program and dairy margin history, 2000-16[1]



1. Up to January 2017.

Source: FSA (2016c), MPP Program, Farm Service Agency, www.fsa.usda.gov/programs-and-services/Dairy-MPP/index/.

Table 2.5. Milk payments calculation mode

	Margin protection program (MPP)
Commodity basis	Individual-milk
Eligible production	25% to 90% of milk production history[1]
Payment trigger	National benchmark margin for a consecutive 2-month period falls below the USD 4-8 per cwt threshold margin selected by the farm
Payment rate	Difference between the threshold and benchmark margins,
Payment amount	Payment rate times the amount of covered production history, prorated to a 2-month period

1. The production history is the highest of the annual quantity of milk marketed by the farm during calendar year 2011, 2012 or 2013. This production quantity is adjusted annually for national average milk production increases.

Source: MacDonald et al. (2016), www.ers.usda.gov/publications/err-economic-research-report/err205.aspx.

Participation choices

In 2015 55% of dairy farms enrolled in the first full year of implementation of MPP (Table 2.5). On average, they are larger than average operations as they account for 80% of total milk production history in the United States. Most participants had chosen margin coverage between USD 4 and 6 per cwt, and few had chosen the highest margin of USD 8 per cwt. Many dairy producers have chosen not to enrol in 2015, but they represent only 20% of total milk production history. On average, they have smaller operations than the national average.

The following year, farmers opted for lower coverage (Table 2.6). The total shares of dairy operations and milk production enrolled in MPP increased between 2015 and 2016 — 59% of licensed dairy operations representing close to 86% of milk production participated in the second year of the programme, but most of the producers chose the minimum coverage level of USD 4 per cwt in 2016: 77% of enrolled farms and 88% of all milk production history. Mark et al. (2016) suggest that higher margin coverage might not be very attractive because of the higher premiums to be paid, especially for producers with larger herds.

Table 2.6. MPP coverage in 2015 and 2016

Margin Protection Program for Dairy Producers, enrolment data for 2015 and 2016

% share of	**Dairy operations**		**Milk production**	
	2015	2016	2015	2016
Not enrolled[1]	44.8	41.1	19.3	14.2
Enrolled	55.2	58.9	80.7	85.8
Of which milk production history is covered at:				
USD 4 per cwt	44.0	77.4	61.5	88.1
USD 6 and 6.5 per cwt	41.6	16.8	29.4	8.5
USD 8 per cwt	1.1	0.6	0.4	0.1
Other	13.3	5.2	8.7	3.3

1. Dairy farmers sign up for the MPP-Dairy program in the year before coverage. Percentages not enrolled and enrolled are for dairy operations and milk production of the previous year.

cwt: hundredweight = 100 pounds = 45.35923 kg.

Source: Mark et al. (2016), http://ers.usda.gov/publications/pub-details/?pubid=79414.

In light of continued low margins over the summer of 2016, USDA has announced it was postponing the deadline for milk producers to enrol to MPP in 2017 from 30 September to 16 December 2016, thus allowing more time for dairy producers to decide whether to purchase dairy margin protection for 2017 (USDA, 2016a, Press release).

Enrolment rates varied across states. Whether measured by share of farms or by production history, the lowest rates of enrolment among major dairy states were in the Northeast (Pennsylvania, New York and Vermont). Meanwhile, the highest rates of enrolment were in the Southwest dairy states of Arizona, New Mexico and Texas (MacDonald et al., 2016).

Sumner and Yu (2014) noted that participation was higher in California, where farms tend to have larger herds, than the national average: 69% of Californian dairy farmers enrolled in MPP in 2015. However, only 35% of those enrolled Californian farmers chose to pay additional premium for higher coverage than catastrophic. Despite this low enrolment rate for higher coverage, the MPP enrolment rates in California are above the national averages, suggesting that the new programme is somewhat attractive for larger dairy enterprises.

Discussion of programme effectiveness and efficiency in the literature

Budgetary costs

Many analysts estimate *ex ante* the wide potential range of payments under MPP-Dairy, based on the simulation of likely combination of feed and milk prices. When discussing results, they outline the scope for high levels of payments under specific circumstances, which do not correspond to the current situation.

Because of falling feed costs in 2015, dairy margins only triggered MPP payments for the 0.6% of all milk producers who had chosen the maximum protection margin of USD 8 per cwt. As a result, net payments were actually negative for the year. In the outlook of the US farm sector for 2016 published in December 2016 as a Congressional Research Service report, Schnepf (2016) expected that the dairy MPP would bring in USD 11 million in 2016 as premiums paid by dairy producers would exceed MPP payments. MPP was triggered in the May/June 2016 period at the USD 6 per cwt level with government assistance valued at USD 11.2 million (FSA, 2016c).

Considering enrolment data released by USDA in January 2016, and using farm-level data from the Agricultural Resource Management Survey (ARMS), MacDonald et al. (2016) calculate government payments for MPP would have a very wide range of USD 1.4-8.2 billion between 2015 and 2018 depending on US feed and milk prices, and on global demand for milk. The authors discuss whether MPP might get trapped in a trend of decreasing dairy margin. By protecting dairy farmers from low margins, MPP could enable some relatively uncompetitive dairies to keep producing despite the market signalling that their enterprise should improve its productivity or move out of dairying. The uncompetitive dairies would therefore keep producing milk. Milk prices would therefore remain low and consequently low margins would trigger MPP again, leading to more budgetary spending.

Nicholson and Stephenson (2014) use a dynamic model of the US dairy industry, calibrated to 2011 data, to simulate the impact of MPP from 2012 to the end of 2018 on a number of variables, for a number of participation scenarios and for 200 stochastic simulations of market conditions. They estimated government spending on MPP that would range up to more than USD 6 billion higher than with previous dairy programmes across the stochastic simulations, and be USD 2.8 billion higher on average.

As noted by Sumner et al. (2015), with an election date at the end of the calendar year, farmers' last-minute enrolment decisions rely on the most accurate market outlook for feeds and milk. This might result in not enough premiums being paid when the margin outlook is good. This situation would then make it difficult to help co-finance the large MPP payments projected to be made in years when the dairy margin is low.

Newton et al. (2016) assess whether the three-month gap between the annual sign-up period and the coverage start date makes it more difficult for dairy farmers to anticipate which coverage option will maximise expected net benefits, using USDA AMS-Dairy programs farm-level data over the period 2009-12 and the expected utility framework to evaluate the impact of MPP decisions under three risk environments corresponding to the 2009, 2014 and 2015 calendar years. They find that, the three-month gap does reduce, but not eliminate the ability to forecast MPP margins and returns to different coverage options. The authors also outline that the lack of production eligibility constraints and means testing on income (as for other commodity programmes) will likely increase the budgetary cost of the programme, and estimate using model simulations that net costs have the potential to exceed USD 3 billion per year, compared to a cost of USD 1.5 billion estimated by CBO in 2014 for the period 2014-24 (CBO, 2014), updated to USD 2.1 billion for 2016-26 in the 2016 projections (CBO, 2016). The authors suggest options to limit budgetary costs in the future, such as increasing the time between sign-up and start of coverage date, and replacing fixed premiums with variable rate premiums reflecting fair market value, providing incentives for dairy farmers to use the programme to protect against unanticipated margin declines.

Impact on income variability

The MPP provides a voluntary mechanism for insurance against different levels of margin loss risk linked to an uncertain dairy and feed market. Many experts agree that MPP, like the menu of choices from the

crop programmes, offers a wide spread of coverage levels from which producers can choose by paying a higher premium (for example, Gouin, 2016; MacDonald et al., 2016; Newton et al., 2016, Sumner et al., 2015).

Presenting the highlights and some economic implications of MPP on web pages, the USDA Economic Research Service (ERS) (2016) explains that the choice by legislators of milk income over feed cost (IOFC) as the trigger for MPP recognises the added instability brought by feed costs in the dairy business. In an ERS report, MacDonald et al. (2016) outline that if dairy producers take on an active management in selecting which year to purchase higher coverage when they expect lower margins, MPP net benefits could be very beneficial for farmers compared with a flat subsidy rate or direct payment.

In a study prepared for the French government, Gouin (2016) considers that the trigger levels of the MPP are very explicit allowing farmers to elect a margin level according to their degree of risk aversion and expected milk production. Estimating MPP payments at different coverage rates under past dairy market conditions, he finds that electing MPP at the minimum catastrophic level would have allowed all milk producers adequately to face the 2009 and 2012 milk crises. The author concludes that MPP is likely to protect dairy farmers from catastrophically low margin conditions. He estimates, however, that for farms with more than 500 cows wanting a high margin coverage level, investing the amount equivalent to the MPP premium into an emergency fund would provide higher returns than enrolling in MPP at maximum coverage.

Comparing different triggers with the actual financial performance of dairy farms in Michigan, New York and Wisconsin, Wolf et al. (2014) conclude that the MPP's trigger indicator is appropriate because it is a reasonable proxy for dairy farm financial risk, being highly correlated with other basic dairy enterprise financial indicators. The comparison outlines, however, remaining targeting issues such as regional differences, herd size and technological change. Because the MPP trigger uses the national feed price, it does not allow for regionalisation across states, which might have different feeding costs. Likewise, the formula calculating the margin also considers that all the feed is being purchased whereas many dairies in the upper Midwest and Northeast grow most of their own feed. However, using a national average facilitates production moving into most efficient, least cost regions.

In a selected conference paper, Richard et al. (2016) simulate the impact of MPP on a regional basis Using ten years (2006-16) of historical prices to parametrise the simulation, they estimate national and regional margins for the period 2017-22. Using the coefficient of variation as a measure of the risk reduction effect of the programme, the study finds that the programme reduces the margin volatility over the whole period. Simulation results also show that the probability of payments being triggered varies significantly across region for a given coverage level. More than half of the regions have higher probabilities of triggering indemnities at every coverage level compared to the national level. This means that if regional parameters were used, the programme might pay out more frequently.

In an ERS report, Mark et al. (2016) estimate the risk reduction associated with purchasing MPP had it been available in 2002-13 by calculating the impact of the programme on realised net margins. They find significant differences by regions, level of coverage, and share of coverage selected by individual farmers. Enrolment into MPP catastrophic coverage for 90% of the milk production history manages to reduce the producer's risk of a drop in gross margin by 7-10% depending on the dairy region considered. In the same conditions, enrolling into the highest coverage at USD 8 per cwt for 90% of the milk production history can reduce gross margin risk by 46-75%.

Nicholson and Stephenson (2014) outline that as it is a voluntary programme with coverage choices to be taken every year, MPP requires a level of managerial effort from farmers that is higher than for the previous MILC programme, whereby all dairy producers were entitled to a MILC payment whenever the Boston Federal Milk Marketing Order (FMMO) price went below a reference price. The authors also remark that the programme's effectiveness depends on its capacity to attract participation at sufficient coverage.

Some authors note that if production costs were to rise again, the probability that dairy farmers will encounter a lower production margin than their historical average will also increase. In a study published in conference proceedings, Yang and Bozic (2015) estimate that if production costs are high, MPP might not be

enough to hedge against dairy farm risk and farmers will have to complement their coverage with existing milk futures markets. Modelling the impact of MPP on dairy producers' use of futures markets for protection, they find that MPP alone is sufficient to protect highly efficient farms whereas less efficient farms must buy additional futures contracts to hedge against production risk. The authors also provide evidence that MPP is particularly appropriate as a risk management instrument for dairies that grow their own feed whereas dairy producers purchasing feed need to get additional protection from the futures markets.

Payments and farm size

The new programme continues to provide proportionally greater support to smaller producers, through lower premiums, and establishes safeguards against rising programme costs by both restricting annual increases in covered production and raising coverage costs for higher levels of production (ERS, 2016). However, the net returns of the programme to smaller farmers are estimated to be lower compared with the previous MILC program, which limited the payment to a maximum quantity of milk per farm. Gouin (2016) calculates that MPP would have provided a lower average return than the former MILC program to farms below 150 cows but larger average returns than MILC for farmers with more than 150 cows. MacDonald et al. (2016) calculate the payments that farms of different size would have receive during the 2009 crisis had MPP been in place, and find that MPP would have provided equivalent returns for farms with around 500 cows but larger average returns than MILC for farmers with more than 1 000 cows.

To avoid creating production incentives, the share of a farmers' milk production history to enrol into MPP was chosen in 2014 and fixed for the whole duration of the Farm Bill in the same way as crop commodity programmes are calculated on the base acreage declared by farmers at the beginning of the Farm Bill and for all its duration. Therefore, expanding dairy farms during 2015-18 would not be able to cover the increase in milk production over the production history value chosen in 2014 (MacDonald et al., 2016).

Impact on markets

In an ERS report, MacDonald et al. (2016) discuss the potential impact of MPP payments on domestic production. In theory, because MPP payments are based on a historical value of production, it should not encourage farmers to produce more milk in order to get more payments. They acknowledge, however, that MPP has the potential to distort milk prices and markets, in particular if it leads enrolled farms to keep producing despite low margins.

In another ERS report, Mark et al. (2016) discusses the supply effect of MPP due to risk reduction by calculating realised net margins, had the programme been in place during the 2002-13 period (see above). They estimate the supply impacts of risk reduction using two different risk elasticities representing the range found in the literature (-0.01 and -0.05) for the nine coverage levels, four size operations and four percent of coverage levels. Supply response estimates range from 0.46% in New England to 0.75% in the Northwest with maximum participation and coverage levels and enrolment with the smallest elasticity, and from 2.29% in New England to 3.76% in the Northwest. They conclude that while the potential for risk reduction from the MPP programme is significant, risk elasticities are likely small, suggesting a small overall supply response. They also consider that impacts of MPP on overall milk supply are limited because the margin impacts of the programme vary by structure of dairy farms. Authors consider that larger producers would be likely to enrol for medium coverage level because net returns from MPP are likely to be negative for them at high coverage levels. They find that small operations would have benefitted most from full participation. For them, choosing the highest coverage level and the maximum percent of coverage would have resulted in the highest margin and greatest reduction of risk level. However, because smaller farms only account for a very small share of total milk production, the supply effect would be negligible.

Mark et al. (2016) note that while enrolment was high in 2015 and 2016, coverage level was generally small and only a small percentage of farmers have received payments during those years (1.1% in 2015, 18.9% by September 2016). Other experts also note that in a market scenario of high international milk prices and stable feed costs, MPP is likely not to be triggered and the payments will thus have no impact on dairy markets. However, Gouin (2016) remarks that in a context of decreasing milk prices, MPP might be triggered

during several consecutive years, allowing milk producers to keep producing without heeding the signal of lower margins, thus feeding a cycle of overproduction and low milk prices, and further triggering MPP. MacDonald et al. (2016) model this deflationary scenario estimating MPP could lead to milk prices falling by 5.4% between 2015 and 2018.

For different participation scenarios, the dynamic model developed by Nicholson and Stephenson (2014) simulates a decline in milk prices compared to a continuation of previous policies. The authors conduct sensitivity analyses over 200 stochastic combinations of milk and feed prices. All but 10 of the 200 simulations results in a lower average margin and all-milk price during 2015 to 2018, and the average reduction in milk price and dairy margin is USD 0.68 per cwt due to MPP.

In a study published in a conference proceedings, Yang and Bozic (2015) consider MPP potential impact on the milk futures markets, under the assumption that dairy producers use hedging and MPP as protection against catastrophic margin risks. They model farmers' behaviour using safety-first preferences assuming farmers seek the lowest risk protection from futures markets as long as they are comfortable with the risk they take. In this framework, MPP crowds out futures market if it reduces the share of milk production being hedged (hedge ratio). Using Monte Carlo simulations to simulate a range of price combinations, they find that MPP's catastrophic coverage of USD 4 per cwt is too low to make a difference in the hedge ratio between MPP participants and non-participants. However, if MPP election is allowed until December of the year when information on futures markets is reliable for the upcoming year, farmers' making a late informed decision of purchasing MPP coverage at higher coverage levels could induce a crowding-out effect on futures markets. The authors estimate the percentage decline in hedge ratio at 14.89-19.99 points in the upper Midwest and 12.99-15.17 points in the lower Midwest as a result of MPP introduction.

Agricultural disaster assistance

Specific programmes provide coverage for losses due to natural disasters for livestock and some crop commodities not covered by other programmes.

Noninsured Crop Disaster Assistance Program (NAP) covers crops for which traditional crop insurance products are not available, generally specialty crops. It could previously secure only catastrophic coverage for yield losses (50% loss at 55% of average market price). The 2014 Farm Bill provided for an expansion of NAP that allows producers to buy additional yield loss coverage for some or all of their eligible commodities (up to 65% of losses at 100% of average market price). However, unlike other crop insurance payments, NAP payments cannot exceed USD 125 000 per individual for a single crop year. As discussed below for insurance programmes, farmers who purchase a policy under the NAP after tilling up native sod see their yield coverage capped to 65% of their transitional yield and the service fee or premium for their NAP policy increased to 200% of the normal premium or fee for the policy purchased. Under the 2014 Farm Bill, the premiums on buy-up level coverage are reduced by 50 percentage points for new farmers and the application fee of catastrophic-level risk protection is waived for beginning farmers.

Regarding **supplemental agricultural disaster assistance programmes**, the 2014 Farm Bill:

- Permanently authorised, unchanged, four of the five standing disaster assistance programmes under the previous Farm Bill that help livestock producers and orchard, vineyard, and nursery tree growers manage the risk of loss from natural disasters — the Livestock Indemnity Program (LIP), Livestock Forage Program (LFP), Emergency Assistance for Livestock, Honeybees and Farm-Raised Fish Program (ELAP) — and the Tree Assistance Program (TAP).
- Did not re-authorise the expired whole-farm revenue-based crop disaster assistance programme, the Supplemental Revenue Assurance (SURE).

Livestock covered by the programmes include dairy and meat cattle, bison, poultry, sheep, pigs, horses, and other minor livestock species. The TAP provides financial assistance to qualifying orchardists and nursery tree growers to replant or rehabilitate eligible trees, bushes, and vines damaged by natural disasters.

In terms of budget outlays, livestock forage disaster payments are expected to constitute the bulk of payments (Table 2.7). They cover primarily grazing losses caused by adverse weather. Livestock indemnity programs cover losses from excess animal death caused by adverse weather or wild animals, losses due to animal disease and some costs incurred for some disease prevention, as discussed below.

Table 2.7. Supplemental agricultural disaster assistance program outlays, 2015-18

USD million

Payment type	2015 (actual)	2016	2017	2018	Total 2015-18	% of total
Livestock indemnity payments	52	30	25	24	131	3
Livestock forage disaster program	2 521	524	316	290	3 651	93
Emergency assistance for livestock, honey bees, and farm-raised fish	49	29	18	18	114	3
Tree assistance program	11	7	5	5	28	1
Total	2 633	590	364	337	3 924	100

Fiscal years (FY): 2016 runs from 1 October 2015 to 30 September 2016.

Source: CBO (2016), CBO's March 2016 Baseline for Farm Programs, www.cbo.gov/sites/default/files/51317-2016-03-USDA.pdf.

Livestock disaster payments mechanisms

The Livestock Indemnity Program (LIP) provides benefits to livestock producers for livestock deaths in excess of normal mortality caused by adverse weather or by attacks by animals such as wolves or predatory birds reintroduced into the wild by the federal government. The indemnity rate was set by the Farm Bill at 75% of the market value of the applicable livestock (US Congress, 2014).

The Livestock Forage Program (LFP) provides compensation to eligible livestock producers who have suffered grazing losses due to drought or fire on land that is native or improved pastureland with permanent vegetative cover or that is planted specifically for grazing. LFP is not eligible for grazing losses on land used for haying or grazing under a Conservation Reserve Program. The payment rate for a single month is equal to 60% of the lesser of the monthly feed cost for covered livestock, owned or leased, or the monthly feed cost calculated by using the normal carrying capacity of the eligible grazing land. If ranchers have had to sell or dispose of livestock due to drought in one or both of the two production years preceding the current production year, they are eligible to 80% of the LFP monthly payment rate described above (US Congress, 2014).

The formula to calculate the monthly feed cost for cattle used for LFP compensation is elaborated by the Farm Bill as: 30 days times 15.7 pounds of maize per day, times the higher of a 12-month or 24-month average of the past March-to-February maize prices per bushel, divided by 56. USDA is mandated to calculate the ad hoc formula of monthly feed costs in equivalent pounds of maize for other types of livestock in view of paying LFP compensation. USDA is also mandated to calculate the normal carrying capacity and normal grazing period for the different types of grazing land across the counties covered by LFP.

The Farm Bill also specifies the variable LFP monthly payment rates according to the level of intensity of the drought, as determined by the US Drought Monitor. An eligible rancher facing a drought of severe intensity (coded D2) during at least eight consecutive weeks within the normal grazing period can receive one monthly LFP payment. Eligible ranchers are paid three monthly payments if hit by extreme (D3) drought at any time during the normal grazing period. If their county faces at least four weeks of D3 extreme drought or a D4 exceptional drought during the normal grazing period, eligible ranchers can receive four monthly payments as calculated above. They receive five monthly payments if faced with D4 exceptional drought during four weeks of the normal grazing period.

In case a fire leads federal authorities to deny access to federal lands on which a rancher had a lease with grazing rights, an LFP payment is made to the prejudiced rancher equivalent to 50% of the monthly feed cost.

ELAP provides emergency assistance to eligible producers of livestock, honeybees and farm-raised fish for losses due to disease and costs incurred for some disease prevention, adverse weather, or other conditions, such as blizzards and wildfires, not covered by LFP and LIP. The Farm Bill text allocates up to USD 20 million per fiscal year for this programme.

Livestock disaster payments impact

As recommended in OECD (2011b), the livestock disaster payment programmes define ex ante the events and conditions for triggering payments, using measurable criteria, and the provisions for calculating payments, which are based on losses and cover part of them in some cases. As a result, the programmes are expected to provide livestock producers with predictable payment levels in loss circumstances, with limited influence on farmers' behaviour. Very little research has been identified, however, on the observed impact of the livestock disaster payments on farmers' behaviour and markets.

Federal crop insurance programmes

Overview and main changes

The 2014 Farm Bill extends most of the crop insurance instruments from the previous legislation, with minor amendments. The main federal crop insurance programmes are the so-called "traditional crop insurance" covering both yield and revenue losses for an increasing number of commodities. In addition, various insurance programmes cover catastrophic risk (e.g. CAT), specialty crops, or revenue losses (Box 2.1), and two new programmes were introduced to cover more shallow losses: the Supplemental Coverage Option (SCO) for commodities for which producers did not opt for ARC; and the Stacked Income Protection Plan (STAX) for upland cotton producers.

Another novelty is that the environmental cross-compliance that was tied to the commodity title farm payments is now extended to the crop insurance title. Receiving subsidies on crop insurance premium is also subject to the recipients having established an individual farm-based conservation plan to protect highly erodible cropland and wetlands.

When farmers apply for government-based insurance instruments, there are generally no payment limitations on payments they receive under the federal crop insurance program, and the new SCO and STAX. These payments are also not subject to adjusted gross income (AGI) eligibility limits.

Box 2.1. Federal crop insurance programmes

Traditional crop insurance policies are widely available covering up to 100 different commodities. However, coverage is not available for all crops in all areas. These insurance policies make indemnity payments to producers based on current losses related to either below-average yields (crop yield insurance) or below-average revenue (revenue insurance). Main policies are listed below.

Actual Production History (APH) policies insure producers against yield losses due to natural causes. The producer selects the amount of average yield to insure; from 50-75% (in some areas to 85%). The producer also selects the percent of the predicted price to insure; between 55 and 100% of the crop price established annually by RMA. If the harvested plus any appraised production is less than the yield insured, the producer is paid an indemnity based on the difference. Indemnities are calculated by multiplying this difference by the insured percentage of the price selected when crop insurance was purchased and by the insured share.

Yield Protection policies insure producers in the same manner as APH polices, except a projected price is used to determine insurance coverage. The projected price is determined in accordance with the Commodity Exchange Price Provisions and is based on daily settlement prices for certain futures contracts.

Within traditional crop insurance, **Catastrophic Risk Protection Endorsement (CAT)** coverage provides a lower level of coverage on yield losses at a low cost to producers. It pays indemnities at a rate of 55% of the established price of the commodity when farm yield losses are more than 50%. Producers pay an administrative fee for each crop insured. Coverage above the CAT level is often referred to as “buy-up” coverage.

Dollar Plan coverage pays for both quantity and quality yield losses and is limited to some **high-value crops** (e.g., fresh market tomatoes and citrus (oranges/grapefruits). It guarantees a dollar amount per acre rather than a particular yield level.

Area Risk Protection Insurance (ARPI) policies may cover either yield or revenue and use county yields as the basis for determining a yield loss or calculating revenue coverage levels and actual revenue loss (similar to the SCO and STAX programmes). When the county yield for the insured crop falls below the trigger level chosen by the farmer, an indemnity is paid. Yield coverage is available for up to 90% of the expected county yield; producers may select revenue coverage levels from 70 to 90% of expected county revenue. ARPI premiums are usually lower than those for individual insurance.

Actual Revenue History (ARH) plan of insurance has many parallels to the APH plan of insurance, with the primary difference being that instead of insuring historical yields, the plan insures historical revenues.

Index insurance, which offers area coverage based on estimated production losses related to indexed levels of rainfall, is available for the Pasture, Rangeland, and Forage Pilot Program, the Apiculture Pilot Program, and the Annual Forage Pilot Program.

Revenue Protection (RP) policies provide protection against a farmer's gross revenue for an individual crop falling below a guaranteed level. Farmers elect a coverage level (50-85%), which is multiplied by their Actual Production History (APH) yield and the higher of 1) the base market price, which is an average of the harvest-time futures price for a month prior to planting; or 2) the month-long harvest market price for the last month of the contract to determine the revenue guarantee. Trigger level and premium for Revenue Protection are set by RMA based on APH yields in a similar fashion as for yield protection insurance. From the 2015 crop, a RP programme is available for peanuts. **Revenue Protection With Harvest Price Exclusion** policies insure producers in the same manner as RP, except the amount of insurance protection is based on the projected price only.

Whole Farm Revenue Protection, established in 2015 from the previous Adjusted Gross Revenue (AGR) Pilot Programs, insures the revenue of the entire farm rather than an individual crop by guaranteeing a percentage of average gross farm revenue, a share of which may come from livestock revenue. The plan uses information from a producer's farm business income tax forms to calculate the policy revenue guarantee. This new whole farm revenue protection was available for sale in the 2015-16 crop year when 1 128 policies were sold for a total liability of USD 1.15 billion. As of 30 January 2017, 2 239 policies were sold the following year for a total liability twice as large (RMA, 2017).

RMA is studying new insurance products for bioenergy crops, catfish, alfalfa, livestock diseases and business interruptions, and food safety for specialty crops.

The **Livestock Gross Margin Insurance for Dairy Program (LGM-Dairy)** was introduced by the 2008 Farm Bill. Administered by RMA, it allows dairy producers to purchase a margin insurance product based on deferred futures prices for Class III milk, and maize and soybean meal. Since 2011 premiums for LGM-Dairy have also been subsidised to attract more farmers. Despite its potential benefits, LGM-Dairy has had limited participation due to the statutory livestock insurance limit in the Federal Crop Insurance Act. Unlike the funding for non-livestock insurance products, government expenses to administer livestock insurance are currently limited to USD 20 million per fiscal year. Once this limit is reached in a fiscal year, sales of the insurance product must cease. Because of this statutory limit, funds for LGM-Dairy can be exhausted during the year, suspending LGM-Dairy until the start of the next year. Consequently, LGM-Dairy has not become a regular part of many farmers' risk management strategies. Milk producers cannot be enrolled concurrently in LGM-Dairy and the Margin Protection Program. LGM Insurance is also available for swine and Livestock Risk Protection for swine, fed cattle, feeder cattle and lamb, but all within the USD 20 million cap on expenditures.

Source: RMA web site: www.rma.usda.gov/policies/; and ERS website: www.ers.usda.gov/topics/farm-economy/farm-commodity-policy/crop-insurance-program-provisions-title-xi/

Developments in traditional crop insurance

US traditional crop insurance provides the bulk of federal crop insurance coverage. Producers purchase policies through several private insurance companies (16 in 2017) and 12 000 to 15 000 independent licenced insurance agents at a subsidised rate. On average, producers pay only about 40% of their premiums (RMA, 2017). In addition to paying about 60% of producers' premiums (63% in 2016 over all programmes), the government also pays for a portion of operating expenses (costs) of insurance companies, and provides reinsurance to the private insurance providers. In a web-based note discussing developments in US crop insurance, Zulauf (2016a) reports the growth in the total cost of the programme for the US government from USD 3.3 billion in 2000-04 to USD 8.6 billion in 2010-14, while the share of the premium subsidy was increasing from 56% to 87% of the total costs. CBO (2016) projects a share of premium subsidies of about 81% for the period 2015-18.

Insurance policies make indemnity payments to producers based on current losses related to either lower than expected yields (crop yield insurance) or lower than expected revenue (revenue insurance) (see Table 2.8 for an example of payment calculation). Farmers purchase insurance before planting, but usually pay premiums near harvest. Governance mechanisms are summarised in Box 2.2.

Box 2.2. Governance of US crop insurance

Under the federal crop insurance program, private-sector insurance companies sell and service the policies. Independent insurance agents broker insurance contracts between farmers and insurance companies. The agents usually build up a portfolio of insurance contracts purchased by farmers and distribute this portfolio among the various insurance companies that are present in their state. Insurance companies compete for the contracts brokered by the independent agents.

Federal crop insurance is overseen by the Federal Crop Insurance Corporation (FCIC) of USDA. USDA's Risk Management Agency (RMA) develops the premium rate calculation or approves the premium rate calculated by an insurance company for a new product. RMA also administers premium and operating expense subsidies, approves and supports insurance products, and reinsures the insurance companies.

RMA thus subsidises the insurance premiums paid by farmers as well as a portion of the companies' administrative and operating (A&O) expenses, and it shares underwriting gains and losses with the companies each financial year. A&O expenses reimbursements are proportional to the amount of premium the insurance company receives from its customers.

The relationships between the different stakeholders in the federal crop insurance system are outlined by the Standard Reinsurance Agreement (SRA), which is periodically reviewed and modified through negotiations between the insurance companies and FCIC, followed by Congressional legislation. According to the SRA, insurance companies must accept all contracts brokered by the independent insurance agents and cannot modify the premium for an individual contract negotiated by the broker. The SRA limits the compensation rate paid by insurance companies to independent agents to 80% of the total amount of A&O subsidies and Catastrophic Risk Protection reimbursements.

Source: RMA web site: www.rma.usda.gov.

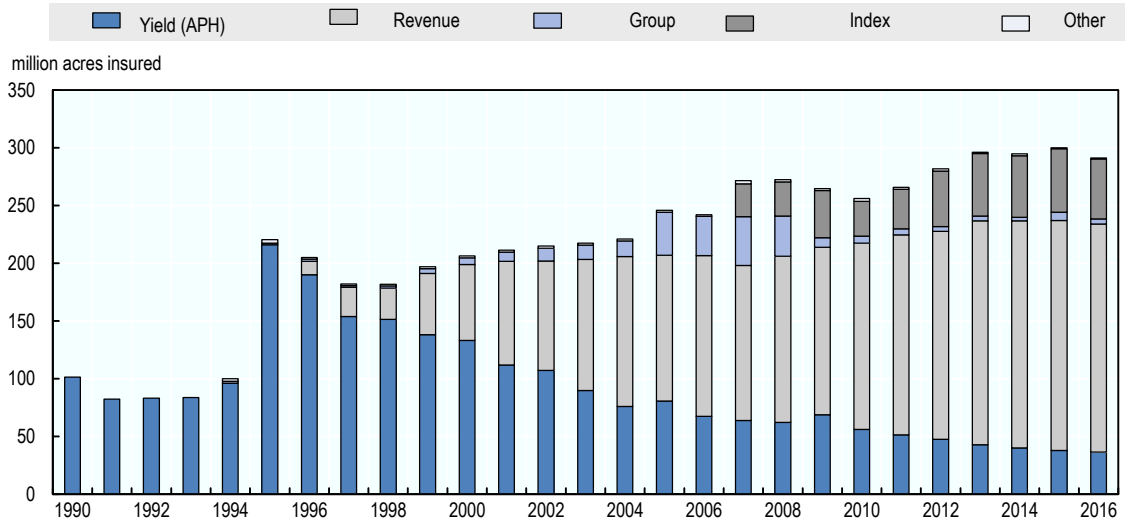
Crop insurance options have offered expanding risk management choices over time. Producers may choose from among a variety of yield and revenue insurance products, although not all policy types are available for all crops in all areas.

The number of acres covered has tripled from 100 to about 300 million acres between 1990 and 2016, accounting for over 85% of potentially insurable area according to Glauber (2016). The largest increase was in 1995 when insured area more than doubled compared to previous year with the introduction of catastrophic coverage. It then fluctuated around 200 million acres during the following ten years and gradually increased from 2004 (RMA, 2017).

Actual Production History (APH) yield protection is the oldest and most widely available crop insurance product. It protects farmers against yield losses due to natural causes such as drought, excessive moisture, hail, wind, frost, insects, and disease, using mechanisms described in the next section.

The increasing availability of revenue insurance products has steadily expanded their share of all crop insurance policies and by 2015 revenue protection accounted for about two-thirds of all area insured (Figure 2.3). For a given subsidy rate, the growth in revenue product has offered opportunities to lower insurance cost for farmers because the natural hedge combining price and yield of a given crop contribute to reducing revenue variability.

Figure 2.3. Crop insurance coverage by option, 1994-2016



APH: Actual Production History (farm or sub-farm unit level). Revenue: APH yield x national price (farm or sub-farm unit level).
Group: County yield (GRP) or county revenue (GRIP). Index: Rainfall or vegetation (pasture, rangeland and forage).
Source: ERS compilation of Risk Management Agency data.

The 2014 Farm Bill provides specific and more favourable conditions to a "beginning farmer or rancher", defined as a farmer or rancher who has no more than five years of experience:[11]

- Exemption from paying the USD 300 administrative fee for catastrophic coverage (CAT) and additional coverage (buy up) level policies;
- Additional 10 percentage points reduction of premium subsidy for additional coverage policies (buy-up) that have premium subsidy;
- Use of the production history of farming operations where beginning farmers and ranchers were previously involved in the decision making or physical activities; and
- An increase in the substituted yield for yield adjustment, which allows a replacement of a low yield due to an insured cause of loss,[12] from 60 to 80% of the applicable county level-yield established by RMA (transitional yield or T-Yield) for the crop.

On web pages presenting the implications of 2014 Farm Bill features, ERS (2016) expects that the new federal crop insurance premium assistance to beginning farmers and ranchers will have a considerable impact on enrolment rates. It should encourage more beginning farmers and ranchers to enrol in the programme or to enrol more acres if they already participate. In terms of funding, USD 261 million over 10 years was allotted specifically to allow beginning farmers and ranchers to purchase crop insurance. Historically, beginning farmers have been less likely than their established counterparts to participate in federal crop insurance programmes. While they accounted for nearly 11% of land in all US farms in 2011 beginning farmers operated only 7% of the acres enrolled in crop insurance.

The 2014 Farm Bill also reduces the crop insurance benefits received by farmers who put untilled grassland, referred to as native sod, back into production. This so-called "sodsaver" provision is applicable

11. www.rma.usda.gov/help/faq/farmer_rancher.html.

12. See provisions allowing farmers to adjust their reference yield to minimise the impact of exceptional unfavourable circumstances in the description of Actual Production History (APH) yield protection in the next section.

only to native sod areas in the states of Minnesota, Iowa, North Dakota, South Dakota, Montana and Nebraska. Producers who till up native sod see their benefits from federal crop insurance programmes reduced during the first four years of planting. Not only is the farmers' yield trigger level reduced to 65% of his or her transitional yield, but the premium subsidy only amounts to 50 percentage points of the premium subsidy that would normally apply to the policy purchased..

Actual Production History (APH) and Actual Revenue History (ARH) protection mechanisms

Coverage

With APH yield and ARH revenue protection, the farmer can select a coverage level from 50 to 75% of average yield (up to 85% in some areas), and a guarantee price, ranging from 60 to 100% of the crop price established annually by USDA's Risk Management Agency (RMA). Main parameters and payment calculation formulas are summarised in Table 2.8, and compared with those of other risk management programmes introduced with the 2014 Farm Bill to illustrate differences in risk coverage. The main differences between crop insurance and ARC are that farmers must pay a premium to enrol, that crop insurance is available on all current crop area planted, and that crop insurance payments do not have upper limits. Most importantly, APH and ARH cover losses due to farm yield or revenue changes, while ARC-CO payments are made on the basis of the difference between county actual revenue and a county benchmark revenue, and are paid on historical base, not current plantings.

Yield or revenue coverage levels (both liability and trigger level) are based on a producer's expected yield or revenue, which is calculated from the farm's actual production history (average of yields or revenue over the last 4-10 years).[13] Several yield adjustment provisions allow producers to minimise the impact of exceptional unfavourable circumstances, and thus increase their coverage levels:

- A **yield substitution provision** allows farmers to substitute a low actual yield observed by the value corresponding to 60% of the county proxy yield if the actual yield goes below this latter value. This substitution provision allows farmers to level out the variability in their actual production history caused by extreme loss events when calculating their yield coverage level.
- To allow further levelling of the variability observed in APH, the 2014 Farm Bill introduced an additional **yield exclusion provision** allowing farmers to exclude the value of a catastrophic yield from their APH. Years eligible for catastrophic yield exclusion are determined by RMA when the yield in a specific county falls below 50% of county average yield for a planted acre in the past ten consecutive years (RMA, 2016a). A crop year that has been determined eligible for exclusion for a crop in a county will also be eligible for exclusion in contiguous counties.
- **Yield floors** allow the APH not to go below a specified percentage of the so-called T-yield, which is the variable transitional yield calculated by RMA for a given crop in a given county. Farmers can choose so-called **yield cups**, which prevent their actual yield record to decrease by more than 10% from the previous year's record. In some areas and for some crops, policy holders can also choose **trend-adjusted APH**, which allows farmers to adjust their individual APH according to their county's historical yield trend.

13. Detailed regulations applicable to the calculation of federal crop insurance expected yields are available in the RMA's *Crop Insurance Handbook*: www.rma.usda.gov/handbooks/18000/2015/15_18010.pdf.

Farmers choosing the yield exclusion provision cannot apply for yield substitution but the RMA has increased the premium for insurance policies with a yield exclusion provision to cover the additional risk arising to insurers from the heightened guarantee level. Yield substitution still applies, if elected by the producer, on years not excluded. RMA data from February 2016 indicated that yield exclusion had been used within APH in 20% of the policies overall and in 56% of all the policies sold for maize in 2015. The respective figure for cotton was 7%, and 2% for wheat (RMA, 2016b).

Table 2.8. Insurance payments calculation compared with ARC-CO

	Actual Production History (APH) and Actual Revenue History (ARH) protection	Supplemental Coverage Option (SCO)	County Agriculture Risk Coverage (ARC-CO)
Commodity basis	Individual	Individual	Individual
Eligible area	Current area planted	Current area planted	85% of historical base area of the commodity
Payment trigger	Current yield or revenue drop below the farm's actual production or revenue history (average of the last 4 to 10 years), but alternatives are possible.	Realised revenue (or yield) drops below 86% of county average revenue (or yield)	County crop revenue drops below 86% of county benchmark revenue
Payment rate	Covered yield minus current yield, times the covered guarantee price, or covered revenue minus current revenue	Covered yield or revenue minus realised yield or revenue	Benchmark guarantee minus county crop revenue (actual average county yield times national farm price)
Benchmark (covered) revenue	Covered yield (50% to 75% of average yield and up to 85% for some crops and areas) times a guaranteed price ranging from 60% to 100% of the annual crop price established by the RMA, or covered revenue (50% to 75% of average revenue)	86% of county average yield or revenue	5-year Olympic average[1] **county** yield times 5-year Olympic average national price or the PLC reference price, whichever is the higher for each year
Payment amount	Payment rate times current area enrolled	Payment rate times current area enrolled	Payment rate times eligible area enrolled
Subsidy rate	Varies but about 60% of premium on average	65% of premium	100%
Maximum payment per acre	Payment is limited by amount of liability on policy (benchmark revenue as described above)	Payment is limited by amount of liability on policy	10% of the commodity's benchmark guarantee
Ceiling on payment per farm	None	None	USD 125 000 for each individual actively engaged in farming, for the total of payments from the PLC and ARC programs, and marketing loan gains and loan deficiency payments under the marketing assistance loan program.

1. The five-year Olympic average is the average of the last five years minus the highest and lowest observations.

Source: 2014 Farm Bill.

APH premium calculation

The premium to be paid by farmers for APH yield protection policies is calculated by the RMA for different combinations of crop, county, farm type and farm practices according to the average APH at county level. The RMA usually considers that production units with higher expected yields are less risky, resulting in lower premium rates. The premium for individual farms in a given county can then be adjusted by RMA according to the individual APH. The premiums calculated for revenue-based insurance are also derived from an individual farm's APH.

The farmer's choice of APH substitution or exclusion can also lead to an adjusted premium to cover the higher risk to the insurance service provider of having to insure yield to a higher calculated trigger level than actual production history would entail. To compensate for the exclusion of yields from the calculation of APH, RMA charges premiums commensurate with the increase in effective coverage (RMA, 2015). The RMA increases all premiums to meet the legislative mandate that premiums cover anticipated losses plus a reasonable reserve (RMA, 2008).

In a working paper published on the *AGree* blog to stimulate discussion, Woodard (2016) outlines that the whole crop insurance industry is based on the assumption that the premiums calculated by RMA are actuarially fair, which is required by law. In other words, the variation across counties and individual farms of the premiums calculated does indeed represent the variability of yield potential in the different locations where yield protection insurance is provided.

Traditional crop insurance evaluation in the literature

As the traditional crop insurance payments are essentially a continuation of the same policy instruments in the previous Farm Bills, the body of research identified on these policies is very extensive. Findings from studies pre-dating the implementation of the 2014 Farm Bill are thus expected to remain largely relevant for the evaluation of current traditional crop insurance programmes, although potential differences are highlighted.

Subsidising crop insurance: Rationale and evidence

The literature discusses government role in insurance markets in theory and practice. Insurance schemes can be offered at a reasonable cost when risks can be spread over a large number of clients, and are not too highly correlated or too high to make premiums unaffordable. In agriculture, price and yield risks often affect large regions, and except for those covering risks of a limited geographical scope such as hail, agricultural insurance schemes generally function with government subsidies that reduce premium costs for farmers (OECD, 2000). In the case of the United States, the government may also pay for a portion of administration costs for insurance companies, and provides reinsurance. One argument for significant shares and levels of government support in crop insurance programmes is their potential capacity to cover catastrophic risks and prevent using *ad hoc* disaster payments (Box 2.3; OECD, 2011). Box 2.4 offers selected evidence from the literature on this issue.

In a web-based note posted on *farmdoc daily*, discussing developments in US crop insurance, Zulauf (2016a) remarks that successive Farm Bill reforms have added more crops and risk coverage options to the federal crop insurance programme, and increased the premium subsidy rates at all coverage levels to encourage participation over time, mainly in 2000 and 2008. He explains that the higher subsidy rate was needed to induce low-risk farmers to participate, but the same rate was also offered to high-risk farmers, who would have bought insurance with a lower subsidy rate.

Box 2.3. Government intervention in agricultural risk management: OECD guiding principles

OECD analysis of risk management in agriculture has identified three layers of risks which require different responses:

- *Normal* variations in production, prices and weather do not require any specific policy response. These can be directly managed by farmers as part of normal business strategy, via the diversification of production or the use of production technologies which make yields less variable. Income-smoothing through tax instruments for businesses is also part of normal risk management.
- At the other extreme, infrequent but *catastrophic* events that affect many or all farmers over a wide area will usually be beyond farmers' or markets' capacity to cope. A severe and widespread drought is one example. The outbreak and spread of a highly contagious and damaging disease is another. Governments may need to intervene in such cases.
- In between the normal and the catastrophic risk layers lies a *marketable* risk layer that can be handled through market tools, such as insurance and futures markets, or through co-operative arrangements between farmers. Examples of marketable risks include hail damage and some variations in market prices.

Risk management tools are essential to enable farmers to anticipate, avoid and react to shocks. A broad approach is needed that recognises how different sources of risk, different strategies and different actors – both public and private – interact. Governments should adopt a holistic approach to risk management, assessing all risks and their relationships to each other, and avoiding focusing on a single source of risk, such as prices. Increased co-operation and communication with stakeholders – farmers and veterinarians included – is essential for better policy design in order to understand the capacity of farmers to manage risk and the additional sources needed to improve responses. Governments can also play a primary role in facilitating good "start-up" conditions, by providing information, regulation and training for the development of market-based risk management tools such as futures, insurance and marketing contracts. The OECD has developed three guiding principles of good design of risk management policies in agriculture:

- Agricultural risk management policies should focus on catastrophic risks that are rare but cause significant damage to many farmers at the same time. The procedures, responsibilities and limits of the policy response – including explicit triggering criteria and types and levels of assistance – should be defined in advance of the event.
- Policies should not provide support for the management of "normal" risk. This should be the preserve of farmers themselves. Minimum intervention prices or payments that are triggered when prices or returns are low may actually be counter-productive, as they tend to induce more risky farming practices.
- Policies should also avoid crowding out the development of private insurance markets by subsidised insurance. Subsidising insurance can be costly for governments and has not deterred pressure for additional *ad hoc* governmental assistance after a catastrophic event.

Source: OECD (2016) based on OECD (2009, 2011c).

Box 2.4. Can crop insurance address catastrophic risks?

In a web-based note discussing historical developments in US crop insurance programmes, posted on *Farmdoc daily*, Zulauf (2016a) explains that "a rationale consistently given for enhancing participation in crop insurance was to reduce *ad hoc* crop disaster assistance".[1] He outlines that since the enactment of a permanent crop disaster programme in the 2008 Farm Bill, no *ad hoc* payment was made for crops, but expenditure on crop insurance subsidies as a share of crop receipts more than doubled between 1990-2008 and 2014-15. The share of crop insurance subsidy as a share of US crop receipts increased by 1.8 percentage points— from 1.3% in 1990-2008 to 3.1% in 2014-15, while *ad hoc* disaster payments accounted for 0.9% US crop receipts in 1990-2008.

Deryugina and Kirwan (2016) attempt to estimate empirically the likely importance of the Samaritan's dilemma in US crop farming, i.e. the extent to which the expectation of receiving *ex post* disaster payments has affected farmers' buy up of crop insurance. Using county-level information for the period 1990-2011, they estimate econometrically the purchase of insurance as a function of expected disaster payments, first using past experience, then using a swing voter model to represent expectations. They find that contemporaneous disaster payments are positively correlated with insurance expenditure as they both respond to the same shock. They also find a positive correlation between lagged disaster payments and insurance expenditure as farmers who receive a disaster payment are typically required to purchase crop insurance in the next year or two, and they may also change their perception of risk. When using the predicted value of disaster payments based on swing votes to explain crop insurance choices, they estimate that for a 1% increase in expected disaster payments, the number of farmers choosing the most generous plans falls by about 1.2%, the number of plans with a 70 to 75% coverage level falls by 0.4%, while there is a rise in the number of lower coverage plans, by 0.2% in both the 50% and 55-65% coverage levels. They conclude that the Samaritan's dilemma exist in US agriculture as expected disaster payments affect significantly farmers' crop insurance decisions. They also warn about the risk of farmers expecting ad hoc support purchasing less insurance and adopting a riskier behaviour.

1. There is some evidence that in the 1980s, *ad hoc* disaster payments lowered demand for crop insurance, as reported by Smith and Goodwin (2013). For example, estimating econometrically the demand for multi-peril crop insurance by Iowa corn producers in 1985-90, Goodwin (1993) found a lower response for crop insurance participation in areas where disaster aid had been paid the previous year.

In another *farmdoc daily* note, Zulauf (2016b) discusses the rationale for subsidising crop insurance and, recognising with most economists that private markets can provide cost-effective insurance for idiosyncratic risks, he proposes to calculate subsidy rates based on systematic risks only. The note also discusses the implication of increasing subsidy rates as the coverage level declines, which is consistent with the principle that government assistance should focus on larger risks, while farmers and markets should be able to manage the lower risks. However, it results in high-risk farmers receiving most subsidies, which may encourage risky practices. In an earlier study presented at a conference, Zulauf et al. (2013) estimated the share of crop revenue loss that is systemic at the county level as the minimum of farm loss or county loss as a share of farm loss, using data for Illinois and Kansas management association farms over the 1977-2012 period. They found that for losses over 15%, the share of farm losses systemic with county losses averaged 46% across crops in Illinois and 50% in Kansas, but for greater losses over 50%, this share was much lower (11% in Illinois and 30% in Kansas). On this basis and other concurring evidence that farm level risk only partially reflects county level risk, which largely determines premiums, Zulauf and Orden (2014) argue in an IFPRI discussion paper, that the average subsidy rate is too high if one concurs with the economic rationale that idiosyncratic risk should not be subsidised.

While some argue that the subsidy on insurance premiums to farmers might actually not be needed in every case, there is little evidence available that farmers would buy non-subsidised multi-peril crop insurance products. Luckstead and Devadoss (2016) use their model of a representative Kansas dryland wheat farm to simulate the impact of a removal of crop insurance premium subsidies on farmers' benefits and find that under several scenarios combining different risk management programmes, farmers would keep making a net benefit over the baseline by enrolling in crop insurance even without government premium subsidy.

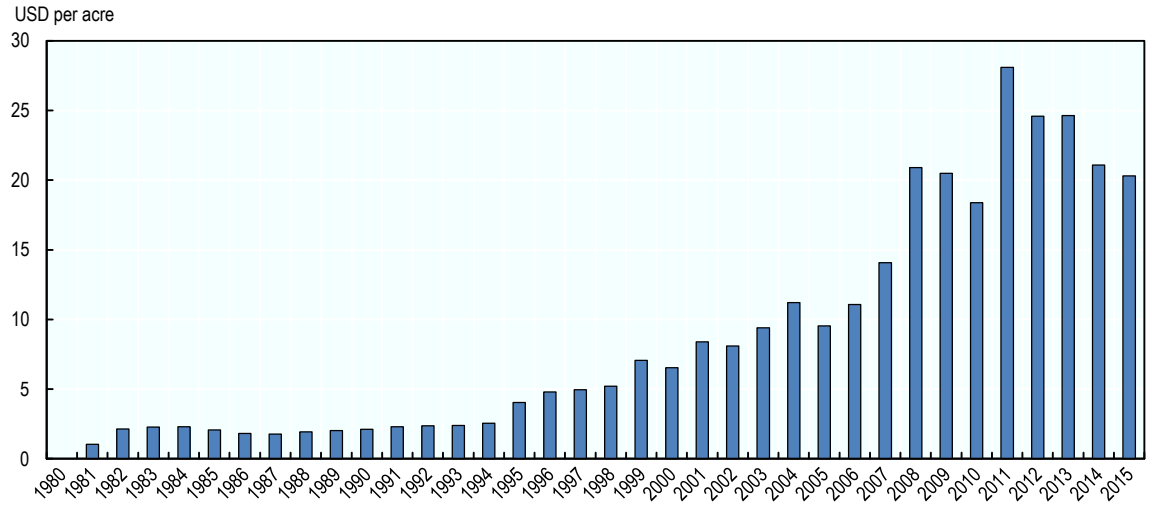
Pearcy and Smith (2015) develop a theoretical model of relationships between economic agents involved in crop insurance programmes — the federal government, farmers, insurance agents and insurance companies — and use it to investigate the impact of a marginal increase in A&O subsidies given to insurance companies. In the model, higher A&O subsidies result in an increase in the compensation rates given to the independent agents in charge of brokering insurance contracts for the companies. This also increases the quantity of policies sold because the brokers are encouraged to assemble a bigger portfolio of policies. Mathematically, increases in policy numbers lead to higher premium subsidy payments to farmers and bigger company profits. The authors conclude that an increase in A&O subsidies benefits most insurance companies, and does not benefit farmers while it has a high incidence on government payments.

Developments in budget costs

As shown by Barnett et al. (2016) in a study published in the *AGree* blog, using RMA statistics, US federal crop insurance programmes have become increasingly costly to the public budget in the form of premium subsidies and subsidies to cover the costs of administration and operation (A&O) of private insurance providers (Figure 2.4). The increase in premium subsidies since the start of crop insurance programmes is due to higher premium subsidy rates, higher crop prices since 2008, enhanced yields, and farmers' choices to opt for higher coverage.

In a web-based note posted on *farmdoc daily*, Zulauf (2016b) calculates that a 50% premium subsidy rate (compared with the current average closer to 60%) would have lowered 2015 crop insurance premium subsidies by USD 1.2 billion. Discussing the potential for crop insurance reform, Paulson et al. (2014) estimate the impact of a cap on premium subsidies on the amount of subsidies and the insured area, using data from the RMA summary of business for 2012. They find that if premium subsidies had been capped at USD 20/acre, total subsidy costs would have been 40% less than they were in 2012, for a saving of nearly USD 2.9 billion and with about 58% of insured land being affected by the cap.. In this case, most farmers are affected and see their premium subsidy per acre decrease by at least 20%, except for barley and oats. Even a relatively high cap of USD 40/acre would lower total subsidies by over 13% and ensure USD 1 billion savings.

Figure 2.4. Developments in crop insurance subsidy per acre, 1980-2015



Source: Barnett et al. (2016), "Public and private roles in agricultural risk transfer", www.foodandagpolicy.org/sites/default/files/AGree_4%20Papers%20Compilation_March2016_FINAL_0.pdf.

Lusk (2016) estimates the welfare effects of the removal of crop insurance premium subsidies, using a partial equilibrium model of the US agri-food system. Overall, removing crop insurance subsidies is estimated to result in annual welfare gains of USD 622, 932 and 522 million in 2012, 2013 and 2014 respectively. Taxpayers would be the only net beneficiaries with welfare gains ranging from USD 6.5 to 7.5 billion, while all other categories would be worse off. According to model simulations, the removal of subsidies results in lower production leading to higher commodity and food prices. US food consumers lose about USD 2.3 billion in 2014, mainly due to the rise in food prices, and foreign consumers over 0.8 billion. Ethanol producers and consumers are mainly affected by an estimated 4.75% rise in maize prices, generating a loss of close to USD 0.8 billion in 2014. Finally, US agricultural producers (and their input suppliers) are expected to record welfare losses of over USD 2 billion although prices for most commodities increase because of lower volumes sold and the loss of subsidies.

Ramirez, O.A. and J.S. Shonkwiller (2017) develop a probabilistic model of the crop insurance purchase decision that explicitly recognises that neither the producer nor the insurer knows the exact value of the actuarially fair premium. Applying the model empirically to a corn producing county of Illinois, they find that a 1% reduction in subsidy rate would decrease participation by about 0.22%, but it would reduce government expenditure by nearly 1.2%. The farmers exiting are those with lower risk exposure, who can find other ways to manage risk. The model also suggests that further subsidy increases might have much smaller impact on program participation as this expands. Contrary to past literature, the authors find that increased producer knowledge about correct premiums should enhance (not hinder) the actuarial performance. They conclude that educational programmes aimed at improving farmers' capacity to assess yield risks could increase enrolment in crop insurance without additional subsidies.

In a recent IFPRI Working Paper, Smith et al. (2016) analyse rent dispersion in the US agricultural insurance industry, by applying econometric methods to company expense data. They find that as payments to insurance companies to compensate delivery costs increased between 2001 and 2009, an increasingly large share of the rent accrued to insurance agents, through commissions paid by insurance companies. In a study for an organisation dedicated to increasing transparency in government spending Glauber (2016) analyses the partnership between the government and private insurance companies and agents for the delivery of US crop insurance programmes, and discuss various options to reduce delivery costs for the government. For example, they suggest that fixed delivery costs should be negotiated with insurers, and de-linked from premium size, which vary with crop prices as they influence the amount of indemnities. They conclude that opening up the delivery system to more competition on prices, will ensure that companies have incentives to deliver

insurance at costs reflecting their true marginal costs, and thus reduce economic rents, and costs for producers and taxpayers.

Impact on income variability

In a study published on the *AGree* blog to stimulate policy discussion, Barnett et al. (2016) consider that US crop insurance programmes offer crop producers effective tools to reduce the losses due to the various types of risks they face. Coverage has improved for commodity specialties, which were previously not covered or less well covered than main crops. The range of risks covered has increased and crop farmers have now a more diverse selection of tools and options to manage their own risk. However, crop insurance programmes do not generally cover shallow losses, thus the introduction of new programmes to offer additional protection: ARC and PLC in the commodity programme title and SCO in the insurance programme title.

Many of the studies discussing crop insurance performance on the basis of implementation features highlight the great flexibility given by the various crop insurance options for farmers to choose the type of insurance and coverage level depending on their yield variability and their risk aversion (see for example selected conference paper by Adhikari, 2016; book chapter by Babcock, 2016). This flexibility is also embodied in the possibility of excluding or modifying a bad year's yield from a farmer's APH every time the farmer purchases a new insurance policy (selected conference paper by Adhikari and Luitel, 2016; Woodard, 2016 in *AGree*). Smith and Goodwin (2013) consider that another component of the flexibility of the US crop insurance system is the fact that farmers' groups and insurance companies can propose new insurance products that are considered more relevant or useful to RMA for premium subsidy.

Evidence suggests that subsidised crop insurance does more than stabilise income over the medium-term and provides income support. In a report published by the Environmental Working Group (EWG), Babcock (2016) compiles data from RMA's Summary of business reports from 2000 to 2014 to calculate the average rate of return of purchasing crop insurance — the amount of net claims payouts as a percentage of the premium paid. He finds that producers' aggregate rate of return from buying a crop insurance policy averaged 120% per year between 2000 and 2014, and ranged from a low 29% in 2007 to a high 324% in 2012 during the period. This means that on aggregate, farmers receive much more than what they pay every year. The average rate of return reflects the share of premium paid by the government at most popular coverage levels between 65% and 75%, which are subsidised at 59% and 55% respectively. Considering rate of return by crops and states, he finds significant differences.

Distribution of benefits among farmers

Disaggregating the simulated welfare effects of a removal of crop insurance subsidies across states, Lusk (2016) finds that producers in Midwest and Southern grain producing states are the main beneficiaries of crop insurance subsidies, while producers of fruits and vegetables in Western states are actual net losers, and would benefit from a removal of the subsidies..

Overall, the odds of making a net return from crop insurance vary considerably across main crop and location, as do yield and price risks. For example, calculations based on RMA data between 1981 and 2012 show that rangeland ranchers, cotton and sunflower farmers have earned close to or more than USD 3 for each dollar paid in premium whereas soybean, hybrid maize and almond producers received USD 1.6 or less per dollar of premium paid (Smith and Goodwin, 2013).

In a selected conference paper, Adhikari and Luitel (2016) find that the recent tweaks in the yield exclusion and substitution provisions in APH calculation lead to variations in producers' welfare increases. These variations also depend on the type of crop and coverage level chosen. The authors show that welfare gains are greatest for low-risk crops like Midwest maize at highest coverage level whereas for high-risk crops like cotton in Texas, the optimal welfare gains from yield modification provisions are secured when choosing a coverage level of 75% or lower.

Impact on risk markets and farmers' risk management strategies

OECD work (OECD, 2011) has discussed government intervention on risk management in agriculture, distinguishing three layers of risk level (Box 2.3), outlining that insurance subsidies risk crowding out market-based solutions and own-farm strategies, and may transfer part of the risks that should be borne by farmers onto the public budget. Insurance subsidies may also crowd out on-farm risk management strategies, such as production and income diversification, savings and investment, or contracting.

A recent ERS study analyses the factors affecting farmers' crop insurance demand using reasonable values to represent a farmer's financial and risk environment and risk preferences, and finds that farmers' level of income and wealth are important factors (Farrin et al., 2016). For US farmers, savings are an alternative method used to manage risk and lower insurance demand. US farmers with more wealth and savings tend to spend less on crop insurance and use savings to manage income risk, unless they have low farm income. Farmers with low farm revenues are less likely to purchase insurance than those with higher revenues, but having limited resources increases demand for insurance among lower income farmers. Farmers with larger farm debt are more likely to purchase insurance, which can protect them against falling further into debt.

The model developed Ramirez and Shonkwiller (2017) mentioned above predicts that high-risk producers could receive on average much larger subsidies than low-risk ones, potentially leading to adverse selection as high-risk farmers are more likely to enrol than low-risk ones. They suggest that the government could use the model to predict enrolment and adjust premiums to minimise adverse selection.

Regarding the interaction between crop insurance programmes and other risk management tools, Du et al. (2015) investigate the relationship between agricultural contracts and crop insurance. Using an agency theory framework and expected utility maximisation, they develop a theoretical model of risk-adverse farmers buying crop insurance and engaging in supply contracts with risk-neutral buyers to characterise the features of optimal agricultural contracts under the availability of crop insurance. The model posits that an increase in crop insurance premium subsidy would make farmers less likely to get involved in marketing contracts because the returns from insurance would be a more efficient way of maximising their utility. The authors find that risk adverse farmers would still bear risk in the optimal contract design, even under the availability of crop insurance. However, summary statistics suggest that, over the period of 1999 to 2012, crop insurance participation has increased while the use of contracts was generally stable. The authors conclude that this issue requires further empirical analysis, in particular using econometric methods.

Insurance subsidies may also lead to unsustainable choices of production and farm practices in the short term. Any insurance system is prone to moral hazard, which arises when those purchasing insurance adopt a riskier behaviour knowing they will be compensated for their losses. Provisions such as basing benefits or premiums to past history limit this effect. Conversely, expectation of net benefits due to subsidisation of premiums may lead to more risky behaviour (moral hazard).

A recent US Government Accountability Office (GAO, 2015) report calculated, using RMA data, that crop insurance costs were significantly greater in areas with higher crop production risks (e.g. drought), than in areas with lower risks during the period 2005-13. Despite changes to premium rates in 2014, decreasing some rates and increasing others, GAO's analysis of RMA data shows that, for some crops, RMA's higher risk premium rates may not cover expected losses. In fact, RMA plans to phase in changes to premium rates over time as USDA is required by statute to limit annual increases in premium rates to 20% of what the farmer paid for the same coverage in the previous year. However, GAO found that, for higher risk premium rates that required an increase of at least 20% to cover expected losses, RMA did not raise these premium rates as high as the law allows making the rates more actuarially sound, resulting in premiums potentially not covering expected losses.

Ramirez et al. (2015) explore the impact of premium calculation on farmers' benefits from crop insurance using Monte Carlo simulations of expected yields typical of corn production in the Midwest. They find that maize yield insurance seems to be channelling the majority of subsidies to the riskier farmers. They find that the shrinkage estimator used by RMA to reduce the gap between individual farm-level and county-level premiums, results in farmers with a risk profile different from the county-average receiving net benefits

very different from the average and has the unintended effect of disproportionally subsidising producers who are less effective in managing risk.

On web page highlighting new Farm Bill programmes and possible implications, ERS (2016) consider that allowing producers to drop very bad years in calculating insurable average yields addresses the problems of isolated severe losses and of systemic disasters that make county-based yield alternatives ineffective. Since this solution increases producers' insurable yields, it will increase indemnities in years when losses are incurred, although to the extent indemnities increase, premium rates will increase as well.

In a selected conference paper analysing the potential impacts of yield exclusion, Adhikari and Luitel (2016) outline that the new provision allowing farmers to substitute or exclude some lower-than-average yields from their APH allows farmers producing in risky environments to qualify for higher trigger yields than their historical record would allow.[14] They compute actuarially fair premium for yield protection and revenue protection insurance products both yield substitution and yield exclusion and find that yield exclusion leads to significant increases in the premium farmers have to pay, which will have an impact on the insurance service market.[15] They consider that this provision will decrease the variance of historical crop yields used to calculate insurance coverage level and premiums. Using a constant relative risk aversion (CRRA) utility function with a moderate level of risk aversion, they estimate that choosing yield exclusion over substitution increases producer welfare, the gain varying by crop and coverage level. The authors calculate that yield exclusion is particularly beneficial to cotton producers. The authors report that yield modification provisions have been used equally in risky locations like Texas but also in low risk areas like Nebraska and Illinois. RMA data computed by Barnett and Stockwell (2016) show that yield exclusion decisions happen more frequently in marginal, high-risk areas.

Impacts on producer decisions and agricultural markets

OECD work on decoupling (OECD, 2006) and evaluations of previous US Farm Bills (OECD, 2011) suggests that as US crop insurance programme deliver support based on current area and yields, which is specific to commodities, they may create some distortions among commodities leading to inefficient resource allocation.

In their study of the impact of farm programme mentioned above, Luckstead and Devadoss (2016) also propose that in a risky environment, all insurance policies encourage more input use by risk-adverse farmers to maximise their profits, leading to higher yields and production. Revenue protection influences farmer's input use directly as the payment depends on current input use, and indirectly through wealth and insurance effects.

Recent empirical analysis of the impact of crop insurance programmes estimates very small effects on total land use, although effects on production practices such as crop rotation might be more significant. For example, a study using the FAPRI-MU stochastic model of farm policies and prices and posted on *farmdoc daily*, shows that the impact of crop insurance programmes from 2008 and 2014 Farm Bills is actually negligible on total crop area because the payments are much lower than the market returns on crops (Gerlt et al., 2016).

In a selected conference paper, Weber et al. (2015) explore the impact of changes in crop insurance coverage on the use of land, fertilisers and agrochemicals and find them very small. Using Ordinary-Least Square regression on panel data of US farms with federal crop insurance coverage for the period 2000-13, they find that a 10% increase in insurance coverage (measured by the premium paid per acre) is associated with an increase in the share of acres harvested of only 0.11% and a 0.44% increase in fertiliser and chemical

14. Other authors make the same point, for example Barnett and Stockwell (2016) in a paper published on the *AGree* blog.

15. Yehouenou et al. (2016) also suggest that these provisions may have the impact of artificially pushing up average county yields, which are now calculated from individual farm data for lack of county-level statistics.

expenses. However, when using the initial coverage ratio as a measure for changes in insurance coverage (Instrumental Variable approach), they find that crop insurance decreased the share of area harvested and had little effect on input use. Regarding crop specialisation, both approaches find positive and extremely small effects of crop insurance.

Claassen et al. (2015) analysed the impact of crop insurance on land use and environmental quality in the Corn Belt, using a model estimated econometrically at the parcel level for the period 1997-2010 in a selected conference paper. They compare a no-insurance scenario with an insurance scenario, by modifying the expected revenue and the variance of revenue variables to reflect the effect of revenue protection crop insurance plan. Simulation results suggest that crop revenue protection insurance does not lead to significant conversion of land under pasture or conservation programmes to crop land: area under cropland would increase by only 0.18%, pasture area would decrease by 1.07% and CRP acreage would decrease by 0.23% compared to the no-insurance scenario. On the other hand, revenue insurance has a more sizeable impact on the choice of crop rotation: the land area under continuous maize increases by 4.07% while the area under continuous soybean increases by 3.29%. Conversely, revenue insurance leads to a 14.4% decrease in area planted under continuous wheat.

Lusk et al. (2016) estimate the impact of the removal of crop insurance premium subsidies, using a partial equilibrium model of the US agri-food system, and find that this would lead to a general increase in food prices because of the higher costs of production for farmers and their supply chain partners.

In a selected conference paper, Burns and Prager (2016) analyse the impact of crop insurance on commercial farm survival and decisions to expand, using the 2007 and 2012 Censuses of agriculture complemented by county-level data. They estimate a three stage model that accounts for sample selection bias, and the endogeneity of the choice to purchase insurance, and control for farm characteristics. Preliminary results indicate a small, but positive effect of owning crop insurance on expanding the number of acres operated. For each one USD increase in insurance premium paid in 2007, cash grain farms expanded their area by 0.002%.

Another selected conference paper analyses the effects of the crop insurance premium subsidies on crop acreage (Yu et al., 2016). The authors recall the two channels through which insurance subsidies may encourage changes in crop area: first because they increase expected returns (profit effect); second because they encourage higher insurance coverage (coverage effect). They estimate econometrically planted area as a function of premium subsidies and expected prices using 26 years of county-level data, and find that the premium subsidy has a significant effect on crop acreage, greater than that found in earlier studies. The authors attribute this larger effect to the inclusion of the profit effect in the theoretical framework. They also find that the premium subsidy has a larger effect than the price changes, considering the small share of the premium subsidy in revenue, which suggests there is a coverage effect.

As the crop insurance program developed, its impact on the environment has been increasingly discussed in the literature. Many of the studies reviewed that are *ex ante* in nature or limited to the building of a theoretical model assume that the way crop insurance programmes are implemented is detrimental to the environment. For example, in certain circumstances, higher variable input use could have detrimental environmental consequences.

In a study published on the *AGree* blog to stimulate policy discussion, Barnett and Stockwell (2016) discuss the current mode of calculation for premiums used by RMA and its likely effect on farm practices. As the premium subsidy is a fixed proportion of the premium for a given coverage level, and premiums reflect risks, the subsidy is usually higher in areas considered risky. The authors consider that providing higher subsidies in these areas where soil erosion risk is higher is likely to lead farmers to continue risky farm practices, and does not reward farm practices that are beneficial to soil fertility and protection. This therefore discourages more farmers from adopting conservation practices.

A review of the past empirical studies on the environmental impacts of US crop insurance programmes acknowledges that subsidised crop insurance encourages farmers to reduce their use of risk-preventing and yield-increasing practices (for example, organic fertilisers, contour ploughing) while also expanding crop

production onto less productive, possibly more erosive land (Smith and Goodwin, 2013). However, the authors also report that the evidence of past research on the land allocation impact of crop insurance is disputed.

Recent empirical research suggests that subsidised crop insurance only has a small effect on land allocation. Smith and Goodwin (2013) conclude that the impact of crop insurance on soil erosion is undoubtedly negative but likely to be small. The authors conducted an analysis of production behaviour for three important corn-producing states, Iowa, Illinois and Indiana, linking econometrically expenditures on seed, fertiliser and chemicals to farm prices and indemnities received using 181-2011 data. They found that higher rates of return from crop insurance actually lead to small but significant decreases in purchases of fertilisers and chemicals by maize producers in three Midwest states, suggesting that areas receiving higher relative net benefits from crop insurance tend to use less variable inputs.

Weber et al. (2015) estimate very small impacts of changes in crop insurance coverage on the use of land, fertilisers and agrochemicals using econometric approaches on farm-level panel data covering 2000-13, and conclude that the negligible effect of crop insurance coverage on farmer decisions estimated from past data, combined with the linking of federal crop insurance to conservation requirement suggests that the programme is likely to have fairly benign environmental impacts in the future.

In a selected conference paper, Claassen et al. (2015) use a model based on farm-level data from the Corn Belt to estimate the impacts on changes in cropping patterns from revenue insurance, and find they lead to small or negligible effects on the environment. The largest effect of revenue insurance is on wind erosion, which is predicted to increase by 6.82% compared to a no-insurance scenario. Nitrogen percolation is predicted to increase by 1.1% while nitrogen runoff, loss of soil carbon and water erosion are all predicted to increase by less than 1%.

Miao et al. (2016) analyse the impact of crop insurance subsidies on land use, including the impact of the sodsaver provision, under which producers who till up native sod see their benefits from federal crop insurance programmes reduced during the first four years of planting. They develop a theoretical framework based on optimisation of utility function of profit, assuming the growers have a constant absolute risk aversion (CARA), and apply it to seventeen counties in Central and North Central South Dakota and three major crops in this area: maize, soybean and wheat, using data covering the period 1960-2009. The impact of crop insurance subsidies and sodsaver provisions on land use are simulated under four scenarios corresponding each to the market environments in 2005, 2006, 2007 and 2008 respectively. Simulation results show that the impact of crop insurance subsidies on conversion of grassland to crop land is higher when crop prices are lower: if the projected prices of crops had been those in 2006, 3.3% of the area under crop insurance would have been more profitable under grass land than under crop land, in the absence of insurance subsidies, while with higher 2008 prices, only 0.05% of the area would have been converted. On average over the four scenarios, the land-use effect is 1.7% and 2.3% if the 2008 scenario is excluded. However, if crop prices became very low, then subsidies would have almost no effect as farmers would have a strong preference for grassland. If the projected prices in each year were the same as those in 2006 over 50 years, and if the sodsaver provision had been implemented, about 6.9% of the 15% least productive crop land would not have been converted from grassland, and the average effect over the four scenarios is 4%.

Finally, the 2014 Farm Bill reinstated mandatory conservation compliance for producers receiving crop insurance premium subsidies, which were in place between 1985 and 1996. Mandatory conservation compliance requires that producers apply a soil conservation system on highly erodible cropland and refrain from draining wetlands in order to benefit from other farm programmes, including both income support and risk management and insurance programmes. This is expected to maintain the broad area coverage of these requirements after the abolition of fixed direct payments. From an environmental perspective, the fact that a conservation plan is now required to be eligible to crop insurance subsidies will not make much difference according to Paulson et al. (2016) in a study posted on *farmdoc daily*. Indeed, most producers already had an environmental conservation plan in place to benefit from commodity title programmes. An USDA ex-ante study using 2010 ARMS survey data calculated that only 2.4% of farms, representing 17 million crop acres

(4.3% of cropland area) could be potentially affected by the introduction of cross compliance on federal crop insurance programmes under the 2014 Farm Bill (Claassen, 2012).

Supplemental coverage option (SCO)

Description and implementation mode

The Supplemental Coverage Option (SCO) offers additional coverage in conjunction with traditional crop insurance policies for commodities that producers have not elected to enrol in ARC. SCO insurance coverage is based on county averages for yield and revenue. Producers cannot purchase SCO policies for commodities they have elected to enrol in ARC, which covers a similar risk layer.

Producers typically purchase crop insurance policies to cover around 70-75% of yield or revenue; SCO policies provide an option for additional area-based coverage between the underlying insurance policy and 86% of yield or revenue (Table 2.8). SCO policies will cover either yield or revenue risk to match the underlying crop insurance policy. Because SCO covers the most active layer of losses, it can have a higher premium rate than many traditional insurance policies for the same coverage level, but also has a higher premium subsidy rate (65%) than most traditional crop insurance policies.

SCO uptake and impact on farm returns

SCO policies have not been a popular option with producers, with about 16 000 policies sold in 2016 (compared to 1.5 million for Revenue Protection, the most popular crop insurance policy) and 2.5 million acres covered (RMA, 2017).

In a study selected for presentation at a conference, Adhikari (2016) models farmers' decision on coverage level to maximise their net return and shows that combining SCO with yield or revenue crop insurance would deliver optimal net benefits to producers who chose a lower level of coverage for their crop insurance. In a selected conference paper, Luckstead and Devadoss (2016) present the results of a model calibrated to a representative Kansas dryland wheat farm, which assumes certainty equivalent wealth to rank farm choices and assess whether supplemental revenue options, including SCO, offer additional benefits to crop insurance at high coverage, Model results show, for example, that electing SCO would bring the farmer a net benefit of USD 6.514/acre of wheat. Using a model based on certainty equivalent wealth to simulate farmers' choices between crop insurance and supplemental revenue options, including ARC, PLC, SCO and STAX, and identify possible substitution effects, Bulut and Collins (2014) find that for most crops, an underlying crop insurance policy combined to SCO and PLC provides a higher farm value than crop insurance alone. However, model results indicate that SCO is less effective in the low price scenario.

In a selected conference paper, Bradley et al. (2016) use RMA data from 2008 to 2015 cropping years to study the interactions between farmers' choices of commodity and crop insurance programmes on land area allocated to maize, wheat and soybeans in the Midwest and Southern plains. Estimating econometrically crop insurance coverage as a function of insurance subsidies, other program payments, and program participation in the state, they find that the option to purchase SCO does not have a significant impact on coverage level of traditional yield or revenue insurance. But a higher level of participation in the ARC program relative to PLC is associated with higher levels of crop insurance purchased.

Stacked income protection plan for producers of upland cotton (STAX)

Description and implementation mode

Following a WTO ruling that US upland cotton subsidies under previous Title I programs affected world prices and thus distorted trade (ERS, 2016), all the previous Title I programmes for cotton, bar the upland cotton marketing loan, have been repealed and the new STAX crop insurance product established. At the same time, upland cotton is not a covered commodity under the PLC and ARC programs.

STAX policies can supplement insurance coverage available through the federal crop insurance program, or be purchased as a stand-alone policy. Producers of upland cotton may purchase SCO coverage but are alternatively eligible for the STAX program. STAX is a revenue insurance option similar to SCO in that coverage is based on county averages for revenue but it is only available for upland cotton. The trigger for STAX is based on actual cotton prices times expected county average farm yields, if this is higher than the expected revenue using futures prices. STAX does not require purchase of an underlying traditional policy, although it offers protection only for losses between 10 and 30% of expected revenue. Premium subsidies are higher for STAX (80%) than for SCO.

Because the benchmark price for cotton coverage under STAX will be the expected price for the current year, the programme will reflect within-year market expectations unlike Title I commodity programmes for which benchmark prices are either fixed reference prices or multi-year averages (ERS, 2016).

STAX uptake

Like SCO, producers have shown moderate interest in purchasing these policies. At national level, STAX covered about 2.5 million acres in 2015 and 2016 (RMA, 2017). According to Hungerford and O'Donoghue (2016), this represented 29% of total area planted in cotton in 2015. The authors also find that 38% of the counties with cotton operations recorded by the 2012 Census had no STAX policy. In a selected conference paper, Boyer et al. (2016) use RMA 2015 data to calculate a state land-weighted average of uptake percentages and suggest that only 38% of the planted cotton area in Mississippi and Tennessee was enrolled in STAX in 2015.

In a *Choices* article, Townsend (2015) notes that projected high cotton prices and yields in 2015 would have lead cotton revenues to stay above the STAX trigger of expected cotton revenue, so no STAX payment would ensue, leading to a net loss for cotton farmers of USD 10/acre corresponding to the premium they have paid. The author argues that this projected net deficit might have explained the relatively low participation. Hungerford and O'Donoghue (2016) also suggest high cotton prices may be an explanation, as well as unfamiliarity with the new programme, and that adoption of SCO and STAX could change with price and yield expectations and perception of revenue risk.

STAX impact on farm returns

A recent ERS report (Hungerford and O'Donoghue, 2016) analyse the potential for SCO and STAX for reducing cotton producers' revenue risk across three cotton producing counties representing high, medium and low revenue risk. The authors estimate revenues and payments for a representative farm and county using 10 000 simulations of a range of prices and yields observed during the period 1975-2013. Simulated payments are lower in the high-revenue risk county than in the low-revenue risk county, as higher risk is closely associated with lower revenue, and thus lower guarantee. However, producers in high-risk counties receive higher indemnities from the Revenue Protection programme at 70% coverage level, which protects against the most significant revenue losses (up to 70%). Conversely, producers in low-risk counties receive greater risk reduction payments from STAX and SCO than from Revenue Protection insurance at 70% coverage level.[16]

Regarding the environment, farmers applying for STAX have to implement an approved conservation plan to obtain the subsidy of their insurance premium. In a selected conference paper, Boyer et al. (2016) outline that this cross-compliance provision is meant to deter the potentially detrimental effect of risky crop

16. Lau et al. (2016) report that 95% of US cotton acreage is now covered by crop insurance. Cotton producers opted for coverage levels of 70-75% of their cotton revenues and revenue insurance accounts for 80% of the total insurance coverage purchased related to cotton. However, the increase in insurance uptake may not reflect only higher effectiveness of the programmes in stabilising income. In a discussion note posted on *farmdoc daily*, Zulauf (2016b) considers it may be brought by historical increases in the subsidy rates on premiums.

intensification on marginal lands. In their study, they propose pilot crop insurance programmes that would incentivise use of cover cropping and no-till practices coupled with crop insurance via an additional cost share payment above current Environmental Quality Incentive Program cost share payments, and survey Tennessee and North Central Mississippi cotton producers about their willingness to participate in these hypothetical pilot programmes. In the specific hypothetical case of bundling STAX with conservation practices funded by EQIP, the authors find that 35% of Mississippi cotton growers would be interested in implementing crop covering as a cross-compliance practice to receiving STAX payments whereas only 28% of producers would be interested in adding no-till practices. This is because 77% of cotton producers already use no-till while only 25% of cotton farmers currently use cover crops. The authors conclude that coupling STAX to a pilot conservation programme would be more efficient if it nudges farmers to adopt conservation practices that are not yet widespread.

3. ENVIRONMENTAL CONSERVATION PROGRAMMES

Overview

At the federal level, the United States operates two types of agri-environmental programmes: mandatory conservation compliance for participants in most farm programmes (Chapter 3), and voluntary conservation programmes that may involve land rental, cost-share for implementation of conservation practices, and incentive payments. Federal conservation spending includes financial assistance to farmers as well as spending on services provided by federal agencies. This Chapter considers the main Federal programmes (Box 3.1).

Box 3.1. Conservation programmes in the 2014 Farm Bill

Land retirement programmes

The *Conservation Reserve Program (CRP)* generally provides 10-15 year contracts to remove land from agricultural production and place it under grass or tree cover. A large majority of CRP contracts enrolled whole fields or whole farms. Increasingly, however, CRP contracts fund high-priority, partial-field practices such as filter strips and grass waterways, rather than whole-field or whole-farm enrolments. Up to 2 million acres of grassland can also be enrolled in CRP if landowners agree to keep the land in grazing use. CRP enrolees receive land rental payments, and additional payments reflecting a share of the costs of installing various conserving practices on their land.

The ***Agricultural Conservation Easement Program (ACEP)*** provides long term or permanent easements for preservation of wetlands and the protection of agricultural land (cropland, grazing land, etc.) from commercial or residential development. It includes the former Wetland Reserve Program and the Farm and Ranchland Preservation Program. The Grassland Reserve Program was split between the CRP and ACEP. Some easements are on working land.[1]

Working land programmes

The ***Environmental Quality Incentives Program (EQIP)*** provides financial assistance to farmers who adopt or install conservation practices on land in agricultural production. Common practices include nutrient management, conservation tillage, field-edge filter strips, and livestock exclusion from streams. Sixty percent of programme funds are targeted to livestock-related practices and at least 5% are targeted to wildlife-related practices.

The ***Conservation Stewardship Program (CSP)*** supports ongoing and new conservation efforts for producers who meet stewardship requirements on working agricultural and forest lands. CSP provides two types of payments through five-year contracts: annual payments for installing new conservation activities and maintaining existing practices; and supplemental payments for adopting a resource-conserving crop rotation.

The new ***Regional Conservation Partnership Program (RCPP)*** is designed to coordinate conservation programme assistance with partners to solve problems on a regional or watershed scale. It can include land retirement components.[1] Financial assistance is coordinated through RCPP but provided to producers largely through "covered" programmes: EQIP, CSP, ACEP, and *Healthy Forests Reserve Program*. Up to 7% of the dollars or acres available under each of these programmes will be allocated through RCPP.

1. ACEP and RCPP are not exclusively for either land retirement or working land, but include both types of actions.

The 2014 Farm Bill consolidated voluntary environmental conservation programmes into a smaller number, but most previous options remain in place. Environmental conservation programmes, generally governed by the Conservation Title of the Farm Bill, have multiple objectives. Originally focused primarily on soil quality and water quality and conservation, these objectives have expanded to include wildlife habitat, air quality, carbon sequestration, energy conservation, and preserving farm and ranch lands. At the same time, programmes have become increasingly focused on working lands and away from land retirement, although targeted land retirement remains an important programme component.

While most of these conservation issues occur in some form across the United States, specific problems are often regionally concentrated. For example, water quality and conservation are a critical focus in California, while in the Northern Great Plains wetlands and grassland preservation rank high among

environmental concerns. Soil erosion problems, the historical core of USDA conservation programmes, differ regionally as well, with wind the primary concern across the Great Plains and other open lands with little forest cover and water the greater concern in hilly or mountainous topographies. The Secretary of Agriculture has designated eight critical conservation areas for concentrated attention under the 2014 Farm Bill's Regional Conservation Partnership Program:

- Chesapeake Bay Watershed — water quality, agricultural soil erosion and nutrient runoff
- Great Lakes Region — water quality, agricultural soil erosion and nutrient runoff
- Mississippi River Basin — water quality, agricultural soil erosion and nutrient runoff
- Colorado River Basin — water conservation and sustainable use of water resources
- Longleaf Pine Range — long-term sustainability of pine forest ecosystems
- Columbia River Basin — water quality and quantity for salmon habitat
- Prairie Grasslands Region — flood mitigation, irrigation efficiency and water conservation, wildlife habitat conservation
- California Bay Delta — water quality and conservation, wildlife habitat conservation.

Conservation programmes in the United States are operated at all of federal, state, and local levels. Federal programmes are operated by USDA through the Farm Service Agency and the Natural Resources Conservation Service. At the state and local level, a system of field offices and local conservation districts interacts directly with producers to implement federal programmes, which may be supplemented by additional funds from the state and county and from local conservation districts. Conservation districts are special districts authorised by the states to organise producer cooperation with federal agricultural conservation programmes. They are generally contiguous with counties, but in some cases may be at a sub-county scale.

Many states and some counties also operate agricultural conservation programmes that are independent of federal programmes. These may address more local conservation issues or may reflect heightened public concerns in some states about broader environmental problems. For example, California operates a greenhouse gas cap-and-trade programme that recently linked with a similar programme operated by the Canadian Province of Québec. Both New York and Massachusetts offer assistance for production of renewable energy from agricultural sources using anaerobic digester technologies. A large number of states and some counties also operate farmland preservation programmes.

The five conservation programmes listed in Box 3.1 account for more than 95% of spending on voluntary programmes that provide financial assistance to farmers in exchange for either retiring land from crop production or adopting more environmentally benign practices on land that is in production. Out of these five programmes, only the Agricultural Conservation Easement Program (ACEP) and the Regional Conservation Partnership Program (RCPP) are new additions by the 2014 Farm Bill. They actually consolidate previous smaller conservation programmes. In 2015 the five programmes received budget authority amounting to USD 1.81 billion for CRP (or 37.5% of total funding for these programmes), USD 1.35 billion (28%) for EQIP, USD 1.18 billion (24.4%) for CSP, USD 394 million (8.2%) for ACEP, and USD 93 million (1.9%) for RCPP.

Conservation Technical Assistance (CTA), also a voluntary programme, provides ongoing technical assistance to agricultural producers who seek to improve the environmental performance of their farms. The assistance is provided through a system of professional conservationists based in most US counties to help farmers and other landowners manage natural resources on their land. Conservationists provide individual on-farm review of conservation problems, helping producers develop conservation plans that incorporate practices and technologies to meet required standards under cross-compliance and other federal, state, and local environmental regulations. CTA also provides area-wide, community, and watershed plans in cooperation with local leadership to identify resource conservation priorities and methods, and funding sources for addressing those needs. Spending on CTA has remained USD 700-800 million per year over the

last ten years (NRCS, 2016a). Producers can also receive technical assistance to prepare the specialised conservation plans required for financial assistance under voluntary USDA conservation programmes to implement environmentally friendly practices.

Conservation programme spending has also become increasingly targeted to land where retirement or enhanced practices can have the greatest environmental benefit. Whole-field and whole-farm CRP expenditures, for example, are awarded on the basis of expected environmental benefits and increasingly CRP funds have been reoriented to support high-value partial field land retirements that provide riparian buffers, field-edge filter strips, wetland restoration, and wildlife habitat. While most conservation programme spending is mandatory, it is subject to budget or area caps. As a result, enrolment is competitive: for some programmes, fewer than 50% of prospective participants are accepted.

Competition for participation is generally managed through a bidding process. In most cases, eligible producers submit offers for participation, specifying the practices they are interested in applying and details of the land to which they would apply them, as well as, in some cases, what payment they are willing to accept. These offers are scored on potential environmental benefits and ranked according to the value of benefits against the cost of payments producers are willing to accept to achieve them. The primary ranking mechanism is the Environmental Benefits Index, which scores bids on the practices offered and the payments required to reach a composite score that can rank all bids on a single scale (Box 3.2).

Just like for commodity payments, the limit on eligibility to receive conservation programme benefits no longer distinguishes between farm and non-farm income. Under the single adjusted gross income (AGI) limit, any individual with an annual AGI above USD 900 000 (including non-farm income) becomes ineligible to receive farm programme payments under conservation programmes.

Box 3.2. The Environmental Benefits Index

The Environmental Benefits Index (EBI) is a ranking system used by USDA's Farm Service Agency (FSA) for enrolling land in the Conservation Reserve Program (CRP). The CRP offers long-term rental payments, and technical and cost-share assistance for establishing conserving practices (generally cover plantings) to control soil erosion and improve water quality and wildlife habitat on environmentally sensitive farmland. The EBI is a mechanism for determining which contract offers from agricultural landowners provide the greatest environmental benefits at the least cost, in order to assure that programme funds are used most effectively. FSA assesses data on five environmental factors plus cost competitiveness to rank CRP contract offers:

- Wildlife habitat benefits that will result from the cover plantings offered;
- Water quality benefits from reduced erosion, runoff, and leaching;
- On-farm benefits from reduced erosion;
- Benefits that are likely to endure beyond the contract;
- Air quality benefits from reduced wind erosion;
- Cost (rental rate offered).

Each contract offer is scored according to the benefits provided in each of these categories, which can be affected by both planned practices and by the location and environmental sensitivity of the land offered. All offers in the same signup period are comparatively ranked and selections for CRP contracts are made based on this ranking.

Conservation Reserve Program (CRP)

The Conservation Reserve Program (CRP) is carried over from the previous Farm Bill. It generally provides 10-15 year contracts to remove land from agricultural production and place it under grass or tree cover. A large majority of CRP contracts enrolled whole fields or whole farms. Increasingly, however, CRP contracts fund high-priority, partial-field practices such as filter strips and grass waterways, rather than whole-field or whole-farm enrolments. Up to 2 million acres of grassland can also be enrolled in CRP if landowners agree to keep the land in grazing use. CRP enrolees receive land rental payments, and additional payments reflecting a share of the costs of installing various conserving practices on their land. The amount of the

payments is based on the National Agricultural Statistics Service (NASS) survey of dryland cash rental rates. The CRP is managed by USDA's Farm Service Agency (FSA).

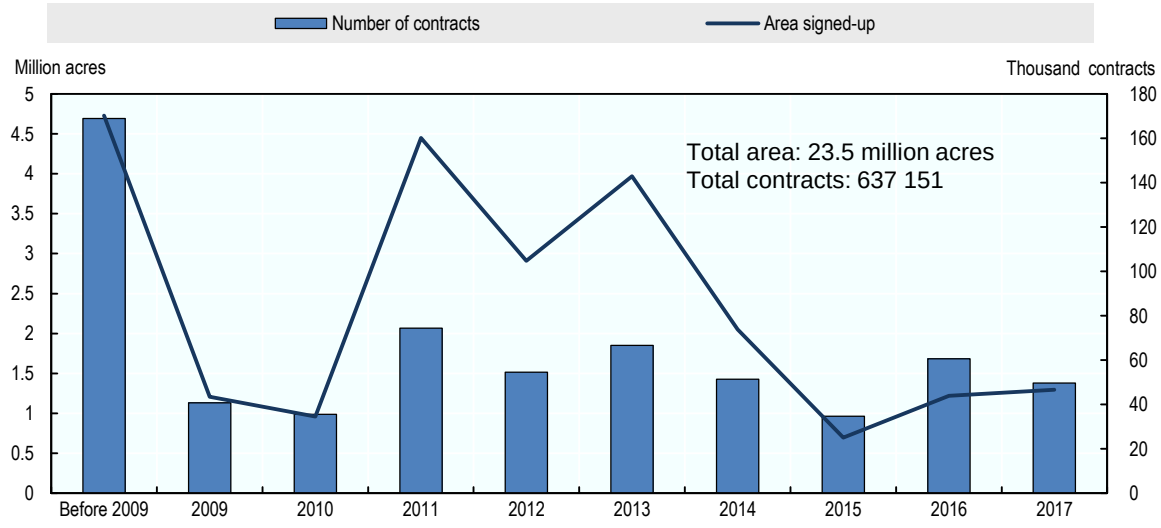
The total surface of land that can be enrolled into the CRP nation-wide is capped by the Farm Bill. From 27 million acres in fiscal year 2014, total land under CRP enrolment is meant to decrease to 24 million acres by fiscal year 2018. The legislators have stressed that this decrease in the maximum area for CRP enrolment should not be seen as turning away from this policy instrument. Rather, the goal of conserving land-based natural resources in good condition is to be achieved by combining CRP with the other conservation programmes (US Congress, 2014).

Grasslands enrolled in CRP can be used for grazing, haying, mowing, or harvesting for seed production. USDA may also allow land under CRP to be used for fire presuppression, rehabilitation and construction of fire breaks, fencing, livestock watering and necessary cultural practices. An early termination of a CRP contract is allowed for retiring farmers and ranchers if they intend to transfer the land to a beginning or military veteran farmer or rancher who plans to start crop or livestock production.

As of end of January 2017 there were about 637 thousand current active CRP contracts spread out over 358 thousand farms and covering about 23.5 million acres. The average rental payment for all CRP contracts was worth USD 76.6/acre (FSA, 2017). The number of annual CRP enrolled acres has fluctuated since 2009. After high levels of sign-up during 2011-13, and they have started to decrease to about 1.3 million acres in 2017 (Figure 3.1).

Figure 3.1. Annual CRP enrolment, 2009-17

As of January 2017



Source: FSA (2017), Conservation Reserve Program Monthly Summary - January 2017, www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Conservation/PDF/jan2017summary.pdf.

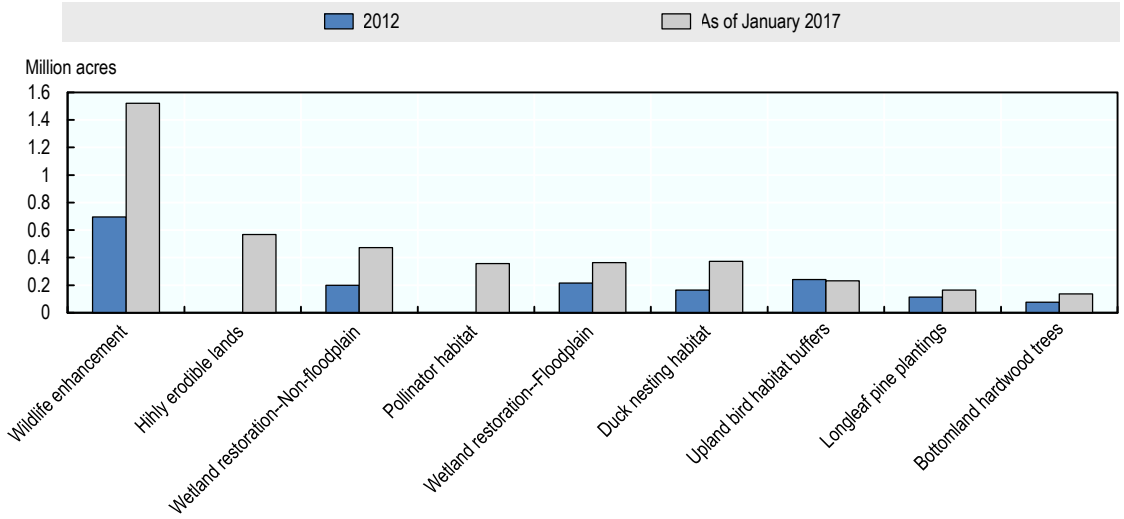
The CRP includes a number of specific initiatives that focus CRP retirements on addressing particular conservation goals. All initiatives but two were started between 2004 and 2008. As of January 2017, the largest share of acres among these initiatives were allocated to wildlife enhancement with close to 1.5 million acres, and Wetland restoration in flood and non-flood plains came second with 1.2 million acres.[17] Among the two most recent initiatives launched in 2012, highly erodible lands came third with over 0.6 million acres, while Pollinator and Duck Nesting habitat covered close to 0.4 million acres each (Figure 3.2).

17. The State acres for wildlife enhancement (SAFE) initiative started in 2008 and the two wetland restoration initiatives in 2004 (floodplains) and 2005 (Non-floodplains).

Congress requested that USDA monitor the impacts of the CRP on land quality, land capability, erosion, and natural resources benefits. The Farm Bill managers' report asked USDA to produce and submit to Congress a monitoring and evaluation report of the CRP one year after enactment of the 2014 Farm Bill, and again five years thereafter. Another report on the economic impact of the CRP on rural communities was requested two years after the date of enactment. At the time of writing this report, USDA had not yet finalised these evaluation reports.

Figure 3.2. Cumulative acres under the different CRP initiatives, 2012, January 2017

As of January 2017



Source: FSA (2017), Conservation Reserve Program Monthly Summary - January 2017, www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Conservation/PDF/jan2017onepager.pdf.

Conservation Stewardship Program (CSP)

The Conservation Stewardship Program (CSP) is carried over from the previous Farm Bill. It supports ongoing and new conservation efforts for producers who meet stewardship requirements on working agricultural and forest lands. The programme's purpose is clearly stated in the amended Section 1240 of the Food Security Act of 1985 that created CSP: to improve and conserve the quality and condition of natural resources. CSP provides two types of payments through five-year contracts: annual payments for installing new conservation activities and maintaining existing practices; and supplemental payments for adopting a resource-conserving crop rotation.

The implementation of the CSP is based on the concept "priority resource concern". This priority resource concern is defined as "a natural resource concern or problem that is identified at the national, state, or local level as a priority for a particular area, and that represents a significant concern in a state or region that is likely to be addressed successfully through implementing conservation activities" (US Congress, 2014, p. 983). The process of identifying priority resource concerns should involve as much consultation as possible at the state and local levels. The stewardship threshold is the level of management required to conserve and improve the quality and condition of a natural resource. The stewardship threshold for a natural resource is a science-based standard at an advanced level of conservation providing for the long-term continued productivity, use, and quality of the resource.

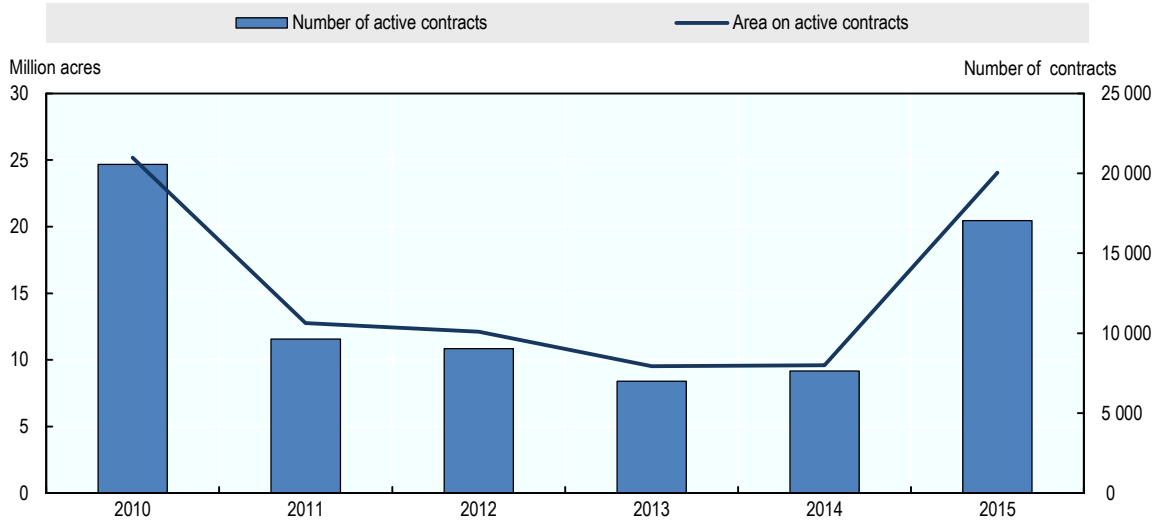
New enrolees into CSP must demonstrate that they already meet or exceed the stewardship threshold for two priority resource concerns. The CSP is meant to encourage farmers to adopt innovative conservation practices and techniques. CSP contract renewal is therefore subject to the producer meeting at least two additional resource concerns or exceeding two existing resource concerns. Producers under a CSP contract are

allowed to modify their production systems to adjust to changing markets, weather-related causes and other external factors.

USDA's Natural Resources Conservation Service (NRCS) is charged with the implementation of this programme. The annual enrolment into CSP is capped by the Farm Bill at 10 million acres at USD 18/acre from fiscal years 2014 to 2022. This represents a decrease in the area covered by the programme between 2010 and 2015 (Figure 3.3).

According to NRCS (2016b), the ten states with the biggest land surface covered by CSP in 2015 (close to or more than 1 million acres each), cumulated more than 60% of the total area covered by CSP.[18] South Dakota alone had more than about 2.1 million acres or 9% of the total area covered by CSP.

Figure 3.3. Number of active CSP contracts and area covered, 2010-15



Source: NRCS (2016b), ProTracts Program Contracts System, October 2015, CSP Contract Data by State and Fiscal Year, www.nrcs.usda.gov/Internet/NRCS_RCA/reports/fb08_cp_cstp.html.

Environmental Quality Incentives Program (EQIP)

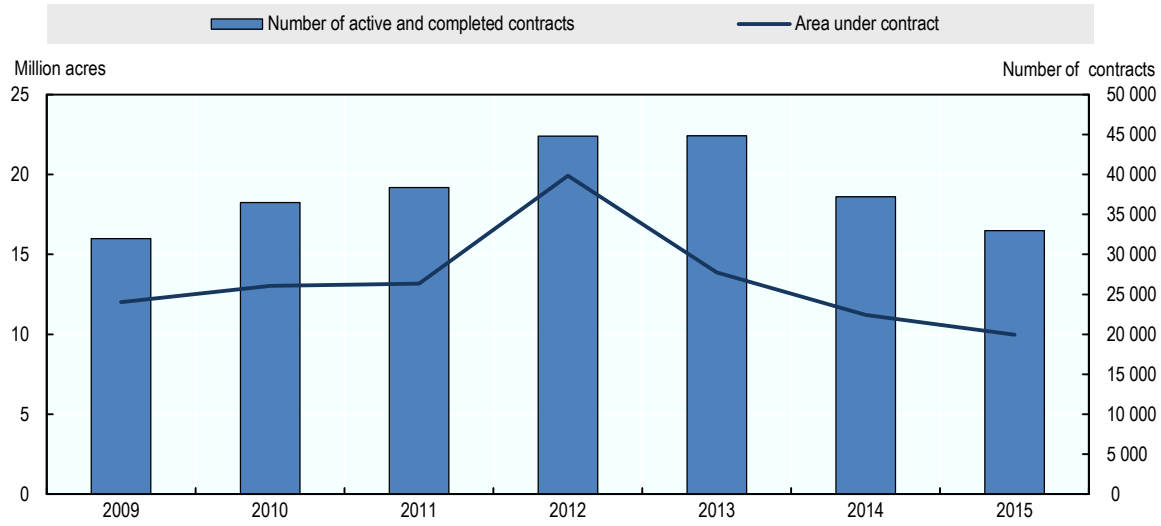
The Environmental Quality Incentives Program (EQIP) is carried over from the previous Farm Bill. With the 2014 Farm Bill, it also includes the functions of the former Wildlife Habitat Incentive Program (WHIP). EQIP provides cost-share financial assistance to farmers who adopt or install conservation practices on land in agricultural production. Participating farmers enrol acres for one or more eligible practices. Common practices include nutrient management, conservation tillage, maintaining cover crops, field-edge filter strips, and livestock exclusion from streams. Sixty percent of programme funds are targeted to livestock related practices and at least 5% are targeted to wildlife-related practices.

EQIP delivers cost-share payments to producers to implement best management practices. USDA's Natural Resources Conservation Service (NRCS) is charged with the implementation of this programme. Producers collaborate with NRCS staff to document and implement the best practices in return for a partial reimbursement of the costs involved. EQIP contracts are limited to USD 450 000 per person or legal entity (US Congress, 2014).

Following a significant increase in 2012, the area under EQIP contracts has decreased since. At 10 million acres in 2015, it was 17% lower than in 2009. The number of EQIP contracts in 2015 was also lower than in 2009 (Figure 3.4).

18. These are South Dakota, Montana, New Mexico, Nebraska, Oklahoma, Texas, North Dakota, Kansas, Oregon and Colorado.

Figure 3.4. Number of EQIP contracts and area covered, 2009-15



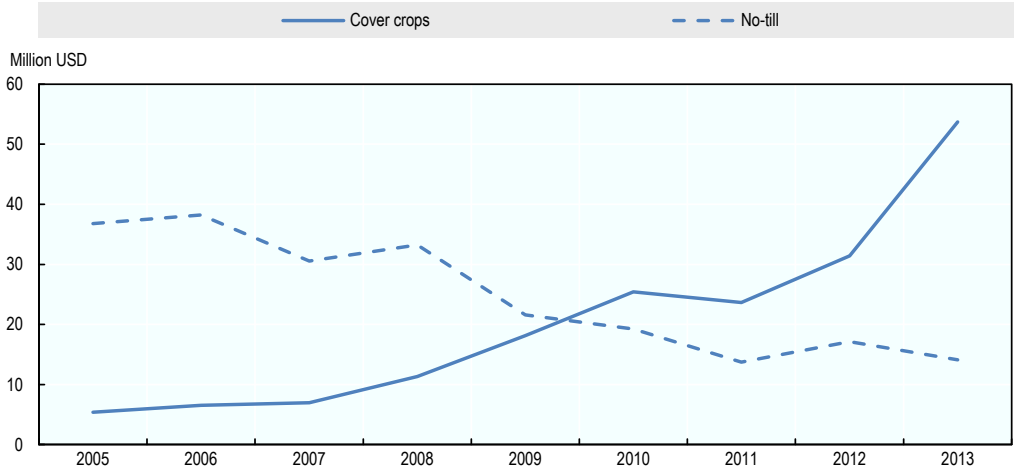
Source: NRCS (2017), Environmental Quality Incentives Program (EQIP), www.nrcs.usda.gov/Internet/NRCS_RCA/reports/fb08_cp_eqip.html#sq.

From 2005 to 2013 the focus of EQIP funding has shifted from no-till to cover crop practices (Figure 3.5). The shift in focus of EQIP payments over time from no-till projects to applications to support cover crop practices can be explained by an increasing number of farmers realising that no-till practices are a cost-effective way to address soil erosion problems. Thus, no-till is increasingly becoming widespread in the locations where agro-climatic conditions are favourable to this practice. On the other hand, adopting cover crop practices represents an additional cost to farmers, which is being compensated by the EQIP financial and technical support (Bowman et al., 2016).

Conservation Innovation Grants (CIG), a sub-programme of EQIP, encourages innovative approaches, and knowledge and technology transfer for conservation on agricultural land. CIG leverages federal funding by partnering with other public and private entities through a competitive grants programme. Funding is targeted to projects that demonstrate opportunities for application of proven and emerging technologies for a wide range of users through on-the-ground pilot projects, field demonstrations, and on-farm conservation research. CIG provides 50% of project costs, which must be matched by funds from other sources secured by the grant recipients. The programme is funded at USD 20 million annually and by July 2016, it has distributed USD 237 million in grants since it began in 2004 (NRCS, 2016e).

Figure 3.5. Relative developments in cover crops and no-till practices under EQIP, 2005-13

Millions of USD obligated (nominal)



Cover crops correspond to EQIP conservation practice 340; and no-till to EQIP conservation practice 329.

Source: Bowman et al. (2016), "An economic perspective on soil health", *Amber Waves*, www.ers.usda.gov/amber-waves/2016/september/an-economic-perspective-on-soil-health/ (accessed 23 September 2016).

Agricultural Conservation Easement Program (ACEP)

The Agricultural Conservation Easement Program (ACEP) is a new programme of the 2014 Farm Bill. It provides long term or permanent easements for preservation of wetlands and the protection of agricultural land (cropland, grazing land, etc.) from commercial or residential development. The easements can last for a term limited by local state law, up to 30 years or become permanent easements in perpetuity. The programme consolidates the former Wetland Reserve Program and the Farm and Ranchland Preservation Program. The former Grassland Reserve Program was split between the CRP and ACEP. USDA's Natural Resources Conservation Service (NRCS) is charged with the implementation of this programme.

Under the Agricultural Land Easements component, NRCS helps American Indian tribes, state and local governments and non-governmental organisations protect working agricultural lands and limit non-agricultural uses of the land. NRCS provides financial assistance to eligible partners for purchasing Agricultural Land Easements that protect the agricultural use and conservation values of eligible land. In the case of working farms, the programme helps farmers and ranchers keep their land in agriculture. ACEP also protects grazing uses and related conservation values by conserving grassland, including rangeland, pastureland and shrubland. To enrol land through agricultural land easements, NRCS enters into cooperative agreements with eligible partners. Each easement is required to have an agricultural land easement plan that promotes the long-term viability of the land. NRCS may contribute up to 50% of the fair market value of the agricultural land easement. Where NRCS determines that grasslands of special environmental significance will be protected, NRCS may contribute up to 75% of the fair market value of the agricultural land easement (NRCS, 2016c).

Under the Wetlands Reserve Easements component, NRCS helps restore, protect and enhance enrolled wetlands' functions and values. To enrol land through wetland reserve easements, NRCS enters into purchase agreements with eligible private landowners or Indian tribes that include the right for NRCS to develop and implement a wetland reserve restoration easement plan (NRCS, 2016c). On web pages presenting the implications of new farm programmes, ERS (2016) estimate that funding for new wetland easements is likely to decline under the 2014 Farm Act. This is a major change because wetland protection was an important component of agricultural conservation policy under the 2002 and 2008 Farm Bills. In particular, funding for the Wetlands Reserve Program (WRP) was increased in the 2002 and 2008 Farm Bills, while the 2014 Farm Bill merges WRP functions into ACEP but with much lower funding. Even if all ACEP funding for the next

five years was devoted entirely to wetland protection, it would be only 73% of WRP funding under the 2008 Farm Bill, and doing so would leave functions previously covered by the Farmland Protection Program and the Grassland Reserve Program unfunded.

For financial year 2014 NRCS (2016c) reported having enrolled 88 893 acres under 190 agricultural land easements and 54 941 acres under 295 wetland reserve easements across the country. Montana, California and Florida were the top three states enrolling new lands under ACEP in 2014.

Regional Conservation Partnership Program (RCPP)

The new Regional Conservation Partnership Program (RCPP) is designed to coordinate conservation programme assistance with eligible partners such as a water district, irrigation district, rural water district or association, water treatment entity or other organisation with specific water delivery authority to producers on agricultural land. Its objective is to "further the conservation and sustainable use of soil, water, wildlife and related natural resources on a regional or watershed scale." (US Congress, 2014). RCPP combines the authorities of four former conservation programmes: the Agricultural Water Enhancement Program, the Chesapeake Bay Watershed Program, the Cooperative Conservation Partnership Initiative and the Great Lakes Basin Program.

Financial assistance is coordinated through RCPP but provided to producers largely through other NRCS programmes, referred to the 2014 Farm Bill as "covered" programmes: EQIP, CSP, ACEP, and the Healthy Forests Reserve Program. Up to USD 100 million of mandatory funding is allocated to RCPP every year of the current Farm Bill. In addition, up to 7% of the dollars or acres available under each of the "covered" programmes will be allocated through RCPP. USDA will allocate, from all funds and acres of the programme, 25% to projects based on a state competitive process, 40% based on a national competitive process, and 35% for critical conservation areas. The legislators encourage USDA to distribute funding equitably across the nation while keeping in mind different natural resource concerns that may be unique to each region (US Congress, 2014).

The Farm Bill expects the contribution of the partner to be a significant portion of the overall costs of the activity covered. However, the Farm Bill does not define a set percentage of the cost as a minimum standard to be applied to all applications. Rather, USDA should evaluate the overall merits of each proposal and the significance of the partner's contribution to the potential successful implementation. The legislators were concerned that a set percentage might preclude proposals from partners that require high financial assistance from USDA to the producer because the partner's support is in the form of a smaller, but essential technical assistance contribution (US Congress, 2014).

USDA's Natural Resources Conservation Service (NRCS) is charged with the implementation of this programme. The 2014 Farm Bill managers' report requests USDA to produce a report on the programme, including how funds have been allocated, one year after its enactment and every two years thereafter. At the time of writing, USDA had not yet finalised this report.

Out of 256 project proposals received, NRCS approved 84 projects for 2016. These address water quality (34 projects), water quantity or drought (11 projects), wildlife habitat (25 projects), soil health (11 projects) as well as air quality and degraded plant conditions. In 2016 projects accepted were mainly at state level (50 projects) while 16 projects were selected within all of the eight critical conservation areas (NRCS, 2016d).

Evaluation findings on conservation programmes from literature reviewed

Environmental impact

Overall, the literature finds that conservation payments seem to have had a positive impact on the environment. In particular, they have encouraged farmers to adopt more environmentally-friendly practices and address a broader set of environmental objectives. Claassen et al. (2014) showed that they have fostered the use of practices that do not provide an immediate benefit to farmers (for example, buffer strips) or that are relatively expensive to set up (for example, building a water or soil conservation structure) in a way that

would not have occurred without the policies. An evaluation study of US conservation programmes found that current conservation payments were reasonably effective in securing additional environmental structural practices (Claassen et al., 2014). In particular, the probability that CRP and EQIP had led farmers to adopt soil conservation structures, buffer practices and nutrient management was above 80%. However, the additionality potential of the measures in support of conservation tillage was lower because 44% of farmers practicing conservation tillage were likely to do so even without receiving a dedicated payment. The efficiency of this latter conservation payment can therefore be put into question.

According to Claassen et al. (2004), cross-compliance mechanisms have partly contributed to reduce soil erosion since the 1980s by encouraging farmers to use less erosive cropping practices (e.g. conservation tillage, conservation crop rotations) and to retire particularly erosive land (CRP). Cropland soil erosion declined by 40% between 1982 and 1997 and it is estimated 25% of this decline is directly attributable to cross-compliance incentives. Erosion reduction on land subject to cross-compliance erosion mitigation requirements (28% of all cropland) accounted for more than 50% of the soil erosion reduction on land that was continuously cropped during that period (i.e. not entered into CRP or otherwise removed from crop production).

On web pages presenting the implications of 2014 Farm Bill features, ERS (2016) outlines that despite the 25% cut in maximum land area enrolled into the CRP introduced by the 2014 Farm Bill, the impact on enrolment and related environmental benefits may be relatively modest. ERS also thinks that "environmental benefits may not be diminishing as quickly as the drop in enrolled acreage might suggest because of better targeting at local level. CRP has shifted rapidly from enrolling whole fields or farms (through general signup) to funding high-priority, partial-field practices, including riparian buffers, field-edge filter strips, grassed waterways, and wetland restoration (through continuous signup). On a per-acre basis, these practices are believed to provide greater environmental benefits than whole-field enrolments while taking less land out of crop production. Because partial-field practices are more expensive, however, CRP annual payments have fallen by only 10% since 2007. At the end of 2013 the average annual payment for partial-field practices was USD 103 per acre, versus only USD 50 per acre for whole fields."

Gerlt et al. (2016) posted on *farmdoc daily* the results of a simulation of the impact of the 2008 and 2014 Farm Bills compared to a baseline without any programme, carried out with the FAPRI-MU stochastic model. Model results show that area under CRP hardly changes between the 2008 and the 2014 Farm Bills. This is due to the assumption that the CRP rental rates are not increased to meet the higher cap, but are driven by changes in crop returns. In both cases, CRP has a significant effect on planted area, which differs by crop.

Johnson et al. (2016) estimate the economic value of biophysical changes arising from CRP contracts in an Iowan watershed for different scenarios of additional CRP acreage, and find that in all cases, the value of ecosystem service benefits provided by CRP's targeted retirement of agricultural land — for reducing flood damages, improving water quality and air quality, and contributing to greenhouse gas mitigation — in the watershed area is equal or greater than the cost of rental payments to farmers. Investing more funds to allocate more acreage under CRP would lead to environmental benefits valued at 1.5 to 8.1 times the cost of payments to farmers. The scenario encouraging the establishment of riparian strips led to the highest cost-benefit increase over the baseline: USD 8.7-13.3 million. The authors consider that 77-92% of the benefits from CRP acreage increase are water quality benefits. On the other hand, the authors estimate that a decrease in CRP acreage leads to 53-74% losses related to GHG emissions. In some scenarios, ecosystem service values were reduced by 20% to account for the potential for higher CRP enrolment to increase cultivation in other areas, as this slippage or leakage effect was estimated at about 20% by Taheripour (2006) using a general equilibrium framework. It should also be noted that the estimations do not take account of secondary effects of ecosystem services benefits, such as lower depollution needs and habitat-related services, as well as the on-site soil retention benefits that lead to increased yields and reduce use of inputs for farmers identified by Sullivan et al. (2014).

In a book chapter reviewing conservation and agri-environmental programmes, Lichtenberg (2015) argues that at the national level, CRP, EQIP and CSP are not well targeted programmes because the spending in the different states on these programmes closely matches the states' share of total agriculture rather than

indicators of desired environmental outcomes. Examining the distribution of funding under these programs, he finds that the environmental funding has been going to the bigger farm states. The author remarks that the introduction of the EBI as a selection indicator for new CRP projects in 1991 has led to higher enrolment of land in the Corn Belt and Lake States, suggesting greater water quality benefits. However, despite the growing range of environmental issues being considered in CRP, wildlife enhancement still accounts for almost 60% of the CRP's environmental benefits (Figure 3.2), although there might be more pressing environmental issues to address.

Reviewing available evidence on the impact of US agri-environmental programmes on the sustainability performance of the sector, OECD (2016c) concludes that there are encouraging results, but several issues and challenges remain regarding the design and performance of the programmes: 1) Sustainability performances could be further improved, in particular in terms water use, and pollution, and that market mechanisms, regulations and incentives used to promote more sustainable use of resources have not solved acute local problems; 2) Additionality of conservation programmes may be lower for certain practices; 3) Conservation programmes, by increasing profitability of farming, may have indirect land-use and input use effects, which can in turn worsen environmental performances — the so-called "slippage effect" (Wu, 2000; Roberts and Bucholz, 2005; Lichtenberg and Smith-Ramirez, 2011; Fleming, 2014; Uchida, 2014; Lichtenberg, 2014); 4) Targeting and tailoring mechanisms such as the Environmental Benefit Index could be further refined and expanded; and 5) research continues to suggest that commodity and crop insurance programmes encourage crop production on a small but measurable amount of land that would otherwise not be used for crop production (Claassen et al., 2011).

Impact on markets

By paying farmers to take agricultural land out of production, CRP naturally has an impact on farmers' production decisions. An increase in area under CRP would decrease the amount of land under crops. In a study posted on *farmdoc daily*, Gerlt et al. (2016) find, using the FAPRI-MU stochastic model to simulate the impacts of the 2008 and 2014 Farm Bills, that adding CRP to the commodity and insurance policy mix leads to a 8% decrease in planted area for ten crops. However, this might not necessarily have an impact on total production as farmers might intensify their practices on their remaining agricultural land to keep their returns from farming constant.

Working land programmes encourage specific cropping practices without restricting the primary agricultural production function of the land, so their impact on production is likely to be negligible.

Further research is needed to understand better the potential impacts of the US conservation programmes on crop production and commodity markets.

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