Trade Study

Prepared for:

Canadian AgriFood Policy Institute

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Acronyms

AHDB: Agriculture and Horticulture Development Board (UK)
AMS: Aggregate Measure of Support
AoA: Agreement on Agriculture
AUM: Animal Unit Months
BLM: Bureau of Land Management
BTAMS: Bound Total Aggregate Measure of Support
CAP: Common Agricultural Policy (EU)
CCC: Commodity Credit Corporation
CETA: Canada-European Union Comprehensive Economic and Trade Agreement
CIF: Cost, Insurance and Freight
CRP: Conservation Reserve Programme
CSE: Consumer Support Estimate
CTAMS: Current Total Aggregate Measure of Support
CY: Calendar Year
EMS: Equivalent Measure of Support
EQIP: Environmental Quality Incentives Programme
ERS: Economic Research Service (USDA)
FAO: Food and Agriculture Organization
FY: Fiscal Year
GATT: General Agreement on Tariffs and Trade
GHG: Green House Gases
GMO: Genetically Modified Organisms
GSSE: General Services Support Estimate
HA (ha): Hectares
KG (kg): Kilograms
MPC: Marginal Private Cost
MPS: Market Price Support
MSC: Marginal Social Cost
MY: Marketing Year
NAC: Nominal Assistance Coefficient
NATO: North Atlantic Treaty Organization
NES: Not Elsewhere Specified
NPC: Nominal Protection Coefficient
NRA: Nominal Rates of Assistance
NRCS: Natural Resource Conservation Service
NRPS: Nominal Rates of Producer Support
OECD: Organization for Economic Cooperation and Development
PSE: Producer Support Estimate
SAPS: Single Area Payment Scheme
SCM: Subsidies and Countervail Measures
SPS: Single Payment Scheme

SURE: Supplemental Revenue Assistance Payments
TRQ: Tariff Rate Quota
TSE: Total Support Estimate
USDA FS: United States Department of Agriculture Forestry Service
USDA: United States Department of Agriculture
VCS: Voluntary Coupled Support
WTO: World Trade Organization

Chapter 1: Context, Study Parameters and Summary of Issues

Context for this Study

The recognition has grown that protectionist measures and domestic support in agriculture can have distortionary effects on international markets. This maps back to early multilateral trade agreements, such as the General Agreement on Tariffs and Trade (GATT) in 1948. However, trade negotiations that occurred under GATT were unable to effectively restrain agricultural support. Agricultural support measures- both domestic support and export subsidies- grew throughout much of the 1960's, 1970's, and 1980's, creating both increasingly distortionary effects on agricultural markets and burdensome liabilities on government budgets. This, along with an improved understanding of the distortionary effects of support and new metrics for measurement of support, created the impetus for the multilateral agreements that led, in 1994, to the Agreement on Agriculture (AoA), the Subsidies and Countervailing Measures (SCM) Agreement, and the agreements creating the World Trade Organization (WTO).

Among the major accomplishments in the 1994 agreements were a framework to classify protective measures using a traffic light-type of scheme, and quantitative limits for domestic support using this framework. The result was that, since the mid-1990's, the most distorting types of domestic agricultural subsidies employed by WTO member countries have been brought under control and reduced significantly. The implication is that the worst of the distortionary effects of domestic policies have been mitigated. This remarkable accomplishment has recently been built upon further in the Doha Round under the 2015 Nairobi Declaration, which effectively phases out and ultimately abolishes export subsidy programs in agriculture.

However, there is much work left to do, and it is in the Canadian agenda to push further reduction in domestic support. Since the agreements of 1994, a broader understanding has developed that other types of subsidies, not just the "most distorting" and subject to limits, can have distortionary effects. This was illustrated in the successful challenge by Brazil of US cotton programs decoupled from current production, and also in economic research linking lump sum-type payments to supply response among risk averse producers. As the most distorting support limited in the 1994 AoA has declined, these other types of payments have increased- quite significantly in many cases. This in effect waters down the reductions in the most distorting forms of support.

The Doha Round of negotiations started in 2001 with the intention to lower domestic subsidies and progressively reduce the distorting impacts of domestic subsidies in agriculture. In the course of the negotiations, draft modalities were developed in 2008 to further limit domestic subsidies in agriculture (as well as other issues). However, these modalities have not been implemented because the negotiations are essentially moribund. With another nine years of experience, additional issues have emerged that also need to be considered beyond those developed in 2008. Additionally, trade dispute resolution has continued since 2008, offering additional experience on which to base strengthening the

rules on domestic subsidies. A significant example is the Brazil cotton case challenging the US domestic subsidies for cotton, resulting in a finding of global price suppression as a result of the US subsidies.

In addition, natural capital- of which Canada is abundantly endowed- was never a part of the agreements of 1994. However, it is widely accepted that domestic support programs can have the unintended effect of eroding natural capital. Conversely, underpricing or preferential access granted to natural capital in agricultural use constitutes an implicit subsidy. These types of measures employed by other countries reduce the value of products produced from Canada's natural capital stock.

As Canada approaches the Buenos Aires WTO Ministerial in the fall of 2017, an awareness and understanding of these issues is necessary for Canada to formulate its agenda, and to work effectively with other countries in pressing further liberalization in domestic support policies.

Study Parameters

Despite agreements to reduce domestic and export subsidies in agriculture through the Uruguay round (1994) and Nairobi (2015), estimated total producer support for OECD countries is not much different than in the late 1980's. Nevertheless, CAPI has more recently raised the issue of the broader impacts and implications of such global subsidies (at a high-level) for Canadian agri-food sector competitiveness. This matter was addressed in a published policy commentary specific to the dairy sector (June 2015) and from the output of the Forum on Canada's Agri-Food Future (November 2015).[1]

This work is about understanding subsidies in terms of Canada's trade policy interests and the competitive positioning of Canada's agri-food sector. Agricultural supply chains and commodity sectors should take a strong interest in this matter as it affects their commercial positioning as well as their trade policy deliberations. As Canada depends on global agricultural trade, the country needs to ensure it remains at the leading edge of understanding how the role and impact of subsidies and their affects have implications for our trade relations in developed countries and among leading emerging countries, alike. As well, the project breaks new ground by making the connection between certain domestic support policies and the perpetuation of unsustainable agriculture and agri-food systems.
Objectives and Scope of the Study

The project will address the following questions:

1. What are some noteworthy and relevant subsidies (direct and indirect) in question that are significant in terms of their impact on production and prices?

2. To what degree and how are these subsidies misallocating resources and distorting markets?

3. What are the current and prospective economic effects of these subsidies on Canadian agriculture and consumers?

4. What is their significance on Canada's future competitiveness, particularly given the emerging long-term focus on environmental sustainability globally?

[1] CAPI 2016.

5. What are the policy options and industry strategies required to secure the Canadian agriculture's future competitiveness?

Scope of the Study

While the project will provide some global perspectives, the focus will be primarily on subsidies that impact Canada the most and will identify pertinent implications and, where possible, point out what actions could be taken. The research will be limited to the US, EU and Canadian agricultural subsidies with some attention to emerging markets, e.g., China or India. A short-list of commodities was chosen for this project, although reference to a wider range of commodities and whole farm subsidies/support will be included.

- Corn: As the most widely traded feed grain in the world, corn plays a central role in livestock production systems. Corn also serves the industrial market for ethanol and related food products including high fructose corn syrup, starch and others.

- Oilseeds: Canada is a major exporter of canola and canola products, competing with soybeans (and some other oilseed and oil crops) from the USA and South America. Soybeans are the most widely traded oilseed in the world, particularly as exports to China, competing directly with canola. Both canola meal and soybean meal complement corn (and other feed grains) in the livestock industry; canola oil, soybean oil and corn oil represent the large volume cooking and salad oils in world trade. As well, edible flaxseed and oil, developed in Canada, offers long term export growth opportunity.

- Pulses: Peas, beans and lentils (pulses) have become a large and growing export crop, particularly in western Canada. Other countries are looking to expand their own production of these crops. Maintaining Canada's advantage and building on this foundation for continued export expansion will depend on assuring that other countries do not use subsidies or other export enhancing methods to unfairly gain market share.

- Dairy: The selection of dairy is timely because of the forthcoming changes in both domestic and international trade agreements for Canadian dairy products. These changes include greater access to the Canadian market for dairy products through the TPP and CETA agreements.

- Hogs and pork: Hogs and pork represent major Canadian exports to the US, Asia and EU markets. The Canadian industry relies on corn and barley as a major feedstock.

The initial view was that the study would be based on two areas, commodities outlined above and the four countries. As the study progressed it became apparent that two additional parts of the framework were needed. First was a comparison of the two major datasets, the WTO notifications and the OECD dataset. Included in these data sources are the trade statistics in various databases, UN Comtrade, national databases for EU (Eurostat), USDA GATS, Canada's on-line trade data, and private sources for

other elements such as prices, including Genesus and AHDB (UK) among others. Second, the need for comparisons of the ways in which countries interpret and use their notifications to describe their subsidy regimes, and the concerns that arise regarding the rules under the AoA Annex 2 and other parts of the AoA and to a lesser extent the SCM.

Chapter 2 outlines the conceptual basis for support of agriculture, and the prospect for distortionary effects of such support. Chapter 3 provides a comparison of the WTO notifications and OECD PSE datasets. Each country is then described in more detail in Chapters 4 through 7, as well as identifying specific issues that have been found or identified by other authors as cause for concern. The country chapters go beyond the principal commodity set in some cases, simply to identify broader concern with subsidy elements and rules of the AoA, e.g., beef in the EU. The final chapter is focused on three broad elements. One part will look at the trade rules under the AoA, the second part will consolidate the findings in the country chapters, and the third part will summarize conclusions regarding natural capital.

Study Outline

Chapter 1: Context, Study Parameters and Summary of Issues

Chapter 2: Theory and Analytical Approach

Chapter 3: Overview and Exploration of the Datasets and Application to the Four Countries

Chapter 4: Country Study: China

- Crop Insurance
    - The crop insurance subsidies are not included in the most recent (2010) WTO notification, even though it is seen as the largest and growing crop insurance program in the world.
- Subsidies for Canola and Soybeans
    - The subsidies up to 2015 for wheat, corn, rice, soybeans and rapeseed/canola are based on stock purchases held for food security. The US challenge in the WTO on wheat rice and corn appear to have considerable merit, depending on the legal interpretations of China's accession agreement, and the way they are notified. Various calculations would suggest that subsidies for these three commodities as well as soybeans, rapeseed/canola are well in excess of the de minimis of 8.5 percent.[2]
- Changes to China's Support Programs
    - One of the difficulties is that China has announced considerable changes in overall approaches to agricultural policy although the changes in support program mechanisms remain unclear. The changes may make the US challenge moot. Until additional notifications by China are made, and until the program design and implementation methods of agricultural and commodity support are made available, little more can be done to up-date the assessment. A watching brief and further assessments will need to be made.

[2] The calculations have been made by the authors of this chapter, and confirmed by a recent paper by Brink and Orden.

- China appears to recognize the considerable deterioration in natural capital, land quality and water in particular in both past programs and a strengthening of these policies in the most recent document (Anderson, 2017). Nonetheless, both domestic policy and import arrangements do not appear to maximize/optimize the countries use of land and water availability.

Chapter 5: Country Study: EU

- Decoupled Payments

  Europe has moved over the past ten years from commodity specific support to decoupled farm payments, most recently amounting to €33 billion. This amount is shown in notifications as decoupled income support, exempt from inclusion in the Current Total Aggregate Measure of Support (CTAMS).

- Beef and Dairy

  The European Parliament has just published a major study (2017) on the impact of subsidies on the incomes in the beef and dairy sectors. The report deals with data up to 2014, although the authors indicate that the changes in the CAP going forward will have minimal impact on the results of the study. In their findings, the estimated average return to labour is 100 percent of the payments to the beef industry, and 49 percent in the dairy sector from the decoupled and other forms of support. The appearance is that neither of these industries could survive at current levels without the continued support.

- Hogs

  For hogs, there is minimal notified support. However, cost of production estimates exceed prices at farm level for hogs for all countries for which data exist (an except is Italy, although it shows the highest farm gate price for live hogs in the Eurostat dataset. Cost of production estimates from Genesus and AHDB indicate that the USA, Canada and Brazil have the lowest costs of production, considerably below those of the EU, even though the EU is maintaining and increasing exports of pork and pork products, some of it based on imported feedstuffs. Much more work is needed on the EU pork industry.

- Other Observations

  One curiosity is that the EU has notified market price support for dairy products as negative, although the negative is not included in calculation of CTAMS.
  The Eurostat data on farm prices are highly suspect in many cases. For example, the price of hogs live weight (€/100 kg) is identical to the price of carcasses (€/100kg). However, other private sources such as Genesus, AHDB, and Rabobank appear to have acceptable and realistic prices.

No recent sector wide assessment of subsidy impacts has been found on the hog/pork industry.

Chapter 6: Country Study: USA

- Grazing Subsidies
  - Small amounts of support are notified to the WTO each year. Although USDA has confirmed the levels as accurate, other estimates place the cost much higher than shown in the notifications.
- Crop Insurance
  - The US has changed the way it notifies crop insurance subsides, from non-commodity specific to commodity specific. This has led to double counting of the value of production in the calculation of commodity specific and non-commodity specific subsidies as a percentage of value of production.
  - The re-insurance costs are not included in the notification (payments to private insurers for some or all of their losses on an annual basis).
- Disaster Payments
  - No concerns.
- US Irrigation Subsidies
  - Small amounts are notified each year. Amounts are notified as exempt payments under General Services.
  - Irrigators make annual payments only the capital investment by the government, not for interest on the capital.
  - By and large, surface and ground water is underpriced compared to its value in use in agriculture, and under the price charged for other sectors, industrial and consumer households.
    - The irrigation subsidies apply primarily to surface water catchment and distribution.
    - Ground water is essentially a common property resource, owned and allocated by the state in some cases, and attached to land in other states.
    - Ground water irrigation is drawing down the fossil water in almost all areas of the high plains and the central valley in California in the USA. Recharge of the ground water supply cannot offset current use rates in most areas.
    - In some cases, recharge may be impossible because of the land subsidence, shrinking the space available for the water for recharge.
    - Drawing down the water faster than recharge rates increases surface water on the earth, causing some of the rise in ocean levels (Kanikow).
    - The irrigated crops use more fertilizer and pesticide than non-irrigated crops, potentially leading to additional plant nutrient and pesticide runoff into water courses and eventually oceans.
    - The aquifers have limited amounts of water; eventually the ground water will be fully mined or too expensive to pump for agriculture or any other use of the water.

    - Irrigated crops provide higher yields than non-irrigated crops across the high plains in the USA, with the return to irrigation exceeding the costs of pumping and distribution.
    - Limiting ground water use to recharge rates would lower yields and production as well as cause shifts in cropping patterns to crops with less intensive water requirements.
- Dairy
    - US dairy thus presents some notable divergences which merit further investigation. While AMS for milk notified to the WTO has dramatically declined, the market price support (MPS) estimated by OECD has been increasing. What is remarkable about the sharp decline in AMS notified to the WTO for dairy in the US is how little actually changed when the Dairy Product Price Support Program was eliminated. For its last several years, there was very little or even zero product purchased under the price support program, however the US notified AMS based on the differential between its support prices and historical reference prices, multiplied by total production. In effect, when the program was discontinued, no less dairy product was purchased by the US government, but US notification to the WTO of the AMS declined almost to zero.
    - Secondly, while the OECD's MPS for the US has been significant and increasing, the US has also been heavily trade surplus in dairy products. This contradicts accepted wisdom that pricing is an important element in export competition. It also suggests that classified pricing under Federal Milk Marketing Orders in the US has been successful in both increasing relative milk pricing in the US (as measured in MPS) and facilitating dairy exports.

Chapter 7: Country Study: Canada

- Few concerns have been identified. Canada's notifications are the "cleanest" of the four countries.
- For the dairy sector, a likely challenge by the US along with the potential under the NAFTA re-negotiation represent the biggest challenges.

Chapter 8: Issues and Conclusions

Areas of General Concern

- The overall message is that countries are exploiting the porosity of the rules under the AoA Annex 2.
    - In all trade negotiations, the public demand and stated intent of governments is to establish a "level playing field". Every negotiator's job is to reach an agreement that tips the playing field to advantage their own country as much as possible during the negotiations. Following the negotiations, the task for governments and civic organizations appears to be to further tip the playing field in one's favour as much as possible within the agreement and its rules. It is natural then to expect that

governments may exploit, to the extent possible, any latitude on policy limitations imposed by trade agreements to respond to domestic pressures and civil society.
    - "Countries have found ways to adjust policy instruments to appear to show trade distorting support reductions even when incentives to producers are maintained (Josling 2015)."
    - Several authors have noted that the disciplines in the AoA do not have the scrutiny and assessment to verify that the claims for exempt payments or reporting on non-exempt payments remain within the WTO AoA rules or the intent of the rules, e.g., Glauber 2016.
- Crop Insurance:
    - The US changed its method of WTO notification from a lump sum amount under non-commodity specific support to notification of crop insurance subsidies as commodity specific.
    - The reinsurance costs are not included in the estimates.
    - Canada notifies crop insurance subsidies as a lump sum under non-commodity specific support.
    - China does not report crop insurance subsidies, even though it is reported to be the largest program of its kind in the world.
    - As noted in Chapter 6 (USA), given the variation in notifications of crop insurance support, greater clarity in the way in which crop insurance costs are notified appears to be needed. The Ministerial Meeting planned for late 2017 to address domestic subsidies may offer a venue to achieve greater clarity and uniformity in reporting across countries.
- Double Counting:
    - An example has been developed that shows it is possible to have support exceed 10 percent of the value of production. To get to 10 percent, a country counts the value of production in calculating the product specific support, and uses the same total value of production in calculating non-commodity specific support. If commodity specific support is at the five percent limit for all commodities, and at five percent for non-commodity specific support, then support is at 10 percent of the value of production. Going further, the US shows commodity specific support for individual commodities, e.g., each of the meat animals, and also includes more commodity specific support for "Livestock", using again the sum of the value of production from each of the individual commodities.
    - The clue to this is found in the fact that the sum of the individual commodity values of production is substantially greater than the reported total value of production for the US.
    - While the issue has been noted in the literature, no assessment or possible closing of this porosity in calculating the CTAMS has been found in the literature.
    - Stronger rules are needed to close this apparent loop hole.
- Decoupled Income Support

- The exclusion of decoupled income payments from the CTAMS calculation is in great need of overhaul. Europe in particular has exploited the use of this support in notifications. Even though the change in the CAP to rely on decoupled income support within the green box (exempt payments), the total amount of expenditures by the EU on agriculture has remained largely the same over the years.
- EU had €31.8 billion of decoupled income support in the 2014 notification.
- The US has notified roughly US$5 billion for a number of years, although this program has been dropped in the current Farm Bill.

- Blue Box
  - The blue box needs to be closed. Making payments on less than 100 or 85 percent of the commodity, with payments calculated based on some measure in past years represents an open-ended, permanent direct commodity subsidy opportunity excluded from calculation of the CTAMS.
  - EU had €2.7 billion in blue box notifications, a third of which went to the beef industry.

Country Studies

- See summaries above for Chapters 4 through 7.

Natural Capital

- There is no apparent rule in the WTO/GATT agreement or in the AoA that constrains a country from drawing down its natural resources in agriculture, e.g., ground water, or polluting the environment, e.g., nitrogen and phosphorus run off.
- Certainly, drawing down fossil water because of underpricing may be cause for concern, although it questions over 150 years of established riparian rights law in the USA. Without rules in the AoA, SCM would appear the only way to resolve concerns of underpricing water or other natural capital.

References

Kym Anderson, Marianne Kurzweil, Will Martin, Damiano Sandri and Ernesto Valenzuela, 2008. Measuring Distortions to Agricultural Incentives, Revisited. World Trade Review, 7(3), October 2008. Available at: http://www.oecd.org/tad/agricultural-policies/41086933.pdf

Brink, Lars, and David Orden, 2016. US WTO Complaint on China's Agricultural Domestic Support: Some Preliminary Observations on the Case and its Context. Draft paper presented at the IATRC Meeting, Scottsdale, Arizona, 11-13 December 2016.
Available: https://www.researchgate.net/publication/312611277_The_United_States_WTO_Complaint_on_China%27s_Agricultural_Domestic_Support_Preliminary_Observations

Josling, T. 2015. *Rethinking the Rules for Agricultural Subsidies*. E15 Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum. February.

Glauber, Joseph W. 2016. Unfinished business in agricultural trade liberalisation. Presented on 24 November 2016 to Cairns Group Farm Leaders seminar. http://cairnsgroup.org/DocumentLibrary/Unfinished%20Business%20Nov%202016.pdf

Goodwin, B. and A. Mishra. 2006. “Are ‘Decoupled’ Farm Program Payments Really Decoupled? An Empirical Evaluation. Amer. J. Agr. Econ. 88(1) (February 2006): 73–89.

Chapter 2: Domestic Support in Agriculture: Economic Rationale, Distortions and an Unintended Consequences

Introduction

Governments have only four tools with which to intervene in markets: money, information, regulation, and international relationships among countries. The money can provide public goods and income redistribution, incentives for investment, production and consumption, and justice systems. Regulation can correct market failures and assure fairness in markets. Information can assure symmetry in knowledge by market participants. International relationships involve agreements on how countries deal with each other bilaterally, regionally or though international organizations, such as the United Nations, NATO, WTO and the like.

The difficulty in sorting through the many actions taken by governments regarding markets, production, consumption and trade that disadvantage other nations is the requirement for a framework within which those actions that are benign and can be set aside, those that have minimal effect are recognized, and those that materially impair the economies of other countries in some way. Overlaid on this web of governmental actions are the laws within countries as well as legally binding international commitments.

This chapter begins with the basis in established economic theory for governments to intervene in markets, specifically in agriculture and food. Attention then turns to public and private goods to lay the foundation for identifying and justifying the benign actions by government that can be set aside. Next, specific attention is drawn to natural capital in production, consumption, marketing and trade in agri-food, and the implicit transfers and drawdowns in natural capital that agricultural support can provoke. The chapter concludes with a summary of the rationale for government intervention and its intended and unintended effects, in preparation for the discussion of how these have been codified and how disciplines have been established for agricultural support in the next chapter.

Welfare Economics and Market Failure

Government intervention in agriculture and food has a very long history in most developed countries. The purpose of this section is to provide a brief synopsis of the rationale and developments in economics and public policy that have supported this trend. This background allows for an understanding of the elements of government intervention that are seen as distortionary, and form the focus of this study. A broad survey of this literature is well beyond the scope of this paper; instead, this section provides a brief synopsis that orients the reader with the economic rationale for government intervention in the marketplace.

The literature on economics and public welfare highlights the role of competitive markets as the primary mechanism of co-ordination in the economy. As such, the operation of the economy is portrayed as somewhat mechanical:

- Consumers have preferences for goods and a budget (income) with which to purchase goods. The combination of preferences, a budget, and the desire to maximize satisfaction/wellbeing (or 'utility') generates demand in the market for goods and services.
- At the same time, producers purchase labour supplied by households, capital, and inputs to supply goods and combine these with given technology for production in the expectation of profit. Increasing profits induce expansion in production and an increase in the supply; decreasing profits induce a decrease in the supply.
- Prices are determined in markets through the interaction of demand for and supply of the various feasible combinations of goods. The implicit messages sent in interaction between consumers and producers through the price system direct the types and volumes of goods that will be produced and consumed.
- To complete the system, producers are themselves consumers of inputs and labour supplied by households (consumers), and wages direct the supply of labour.
- Viewed from this context, the role of prices in the economy is to direct the producers to produce the goods that consumers want in the volumes they are willing to consume. Completing a circle is the flow of incomes and payments in exchange for supply of inputs to production.

In a market economy, the above process functions on the basis of decentralized competition. This means that the interaction between individual self-interests and maximization of consumer satisfaction and firm profits through the market is used to co-ordinate supply and demand of goods and services.

The central economic concept utilized in measuring the performance of markets is Pareto optimality, or Pareto efficiency. The allocation of resources in an economy is said to be 'optimal', or Pareto efficient, if it is impossible to reallocate resources in such a way that could improve the welfare of at least one individual without making others worse off. Thus, a desirable outcome of any co-ordination mechanism would be that it generates an allocation of resources that is Pareto efficient. This could be viewed as a weak criterion from which to measure co-ordination in an economy; in particular, extremely inequitable allocations that many would consider unfair can be Pareto efficient simply because total welfare is maximized. The difficulty is that for any economic co-ordination mechanism to make interpersonal welfare comparisons (i.e., judge fairness), it must be dictatorial.[3] If the economy is dictatorial, then it is no longer about voluntary choice, which is what we assume is most desirable; thus, stronger criteria relating to fairness is not part of the welfare economics paradigm.

The understanding of the competitive market co-ordination mechanisms in an economy was made precise through the development of general equilibrium theory. General equilibrium theory established the necessary and sufficient conditions for a competitive economy to produce Pareto efficient allocations. The specific conditions are technical; however, at least three of these conditions deserve discussion:

- Consumers and producers take prices as given

[3] This is a simplified version of the Arrow "possibility theorem". See Arrow, 1963.

- Consumer preferences and production technologies are convex
- Markets exist for all goods in the economy

The first condition implies that there are no consumers or producers that are large enough or control enough to autonomously determine prices. The second condition is technical, but implies that the preferences of consumers are strictly selfish (i.e., more is preferred to less), that production technology is characterized by decreasing returns to scale, and that the preferences of all consumers and the profits of all firms are independent. An important element, discussed below, is that all goods are "private goods" and in particular that there are no "public goods". The final condition is that there are viable markets for all the goods (and "bads") in the economy.

If each of the three conditions above hold, general equilibrium theorists have demonstrated that the competitive market will produce a Pareto efficient allocation of resources.[4] The converse is that if these conditions are *not* realized, a competitive market will *not* produce a Pareto efficient allocation. If the key economic criteria for a system of economic co-ordination is Pareto efficiency and the conditions are not met, then the public policy problem is for government intervention to "fix" these "market failures" with corrective actions so that the free economic system can be 'bent' to operate in ways that do satisfy these necessary conditions. Thus, from the traditional economic perspective, if the above conditions are not satisfied, then government remedial actions are justified to make the market behave as though it were competitive. The major categories of market failures governments seek to mitigate through intervention are the following:

- Market power. If consumers and producers in the market behave in such a way that they do not take prices as given, government uses its authority to regulate industry concentration and firm size, and to establish anti-trust measures. In cases of natural monopoly price controls may be imposed.
- Externalities. If the production or consumption decisions of individual consumers or firms have impacts that affect others (such as water pollution from agriculture) government action is justified in taking action to address these external effects. Market-based instruments can be used, or the problem can be addressed directly through regulation.
- Information. If exchanges in the economy occur in such a way that buyers have intrinsically better information than sellers (or vice versa), competitive market behaviour will fail to provide a Pareto efficient allocation, because the less informed party can be made better off without harming the better informed. Under these conditions, government is justified in providing grading and market information services to rebalance the asymmetry in information between buyers and sellers.

Public and Private Goods

Economic theory broadly defines four kinds of goods: private goods, public goods, club goods and common property resources. Two criteria are used to distinguish among them. Non-rivalry indicates that the consumption of the good by one consumer does not deny another from also consuming the same good. Non-excludability means that by one consuming the good, no others within the country are

[4] This is sometimes called the "fundamental theorem of welfare economics", proven by Kenneth Arrow and Gerard DeBreu.

excluded from consuming the good. These two properties, non-rival and non-excludable, define classes of goods in the economy.

Private goods are both rivalrous and excludable. Private goods are controlled to point of sale by the producer; consumption “uses up” the good so it cannot be consumed again by others.

Conversely, defense spending by government provides a good to all citizens; enjoyment by one does not limit the enjoyment of other residents within the country, so it is non-rival in consumption. Similarly, knowledge that can be gained by one does not deny anyone else from also gaining the same knowledge.

Goods can be non-rival but excludable. In this case, the consumption or use by one does not limit the consumption or use by another, but its consumption or use may be limited to an identified subset of the population. An example would be a movie; the fact that one person can see the movie does not “consume” the good, but others can watch the movie also. However, the movie is excludable since only those that pay for the movie can watch it. In other words, the good still exists following the consumption or use by an individual, but by either public regulation or private ownership of the good, its consumption can be restricted.

Goods may also exhibit rivalrous and non-excludable properties. A rivalrous good when consumed or used by one cannot be used or consumed by another; that is, it is “used up” in consumption. When the good is also non-excludable, it is regarded as a common property resource; everyone has access to the good, but once used, it cannot be used again. An example is fishing stocks on the high seas for which no limits on catching volumes are involved. Open and unlimited use of government owned pastures is also an example. Another example would be unlimited use of groundwater for irrigation. A variant of this good is the common pool resource, in which a group of producers use a single water source for distribution and irrigation with protocols among users for timing and level of use, for example.

Categories of Goods		
Criteria	Non-Excludable	Excludable
Non-Rival	Public Goods (national defence, traffic regulations, food labelling)	Club Goods (supply management)
Rival	Common Pool Resources (fish stocks, ground water)	Private Goods (food, GMO seeds, fuel)

Goods can shift categories over time, as technology, regulation and markets change. An example is open pollinated corn or soybean seed. Originally developed as a public good for several years by public research and made available for multiplication and distribution by private companies, genetic

technology has allowed companies to design and create their own varieties, protected by patents, and sold to farmers as private goods, exhibiting both rivalrous and excludable attributes. A regulatory change limiting a fish catch can shift the type of good from common property resource to its subset, a common pool resource.

Governments provide public goods because the private sector will not efficiently produce goods on which profits cannot be secured. As a result, the private sector cannot realistically invest in production with an expected return on the investment, when the same product can be generated by other companies without restriction, leading to underinvestment in such goods unless government carries out or funds the research and development. Public goods can also be created through public-private partnerships; highways built by the private sector with the privilege of collecting tolls for a limited period of time to pay for the initial investment is an example. Information created by government or required by regulation that private firms must provide such as food product labelling is a public good. Equally, government food inspection and hygiene services to ensure food safety are public goods. In domestic food markets, while taste, quality and other attributes may be points of competition among suppliers, food safety and hygiene are normally considered pre-competitive attributes, and not points of competition in marketing and advertising. Nonetheless, food safety and hygiene is often used as a point of competition internationally, and also can be a point of restricting trade among nations.

Risk

There are other aspects that play into the market failure paradigm for government intervention. One relates to risk in outcomes, as well as risky behaviour. Risky or uncertain[5] outcomes result when an action is taken, the consequences of which are outside of an individual's control. For example, a farmer takes the action of planting and fertilizing a crop, but to a large extent, the revenue that will be earned from the crop at harvest is largely out of the farmer's control from that point. It is generally accepted that people are averse to risk and uncertainty; they will willingly accept lower income for greater certainty of income in lieu of a risky income, even when the risky income has a higher expected value. Because they are risk averse, individuals modify their behaviour in anticipation that consequences are variable- in particular, producers may underinvest in assets related to production or product quality. In this context, the price system described will not obtain Pareto efficient allocations. Risky behaviour on behalf of individuals can also have external effects on others. For example, if an individual uses a dubious feed ingredient in livestock production that later proves harmful, the negative effect on reputation can extend to the industry as a whole, and not limited to the individual. Thus, groups or industries can be impacted by the risky behaviour of individuals. This possibility is not always picked up in the price system.

Equity and Income Redistribution

While the competitive markets and the Pareto criteria do not relate to equity of economic outcomes, individual tolerance and collective support for markets as allocation mechanisms depends on a degree of perceived equity in economic outcomes. Market outcomes do not necessarily satisfy specific moral,

[5] Risky outcomes occur as a random draw from a known distribution, uncertain outcomes are drawn from an unknown distribution

ethical, and philosophical beliefs about how a society should operate regarding what should be produced, in what amounts and who should receive the goods, services and income. Also missing is a guarantee that the free market will lead to a sustainable balance in resource use for resources that lie outside markets or for which markets are imperfect.

For example, a market can function in such a way that the purchasers of farm products are highly profitable on a sustained basis, farmers manage to just eek out an existence, and farm prices are chronically low. This could relate to competition issues described above; whatever the source, in this situation it is likely that farmers would eventually reject the market mechanism and many of the institutions that support it. Thus, governments perceive a need to ensure some fairness and equity in economic outcomes. While it is theoretically possible to achieve a collective outcome that is felt to be optimal by those in society, it is generally the case that governments are tasked with adjusting/coordinating these "market" outcomes to meet particular concerns and beliefs within the polity (Coase, 1960 and Ostrom, 1990).

Past Regulatory Failures

Another aspect of government intervention relates to past interventions. The traditional market failure basis for intervention in markets ignores the possibility of "regulatory failure" that can result from government action in the economy. This arises from two perspectives. One is that, if there are multiple market failures, and only one is "corrected" by government action, it does not follow that the resulting allocation will be more Pareto efficient than the initial situation was.[6]

The second is that government intervention in markets is influenced by motivations other than returning the economy to Pareto efficiency. These alternative motivations include the following:

- Rent seeking. Politicians or government regulators choose remedial actions that serve their interests of rewarding or placating their supporters rather than to return the economy to its desired state.
- Regulatory capture. The group that is the subject of regulation is successful in influencing politicians or government regulators to increase the group's benefit as a result of regulation.
- Regulatory drift. In addressing market failures, politicians or government regulators shift regulatory priorities from the source of market failure to other issues
- Disjunction between revenues and costs. In applying policy to resolve a market failure, the absence of a competitive yardstick (a market) for the regulator means that the costs of a regulatory solution may exceed the cost of the market failure it is designed to correct.

Thus, the public policy "correction" to the market failure may not be a correction at all; it may exacerbate the problem, or even create new problems. This, in turn, can provide the motivation for additional corrective policy intervention.

[6] See, for example, Lipsey and Lancaster.

Infant Industries and Protection of Economic Development

Startup industries can face conditions of imperfect competition which act to prevent their initial development, even though they would or could become competitive and profitable after being established. This provides the motivation for governments to intervene and encourage/protect these industries in their formative phases of development. Conversely, it also encourages new industries to actively seek this type of protection and to extend it further into the future. This later tendency for industries to request and for governments to grant support and protection (rent seeking) can lead to legacies of support and protection of industries, and related economic development in the regions where these industries established.

Economic Basis for Intervention

The basis for government intervention in agriculture and food, through policy programming and regulation, thus relates to the following:

- Correction of market failures related to lack of competition/market power, externalities, public goods, and information.
- Control and mitigation of risk aversion and uncertain outcomes, that would otherwise lead to underinvestment and/or externalities.
- Correction of perceived inequities that could otherwise undermine the institutions of the competitive market.
- Corrective action for failures in previous policy.
- Income redistribution.
- Infant industry reasons that persist beyond being needed.
- Economic development in historical contexts that persist.

Natural Capital and Trade Distorting Subsidies

Natural capital refers to a stock of endowments that, for the most part only includes the factor endowments, or resources, within a country's borders, in what is usually called natural resources

Natural capital stock has at least two dimensions. Stocks have a physical size in the sense of acres or tonnes. They also have a quality attribute in the sense of productivity. For example, Australia uses a measure of carrying capacity and potential productivity of pasture land called Dry Sheep Equivalent (DSE). Pasture that supports a 50 kg wether maintained at constant weight has a dry sheep equivalent (DSE) rating of 1. Land area of native pasture + sub clover + superphosphate that can sustain on average 6.5 animals with a DSE of 1, then the average rating is 6.5/ha.[7]

Investment and disinvestment can change the size and value of natural capital. Investment can be in technological change that means that more can be produced with fewer inputs such as with new

[7] http://www.dpi.nsw.gov.au/content/agriculture/farm-business/budgets/livestock/sheep/background/dse

machinery and equipment and new discoveries can change our knowledge about the size of the resource. In the case of irrigation above, the DSE is raised so the land is more productive and therefore 'larger' than its physical size was previously taken to be. Conversely, under depletion in a natural capital there is a disinvestment. If policy is not in place to offset the disinvestment then there is a decline in the stock of natural capital and an implicit subsidy provided to current producers in the form of higher production today at the expense of future production. Environmental degradation wherein natural capital such as fresh water and biodiversity of natural resources are depleted are examples of disinvestment in natural capital that are of particular interest.[8]

Agricultural Policy and Natural Capital

At the interface between the agriculture and the environmental domain there are interventions by government to agricultural producers through subsidies, based upon the motivations above. Some of the income transfer is direct with payments made to producers, while in others the transfers are indirect, and in some cases, implicit. Implicit transfers include cases where there is no cash transfer but instead there is an underpricing of inputs or an exemption to farmers of costs that would be charged to others. Unpacking the circumstances under which such payments are made, or in the case of implicit exemptions, not made, is complicated by the intention of the payments and their net effects. These subsidies can cause the following:

- Overproduction of certain commodities
- Production in ill-suited areas
- Non-optimal allocation of natural resources
- Overuse of natural capital
- Promotion of unsustainable agriculture

Externalities and Implicit Subsidies

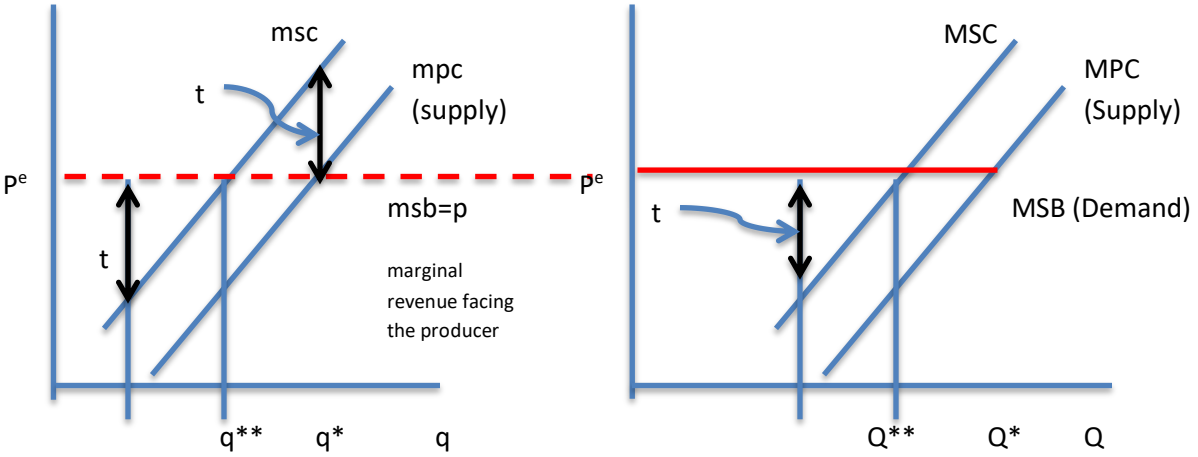
Producers establish production levels based on output prices and their costs, as well as other factors including risk and uncertainty about each of these independent variables, available technology and their expectations. They may lack economic incentives to take account of the costs or benefits they generate that affect others outside their own operation. These other costs and benefits are called externalities. Regulatory, tax and subsidy/transfer instruments can be designed to provide incentives to internalize the externalities. If these instruments are not used, producers will produce more than is socially optimal, profit maximizing prices can be lower than otherwise, and natural capital can be depleted to socially inefficient levels. The net effect is equivalent to an implicit subsidy to producers that keeps prices lower than would be socially optimal.

[8] Clearly, some factor endowments are non-renewable (e.g., coal), while others are certainly renewable. However, there can be a substantial time lag for the resource to be renewed, for example, ground water. To be fully renewable, the extraction rate should equal the renewal rate, otherwise there is an externality imposed on future generations. Also, technology can change the existence and value of an endowed factor. Lithium could be an example. It had little use until the lithium ion battery became the mainstream power storage system.

For a market outcome to be Pareto optimal, it must be the case that Marginal Social Benefit (MSB) of the allocation is equal to Marginal Social Cost (MSC). Hence, if it is not possible to move one unit – the marginal unit - of resource from one activity to another activity to thereby increase total benefits to society, then the current allocation of resources is efficient and we call this allocative efficiency, as well as a Pareto Efficient outcome for the allocation of society's resources. Hence, the condition that MSB = MSC is synonymous with Pareto Efficiency and Pareto optimality, as discussed above.

An example of a non-optimal output level that is chosen by an individual producer whose production activities cause external costs with a value of 't' per unit of output produced, is shown in Figure 1.

Figure 24: Production Externality of t/unit



One Producer

The Market

Figure 24 shows the producer's marginal cost curve, which represents the marginal private cost of production (mpc). This curve embodies the private costs of production that drive the producer's decision to produce the profit-maximizing output given the per unit market price of the output determined in the market. Optimal output is q* given a price of P^e, which is the firm's marginal revenue or 'benefit' of producing the last unit of output. Producing an additional, marginal, unit of output would mean that the additional cost would be greater than the price (marginal revenue or 'benefit') received in the market for that additional unit and so total profits would decline. The same is true if one fewer units were produced wherein the reduction in cost would be less than the reduction in revenue and so total profits would decline. Thus, q* is optimal from the point of view of the producer because marginal private cost just equals marginal revenue (or benefit or price/unit sold) for the producer. Thus profit cannot be increased by either increasing or decreasing the production level. In this example, however, we are assuming that there are externalities associated with production that are additional costs of production not borne by the producer. This could be phosphorous pollution inducing algal blooms in downstream waterways; a real consequence of fertilizing on farms in watersheds such as the at the Great Lakes in SW Ontario. Off farm per unit costs – external costs - are illustrated as the vertical distance 't' between the mpc and the curve that is labeled as the marginal social cost (msc). Total costs of production to society as a whole are included in the MSC curve – private plus external costs. From

society's point of view, market output is optimal if MSC=MSB with MSB assumed here to include all social benefits and reflected in the market price. For simplicity, MSB in the market is shown to be a horizontal, perfectly elastic demand curve in this market. With all costs included, optimal producer output is q**. q** is less than q* and for all producers the result would be the same with the effect that the overall market quantity produced – the sum of quantity produced for all producers - eventually declines from Q* to Q**. The mechanism used to obtain the social optimum in this example is a tax equal to 't'. The ultimate sharing of the tax cost depends on the shapes of the demand and supply relationships. (With a perfectly elastic market demand assumed in this example, all the tax burden is borne by the supply side.) Examples are emission taxes or systems of tradable emissions permits for point source pollution.

With externalities, the policy interventions represent a correction for a market failure to incorporate all costs of production. If, however, policies are not in place to correct for external costs being imposed on others then the jurisdiction is not properly accounting for production costs within society. Q* would persist instead of the lower, socially optimal, output of Q**. In general, if policy instruments are not used to correct for the externality, price would be lower and the quantity higher than would be optimal. This is an example where natural capital is being depleted non-optimally with the consequence that others are bearing the costs that should be borne by the producer. Those that bear the costs can be those 'downstream', those who pay to clean up damage and/or future generations who must pay to reverse damage or live with a degraded environment and ecology. In effect, therefore, producers are receiving an implicit subsidy equal to the tax that would otherwise correct the market failure and lead to q** and Q**. Domestically there is a welfare loss when too much is produced and from a trade perspective, there is a trade distortion when these producers enjoy a cost advantage in comparison to other jurisdictions where taxes that correct for externalities are imposed and natural capital is better managed.

Indirect and Implicit Subsidies

An important indirect subsidy involves underpricing of inputs, such as in the case of irrigation water being provided at costs that are less than the capital and operating costs of provision. Subsidies provided through underpriced irrigation water are well documented across jurisdictions. There are basically two approaches to pricing water. One takes a return to capital approach that says that providing irrigation water should be priced to cover both the operating and capital costs of the irrigation distribution infrastructure. The second prices water at the value of its use. In this second approach, as used in the Murray-Darling Basin in Australia, water trades on a market with willing sellers and buyers entering the market depending on the return to water in use. On top of the water price on the market, distribution is paid for through water charges. Each of these approaches can be consistent with optimal pricing as well as subsidized pricing.

Much of the large-scale infrastructure that is in place was built under economic development policies that induced westward migration in the USA, Canada and Australia, for example. Thus, there are

historical reasons including infant industry arguments for subsidies. At this point, with structures and historical support to which resource users have become accustomed, it is difficult to unpack what is current, intentional subsidy and what is an artifact of the past – a windfall gain from previous generations to today's irrigators. Regardless, there are efficiency arguments for adjusting pricing to reflect current operating including delivery charges as well as replacement costs for sustainability reasons. From a subsidy point of view, there are real concerns that jurisdictions that underprice water are essentially subsidizing production, potentially underpricing outputs and thereby distorting trade. The OECD has estimated the implicit subsidies associated with underpriced water.

There is a range of examples that illustrate that there is unsustainable use that could indicate that there are implicit subsidies for water. For example, Cooley et al. (2016) and others have documented the increasing scarcity of water in the southwest of the USA (Arizona, California, Colorado, Nevada, New Mexico, and Utah). It has the fastest-growing population and is one of the most economically productive regions of the United States. It is also the most arid region and is prone to long-term droughts. These dry conditions combined with the manner in which water is allocated are expected to continue to place extreme pressure on the supply and demand balance across competing water uses including environmental needs. There are real risks of there being insufficient water to meet demand. The water allocation system does not respond to supply and demand pressures in the market according to an allocation mechanism that would reflect a willingness to pay for available supplies.

Instead, the allocation system determined historically means that water is allocated according to 'prior appropriation'. This can be defined as 'a legal doctrine where the interests of the first person in time to take a quantity of water from a water source for a beneficial (agricultural, industrial and household) use has the right to continue to use that quantity of water for the same or similar purposes' (OECD, 2015c). As the Cooley et al. point out, the precedence of the right of use determined by timing over other possible allocation criteria has encouraged potential water users to stake a claim to as much water as they can divert. As a result, it is now the older users, such as agricultural irrigators, that have larger and more senior rights than users whose demands have grown rapidly more recently. Now irrigators that hold the oldest and largest water rights in the basin are facing increasing pressure from urban users to sell or relinquish some of these water rights to urban users and a growing contingent of those concerned about ecological decline in streams and lakes.

The consequence of such a prior appropriation water right allocation system is that water does not get used where it is most valued. This in effect means that the opportunity cost of use is higher than the value in use. Another way of saying this is that the cost exceeds the benefit of use for the marginal unit, which can be illustrated in a similar way to Figure 1 with externalities. Marginal private costs of irrigated agricultural production are lower than the social costs because there is a further cost not accounted for by the producer that is the marginal benefit of the next best use of the water that is forgone. This is the opportunity cost of using the water in its use as determined by prior appropriation, rather than marginal social cost and benefit.

Other examples also suggest that water is provided at prices that do not reflect the full cost of providing the water. The US reported $167.3 million USD[9] in the 2012 fiscal year for 'Other non-product-specific' AMS for irrigation on Bureau of Reclamation Projects in 17 Western States. The subsidy arises because irrigators are obligated to pay a share of the long-term debt for construction of reclamation projects from which they benefit, but pay no interest on that debt. The Government cost of financing the debt is considered support and is calculated using a "debt financing method." A long-term interest rate (30-year Treasury bond) is applied to the outstanding unpaid balance of capital investment by the Government to obtain the support level. Payments are not subject to input constraints or to production limits and payment. Payment rates are fixed. (WTO, USA Notification, Supporting Table DS:9). This subsidy is significant, representing more than half of the total value of all 'Other non-product specific' Aggregate Measure of Support for the US in the 2012 fiscal year. Furthermore, the breadth of the impact is also not likely to be trivial with the 140,000 farmers who receive water from Reclamation producing about 25 per cent of the nation's fruit and nut crops and 60 per cent of the vegetables. [10] (http://www.usbr.gov).

Subsidy Impacts

Support to agriculture can occur in a range of categories; these are described in Chapter 3. However some of the adverse effects of agricultural subsidies can be described in general. Access to agricultural support programming can relate to production level, creating an unintended incentive for producers to expand production in order to obtain additional support. Alternatively, programs can be designed with support based on past production, in order to avoid this distortion. However it has been observed that producers may increase output in response to these programs as well, under the anticipation that eligibility for support will be updated in the future (Sumner, 2005). Support that has the effect of shielding risk can provide the incentive to take risks- in terms of alternative crops, production in areas only marginally suited for production, or using riskier production techniques. Alternatively, the distortion from these interventions lies in entrenching existing production practices when markets would otherwise create incentives for adjustment.

Under-valuation of natural capital can create a distortion in the intensity and location of agricultural production activities. Essentially, industries choose to expand in areas in which the natural capital they consume as inputs is priced at below market rates, or unpriced. Box 2.2 below illustrates this connection between the expansion of the dairy industry in the Western US states and implicit subsidies for water. Preferential access and implicit pricing of water in these regions is consistent with the

[9] The value has declined from 2010 through 2015 potentially because of a lower interest rate or a change in methodology, from 2010 $203.83m, $188.73m, $188.73m, $167.31m, $167.31m to $167.31m in 2015.

[10] Reclamation operates about 180 projects in the 17 Western States. Reclamation projects provide agricultural, household, and industrial water to about one-third of the population of the American West. About 5 percent of the land area of the West is irrigated, and Reclamation provides water to about one-fifth of that acreage or about 10 million acres. Reclamation delivers 10 trillion gallons of water to more than 31 million people each year. Reclamation is a major American generator of electricity producing about 15 per cent of the nation's hydropower and is the second largest hydropower source. The total budget for reclamation is about $1billion. (http://www.usbr.gov/main/about/fact.html)

expansion of the dairy industry, both in terms of irrigation of crops grown as feed for dairy cows and in terms of water consumption on dairy farms.

What each of these has in common is that support- either explicit in the form of a subsidy, or implicit through underpricing- creates the prospect of a supply response. The impact of the supply response, in interaction with the demand for the product, is to decrease farm prices. In some cases, the trigger for support is connected to farm price levels such that lower prices trigger increases in support. This creates a form of feedback loop between agricultural support and farm prices, with the prospect of perverse consequences.

There is also a relationship between subsidies related to current/past output and to risk relative to natural capital. As subsidy programs result in a supply response, one of the effects can be to more intensively draw upon natural capital. As such, support that targets producer prices or returns can have the unintended consequence of depleting natural capital.

Conclusions

This chapter scopes out the theoretical rationales for support of agriculture, and the concerns that can result from this support, with connections to natural capital. It observes the following:

- Intervention by governments in markets has a basis in welfare economics to adjust for effects left unaccounted for in markets, and to correct for imperfections in markets. Markets lack the incentive to supply public goods, so these are typically provided by markets. Interventions also occur to prevent or mitigate certain types of risks, to cushion infant industries, and to rectify failures in previous interventions. In other cases, market interventions occur to obtain or restore a desired distribution of income.
- The recipients of support program benefits can be active and entrepreneurial in their requests for support. This behaviour is the focus of public choice economics, and it is influential in economics.
- Natural capital represents a unique aspect of intervention and support, as it is often implicit through under-valuation versus a market or use value, and underpriced. It is also common that access is controlled, with agriculture obtaining greater/preferential access than under a free market, due to legacy or alternative considerations.
- Interventions in agriculture can create incentives for distortions through supply response, through a variety of mechanisms. One is expansion of production to access additional support. Another is to increase production in anticipation that the eligibility for support will be increased in the future. Shielding risk through support programming encourages production in regions less suited to it, and switching from less risky to more risky products. Underpricing of natural capital provides incentives for overuse. Support of farm prices and incomes can also have knock-on effects in depleting natural capital, due to the associated incentives to expand and intensify production.
- As increased supplies associated with support interact with product demand, price suppression occurs. Where this is material and extends to the global level, international price suppression results.

As will be explored in the next Chapter, the Uruguay Round of trade negotiations placed discipline on the types and levels of support countries could offer to agriculture. The overarching perspective in

developing these disciplines was on subsidies that related to current production, and the prospect for global price suppression. In the period since the Uruguay Round was completed, subsidies of this kind have indeed declined; however countries have proven to be creative in restructuring support to avoid disciplines, with the prospect that many of the unintended side effects of global price suppression remain.

Moreover, natural capital, the potential overuse of natural capital, and implicit subsidies to agriculture related to natural capital were not subject to disciplines in the Uruguay Round. Later chapters will explore the prospect that implicit subsidies for natural capital have influenced production, and that the structure of agricultural support has degraded the status of natural capital.

Box 2.1: Understanding Implicit Water Subsidies

Gaining an understanding of the existence of subsidies related to water use and their significance requires an understanding of the costs of providing irrigation water, the value of the water in production and the payment for the irrigation water. Initial scans suggest that available data are not available in very comparable ways. For example, regarding the value of water in agriculture, for the High Plain (HP) aquifer that can provide water for irrigation of agricultural crops in an area that includes southern South Dakota, southeast Wyoming, eastern Colorado, Nebraska, western Kansas, eastern New Mexico, northwest Oklahoma, and northwest Texas, Suarez et al. (2015) estimated that the average gross value of groundwater for agriculture is $165 - $174 per acre at 2007 prices. In Australia, the market price on average for the decade of the 2000s for the Murray-Darling Basin was approximately $2000 per megalitre with prices rising to over $5,000/ml in some particularly dry years. This price is estimated prior to the period when the value of environmental water was included in the market price after 2007. Delivery charges are paid on top of market prices. For Reclamation lands in the USA, the 140,000 farmers who benefited from $167.314 million USD 'Other non-product-specific' AMS for irrigation on Bureau of Reclamation Projects in 17 Western States farmed, 10 million acres. A rough estimate would suggest that the subsidy is in the order of $17/ac. Clearly, reconciling these values across similar metrics – per volume, per acre – and across crops requires in depth analysis.

The OECD has worked to estimate the total subsidy (TSE) related to water use in irrigation. A 2007 document provides the estimates copied below. Detailed analysis is required to update and unpack the information and be able to make comparisons. However, the subsidies are significant for some countries.

Table 2. Water support currently in the TSE, 2006

National Currency, millions		PSE			GSSE			Total (TSE)		
Country		National currency	USD	% of PSE	National currency	USD	% of GSSE	National currency	USD	% of TSE
Australia	AUD	904	679	37				904	679	28
Japan	JPN	14	117	0.3	330	2829	35	343	2946	6.0
Korea	KRW	76	80	0.3	1061	1113	31	1137	1194	4.1
Mexico	MXN	7490	687	10	704	65	7	8195	751	9.5
New Zealand	NZD	-	-	-	55	36	21	55	36	11.0
Turkey	TRY	15	11	0.1	-	-	-	15	11	0.1
U.S.	USD	333	333	1	34	34	0.1	367	367	0.4
EU25	EUR	372	466	0.3	16	19	0.1	388	485	0.3
OECD Total	**USD**	**-**	**2372**	**0.9**	**-**	**4096**	**5.8**	**-**	**6468**	**1.7**

All amounts in millions, apart from Japanese and Korean currencies in billions.
Annex 2 has a detailed breakdown of the policies included in the above table.
EU includes both EU level and EU member state level expenditures.
Source: OECD PSE Dataset, 2007.

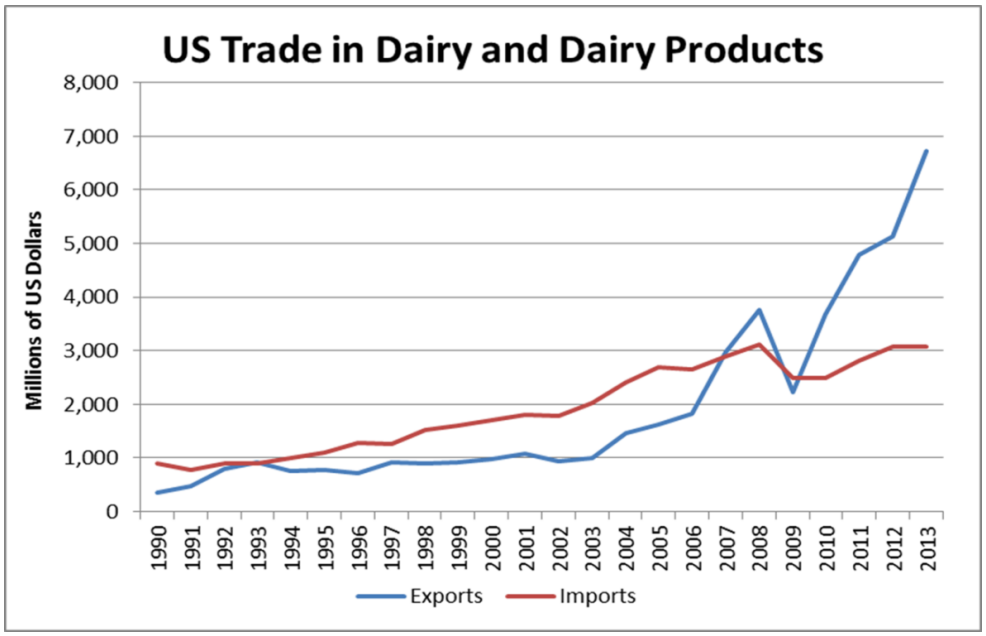
OECD, Trade and Agriculture Directorate Committee for Agriculture Working Party on Agricultural Policies and Markets (2007) *Proposals to improve coverage and measurement of water subsidies in the PSE calculations,*

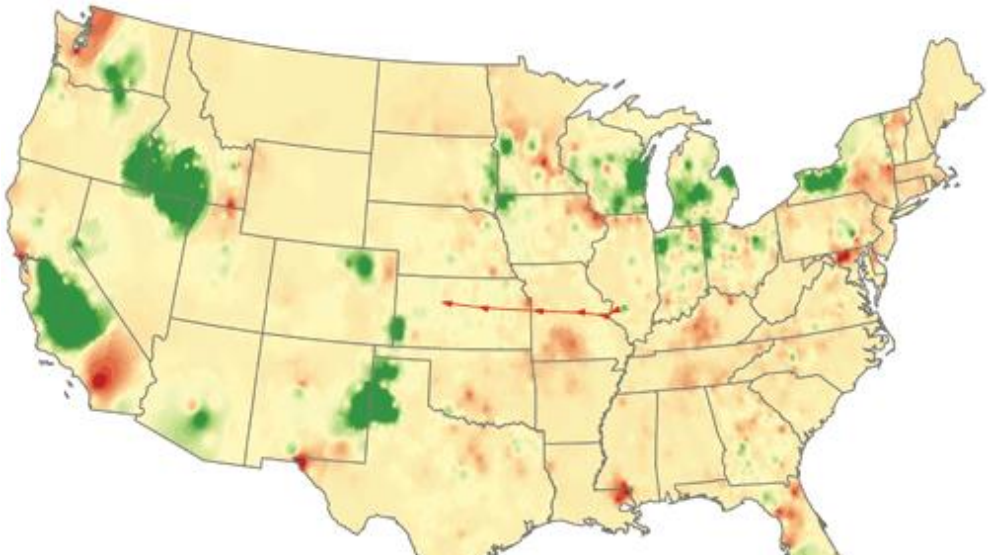
Box 2.2: US Dairy Trade and Subsidized Water

Some recent estimates for the US focus on the implications of underpricing of water provision for the dairy sector.

With no monetary value on water California became the leading U.S. dairy state

American exports increased nearly 7 fold in 10 years, responding to China and other emerging market demand.





References

Arrow, Kenneth J. 1969. "The Organization of Economic Activity: Issue pertinent to the choice of market versus nonmarket allocations", *Analysis and Evaluation of Public Expenditures*.

Bator, Francis M. 1958. "The Anatomy of Market Failure", *Quarterly Journal of Economics* 72(3): 351-379.

Boadway, Robin W. and Neil Bruce. *Welfare Economics*. Oxford, UK: Blackwell. 1984.

Breathitt, Edward T. 1967. *The People Left Behind: A Report by the President's National Advisory Commission on Rural Poverty*. Washington.

Coase, Ronald H. 1960. "The Problem of Social Cost". *Journal of Law and Economics*. 3 (1): 1–44.

Calatrava, Javier and Alberto Garrido 2010. *Measuring Irrigation Subsidies in Spain: An application of the GSI Method for quantifying subsidies*. The Global Subsidies Initiative, International Institute for Sustainable Development.

Cooley, H. et al. 2016. "Water risk hotspots for agriculture: The case of the southwest United States", OECD Food, Agriculture and Fisheries Papers, No. 96, OECD Publishing, Paris. http://dx.doi.org/10.1787/5jlr3bx95v48-en

de Gorter, Harry, and Yacov Tsur 1991. "Explaining the Price Policy Bias in Agriculture: The Calculus of Support-Maximizing Politicians", *American Journal of Agricultural Economics* 73(4) 1244-1254.

de Gorter, Harry, David J. Nelson, and Gordon C. Rausser. 1992. "Productive and Predatory Public Policies: Research Expenditures and Producer Subsidies in Agriculture", *American Journal of Agricultural Economics* 74(1) 27-37.

Gardner, Bruce 1992. "Changing Economic Perspectives on the Farm Problem", *Journal of Economic Perspectives* 30(10) 62-101.

Gravelle, Hugh and Ray Rees 1991. *Microeconomics*. New York: Longman.

Grossman, Sanford J., and Joseph E. Stiglitz 1976. "Information and Competitive Price Systems", *American Economic Review* 66(2) 246-253.

Gundersen, Craig, Mitchell Morehart,, Leslie Whitener, Linda Ghelfi, James Johnson, Kathleen Kassel, Betsey Kuhn, Ashok Mishra, Susan Offutt, and Laura Tiehen. 2000. *A Safety Net for Farm Households.* Agricultural Economic Report No. 788. Economic Research Service, U.S. Department of Agriculture.

Howard, Wayne, Glenn Fox, and Calum Turvey, 1996. *The Economic Benefits of New Information Technology*, Working Paper 3/96. Ottawa: Agriculture and Agri-Food Canada Policy Branch, Economic and Policy Analysis Directorate.

Lange, Oskar 1971. "On the Economic Theory of Socialism", in Marshall I. Goldman [ed.] *Comparative Economic Systems*. New York: Random House.

Lipsey, R.G. and K.J. Lancaster 1956. "The General Theory of Second Best", *Review of Economic Studies* (24) 11-32.

Miranda, Mario J., and Joseph W. Glauber 1997. "Systematic Risk, Reinsurance, and the Failure of Crop Insurance Markets", *American Journal of Agricultural Economics* 79(1) 206-215.

Miranda, Mario J. 1991. "Area-Yield Crop Insurance Reconsidered", *American Journal of Agricultural Economics* 73(2) 233-242.

OECD 2016. OECD's Producer Support Estimate and Related Indicators of Agricultural Support: Concepts, Calculations, Interpretation and Use. (The PSE Manual).

OECD 2015c. Water resource allocation: Sharing risks and opportunities, OECD Studies on Water, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264229631-en.

OECD 2007. Trade and Agriculture Directorate Committee for Agriculture
Working Party on Agricultural Policies and Markets (2007) *Proposals to improve coverage and measurement of water subsidies in the PSE calculations,*
Paris, 9-11 may 2007.

Orden, David, David Blandford, and Tim Josling, 2011. WTO Disciplines on Agricultural Support: Seeking a Fair Basis for Trade. Cambridge University Press.

Ostrom, Elinor (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.

Pasour, E.C. 1990. *Agriculture and the State*. San Francisco: The Independent Institute.

Sarker, Rakhal, Karl Meilke, and Michael Hoy 1993. "The Political Economy of Systematic Government Intervention in Agriculture", *Canadian Journal of Agricultural Economics* 41 (3) 289-309.

Skees, Jerry R. and Michael R. Reed 1986. "Rate Making for Farm-Level Crop Insurance: Implications for Adverse Selection", *American Journal of Agricultural Economics* 68(3) 653-659.

Spriggs, John, and C.G. Van Kooten 1988. "Rationale for Government Intervention in Canadian Agriculture: A Review of Stabilization Programs", *Canadian Journal of Agricultural Economics* 36 (1) 1-21.

Suarez, Federico Garcia, Lilyan Fulginiti, Richard K Perrin 2015. The Value of Water in Agriculture: The U.S. High Plains Aquifer. Contribution700, ICAE in Milan 2015.

Sumner, Daniel A. *Boxed In: Conflicts Between US Farm Policies and WTO Obligations*, Trade Policy Analysis No. 32. CATO Institute, Center for Trade Policy Studies. December, 2005.

Ward, Clement E. 2002. "A Review of Causes for and Consequences of Economic Concentration in the U.S. Meatpacking Industry", *Current Agriculture, Food & Resource Issues* 3(1) 1-28.

Chapter 3: Understanding Global Agricultural Subsidies

Introduction

Government intervention through direct and indirect subsidies influences agriculture production choices, such as selection of crops/livestock combination, scale of operation, technology and input use, production and productivity. The overall impact of these policies spreads along the value chain and can alter structure (production, yield, etc.), conduct (input and output, technology, location, etc.) and performance (cost, value addition, margins, returns) of value chains and thus have global effects on price, production, and level and direction of trade.

The WTO Agreement on Agriculture (WTO AoA) brought world agricultural production and trade under a rules-based regime that not only governs market access, but also domestic support and export subsidies in the agricultural sector[11]. The Doha Round of trade negotiations, which began in 2001, has called for further substantial reductions in distortionary agricultural support and protection. In the current negotiations, various proposals deal with how much further these subsidies should be reduced, and whether limits should be set for specific products rather than continuing with the single overall aggregate limits. In 2016, the Nairobi Agreement of the WTO set a time line for removal of subsidized agricultural exports.

There are two general types of subsidies: export and domestic. An export subsidy is a benefit conferred on a firm or industry by the government that is contingent on exports. Leading world agricultural producers and exporters as well as emerging economies maintain substantial support measures for agriculture and the consequences are distortionary policy impacts that influence all the world's economies. A domestic subsidy is a benefit not directly linked to exports. Nonetheless, a domestic subsidy/transfer based on domestic production, some of which is exported, can materially affect export prices and volumes. Evaluating the impacts that subsidies have on the agriculture and food system is complex. The impact can vary by country, depending on the net importer/consumer or net exporter/producer position of the country and the market conditions.

Using OECD and WTO

[11] Aggregate Measurement of Support (AMS) and Equivalent Measurement of Support (EMS) are commonly used indicators of the WTO. AMS means the monetary value of non-exempted supports. EMS means non-exempted supports that are provided to producers through the application of one or more measures, the calculation of which in accordance with the AMS methodology is impracticable. Total Aggregate Measurement of Support (Total AMS) means the sum of all domestic support provided in favour of agricultural producers, calculated as the sum of all aggregate measurements of support for basic agricultural products, all non-product-specific aggregate measurements of support and all equivalent measurements of support for agricultural products.

OECD and WTO data measure different things, and in some cases use different measurements for similar concepts (e.g., Market Price Support). OECD data measures total spending under a range of formats according to inferred distortionary impact on incentives. WTO contains a more prescriptive format, taking the view of Amber Box as distortionary (subject to *de minimis*) and the Green Box as non-distortionary.

The combination of OECD and WTO data can be used together in a search for distortionary programs. This is done by to looking at OECD and WTO data on non-specific and (especially) commodity-specific support, and inspecting for divergences between the two. For example, if OECD data reports high levels of PSE and Market Price Support for a given commodity, but the same year's WTO notifications indicate low levels of AMS and CTAMS, this suggests that support is being provided that is not being reported, or perhaps is being re-packaged to avoid trade disciplines in some way. This divergence is thus an indicator to examine the country's programs that exist for that commodity, how they operate, their funding levels, and what incentives may exist. A similar case exists in the case of non-product specific support.

This approach is employed here. In each case, an overview of agricultural support policy in the country is provided along with selected literature on the country's support policy. This is followed by an overview of its OECD metrics. This is then followed by the country's WTO reporting on a product-specific and non-product specific basis. The divergences between OECD and WTO are then observed, and coupled with the observations in the literature, provide the basis to examine specific commodities, programs and patterns of WTO notifications and similar data from the OECD.

Definition of agricultural subsidies

The term subsidy covers a broad range of governmental economic interventions and policies while the analysis of this report is based specifically on the definitions used by the OECD secretariat and the WTO. The OECD defines subsidies as "a benefit provided to individuals or businesses as a result of government policy that raises their revenues or reduces their costs and thus affects production, consumption, trade, income, and the environment, **"regardless of their nature, objectives or impacts on farm production or income."**[12]. The benefit generated by policy may take different forms such as an increase in output-price, a reduction in input-price, a tax rebate, an interest rate concession, or a direct budgetary transfer.[13] The OECD has used this definition as the foundation with which to measure and classify subsidies. Essentially, the OECD calculations represent an internally consistent accounting method to measure all transfers from government to producers, from consumers to producers, and from government to consumers.

[12] OECD 2016. OECD's Producer Support Estimate and Related Indicators of Agricultural Support: Concepts, Calculations, Interpretation and Use. (The PSE Manual).

[13] Portugal, Luis (2002), OECD Work on Defining and Measuring Subsidies in Agriculture, paper presented at the OECD Workshop on Environmentally Harmful Subsidies, Paris, OECD, 7-9 November 2002. p.3. 3

The WTO AoA divides domestic support into three categories according to their level of trade distortion and the categories are labeled “Amber Box”, “Blue Box”, and “Green Box” policies. This classification has been used to differentiate between supports that are exempt and non-exempt from control under the Agreement. The agricultural subsidies included in the Amber Box are coupled to output and/or price and are therefore considered trade distorting. Amber Box subsidy limits under the AOA were reduced annually for the first six years following the WTO AoA in 1994 and have remained constant since that time. The measurements of agricultural support used by the OECD and WTO are discussed in detail in the next section.

There are two widely used international indicators to measure the support for agriculture, the aggregate measure of support (AMS) of WTO and the producer support estimate (PSE) of the OECD. The WTO’s notification system requires members to notify the WTO of all measures of support for the agricultural sector, covering budgetary, regulatory and market price support, as well as general services provided to the agricultural sector such as food safety and inspection. The OECD’s PSE is a consensus framework among member nations relying on data provided by members, supplemented with other sources by OECD experts in order to make annual estimates of transfers across sectors of the economy, with comparability across countries. These two indicators are contrasted in terms of their purpose and method of calculations (Table 1 and Table 2).

Structure of the OECD Indicators

The listing below shows the major categories of volumes, values and transfers included in the database. The detailed database includes annual (calendar year) information from 1986 to 2015 on (1) the aggregate across all commodities and transfers, (2) the information on each of the major commodities within the country, usually 12-15 commodities, and (3) the calculation of market price support (MPS) for each of the 12-15 commodities, as well the combined MPS for all of the remaining commodities. The MPS is included in the value of production. To obtain an estimate of the value of production at border prices, the MPS must be deducted from the value of production. The Producer Support Estimate (PSE) is the sum of all transfers in Category III, represented by the lines A, B, C, D, E, F, and G. The PSE is the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm-gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on farm production or income. It includes market price support and budgetary payments, i.e., gross transfers from taxpayers to agricultural producers arising from policy measures based on: current output, area planted/animal numbers, historical entitlements, input use, input constraints, and overall farming income.

I. Level of production (tonnes)
II. Value of production (at farm gate)
III. Producer Single Commodity Transfers
III.I Producer Support Estimate (PSE)
A. Support based on commodity outputs

A1. Market Price Support (MPS)
A2. Payments based on output

B. Payments based on input use
B1. Variable input use
B2. Fixed capital formation
B3. On-farm services

C. Payments based on current Area planted/Animal numbers/Historical entitlements/Input use and constraints, production required, single commodity

D. Payments based on non-current Area planted/Animal numbers/Historical entitlements/Input use and constraints, production required

E. Payments based on non-current Area planted/Animal numbers/Historical entitlements/Input use and constraints, production not required

F. Payments based on non-commodity criteria
F1. long-term resource retirement
F2. a specific non-commodity output
F3. other non-commodity criteria

G. Miscellaneous payments

IV. General Services Support Estimate (GSSE)

H. Agricultural knowledge and innovation system
I. Inspection and control
J. Development and maintenance of infrastructure
K. Marketing and promotion
L. Cost of public stockholding
M. Miscellaneous

V.1 Consumer Support Estimate (CSE)

N. Transfers to producers from consumers (-)
O. Other transfers from consumers (-)
P. Transfers to consumers from taxpayers
Q. Excess feed cost

VI. Total Support Estimate (TSE)

R. Transfers from consumers
S. Transfers from taxpayers
T. Budget revenues (-)

The General Services Support Estimate (GSSE) represents the expenditures by governments for services to the agriculture and food industry, which can be characterized for the most part as public goods. The Consumer Support Estimate (CSE) represents the transfers from consumers embedded in value of production as well as transfers from taxpayers to the industry. The excess feed cost is an adjustment of transfers from the consumer for intermediate products in agriculture.

The total support estimate (TSE) is the sum of the PSE, the GSSE and the transfers from taxpayers to consumers. The TSE is broken down into transfers from consumers, from taxpayers, and any budgetary revenues from producer fees and charges. While the detailed PSE database displays the most complete

listing of all programs providing transfers to producers compared to other datasets, it is up to the OECD member and OECD staff to determine the coverage or inclusion of programs.

Structure of the WTO Database

The WTO database represents the notifications by member countries of transfers to the agricultural sector according to the definitions and methodology provided in the WTO Agreement on Agriculture. The purpose is to monitor the policy instruments used by member countries to support agriculture, to assure compliance with the WTO intention of moderating the use of trade distorting domestic and export subsidies. The WTO system was finalized during the Uruguay Round of negotiations of the General Agreement on Tariffs and Trade (GATT), which brought the world agricultural sector under the umbrella of Uruguay Round Agreement on Agriculture (WTO, 1994). The WTO Agreement on Agriculture (WTO AoA) became part of the system administered by the World Trade Organization (WTO). Under the WTO AoA, member countries agreed to limit the most trade-distorting types of support provided to their domestic agricultural sectors.

Aggregate Measurement of Support (AMS) and Equivalent Measurement of Support (EMS) are commonly used indicators of the WTO. The Aggregate Measurement of Support is the monetary value of domestic support based on the conditions set forth in Agreement on Agriculture. The AMS means the monetary value of non-exempted supports. Equivalent Measurement of Support means non-exempted supports that are provided to producers through the application of one or more measures, the calculation of which, in accordance with the AMS methodology, is impracticable. Current Total Aggregate Measurement of Support (CTAMS) means the sum of all domestic support provided in favour of agricultural producers, calculated as the sum of all aggregate measurements of support for basic agricultural products, all non-product-specific aggregate measurements of support and all equivalent measurements of support for agricultural products for a given year.[14]

The AMS is determined by calculating a market price support estimate for each commodity receiving such support, plus non-exempt direct payments or any other subsidy not exempted from reduction commitments, less specific agricultural levies or fees paid by producers. It differs from the Producer Support Estimate (PSE) in many respects. The most important differences are the use of fixed external reference prices to calculate market price support in the AMS, and by reference to domestic administered prices and not to actual producer prices and revenues in the PSE case. External reference prices for the AMS are fixed at the average levels of the 1986-1988 base period in the AMS, while current world prices are used in the PSE calculation of market price support. In addition, many budgetary transfers included in PSEs are excluded from the AMS; for example, any non-product specific subsidies and product specific subsidies that are less than five percent of the value of production are excluded from the AMS.

[14] To be clear, AMS is the amount notified by a country that includes all payments, while CTAMS is the amount of support in any year that must lie below the limit established for any country. The primary difference is the AMS payments that are *de minimis* or otherwise exempt are not included in CTAMS.

The WTO AoA divides domestic support into three main categories; “Amber Box”, “Blue Box”, and “Green Box” policies, according to their level of trade distortion. This classification has been used to differentiate between supports which are exempt and non-exempt from control under the WTO AoA (Table 2). Amber box programs are those domestic supports that are considered to distort production and trade. These supports are subject to limits under the Agreement on Agriculture. Amber box supports include measures used to support agricultural prices, or subsidies directly related to production quantities such as guaranteed minimum price for an agricultural commodity, or one that paid farmers a certain amount per acre sown or per tonne of yield. Amber box supports are considered to be trade-distorting because they disrupt economic signals and this can encourage overproduction of commodities, squeeze out imports, and lower world prices. The WTO AoA committed industrialized countries to reduce eligible subsidies by 20 percent over a six-year period following the agreement. These reductions all had to come from amber box subsidies because green and blue box subsidies (discussed below) were exempted.

WTO Members are required to notify annual expenditure of their domestic support, including market price support and budgetary expenditures, to the WTO Committee on Agriculture (COA). WTO members are also required to notify WTO of the Current Total AMS. The reduction commitments are expressed in terms of a “Total Aggregate Measurement of Support” (Total AMS), which includes all supports for specified products together with supports that are not for specific products, in one single figure. In the calculation of the Current Total AMS, members are not required to include product-specific domestic support if such support does not exceed the de minimis level (5 percent for developed countries and 10 percent for developing countries). The reporting requirement for trade distorting non-product specific supports is waived if the support does not exceed 5 percent (10 per cent for developing members) of the value of the total agricultural production. Direct payments under production-limiting programs (Blue box) shall not be subject to the WTO AoA commitment to reduce domestic support if: (i) such payments are based on fixed area and yields; or (ii) such payments are made on 85 per cent or less of the base level of production; or (iii) livestock payments are made on a fixed number of head.

Green box measures are those that are permissible under the WTO Agreement on Agriculture. To qualify as green box measures, agricultural policies must have no or at most minimal trade-distorting effects or effects on production. These policies must also involve direct government funding and government revenue foregone; that is, subsidies that arise from charging higher prices to consumers do not qualify for green box assignment. As well, green box measures cannot have the effect of providing price support to farmers and the support cannot be tied to production levels or market prices. The green box supports include programs that fund agricultural and environmental research; agricultural training programs; health and safety inspection services; marketing and promotion services; infrastructure services (electricity, roads, ports, water supply, etc.); stockpiling programs for food security. Direct payments to producers qualify as green box subsidies only so long as they do not link payments with farmers’ production decisions, known as “decoupling.” Examples of direct payments to farmers eligible under the green box criteria include: decoupled income support measures; insurance,

safety-net and disaster-relief payments; compensation for structural adjustments; and some environmental and regional assistance programs.

Blue box subsidies are somewhere in between the green and amber boxes. This is the "amber box with conditions", that is, conditions designed to reduce distortion. Any support that would normally be in the amber box, is placed in the blue box if the support also requires farmers to limit production. Blue box programs include domestic supports that require producers to limit their output. These programs are considered to be trade-distorting, and would otherwise have been placed in the amber box. However, since they limit production, these programs are considered to be less distorting than other types of agricultural support. There is currently no limit on spending on blue box subsidies.

The WTO distinguishes between decoupled and coupled payments, and direct and indirect payments. Direct payments are defined in paragraph 5 of the Annex II of the AoA:

"Direct payments to producers:
Support provided through direct payments (or revenue foregone, including payments in kind) to producers for which exemption from reduction commitments is claimed shall meet the basic criteria set out in paragraph 1 above, plus specific criteria applying to individual types of direct payment as set out in paragraphs 6 through 13 below. Where exemption from reduction is claimed for any existing or new type of direct payment other than those specified in paragraphs 6 through 13, it shall conform to criteria (b) through (e) in paragraph 6, in addition to the general criteria set out in paragraph 1."

Direct payments may be exempt from inclusion in the CTAMS under several conditions (e.g., blue box), or non-exempt.

Decoupled payments are defined in Paragraph 6 of the Annex II of the AoA, and exempt from inclusion in the CTAMS:
"Decoupled income support

(a) Eligibility for such payments shall be determined by clearly-defined criteria such as income, status as a producer or landowner, factor use or production level in a defined and fixed base period.

(b) The amount of such payments in any given year shall not be related to, or based on, the type or volume of production (including livestock units) undertaken by the producer in any year after the base period.

(c) The amount of such payments in any given year shall not be related to, or based on, the prices, domestic or international, applying to any production undertaken in any year after the base period.

(d) The amount of such payments in any given year shall not be related to, or based on, the factors of production employed in any year after the base period.

(e) No production shall be required in order to receive such payments."

The structure of the notifications by member countries follows a standard format, although not all data represent calendar year information. In some cases, the data are provided for a marketing year, not a

calendar year, although notifications are intended to be consistent from year to year. The notifications are shown as an interrelated set of tables.

Table DS:1

- Total AMS commitment level for period in question. This is the maximum level of support allowed for the member taken from the schedule of commitments provided immediately following the WTO Agreement, or following accession to the WTO.
- Current Total Aggregate Measure of Support (CTAMS). The actual level of support provided to producers within the definitions in the agreement.

Supporting Table DS:1

- Measures exempt from the reduction commitment – "Green Box", providing the name and description of the measure with reference to criteria in Annex II of the AoA. It includes the monetary measure for the reporting year and any comment from the member country.
    (a) General Services
    (b) Public stockholding for food security purposes
    (c) Domestic food aid
    (d) Decoupled income support
    (e) Income insurance and income safety-net programmes
    (f) Payments for relief from natural disasters
    (g) Structural adjustment assistance provided through producer retirement programmes
    (h) Structural adjustment assistance provided through resource retirement programmes
    (i) Structural adjustment assistance provided through investment aids
    (j) Environmental programmes
    (k) Regional assistance programmes
    (l) Other

Supporting Table DS:3

- Measures exempt from the reduction commitment – Direct Payments under Production-Limiting Programmes – "Exempt Direct Payments" (Blue Box)

Supporting Table DS:4

- Calculation of the Current Total Aggregate Measurement of Support. These data are drawn from Supporting Tables DS:5 to DS:7, DS:9 and DS:8 if necessary.
    (a) Description of basic products (including non-product specific AMS)
    (b) Product specific AMS, current total AMS for the product, value of production of the product and calculation of whether the support exceeds the *de minimis* level
    (c) Non-product specific AMS, current total AMS for the products, value of production, and calculation of whether the support exceeds the *de minimis* level (from supporting Table DS:9)
- Current Total AMs equals Product specific AMS minus *de minimis* AMS plus Non-product specific AMS.

Supporting Table DS:5

- Product specific Aggregate Measure of Support: Market Price Support. This calculation only applies to those products for which there is an applied administered price. Without an administered price, there is no calculation of Market Price Support. Market Price Support is calculated as the difference between the reference price (the average price of the product on world markets for the years 1986 to 1988) and the current administered price, multiplied by the eligible production, less any fees paid by producers.[15]
    - The information provided includes the external reference price, the applied administered price, eligible production, associated levies/fees, and the total MPS.

Supporting Table DS:6

- Product-Specific Aggregate Measurements of Support: Non-Exempt Direct Payments. This table provides the amounts of all direct commodity specific payments, less any associated fees or levies.

Supporting Table DS:7

- Product-Specific Aggregate Measurements of Support: Other Product-Specific Support and Total Product-Specific AMS. This table aggregates the data from Supporting Tables DS:5 and DS:6.

Supporting Table DS:8

- Product-Specific Equivalent Measurements of Support

Supporting table DS:9

- Non-Product-Specific AMS. This includes the detail on all non-product specific payments, in support of Table DS:4.

Comparison of OECD and WTO Measures

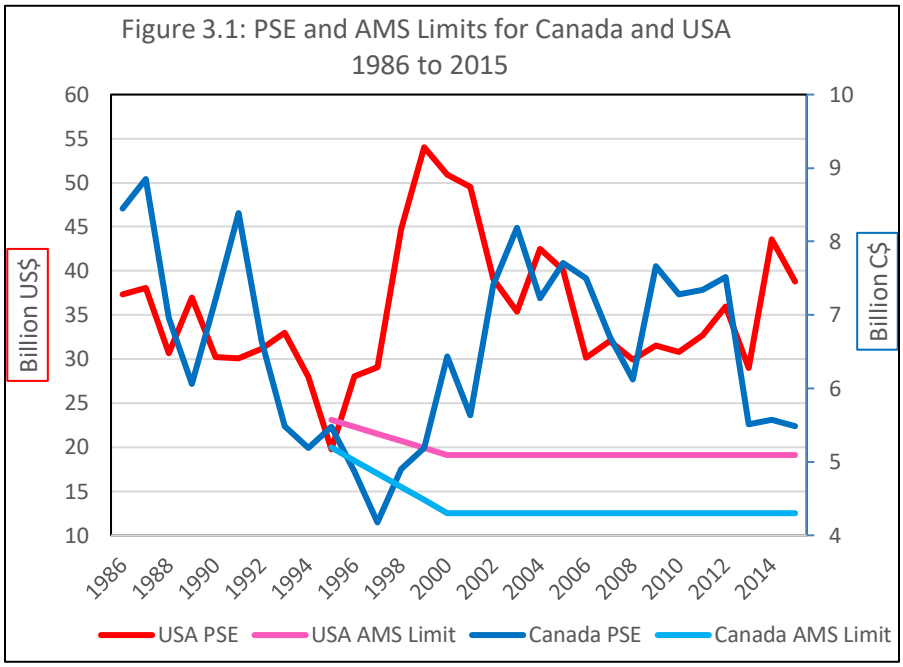
While the detailed PSE database displays the most complete listing of all programs providing transfers to producers compared to other datasets, it is up to the OECD member and OECD staff to determine the coverage or inclusion of programs. The PSE for example does not include impacts on the environment and factor endowments from overuse or pollution.

Table 3.1: Objective, nature and indicators of agricultural support

	PSE	AMS
Objective	Monitoring of agriculture policies (OECD members provide data annually to OECD)	Measure of Agreement on Agriculture trade commitments (WTO members annually notify the WTO)
Nature	Includes transfer from all support policies classified by implementation criteria	Includes transfers classified by the level of trade distortion
Indicators	Measures the monetary value of support for agriculture	Measures exempt and nonexempt support

[15] China uses 1996 to 1998 prices as the external reference prices. Some countries interpret "eligible production" as the total domestic production, while others interpret it to mean only that volume purchased by government.

The figure below shows the PSE for Canada and the USA. Of interest is that these PSE levels are at or above the Aggregate Measure of Support (AMS) limitation in the two countries. The reason is that the AMS excludes a wide range of the transfers to the agricultural sector in several ways. All programs that meet the criteria of AoA Annex 2 (so-called green programs) of the Agreement on Agriculture are excluded from the AMS. Also, commodity specific programs that transfer less than five percent of the value of production are excluded. Similarly, generally available programs that transfer less than five percent of the overall value of production are excluded (*de minimis* provision for developed countries). Finally, programs offering transfers to producers that have the provision to limit production (blue box) are excluded from AMS calculations.



There is a major difference between the WTO's and OECD's calculation of market price support (MPS). For WTO, the identification of MPS relies on the existence of an "applied administered price", without which there is no notifiable MPS.[16] As well, government payments for purchases or storage costs are excluded from MPS calcultions. Such payments however would be captured in AMS as commodity specific payments. For OECD, the MPS is calculated as the gap between the current domestic price and the current landed price before tariffs or other import fees are assessed, or the effects of government purchases or payments to defend a domestic price for example, whether or not there is an applied administered price. The OECD reports on only up to 15 or more of the most important commodities individually for a country; for all others an aggregate estimate is provided.

The exclusions from AMS result from the attempt to distinguish between the transfers that have minimal impact on production, trade and prices, and those that have significant effects on market and

[16] WTO AoA Annex 3, Clause 8. "market price support shall be calculated using the gap between a fixed external reference price and the applied administered price multiplied by the quantity of production eligible to receive the applied administered price. Budgetary payments made to maintain this gap, such as buying-in or storage costs, shall not be included in the AMS."

trade. The AMS does not attempt to measure the impact of transfers included in the calculation; it is simply a largely arbitrary categorization of transfers according to rules designed within the WTO agreement.

The AMS and the PSE datasets do not identify nor do they capture the effects of technical barriers to trade arising from a range of sources, including sanitary and phytosanitary regulations. And the AMS does not include consumer subsidies for food. The OECD Consumer Subsidy Estimates (CSE) identifies these subsidies, but again, there is no estimate of the impact on markets and trade. Orden *et al.* (2011) identify five questionable areas not included or possibly mis-categorized in AMS notifications for the USA including disaster payments, federal tax exemptions for agriculture, crop and revenue insurance costs, irrigation and electric power, and ethanol. They also question the AMS categorization of the single payment scheme and biofuel support in the European Union.

Orden *et al.* (2011) point out that some countries calculate market price support for WTO notifications as the gap between the external reference price and domestic support prices multiplied by the amount of government purchases of the commodity, rather than the domestic production (the definition in the WTO agreement), thereby substantially lowering the amount of market price support included in the AMS.

Both the OECD and the WTO documents describe the programs that offer support/transfers to producers. OECD uses the information provided by member countries to prepare periodic policy evaluations. For WTO, each member country provides notification of new or changed domestic programs on an annual basis. The information from OECD appears to be more complete, but additional information from national governments is usually needed to explore the economic impacts of the program.

Based on the differences in the databases, the differing interpretations of the programs transferring support to producers, and the absence of some transfers in one or both datasets, exploring the economic impact of transfers to producers is difficult. The approach in this paper is to identify a number of stylized examples that can be derived from the scan of programs documented in both datasets that cover a wide range of transfers/subsidies. In each of the examples, we use applied economic theory to identify the nature of the impact on markets, prices and trade. Valuing the economic impacts is necessarily a larger and much more difficult task; the Brazil cotton case would be an example. Yet it is the valuation of impact that is used in many trade challenges.

Table 3.2: Comparison of OECD and WTO Indicators[17]

WTO	OECD

[17] Note: "Development box" is not included under the WTO column: Development programs that provide development assistance for low-income and resource-poor populations in developing countries are included in the development box. Source: WTO, PSE Manual, OECD (http://www.oecd.org/tad/agricultural-policies/psemanual.htm)

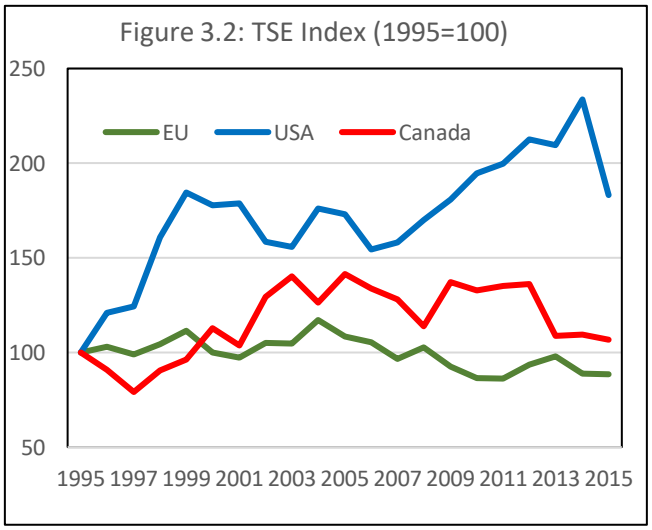
Amber box support The subsidies that are coupled with output or price are considered trade distorting and they are scheduled to be reduced under the WTO AOA. The reduction commitments are expressed as the total Aggregate Measurement of Support (AMS). The total AMS is "the sum of expenditures on non-exempted domestic support, aggregated across all commodities and policies". The current AMS is the sum of expenditures on non-exempted domestic support more than the specified *de minimis* level. **Blue Box** The agricultural supports which are considered less trade distorting are categorized as Blue Box support and they contain production limiting measures. No reduction commitments were made for Blue Box support under the AOA.	Payment based on commodity outputs (CO) Payments based on input use (PI) Payments based on current Area planted/Animal number/Receipts/Income (A/An/R/I) -production required (PC-A/An/R/I-production required) Payments based on non-current area planted/animal number/receipts/income-production not required (PHNR - A/An/R/I-production not required) Payments based on non-current A/An/R/I, production required (PHR-A/An/R/I, production required) Miscellaneous payments (PM) Payments based on non-commodity criteria (PN)
The Green Box Policies include research and development services, buffer stock policies, decoupled income support, income insurance and safety-net, natural disaster relief and environmental programs[18].	General Services Support Estimates
Market price support (MPS)=(Domestic price minus External Reference price) times Volume of production. MPS, a component of Amber Box policy, estimated only when administered price are applied and the domestic price is the administered price while the reference price is the average trade price. The volume production could be either total production or volume purchased at administered price.	Market price support (MPS) = (Domestic price minus Reference price) times Volume of production MPS is a component of payment based on output (CO). The domestic price is average producer price and the reference price is observed average trade price. Negative price support may be accounted or set at zero. The volume of production is total volume of production.
WTO members cover all the products (using HS codes) those are included in the WTO AoA (HS Chapters 1-24, except fish and fish products, plus	A representative set of commodities is selected for calculation of the MPS. The other transfers cover all agricultural commodities produced in the country.

[18] WTO. The Uruguay Round Final Act. Agreement on Agriculture, pp.43-71. https://www.wto.org/english/docs_e/legal_e/final_e.htm

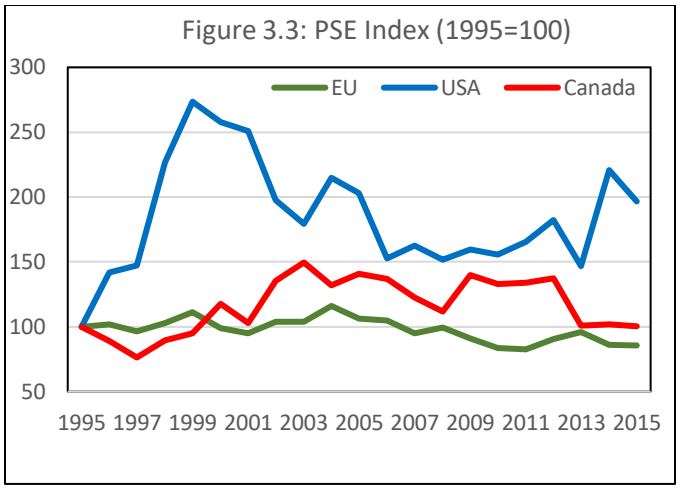
some agriculture based products, such as mannitol, sorbitol, essential oils, albumin, starches, glues, finishing agents, hides and skins, raw furskins, raw silk, wool and animal hair, raw cotton, raw flax and raw hemp)	
AMS estimate indicates only non-exempt support and therefore the value of AMS is nearly always less than that of PSE.	Exempted support under the WTO AOA may be included in the PSE when such support is based on area, animal number, receipts and income.

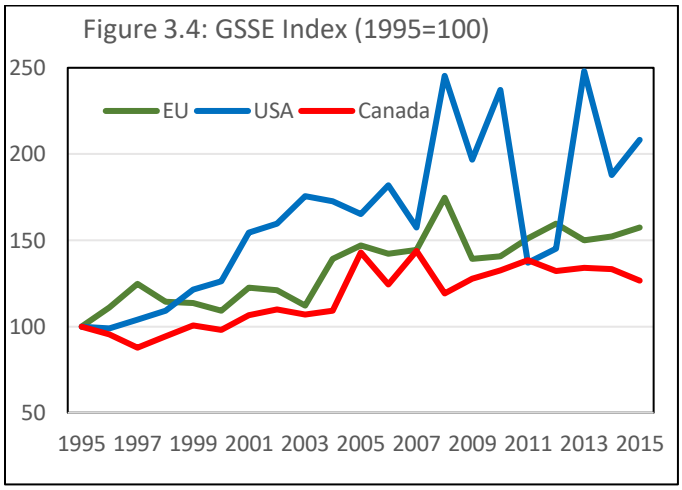
Comparison Across the Four Countries

One of the basic questions in exploring the OECD data is whether the levels of support have demonstrably changed since the WTO 1994. The figures below compare the changes over the period 1995 to 2015 of various OECD measurements. The first figures shown use the value of the measure in 1995 to compare it to all subsequent years, i.e., an index with 1995 equal to 100. These indexes are not adjusted for inflation.



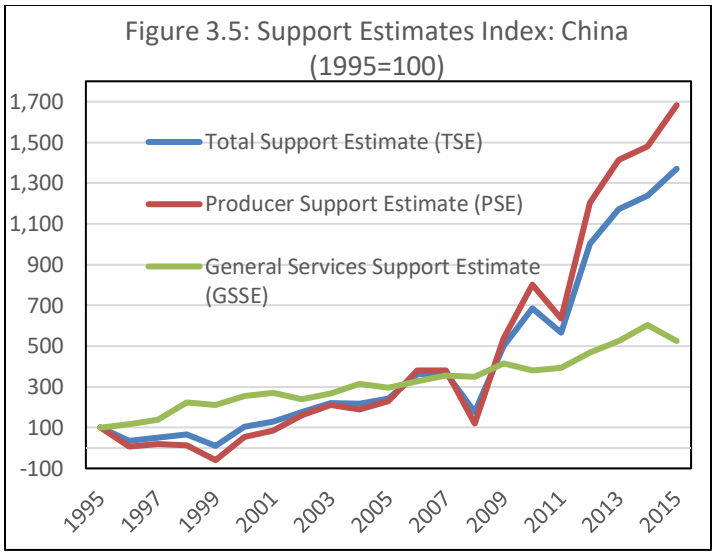
The TSE for the three countries in the Figure 3.2 show the level of transfers relatively stable for the EU and Canada, with significant increases for the USA, clearly greater growth over time than in the other two countries. Figure 3.3 shows much the same pattern for the PSE.





However, the GSSE index shows growth over the period.

China demonstrates an entirely different pattern. Substantial growth in all measures, TSE, PSE and GSSE over the period. The greatest growth has taken place in the PSE with strong but less growth in GSSE.



The following figures explore the relationship between the TSE, PSE and GSSE in relation to the value of production at border prices. The MPS is included in the TSE and PSE measures; as well MPS is included in the value of production. As result, the aggregate MPS has been deducted from the value of production to provide a measure of the value of production using an estimate of the border value of production.

Figure 3.6 shows the annual TSE as a percentage of the value of production adjusted downward to exclude the market price support. Three of the countries show a decline in total transfers in relation to value of production from relatively high levels in 1995 to the 15 to 30 percent range in 2015. The data suggest a convergence in the three countries over time. In China, steady growth throughout the period has led to China's TSE as a share of value of production above the other three countries. A similar pattern can be seen in Figure 3.7 for the PSE as a share of the value of production.

Figure 3.6: TSE as a Percentage of Value of Production Adjusted for Market Price Support

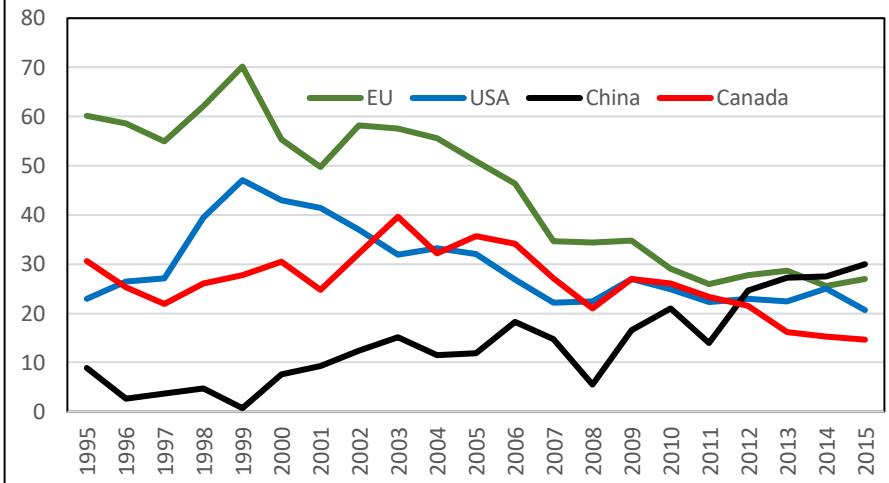


Figure 3.7: PSE as a Percentage of Value of Production Adjusted for Market Price Support

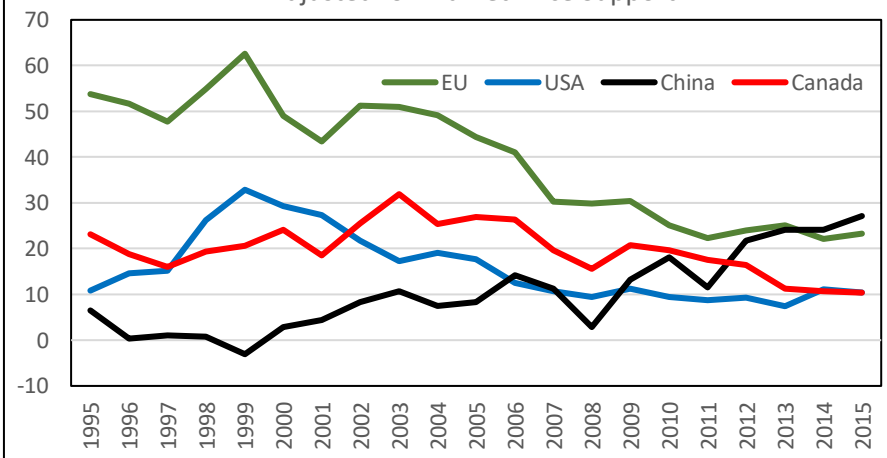


Figure 3.8: GSSE as a Percentage of Value of Production Adjusted for Market Price Support

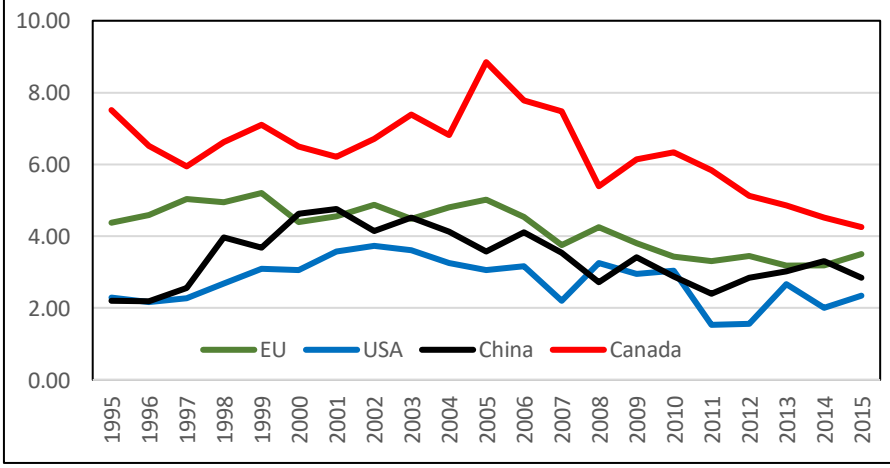
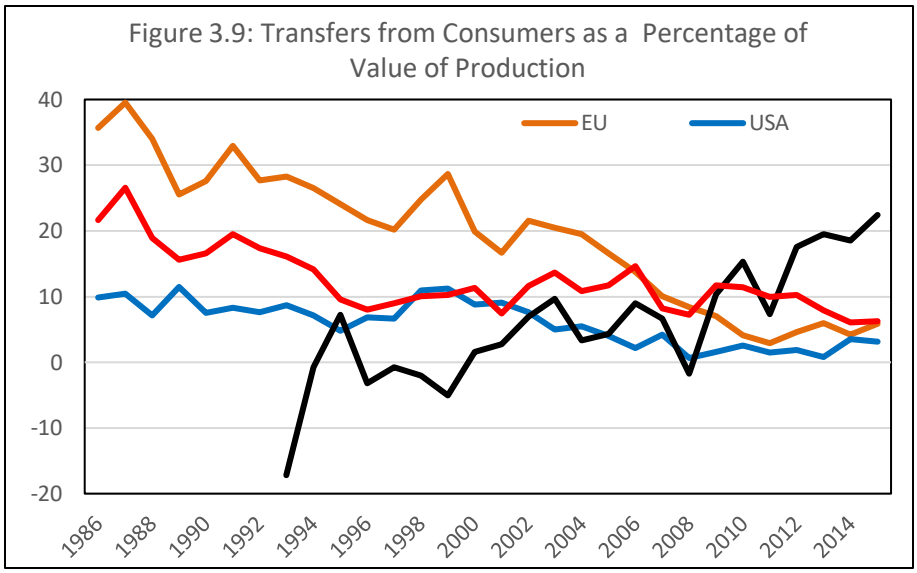


Figure 3.8 shows a somewhat different pattern. Some increases in the GGSE comparison to value of production have occurred after 1995, although for all three countries the ratios are at or below the 1995 levels. Canada remains with the highest GSSE ratio. One explanation for this would be the small country case. The infrastructure for maintaining the public goods in GSSE for a smaller country is probably a higher proportion of the value of production than for large countries.

In further exploration of the GSSE for Canada, considerable growth in expenditures in both research and knowledge and inspection (the two largest components) has taken place throughout the period, while the other components of GSSE for Canada have remained constant or falling.

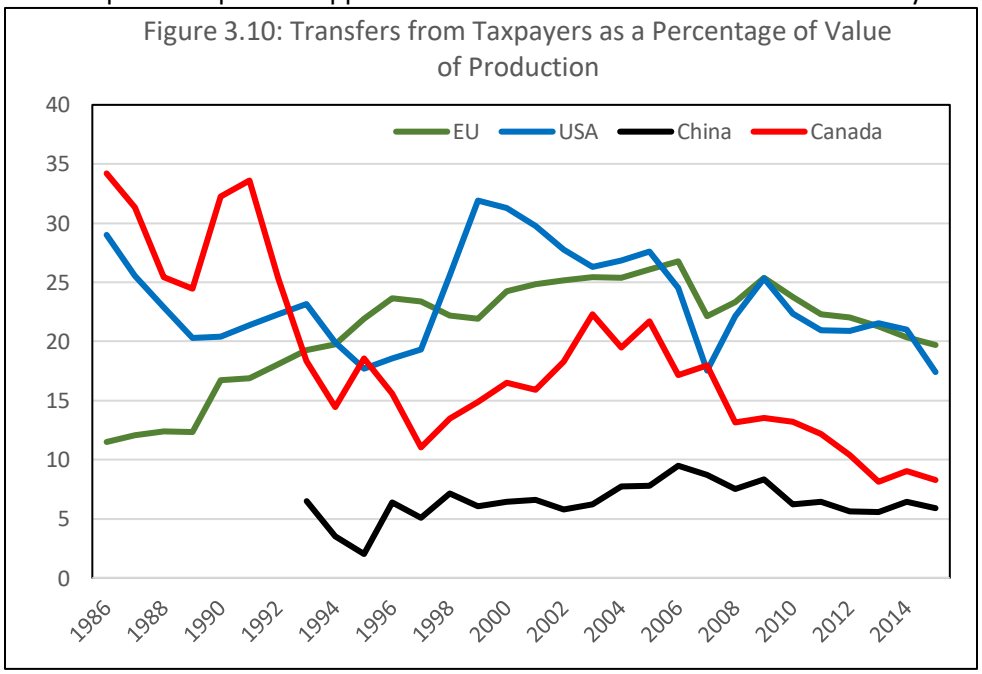
Figures 3.9 and 3.10 show the share of transfers from consumers and taxpayers as a percentage of value of production. For the EU, USA and Canada the share of transfers from consumers, essentially MPS, has fallen sharply over the period. For China, the share has increased substantially, particularly in the latest six years.

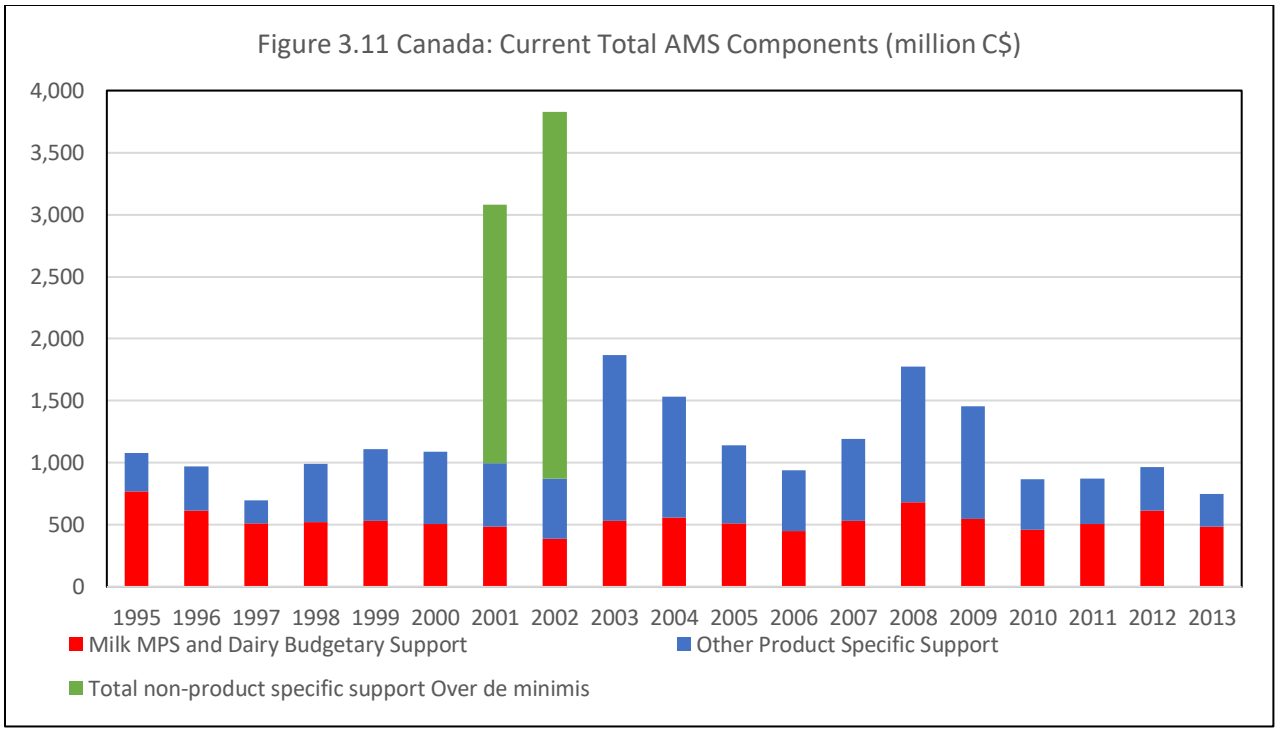


Transfers from taxpayers as a share of value of production has fallen sharply for Canada, moderately for the USA and China, and has risen somewhat for the EU.

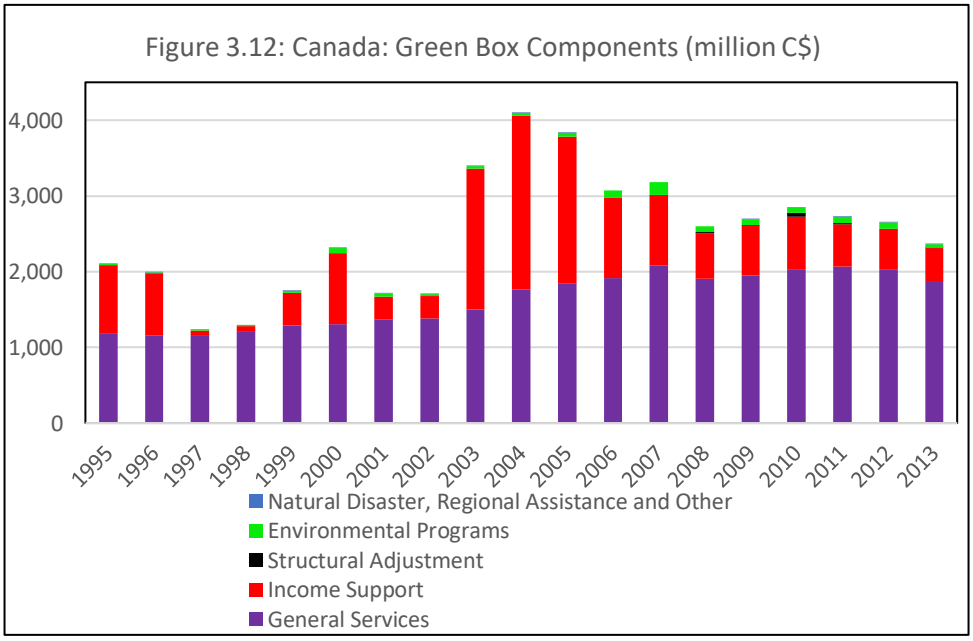
Canada: WTO Notifications

Turning to the examination of WTO notifications, Canada's Current Total AMS has remained relatively stable with a couple of exceptions (Figure 3.11). The support payments in Canada account for pushing the non-product specific support above *de minimis* in 2001 and 2002 thereby drawing all non-specific commodity support into the CTAMS for those two years. The CTAMS levels in the last four years lie below all other years except 1997, a year with strong grain prices and before the expansion of payments in the early 2000s and again in 2007-2008.





Canada's green box programs are shown in Figure 3.12. The general services have been consistently the largest source of continuing transfers to the sector, with spikes in income support in the early 2000s.



Environmental programs show up in all years although they remain as a small share of the green box transfers. Structural adjustment and payments for natural disasters remain negligible.

EU: WTO Notifications

The EU has dramatically changed the balance of support/transfers since the WTO 1994. The major change started in 2006-07, with a sharp decrease in amber subsidies and a concomitant rise in green box subsidies. Once the larges user of blue box subsidies, blue box payments have nearly disappeared (Figure 3.13). The total level of subisidies has changed very little over the period 1995 to 2012-13.

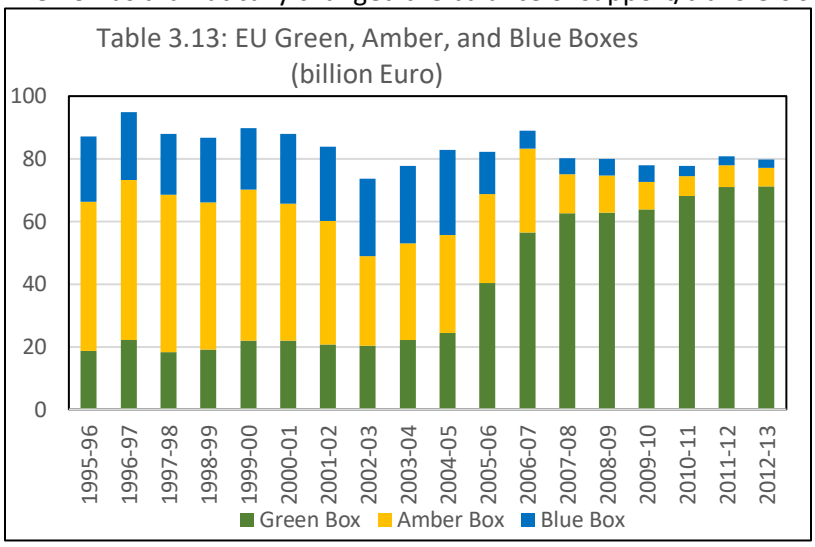


Figure 3.14 breaks out the components of the green box. General services, food aid, and investment aid have remained constant or increased very slightly. The massive increase has taken place in the income support measures because of the shift from commodity specific subsidies to the single farm payment allowing the EU to claim the single farm payment as an exempt from inclusion in the AMS calculation.

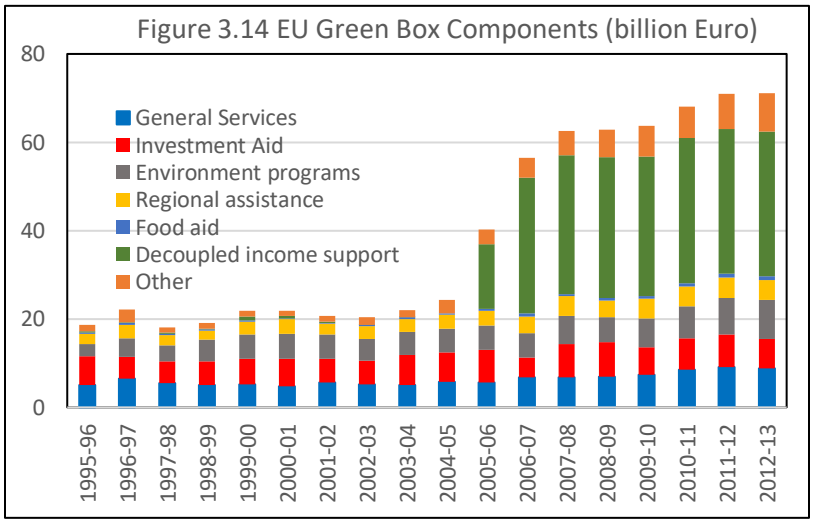


Figure 3.15 shows the shift in the components of the amber box notifications. Market price support has declined sharply because of the shift from commodity specific transfers to single farm payments.

Figure 3.16 shows that export subsidies from the EU have largely disappeared.

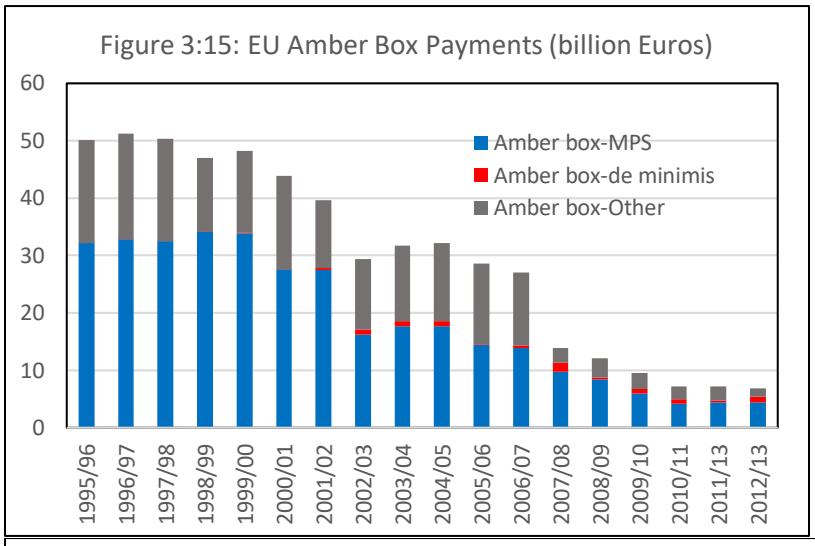


Figure 3:15: EU Amber Box Payments (billion Euros)
60
50
40
30
20
10
0
Amber box-MPS
Amber box-de minimis
Amber box-Other
1995/96
1996/97
1997/98
1998/99
1999/00
2000/01
2001/02
2002/03
2003/04
2004/05
2005/06
2006/07
2007/08
2008/09
2009/10
2010/11
2011/13
2012/13

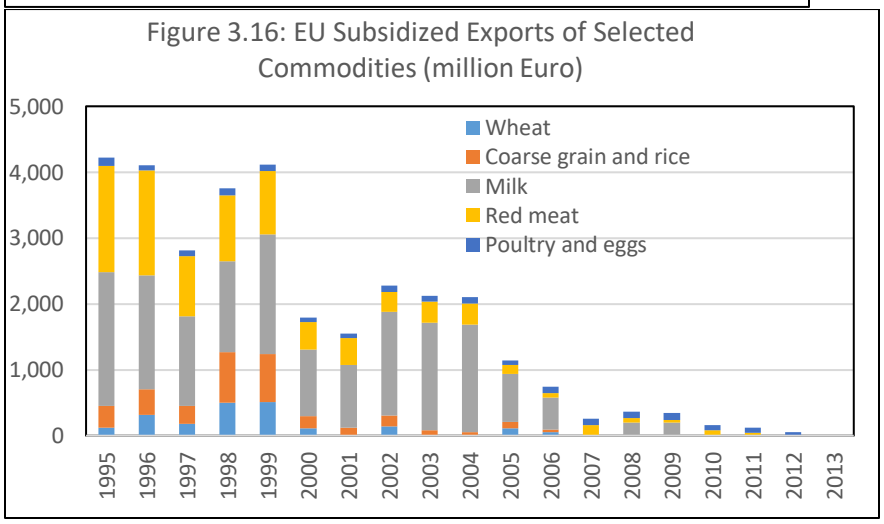
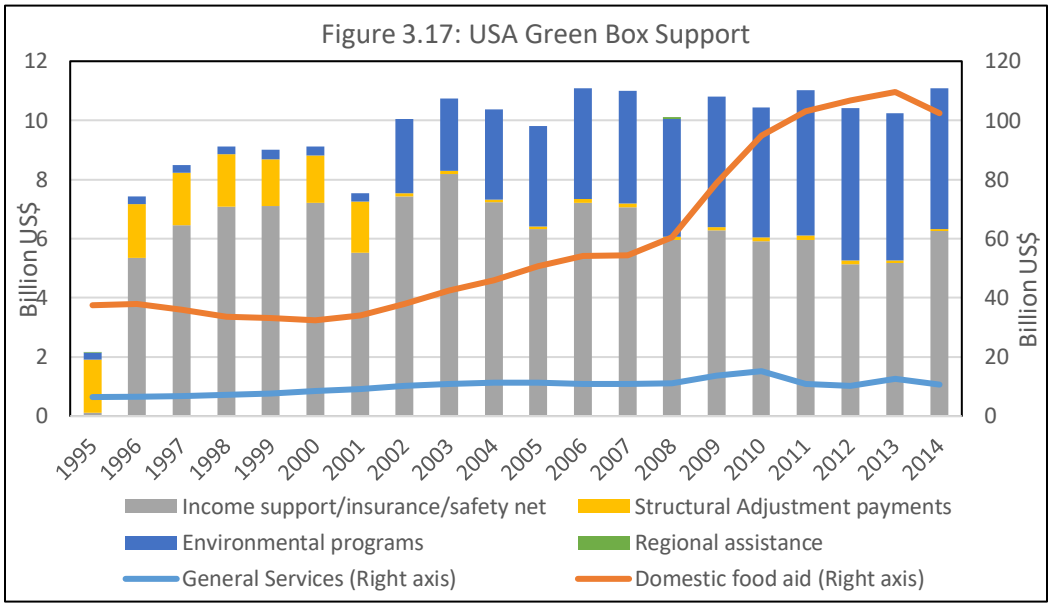


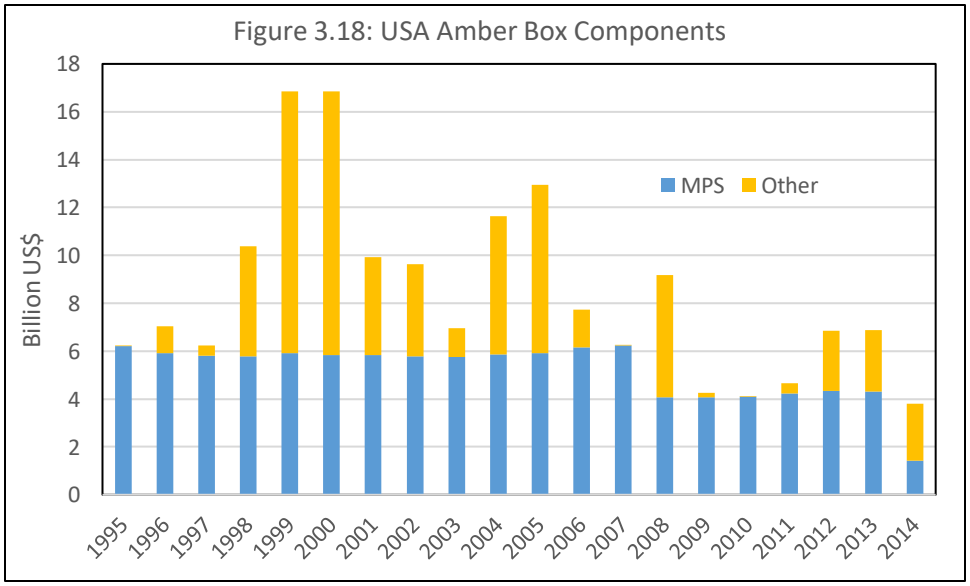
Figure 3.16: EU Subsidized Exports of Selected Commodities (million Euro)
5,000
4,000
3,000
2,000
1,000
0
Wheat
Coarse grain and rice
Milk
Red meat
Poultry and eggs
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

USA: WTO Notifications

Figures 3.17 and 3.18 show the changes over time in the components of the green and amber boxes respectively, based on the US notifications to the WTO. By far the largest expenditure is domestic food aid, peaking at over US$100 billion in 2013 and 2014. The second largest expenditure is general services at US$10 to 15 billion in the most recent years. Environmental programs expanded substantially after 2001 and continued to grow to the US$4.5 to 5 billion annually. Regional assistance has been zero or negligible for the period and structural adjustment programs have largely disappeared in the last 12 years. After domestic food aid and general services, income support, insurance and safety nets is the largest item, ranging from US$5.1 to 6.2 billion in the most recent years, lower than in earlier periods. A significant shift is taking place in the balance between environmental and income support after 2001 although the spending/transfers for these four categories (left axis) have remained quite stable since 2002.



The amber box components have changed dramatically over the period. Market price support, made up primarily of dairy and sugar, remained very stable from 1995 to 2007, dropping sharply as the US reduced the support prices for milk in 2008. In 2014, the market price support for milk declined enough to fall under the five percent *de minimis*, thereby removing it from the



amber box calculations. The shift from the earlier period 1995 to 2007 to the following years shows the movement away from the amber commodity non-specific support programs and toward more commodity specific payments including crop insurance.

China: WTO Notifications

China acceded to the WTO beginning in the 2001 year, and provided notifications for the years 2001 to 2010. China has also provided data for the two preceding years, 1999 and 2000. Figure 3.21 shows the changes in green box components over the period. The largest component is general services, with public stock holding and environmental measure second and third in magnitude. Decoupled payments have been made in all years; on a percentage basis, this component has grown as fast or faster than any other category in general services.

Figure 3.21: China Green Box Components, 1999-2010

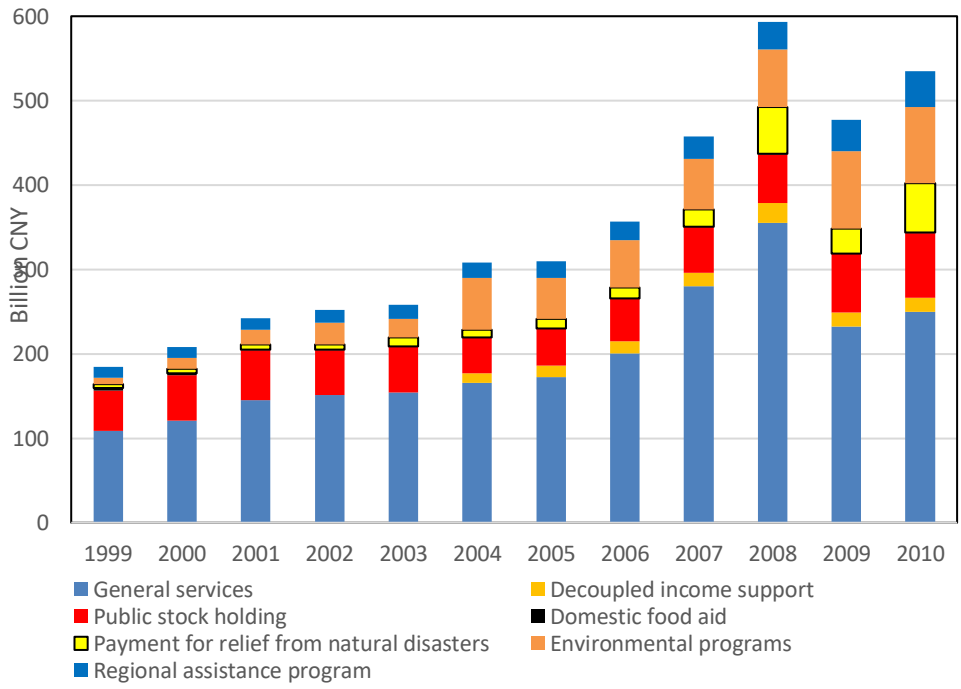


Figure 3.22: China Total Amber Box Support

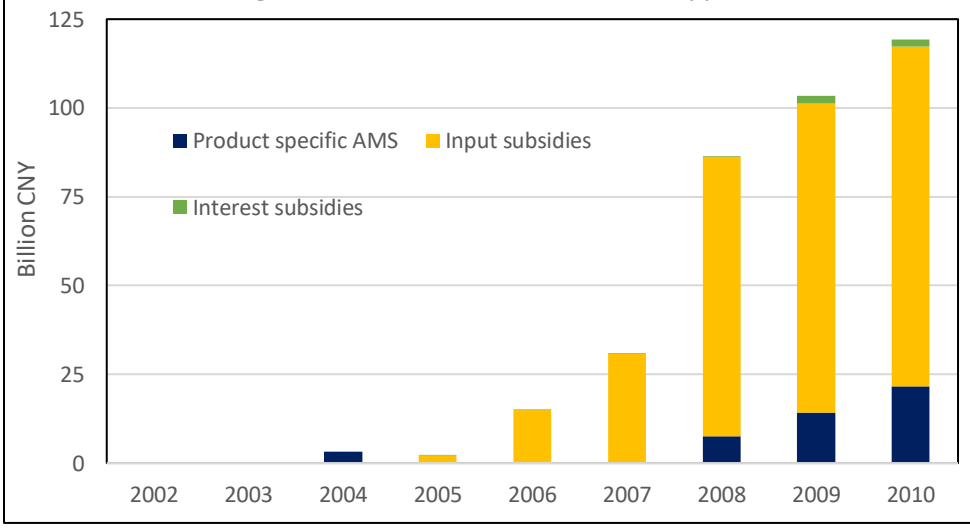
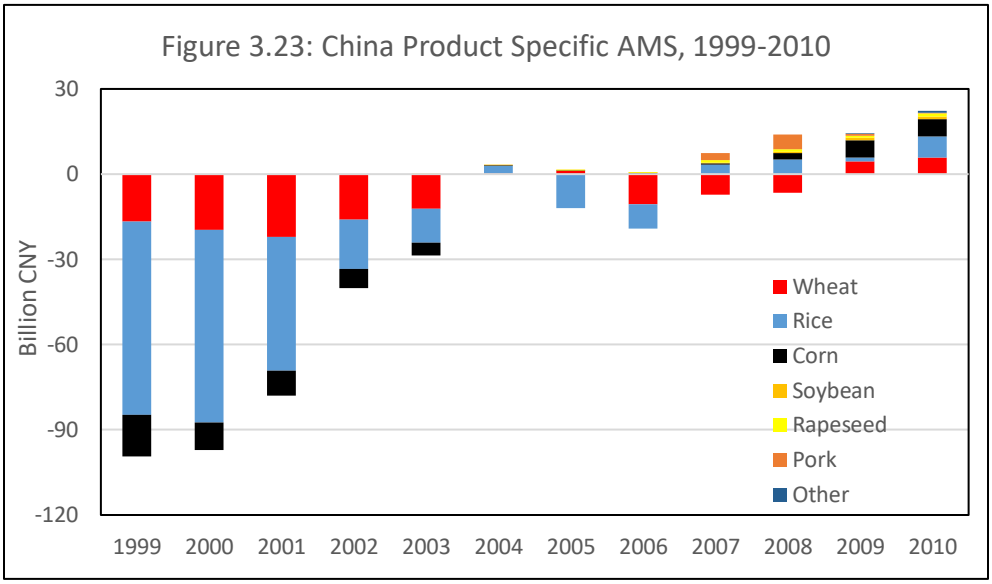


Figure 3.22 shows the amber box support, product specific support and the two major items in non-product specific support. Figure 3.23 shows the breakdown of amber support by commodity. There has been a very sharp increase in the amber supports notified by

China with input subsidies the largest category. A well, the product specific subsidies were heavily negative in the early years for wheat rice and corn. All commodities shown in Figure 3.23 show positive product specific support after 2008. Essentially, China had been taxing agriculture in the late 1990s, and has moved toward significant subsidization of agriculture over time. In all years, China claims that both product specific support and non-product specific subsidies remain *de minimis*.



Market price support for wheat and rice notified for 2009 and 2010 are calculated at volumes considerably below domestic production. Nonetheless, China has notified CTAMS as nil for all years.

Observations

- The structure of Canada's notifications to the WTO have changed little over the past 10-15 years.
- The structure of EU and US notifications has changed dramatically. Programs have been redesigned in both countries to enable exemptions under Annex 2, and sharply lowering the CTAMS.
- The drop in US CTAMS in 2014 is almost entirely due to the change in dairy policy. The most recent Farm Bill eliminated the support price for dairy, and replaced it with an insurance program. Without the support price, no MPS is calculated for dairy. The insurance program costs lie within the *de minimis* amount for inclusion in CTAMS.
- Even though the EU has shown a substantial drop in CTAMS, overall spending has remained virtually constant throughout the period after 1995.
- China continues to notify "nil" for its CTAMS, even though its support expenditures have greatly increased after 2005-2006.
- From OECD data, China has moved from "taxing" agriculture to subsidizing agriculture from 1993 to 2015. The transfers from consumers were negative in the early years of the period, indicating that the transfers flowed from agriculture to consumers.

- The EU's and Canada's level of transfers shown in the OECD information have remained virtually flat from 1995 to 2015, while US transfers have increased over time.
- The OECD data confirm a rapid rise in transfers to agriculture in China in both PSE and GSSE levels.

Natural Capital

Implicit and Explicit Subsidies Related to Natural Capital

In general, programs that lead to producer payments are considered to be unacceptable under WTO and OECD approaches if they distort prices and/or trade flows. Payments might be paid directly out of tax revenues or they may be implicit in a variety of ways. Payments can be implicit in the sense that they may not take place today out of public coffers but may draw down public assets so that less natural capital or natural capability is available to others now and in the future. Examples include greenhouse gas emissions that cause global warming and production practices that reduce soil quality. In effect, in these cases, resources are used in current production but are not paid for by current producers. Hence, the effects on resources used currently – the actual costs - are not influencing market decisions on either the supply or demand side through the price mechanism. As a result, in these cases, market price is not a good indicator of the marginal cost of production or consumption either today or in a present value sense. Explicit and implicit subsidies lead to lower market prices and therefore to the distortions that are of concern for this study both domestically and on the international trade front.

Identifying and disentangling the subsidies so as to first identify them and then to identify which ones are distortionary, is a challenge given current categorizations used by the WTO. Identifying implicit ones goes beyond a review of WTO Notifications. The OECD has made more progress in this regard via its interest in the effect of agricultural programs and activities on the environment and vice versa.
In reviewing the current data from both organizations, we have used a set of criteria for first identifying distortions and then categorizing them. Firstly we identify two categories of situations where there may be distorting subsidies. These two categories are:

1. Current programs that influence how natural capital is used.
2. Cases where natural capital is affected by agricultural production decisions but no specific or identifiable program is in place.

An example from the first category is the USA Conservation Reserve Program wherein payments are made from the government to farmers to replace some portion of production with conservation. An example of the second is the case of depletion of soil structure not covered by government programs to conserve this natural resource.

Within each category there may or may not be distortion that is of interest here for trade in particular and production decisions more generally. For each of the two categories above we consider the available information and focus on two indicators that there may be explicit or implicit subsidies at play.

The following two situations flag for us the situations where further investigation of subsidies is warranted:

1. Activities are being paid for by taxpayers (government budgetary expenditure) and/or consumers (lower prices now but more environmental damage in the future affecting health/general wellbeing) that should be paid for by producers.
2. Activities that impose costs over time and space are not being paid for in the production process.

These two indicators are premised on normative sustainability principles that may differ across jurisdictions. The first is premised on the 'polluter pays' principle, which says that the party imposing the cost should bear that cost. The second is dependent on the sustainability path adopted in a jurisdiction. Typically, lesser developed regions will have higher discount rates and therefore deplete more in the present rather than saving for the future. In more advanced developed regions, with resources running low, there tends to be a lower discount rate and therefore lower tolerance for depletion. At this point in our analysis we are not imposing a common set of principles here but instead flagging situations where subsidies may be higher than elsewhere. Of course, it is a sovereign right to use resources as a jurisdiction chooses. [19]

Elsewhere the link with comparative advantage and the overall global gains from trade that can be diminished over time and space with alternative jurisdictional sustainability policies is discussed.

1. <u>Current programs that influence how natural capital is used.</u>

The intent of the AoA suggests that any programs that lead to producer payments are considered to be unacceptable under WTO and OECD approaches if they distort prices and/or trade flows. The answer to this is difficult in any case and more difficult when it comes to natural capital. Any program identified in the WTO Notifications may affect the use of natural capital. Whether it is considered 'distortionary' is a matter of definition. It is not possible to conduct any activity on this earth without having some impact. Impact, in turn can be considered to be distortionary when it comes to natural capital depletion. We need another yardstick other than whether or not a policy 'affects' natural capital if we want to identify implicit trade subsidies. We therefore would need to agree to the extent to which 'impact' is 'ok'.

At this stage, the above criteria are employed:

1. Activities are being paid for by taxpayers (government budgetary expenditure) and/or consumers (lower prices now but more environmental damage in the future affecting health/general wellbeing) that should be paid for by producers.
2. Activities that impose costs over time and space are not being paid for in the production process.

[19] The focus is on natural capital and not on other considerations that may affect trade such as food safety measures that are governed internationally through protocols such as those of the Codex Food Code and the World Organisation for Animal Health (OiE). However, we do refer to climate change agreements mainly because GHG considerations align more closely with natural capital.

Such programs would indicate that prices do not reflect impacts that should be included in producer costs in line with a country's basic comparative advantage. Hence, an irrigation subsidy induces a producer to produce to a point that would be consistent with a natural situation where water was more available, and therefore 'cheaper'.

A further concept more accessible to most is the criterion of sustainability. This is the overarching concept behind the EU CAP programs in which cross compliance with such goals as environmental ones is tied to support.

Amber Box and Blue Box: Any program identified under the Amber and Blue Boxes is accepted as distorting trade flows. In addition, it could also be inducing production beyond what is sustainable and therefore running down natural capital and it could be running down natural capital also by exacerbating externalities that are not being included as costs of production. Each program is open to scrutiny but such detailed analysis is beyond the scope for this project.

Green Box: Green Box measures are looked at closely in this project for two reasons:

1. Environmental programs in the Green Box compensate producers for costs of conservation and remediation in most cases. There is a question about who should pay for past damage and to what extent these funds lead to more current production on producing lands because the costs of the overall farm enterprise are reduced via the support. This may 'implicitly' further degrade natural capital such as soil structure and farm runoff to water bodies on top of more explicit price effects for commodities.

2. There has been a migration of support spending particularly in the EU from Amber Box to Green Box with little reduction in overall spending. Our scrutiny of Green Box programs therefore relates to a question about whether moving from product-specific (Amber) to non-specific (Green) programs may remove support from what is *defined as* distortionary with current AoA rules, to Green Box, which is *defined* to not be distortionary but which does not change the actual effect on trade and prices. The support itself may still be leading to price subsidies and other distortions across commodities *in general*. It may be that by being buried in 'non-specific' supports, the distortionary extent may be so hidden that it cannot be disentangled either in its effects on a commodity-by commodity or with respect to natural capital effects. If effects cannot be disentangled in this way then according to current rules the effects cannot be challenged. As a country's strategy, it would be rational to move supports to the Green Box thus maintaining protection but in a legitimate way according to current rules. Clearly, new rules suitable to this new approach are required to address the *intent* of the AoA to *reduce* supports rather than hide them.

To qualify as green box measures, agricultural policies must have no or at most minimal trade-distorting effects or effects on production. These policies must also involve direct government funding and

government revenue foregone and they cannot have the effect of providing price support to farmers and the support cannot be tied to production levels or market prices. The green box supports include programs that fund agricultural and environmental research; agricultural training programs; health and safety inspection services; marketing and promotion services; infrastructure services (electricity, roads, ports, water supply, etc.); stockpiling programs for food security. Direct payments to producers qualify as green box subsidies only so long as they do not link payments with farmers' production decisions, known as "decoupling." Examples of direct payments to farmers eligible under the green box criteria include: decoupled income support measures; insurance, safety-net and disaster-relief payments; compensation for structural adjustments; and some environmental and regional assistance programs.

Included therefore, are programs that provide public goods to producers in ways that are intended to be more efficient than if free market forces were relied upon or if regulations induced individuals each provided their own. An example is research. As individuals, less research would be undertaken than is optimal given the public good dimension of research due to inevitable spillover benefits to others. Environmental programs are included presumably because the benefits are widely distributed to society as a whole and would be sub-optimally provided by individual producers or not provided at all if there were no binding regulations combined with sufficient monitoring. This is a consequence of the externality effect of agricultural production practices.

The question concerns, however, the extent to which the programs are distortionary with respect to production decisions and ultimately trade. For example, it is efficient to pool resources to provide insurance protection but is it efficient for taxpayers to fund the policy? Similarly, it is efficient to combine resources to provide shared irrigation infrastructure but is it efficient for taxpayers to fund the investment?

If producers are in the best position to decide what is an optimal investment in say, irrigation, then is the public provision providing this 'right' amount and who is footing the bill? If it is taxpayers then this implies there is an implicit subsidy to producers, which in itself is distortionary because it lowers cost of production, but it is distortionary in a further way by potentially providing more infrastructure than is optimal. Producers would invest to the point where the marginal value of extra infrastructure is equal to the expected marginal return to the water input to agriculture. If the cost exceeds the benefit, they would not invest. This would be inefficient. In the programs we observed in the US for example, there is no obvious relation between the investment and the return and it is not clear that the full cost of the investment is passed on to irrigators. Thus, on two counts, there is no guarantee that the optimal amount of infrastructure is provided or that it is paid for by users. This may mean there are two dimensions to a possible subsidy.
Provided below are comparisons of the Green Box spending of the regions under consideration here. The country chapters consider the spending in more detail.

Green Box Program Spending

The figures provided here illustrate trends of current dollar payment amounts as reported to the WTO in country Notifications. Further analysis would convert to a common currency, constant dollars and would

provide a relative measure such as population so that the relative importance of the spending in each country could be tracked in a more meaningful way over time and across countries.

For the US, environmental program spending allocated to the Green Box support category and as reported to the WTO amounts to about one quarter of the total of all Green Box spending, as shown above in Figure 3.17. Domestic food aid represents about half of all Green Box support and the further quarter is mostly income support, insurance, safety net and some General Services. The share of environmental programs has grown since 2001 as Structural Adjustment has declined as part of Green Box.

For the EU, the most dramatic shift in reported Green Box support occurred over 2004 to 2006 with CAP policy changes (Figure 3.14). Targeted environmental programs have grown little in absolute value suggesting a decline in the constant dollar value of spending. The nature, size and purpose of income support have been the subject of ongoing debate as EU policies have evolved. In essence, income support is now tied to provision of public goods, which for the most part are environmental in nature through 'cross compliance' conditions to income support.

Of relevance here, for identifying what amount to environmental and natural capital subsidies, is that income support is provided 'with strings attached'.

The Philosophy Behind EU Income Support and Cross Compliance

Paying income support to farmers is at the same time a precondition for delivery of basic public goods through responsible land management. With the vast majority of EU territory being used for either agricultural or forestry purposes, it is important that the people managing our natural resources are provided sufficient incomes. In parallel, the link between direct payments and the fulfillment of cross compliance requirements contributes to the provision of public goods. This link is key, as there is evidence of undersupply of most important public goods, for which certain forms of land management are particularly beneficial (such as extensive livestock and mixed systems, more traditional permanent crop systems and organic systems).3 The public goods concerned are mostly environmental and relates for example to maintaining agricultural landscapes, farmland biodiversity, water availability, soil functionality, climate stability and air quality. However, also public goods which are not related to environment are important, where rural vitality is frequently mentioned. Cross compliance links the payments to the respect of basic rules related to environment, health and animal welfare. For instance, GAEC (Good Agricultural and Environmental Conditions) obligations are related to preserving landscape features, permanent grassland conservation and water courses, and obligations related to soil conservation. Farmers' direct payments are reduced when cross compliance obligations are not fulfilled.

Excerpted from: http://ec.europa.eu/agriculture/sites/agriculture/files/policy-perspectives/policy-briefs/02_en.pdf

China's reported payments for environmental programs represent a similar share as the US share but a comparison of this sort is meaningless. Not only are the scales of depletion or damage likely to be very different, many other factors would need to be taken into account in a comparison. Also, natural capital and environmental issues in China are obviously determined in ways that go far beyond agriculture policy and any analysis of how agriculture programs alone affects depletion and how this in turn affects production and pricing demands a deep analysis rather than a simple appeal to what is reported in the WTO Notifications. The relevant principles are those laid out in Chapter 2.

Canada's spending is concentrated on income support and general services (Figure 3.12) which include research and other services to the sector. For these programs distortions could be related mainly to over production or production where farming is unsustainable but supported with income supports. Further analysis plus greater understanding of program specifics and complementarity with other environmental programs outside of the agriculture portfolio would be required to assess implicit subsidies. However, given Canada's relative endowment of natural capital and especially of water and rich alluvial soils, relatively lesser urban encroachment, and relatively younger timeframe for requiring remediation or conservation, it is likely that there are limited distortions indicated in the Green Box programs. This presumption needs to be further investigated.

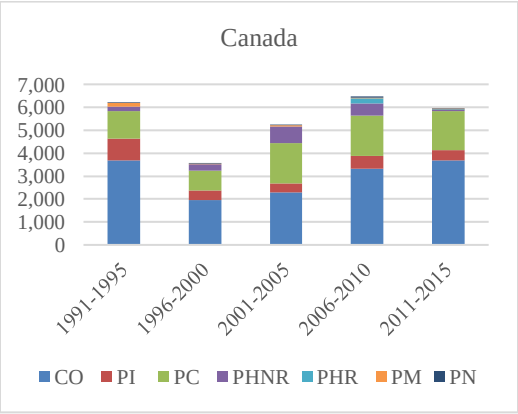
A great deal more detail on natural capital in the US is presented in the Chapter 6.

Annex 3.1: PSE Trends for Selected Countries

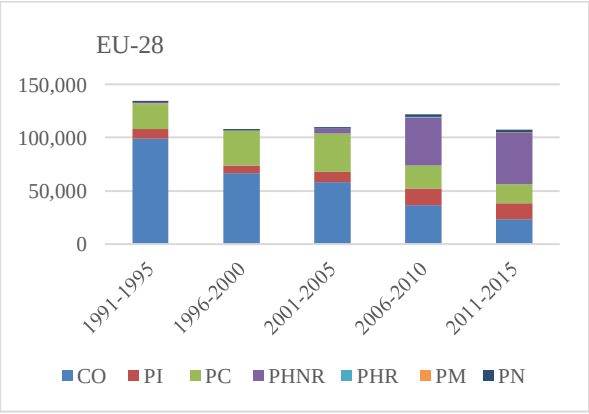
The PSE, measured as a total support by commodity and as a percentage of farm receipts, constitutes the only measure allowing a comparison of the level of support between countries and between commodities. The magnitude of the relative support across countries can be expressed best when this nominal indicator (PSE) is interpreted in relation to the size of production in a country or for specific commodities.

In 2015, the support to agriculture provided by Canada, China, EU and USA, as measured by the PSE, amounted to USD 5.9, 235, 107 and 36 billion respectively (Figure 1). As shown on Figure 1, EU and USA show a clear shift from support based on commodity output to other types of payments while in China, the shift is more towards commodity output based support programs (Figure 1-b and 1-d). During the period of 1990 to 2015, the PSE for Canada, China, EU and the United States shows a decline in support based on commodity outputs. In China, the producer support based on commodity outputs has been increasing over this period. In 2015, EU and the USA accounted for about 60 percent of total producer support outlay of OECD countries while Canada's share was 2 percent. The level of support given by the European Union to its agricultural producers was twice as much as offered by Canada. (Table 3).

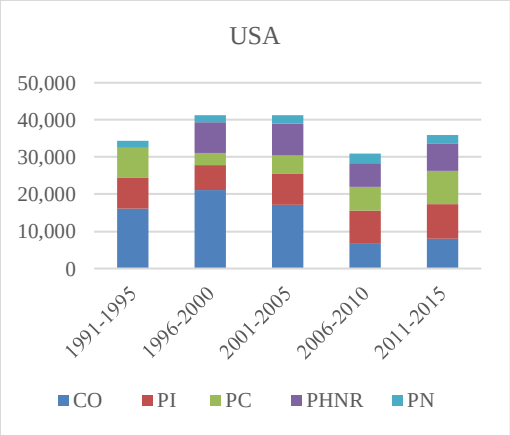
Figure 3.1A: Composition of PSE (Annual Average USD mn): 1991-95 to 2011-2015



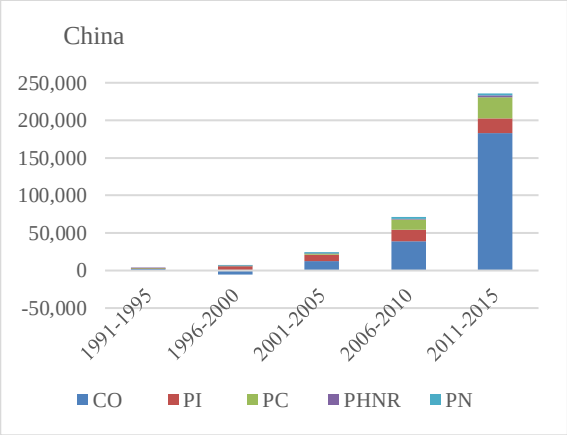
(a)



(b)



(c)



(d)

Note: EU-28 data corresponds to the following: EU12 for 1986-94, including ex- GDR from 1990; EU15 for 1995-2003; EU25 for 2004-2006; EU27 for 2007-2013; and EU28 from 2014. CO - Support based on commodity outputs, PI - Payments based on input use, PC - Payments based on current A/An/R/I, production required, PHNR - Payments based on non-current Area planted/Animal number/Receipts/Income (A/An/R/I), production not required, PHR - Payments based on non-current A/An/R/I, production required, PM - Miscellaneous payments, PN - Payments based on non-commodity criteria
Source: OECD Stat

The PSE expressed in a single currency (US$) is influenced by the changes in exchange rate. The influence of the exchange rate fluctuations can be avoided by expressing the PSE as a ratio of total gross agricultural output. Total producer support in Canada has declined from estimated 35 percent of value of production in early 1990s to 9 percent in 2015. During the same period, producer support in EU has declined from 38 percent (in 1991) to 19 percent (2015). The comparable estimates for China indicates that the farm support has increased from 6 percent in 1995 to 21 percent in 2015. The estimated ratio for the USA for 1995 and 2015 are 24 percent in 1995 and 9 percent in 2015 respectively.

With respect to selected countries' agricultural support, the PSE highlights the following points (Figure 2 through Figure 7);

- There is no substantial change in overall producer support provided by Canada, EU, and USA, while in China, the producer support has increased substantially over this period.
- For EU and USA, there has been a shift from output related payments to non-commodity criteria related payments
- EU and USA accounted for nearly two-thirds of the value of farm support in OECD countries
- The share of PSE to the value of production is relatively larger for EU and China than that of Canada and USA
- The gross farm receipt and GSSE has been increasing for all countries. However, there has been a continued decline in GSSE to value of production in all countries

Figure 3.2A: PSE as a share of Value of Production: 1986-2015

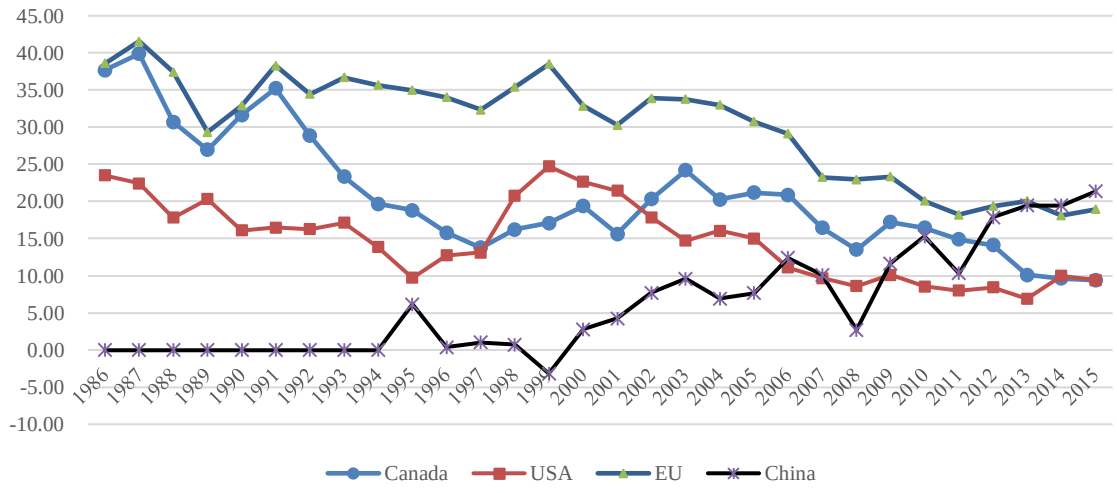


Figure 3.3A: Canada: PSE as a share of Value of Production

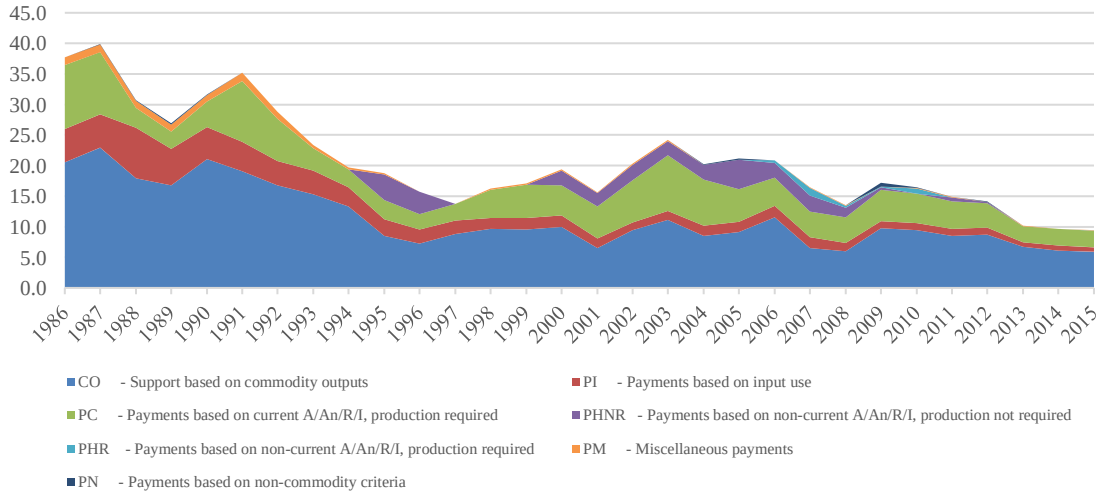


Figure 3.4A: EU-PSE as a share of Value of Production

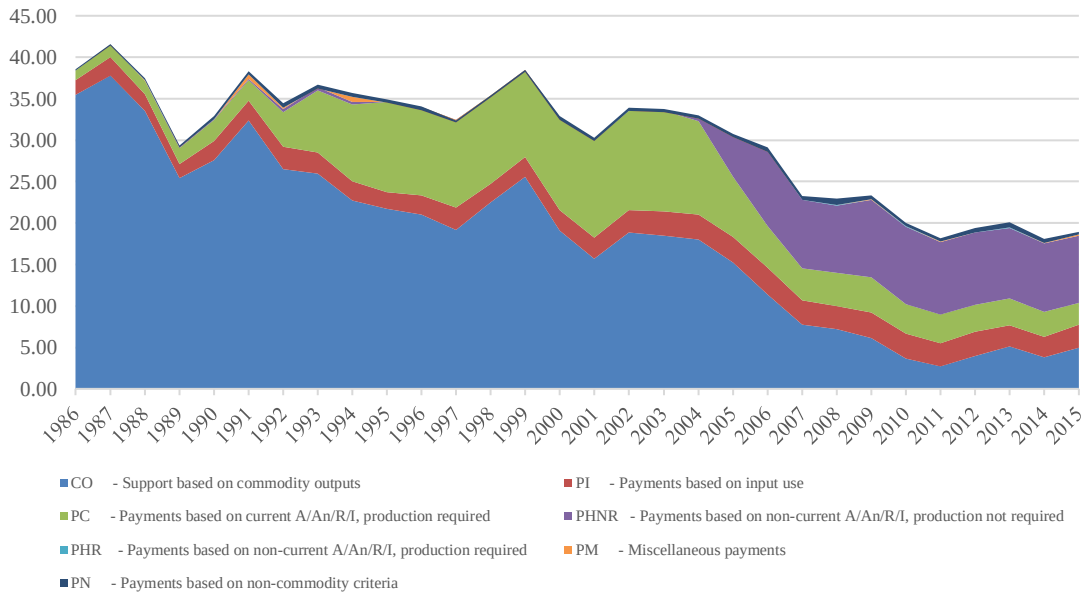
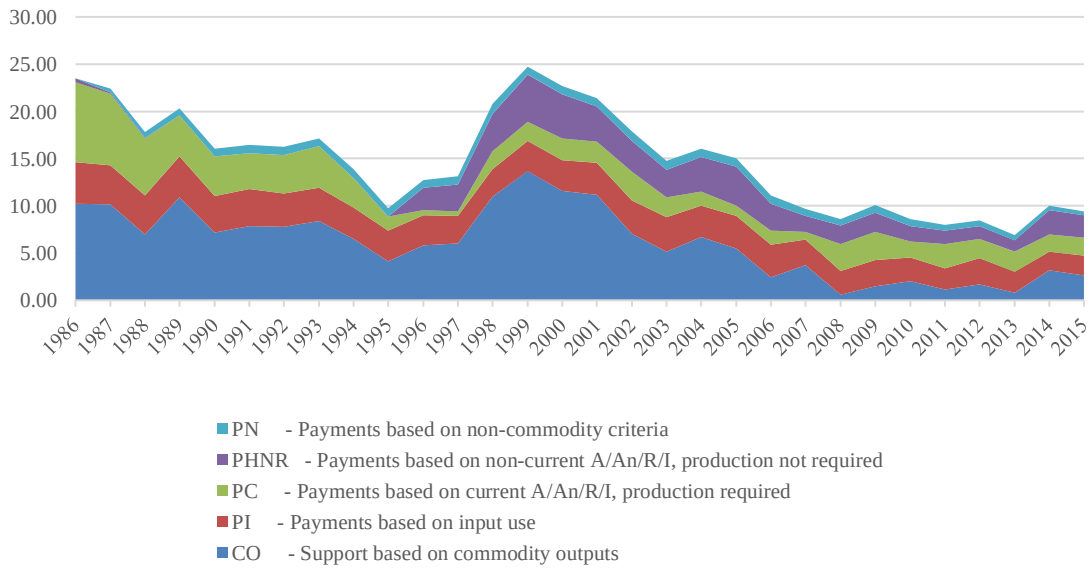
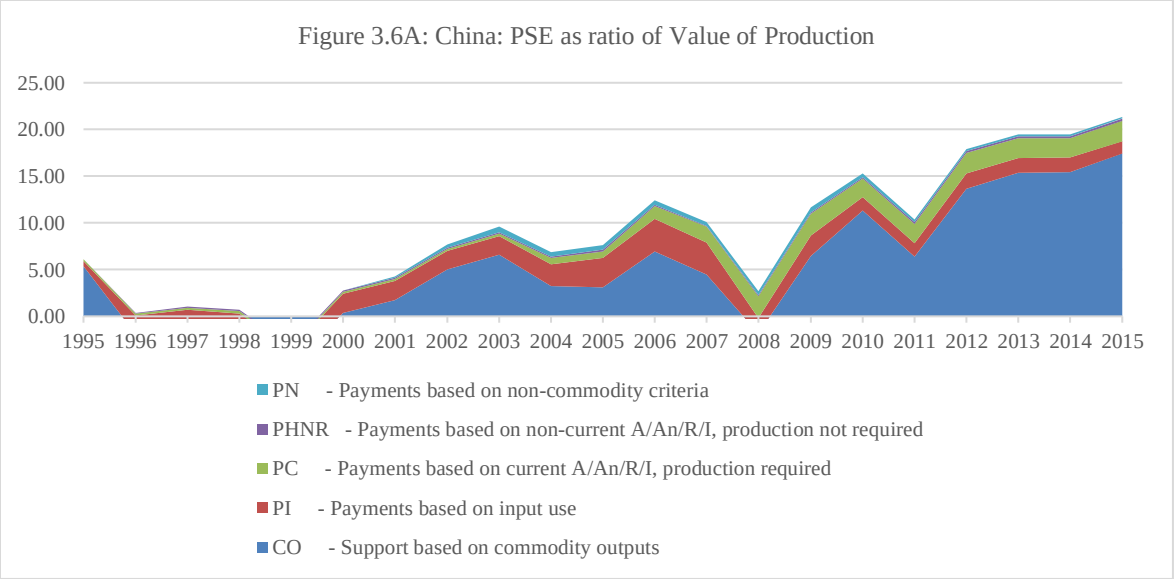
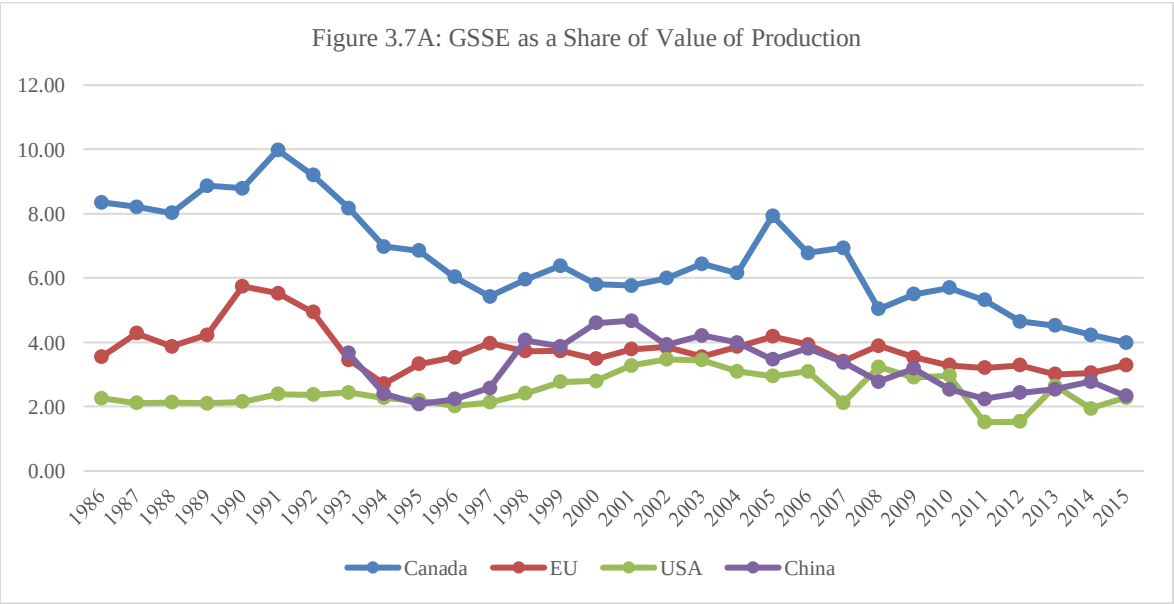


Figure 3.5A: USA: PSE as a Share of Value of Production







The commodity shares of the PSE indicate that the presence of different incentive levels for commodities (Figures 8 to Figure 11). The trend analysis on support levels on each commodity helps to identify the differences in policy incentives provided for promotion of local production of agricultural commodities (Figures 12 to Figure 17). In general, the commodity shares of the PSE fluctuate widely over the time and in many cases, commodity expenditure shares show downward trends. However, some exceptions can be seen for milk, particularly in Canada (53 percent) and the USA (15 percent). The country level analysis of commodity expenditure shares indicate that expenditure shares are relatively high for milk, maize, and soybean for the USA and pork, maize and wheat for China.

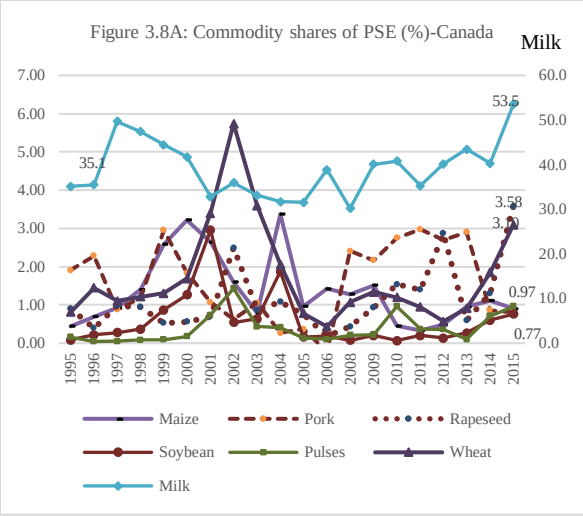


Figure 3.8A: Commodity shares of PSE (%)-Canada
Milk
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
60.0
50.0
40.0
30.0
20.0
10.0
0.0
53.5
35.1
3.58
3.20
0.97
0.77
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2008 2009 2010 2011 2012 2013 2014 2015
Maize
Pork
Rapeseed
Soybean
Pulses
Wheat
Milk

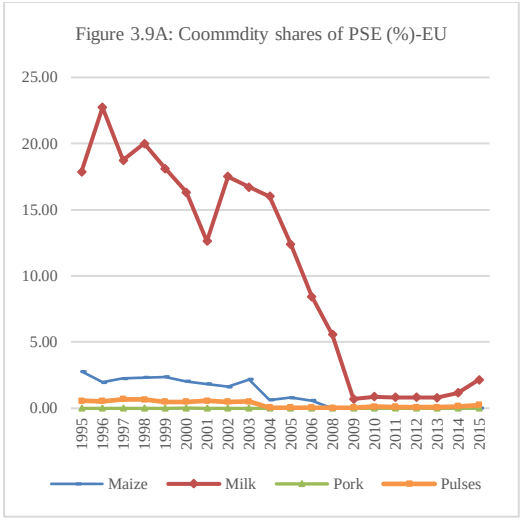


Figure 3.9A: Coommdity shares of PSE (%)-EU
25.00
20.00
15.00
10.00
5.00
0.00
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2008 2009 2010 2011 2012 2013 2014 2015
Maize
Milk
Pork
Pulses

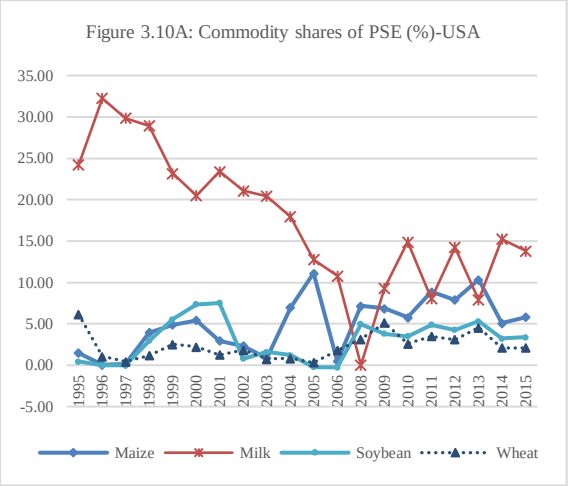


Figure 3.10A: Commodity shares of PSE (%)-USA
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2008 2009 2010 2011 2012 2013 2014 2015
Maize
Milk
Soybean
Wheat

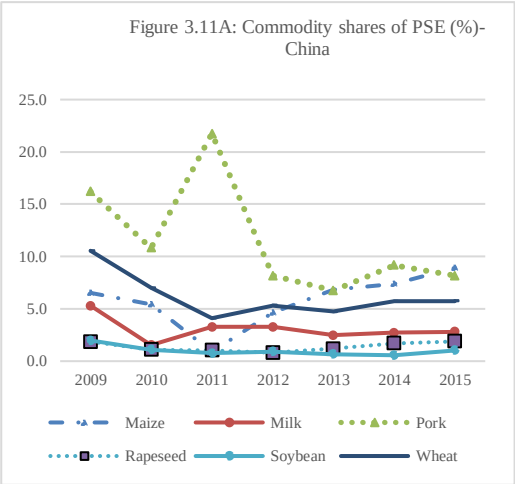


Figure 3.11A: Commodity shares of PSE (%)-China
25.0
20.0
15.0
10.0
5.0
0.0
2009 2010 2011 2012 2013 2014 2015
Maize
Milk
Pork
Rapeseed
Soybean
Wheat

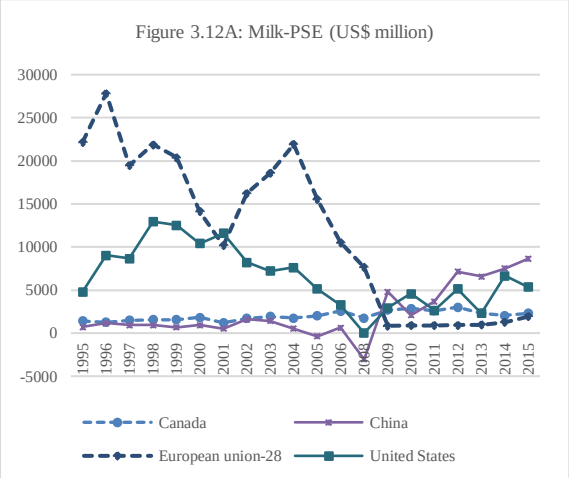


Figure 3.12A: Milk-PSE (US$ million)
30000
25000
20000
15000
10000
5000
0
-5000
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2008 2009 2010 2011 2012 2013 2014 2015
Canada
China
European union-28
United States

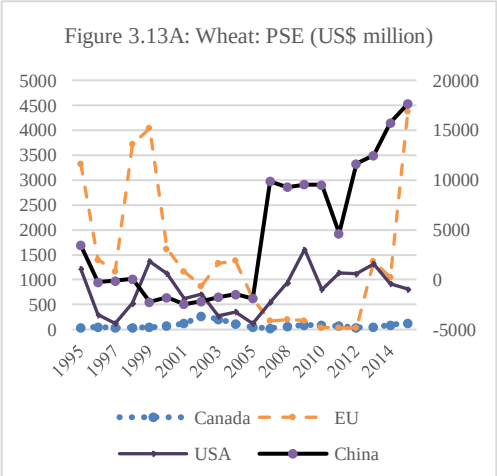


Figure 3.13A: Wheat: PSE (US$ million)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
20000
15000
10000
5000
0
-5000
1995 1997 1999 2001 2003 2005 2008 2010 2012 2014
Canada
EU
USA
China

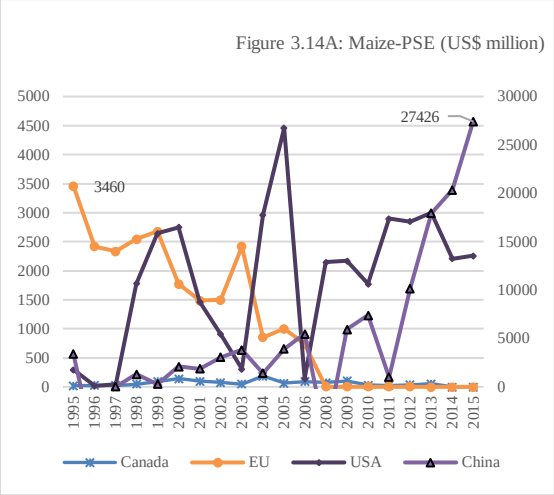


Figure 3.14A: Maize-PSE (US$ million)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
30000
25000
20000
15000
10000
5000
0
3460
27426
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2008 2009 2010 2011 2012 2013 2014 2015
Canada
EU
USA
China

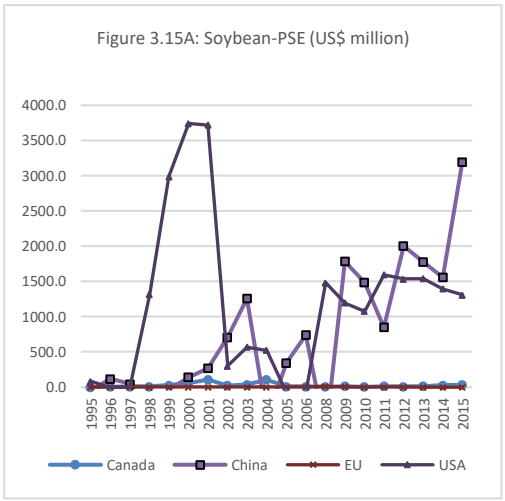


Figure 3.15A: Soybean-PSE (US$ million)
4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2008 2009 2010 2011 2012 2013 2014 2015
Canada
China
EU
USA

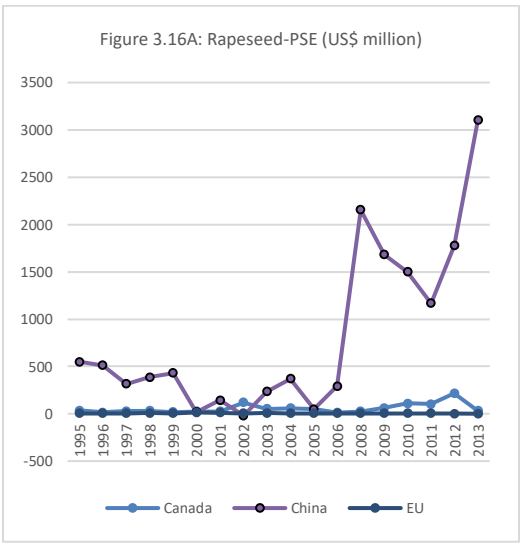


Figure 3.16A: Rapeseed-PSE (US$ million)
3500
3000
2500
2000
1500
1000
500
0
-500
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2008 2009 2010 2011 2012 2013
Canada
China
EU

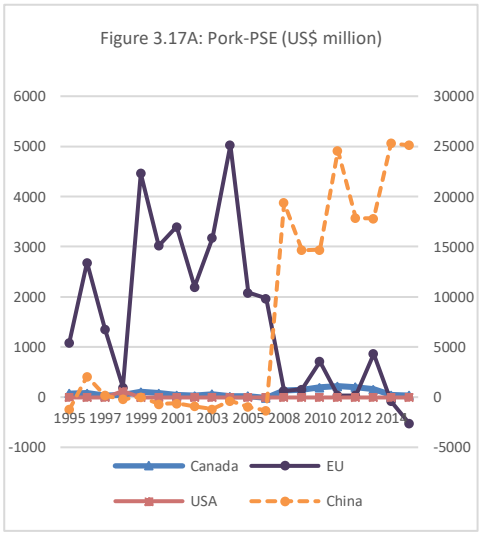


Figure 3.17A: Pork-PSE (US$ million)
6000
5000
4000
3000
2000
1000
0
-1000
30000
25000
20000
15000
10000
5000
0
-5000
1995 1997 1999 2001 2003 2005 2008 2010 2012 2014
Canada
EU
USA
China

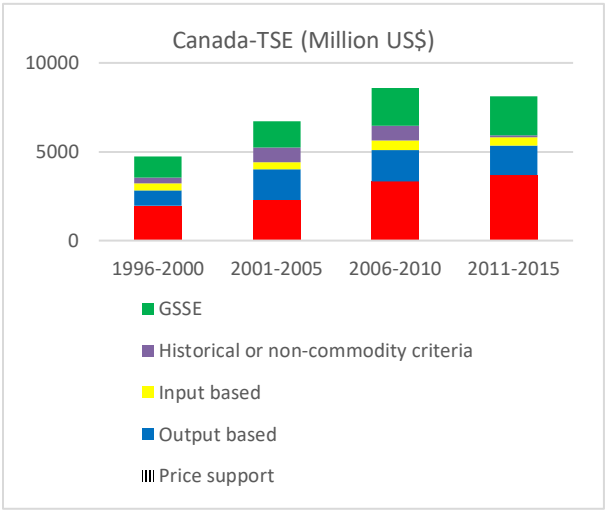
Table 3.1A Producer support estimates of Canada, USA, EU and China (million US$)

Time	PSE (USD mn) and PSE as a % GFR		1990	2000	2005	2010	2013	2014	2015	PSE, % of OECD total 2015
Canada	PSE		6,180	4,335	6,363	7,069	5,353	5,043	4,289	2.02
	GFR (%)	%	31.6	19.4	21.2	16.4	10.1	9.6	9.4	
United States	PSE		30,198	50,880	40,068	30,774	29,020	43,572	38,785	18.30
	GFR (%)	%	16.1	22.7	15.0	8.6	6.9	10.0	9.4	
European Union (28 countries)	PSE		105,262	86,585	125,199	104,902	120,825	108,214	89,987	42.45
	GFR (%)	%	32.9	32.9	30.8	20.0	20.1	18.1	18.9	
China (People's Republic of)	PSE		..	7,297	32,173	135,997	263,844	275,581	307,395	
	GFR (%)	%	..	2.8	7.6	15.3	19.5	19.5	21.3	

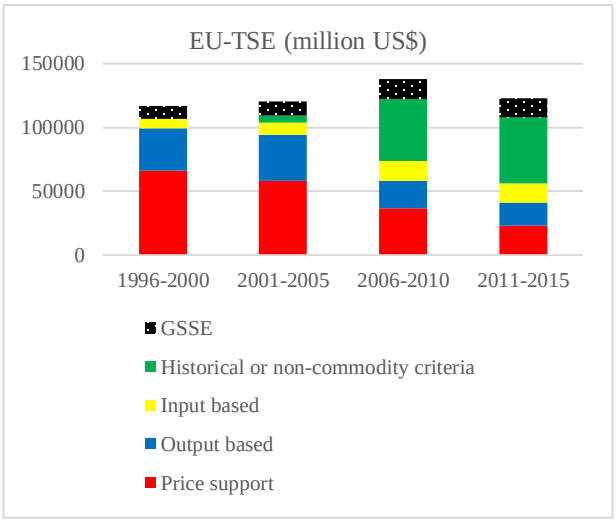
GRF% : Percentage of Value of production. Source: OECD Stat

The support levels for agricultural producers have changed across types of programs. In order to understand how support levels have changed across types of programs, the PSE data categorized into two main groups; market distorting (market price support, payment based on current output payment based on current input use) and less market distorting payments (supports decoupled from output) (Figure 18). The TSE of Canada remain about US$ 8 billion and GSSE of Canada account for relatively large proportion of the TSE. Expansion of GSSE and drop off of market distorting support have occurred in EU. However, about half of the EU support still related to market distortions. In the USA, the price support component has declined while output based and input based support levels for agriculture have increased, making little changes in overall distortionary support levels. China maintains mostly market distortionary supports, of which the price support accounts for the largest component. In recent years, China has introduced some output based and input based support for agriculture (Figure 18). Annex 1 shows the PSE in US dollars for Canada, China, USA and EU 28 for selected commodities.

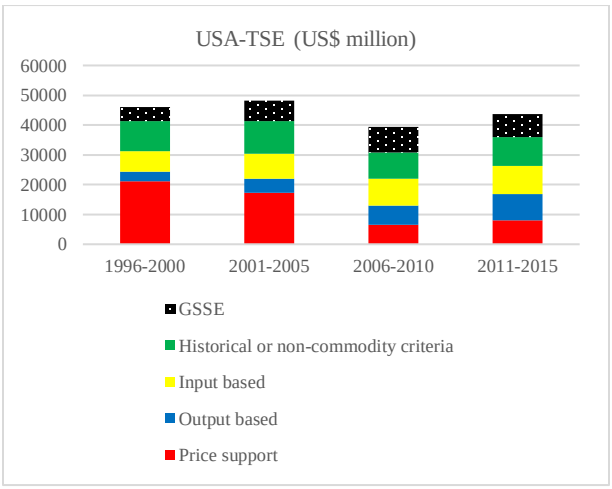
Figure 3.18A: Composition of Total Support Estimate



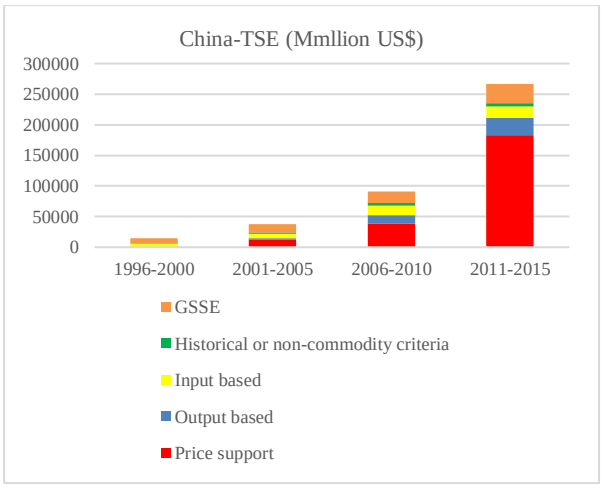
(a)



(b)



(c)



(d)

Data Source: OECD

Chapter 4: China

Introduction

This chapter serves as a background to policies in China, both from an aggregate natural capital viewpoint as well as an outline of policies specifically for the commodities of interest. Production, consumption, imports and exports from Chinese agriculture have changed sharply since the turn of the century. The emerging middle class is demanding a wider array of foodstuffs and more livestock-based proteins, driving considerable change in both production, policy and trade.

The outline of the chapter is as follows. The first section reviews various paragraphs in the WTO agreements and China accession documents to lay out the various rules surrounding WTO notifications for China. The chapter then outlines the recent production, import, export and stocks history on several products including pork, milk powders, corn, canola/rapeseed, and soybeans. Background is provided on the nature of China's support to agriculture in the past few years, and the emerging changes expected to take place under the 13th Five year Plan 2016 to 2020. For completeness, a brief section on China's import tariffs is included. The following section provides rough estimates of the level of support to producers for corn, soybeans and canola based on both WTO and OECD datasets. The penultimate section explores the way in which China is using its natural capital in agriculture. The chapter concludes with some overall comments and observations.

China's Accession Arrangements to the WTO

Some background on China's accession protocol is needed to explain the specific rules under which China operates within the WTO. Some of these are:

- While China referred to itself as a developing country in the Report of the Working Party on the Accession of China (WTO, 2001a, paragraphs 8 and 9), there is no indication in the Protocol on the Accession of the People's Republic of China (WTO, 2001b) whether China has developed or developing country status. As well, the rules of accession are not the same as for other developing economies. The USA treats China as a developed country although the USA has not raised the issue. (Brink et al, 2017)
- China's Bound Total AMS (BTAMS) is nil.
- The latest WTO notification by China is for 2010.
- China has waived the rights available to developing countries to exempt generally available investment and input subsidies for agriculture ("development box") from inclusion in the calculation of AMS (WTO 2001a, paragraph 235).
- Also, China agreed to the *de minimis* level of 8.5 percent in calculation of product specific and non-product specific support instead of the 10 percent allowed for developing countries.
- The Agreement on Agriculture indicates that the years on which the external reference prices are used by members in calculation of market price support is 1986-1988. China has used the years 1996-1998, although there is no reference in the accession documents enabling this change from the Agreement on Agriculture.

- China agreed to the Agreement on Agriculture. Of importance later in this paper is the wording of member commitments regarding Public Stockholding for Food Security Purposes.

Rules for public stockholding for food security purposes is set out in paragraph 3 of Annex 2: Domestic Support: The Basis for Exemption from the Reduction Commitments. It reads:

> "Public stockholding for food security purposes
>
> "Expenditures (or revenue foregone) in relation to the accumulation and holding of stocks of products which form an integral part of a food security programme identified in national legislation. This may include government aid to private storage of products as part of such a programme."
>
> "The volume and accumulation of such stocks shall correspond to **predetermined targets related solely to food security**. The process of stock accumulation and disposal shall be **financially transparent.** Food purchases by the government shall be made at current market prices and sales from food security stocks shall be made at no less than the current domestic market price for the product and quality in question." [emphasis added]

The interpretation of this paragraph could be that while stock purchases are made at prices prevailing at the time of purchase, subsequent sales at a later date must be made at the same price; alternatively, sales are made at prices prevailing at the time of sale. However, even with the latter case, the first quoted paragraph above suggests that any costs of storage (which may involve price risk between purchase and sale, presumably) may be included in the clause for public stockholding for food security purposes and thereby exempt within the green box.

The footnote to the paragraph sets out the rules for conformity as follows:

> "For the purposes of paragraph 3 of this Annex, governmental stockholding programmes for food security purposes in **developing countries** whose operation is transparent and conducted in accordance with officially published objective criteria or guidelines shall be considered to be in conformity with the provisions of this paragraph, including programmes under which stocks of foodstuffs for food security purposes are acquired and released at administered prices, provided that **the difference between the acquisition price and the external reference price is accounted for in the AMS**." [emphasis added]

Finally, one further provision needs to be explored, Agreement on Agriculture, Annex 3, paragraph 8:

> "Market price support: market price support shall be calculated using the gap between a fixed external reference price and the applied administered price multiplied by the quantity of production eligible to receive the applied administered price. **Budgetary payments made to maintain this gap, such as buying-in or storage costs, shall not be included in the AMS**." [emphasis added]

The logic then provides for China, if it is a developing country, to include in the AMS a calculation of the difference between the acquisition price and the external reference price for governmental stockholding programs for food security purposes (assuming the other conditions in Annex 2, paragraph 3 are met), or to include in the AMS the difference between an administered price and the external reference price under the market price support provision. If China is a developed country, then China would be expected to show that purchase prices for stocks are current market prices (i.e., not serving as a domestic support price) and sales are at current domestic prices, or it can include an AMS calculation under the market price support provision. In the former alternative, costs of stockholding can be included in the green box, and therefore exempt. There does not appear to be any other provision for a country that does not have a classification of either developed or developing.

China notified expenditures for public stockholding of "wheat, corn, rice, vegetable oils and sugar for food security purposes" as a component of General Services (green box), but has only notified the support prices and external reference prices for rice and wheat in its latest notifications (2009 and 2010) as part of market price support. Nonetheless, public purchases for stocks have also occurred for corn, soybeans and canola with support prices higher than external reference prices, although no AMS is calculated for these commodities. This anomaly is the basis for the calculations later in this paper on the possible magnitudes of the product specific support provided to corn, soybeans, and rapeseed, whose inclusion in AMS places support levels well above the *de minimis* level. The anomaly is also likely part of the US challenge to China's programs for wheat, corn and rice.

Commodity Reviews

Pork

The table below shows the supply and disposition of pork in China for the years 2000-2016 (USDA)[20]. The data show strong production growth until about 2010 and 2011, with stable levels of production thereafter. Imports remained relatively small and steady until about 2008, with considerable increases thereafter, accelerating in the last two years. Exports of pork to neighbouring countries remain low and stable. Disappearance (consumption) has grown steadily over the period by 37 percent.

[20] For all the supply and disposition tables, the data source is USDA.

Supply and Disposition: Pork (1000 tonnes, CWE)					
Market Year	Beginning Stocks	Production	Imports	Exports	Disappearance
2000	0	39,660	65	144	39,581
2001	0	40,517	76	223	40,370
2002	0	41,231	91	307	41,015
2003	0	42,386	124	397	42,113
2004	0	43,410	137	537	43,010
2005	0	45,553	48	502	45,099
2006	0	46,505	53	544	46,014
2007	0	42,878	182	350	42,710
2008	0	46,205	709	223	46,691
2009	0	48,908	270	232	48,946
2010	0	50,712	415	278	50,849
2011	0	50,604	758	244	51,118
2012	0	53,427	730	235	53,922
2013	0	54,930	770	244	55,456
2014	0	56,710	761	276	57,195
2015	0	54,870	1,029	231	55,668
2016	0	51,850	2,400	180	54,070

An increasing share of consumption is being met by imports; domestic production is not increasing as fast as domestic disappearance. Indeed, production appears to have stagnated at the 50,000 to 55,000 thousand tonnes annually. Total animals slaughtered show a similar pattern of stability over the past five to seven years.

Milk Powders

Dry whole milk powder consumption has increased over three-fold (327 percent) from 2000 to 2016 while production has grown by only 263 percent. Almost all of the increase in production occurred in the first ten years with quite stable levels of production thereafter. The difference has been made up by imports, growing substantially over the past few years. China stepped away from imports in 2015 and 2016, after two years of very high imports. The lower world dairy prices in the last two years have been attributed, in major part, to the decline in Chinese imports.

Non-fat dry milk powder production and disappearance are very much smaller than dry whole milk production and disappearance, although non-fat powder disappearance has shown the same growth trend as whole milk powder.

Supply and Disposition of Whole Milk Powder (1000 tonnes)						
Market Year	Beginning Stocks	Production	Imports	Exports	Ending Stocks	Disappearance
2000	na	522	51	10	na	563
2001	na	610	41	43	na	608
2002	na	577	77	28	na	626
2003	na	750	91	20	na	821
2004	na	832	91	25	na	898
2005	na	918	65	32	na	951
2006	na	1,030	74	33	na	1,071
2007	na	1,150	59	72	na	1,137
2008	na	1,120	46	62	120	1,104
2009	120	977	177	10	110	1,154
2010	110	1,030	326	3	80	1,383
2011	80	1,100	320	9	50	1,441
2012	50	1,160	406	9	60	1,547
2013	60	1,200	619	3	130	1,746
2014	130	1,350	671	6	300	1,845
2015	300	1,300	347	4	145	1,798
2016	145	1,375	375	2	50	1,843

Supply and Disposition of Non-Fat Dry Milk Powder (1000 tonnes)				
Market Year	Production	Imports	Exports	Disappearance
2000	58	22	0	80
2001	70	18	0	88
2002	72	35	0	107
2003	83	51	1	133
2004	68	61	2	127
2005	60	55	0	115
2006	55	62	1	116
2007	58	40	4	94
2008	53	55	1	107
2009	54	70	0	124
2010	55	89	0	144
2011	56	130	0	186
2012	57	168	0	225
2013	54	235	0	289
2014	49	253	2	300
2015	45	200	1	244
2016	40	210	0	250

Soybeans and Rapeseed

Production and Imports: Soybeans and Rapeseed (1000 tonnes)				
Year	Soybeans		Rapeseed	
	Production	Imports	Production	Imports
2000	15,409	13,245	11,381	2,361
2001	15,410	10,385	11,331	775
2002	16,507	21,417	10,552	51
2003	15,394	16,933	11,420	419
2004	17,401	25,802	13,182	316
2005	16,350	28,317	13,052	676
2006	15,082	28,726	10,966	961
2007	12,725	37,816	10,573	805
2008	15,542	41,098	12,102	3,034
2009	14,982	50,338	13,657	2,177
2010	15,083	52,339	13,082	930
2011	14,485	59,231	13,426	2,622
2012	13,011	59,865	14,007	3,421
2013	11,951	70,364	14,458	5,046
2014	12,154	78,350	14,772	4,591
2015	11,785	83,230	14,931	4,011
2016	12,500	86,000	13,500	3,800

The table shows production and imports for both rapeseed and soybeans in China. Production has been remarkably stable for both crops over the period 2000 to 2016, despite sharply increased support prices from 2008 to 2015. Imports of soybeans have increased dramatically from about 15 million tonnes to 86 million tonnes forecast for 2016. Rapeseed imports have increased in the 2008 to 2016 period to levels substantially above earlier years. The growth in imports of both oilseeds represents both an increase in demand for vegetable oils as well as protein meals for livestock production.

Corn

Corn production has more than doubled since 2000; combined with substantial imports utilization/disappearance has also doubled. Feed represents about 70 percent of total utilization in the later years, falling from about 76 percent in 2000. Stocks have more than doubled between 2008 and 2016. Gale (2015) notes that China was building grain stocks considerably in excess of domestic disappearance in since 2012.

Corn Supply and Disposition (1000 tonnes)						
Marketing Year	Beginning Stocks	Production	Imports	Exports	Ending Stocks	Disappearance
2000	123,799	106,000	89	7,276	102,372	120,240
2001	102,372	114,088	39	8,611	84,788	123,100
2002	84,788	121,308	29	15,244	64,981	125,900
2003	64,981	115,830	2	7,553	44,860	128,400
2004	44,860	130,287	2	7,589	36,560	131,000
2005	36,560	139,365	62	3,727	35,260	137,000
2006	35,260	151,603	16	5,269	36,610	145,000
2007	36,610	152,300	41	549	38,402	150,000
2008	38,402	165,914	47	172	51,191	153,000
2009	51,191	163,974	1,296	151	51,310	165,000
2010	51,310	177,245	979	111	49,423	180,000
2011	49,423	192,781	5,231	91	59,344	188,000
2012	59,344	205,614	2,702	81	67,579	200,000
2013	67,579	218,489	3,277	22	81,323	208,000
2014	81,323	215,646	5,516	13	100,472	202,000
2015	100,472	224,632	3,174	4	110,774	217,500
2016	110,774	216,000	3,000	20	103,754	226,000

The dairy herd has increased from 4.6 million head in 2008 to 14 million head in 2016, while the beef herd has remained static at about 50 million head (probably including oxen, yak and water buffalo). The sow herd has fluctuated between 35 million and 50 million from 2008 to 2016. Swine slaughter levels have increased 15-25 percent over the period.

Broiler meat production has increased 40 percent during this period. Overall, dairy, poultry and milk production growth underlie the increased use of feed grain (corn) as well as the protein meals from soybeans and canola. China has invested heavily in technological improvement at farm level with improved varieties, fertilizer, chemicals and production practices. The increased pork production in relation to the sow herd and milk production in relation to the dairy herd show continuing productivity growth. As an example, swine slaughter (head) per sow has grown from 7.7 to 15.4 from 1976 to 2016.

China built very large stocks of corn from 2013 to 2015 based on the purchase and storage support for domestic prices. With the change toward target prices and budgetary outlays for subsidies to farmers, China is now faced with shedding the stocks to more market oriented levels (WSJ, 2016).

Two or three general observations can be made across the survey of production, imports and disappearance, First, production of rapeseed and soybeans has stagnated despite the rising support price levels in recent years. Domestic rapeseed prices appear to be higher in 2013-15 than the price of imported product (including tariffs and transport) for crushers, indicating little or no domestic supply response from the higher support prices. Support prices for rapeseed, soybeans and corn have been abandoned and are being replaced with subsidies and target prices, although program detail is not available. Second, pork production has leveled out over the past 5-6 years. Similarly, the dairy herd shows no growth in the past 5-6 years. In both milk powders and pork, imports are rising. Third, yield (production per harvested hectare) increases in soybeans and rapeseed from 1980 to 2016 have taken place but they have been far slower than the yield increases in corn, and have shown little yield increases in the past several years. Corn yields (production per harvested hectare) have grown nearly six fold over the period 1980 to 2016. Finally, yields calculated as total production divided by total hectares harvested suggests that there is ample room for productivity increases across the three crops. This is consistent with past efforts at productivity increases, and also with the priority placed on technological improvement in agriculture in the 13th Five Year Plan.

The Shift from Support Price Using Purchase and Storage to Direct Subsidy

The support price arrangements in effect through the 2015 crop year were operated by a government agency ready to purchase any amount of product (rapeseed, corn, soybeans) at the support price. The support price has usually been announced after planting and before harvest. There are no apparent guidelines or storage rules for the government agency to release stocks. China has notified the cost of purchase and storage as a food security measure, exempt under the WTO CTAMS calculation. Purchase and storage of food/feed stuffs for food security purposes usually imply that the purchase price, amount to be purchased, the triggers for releasing stocks in store, and the path for rebuilding the security stock level, are well known in the market. Without this information, it is virtually impossible for a private market to operate grain and oilseed storage from harvest to ultimate use throughout the year. With a fixed price for both purchase and release of stocks, the private sector cannot earn the usual carrying charge (interest, insurance and storage) in a private market. The upper limit on the support price is the price of imported product plus the import tariffs and movement costs to the final user.

The shift to a direct subsidy with a target price (yet to be defined) for rapeseed and soybeans suggests that domestic market forces will be the primary pricing mechanism for these products, while the government will provide deficiency payments for the difference between market and target prices, possibly only for some regions of the country. The limitation China faces in this approach is that the deficiency payment cannot exceed 8.5 percent of the value of production for the commodity. China has a bound zero AMS limit; the only subsidies allowed must be *de minimus*, i.e., under 8.5 percent of commodity production value at farm gate. Without limitations by government on import levels (either by volume limits or quality/safety regulations), market prices to farmers should reflect the full cost of imports, adjusted for quality differences.

It is quite straightforward using static economic diagrams to show that in the case of relatively inelastic demand for a product, purchase and resale by government is a far less costly price support mechanism than a deficiency payment arrangement. Small purchase levels can raise prices substantially with inelastic demand; resale of the product later in the year will also recoup some or all of the purchase price. For relatively elastic demand, the converse holds. Very large purchases are required to raise domestic market prices. However, with elastic demand, a small deficiency payment may be sufficient to meet a target return for farmers.

Even with elastic demand for a perishable commodity such as fresh fruits and vegetables, hogs, cattle, if production levels exceed processing capacity, the elastic demand can become very inelastic at the processing capacity volume, leading to a price collapse. Without purchase and storage for processed product usable for a perishable product, the only policy mechanisms to support a farm price are deficiency payments or purchase and dump.

Clearly, the import price (including transport costs and tariff) sets an upper limit on support prices maintained by government purchases. Moving to a deficiency payment allows domestic target prices on which a deficiency payment is calculated to move above the all-in imported price, offering greater incentive to increase domestic production than what the purchase and storage arrangement would allow. The limitation, however, is that the deficiency payment becomes a commodity specific subsidy, and therefore included in the AMS calculation under WTO, and is limited in China's case to the 8.5 percent *de minimis* calculation.

Crude Estimates of Nominal Rates of Producer Support

The OECD database allows the rough calculation of Nominal Rates of Producer Support (NRPS) as an approximation of the Nominal Rates of Assistance (NRA). It can be calculated as the commodity specific direct support, plus an allocation of the non-commodity specific support allocated to a group of commodities or individual commodities based on their shares of the total value of production. Additionally, it can also be calculated as the commodity specific direct support, plus an allocation of the non-commodity specific support allocated to a group of commodities or individual commodities based on their shares of the total value of production, plus an allocation of the General Services Support Estimate (GSSE) based on their shares of the total value of production.

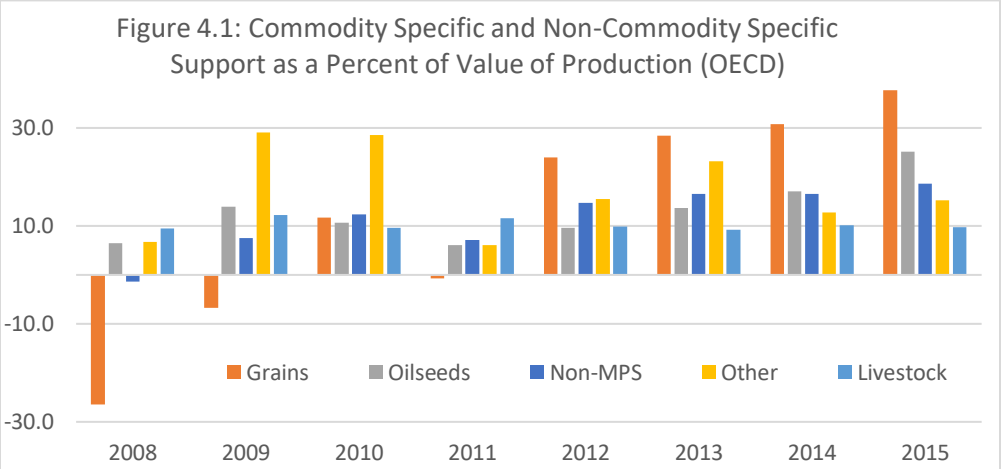


Figure 4.1: Commodity Specific and Non-Commodity Specific Support as a Percent of Value of Production (OECD)

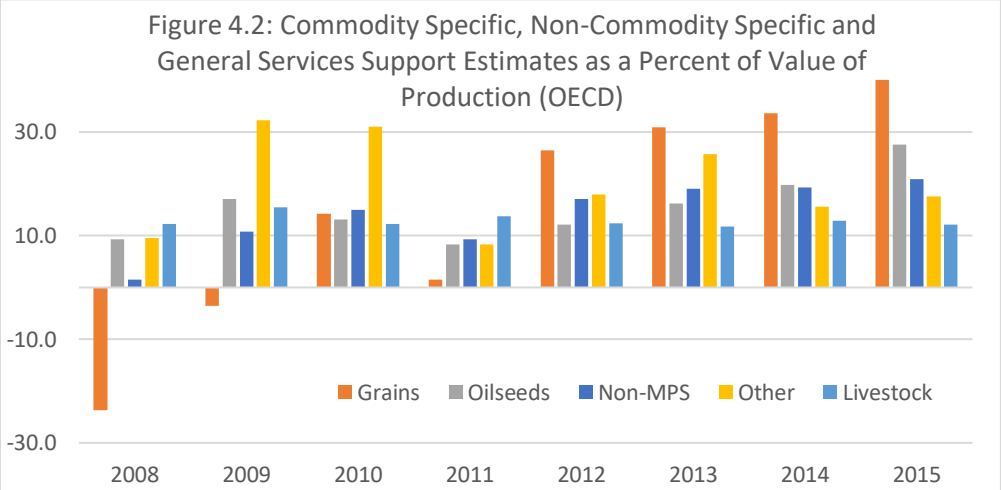
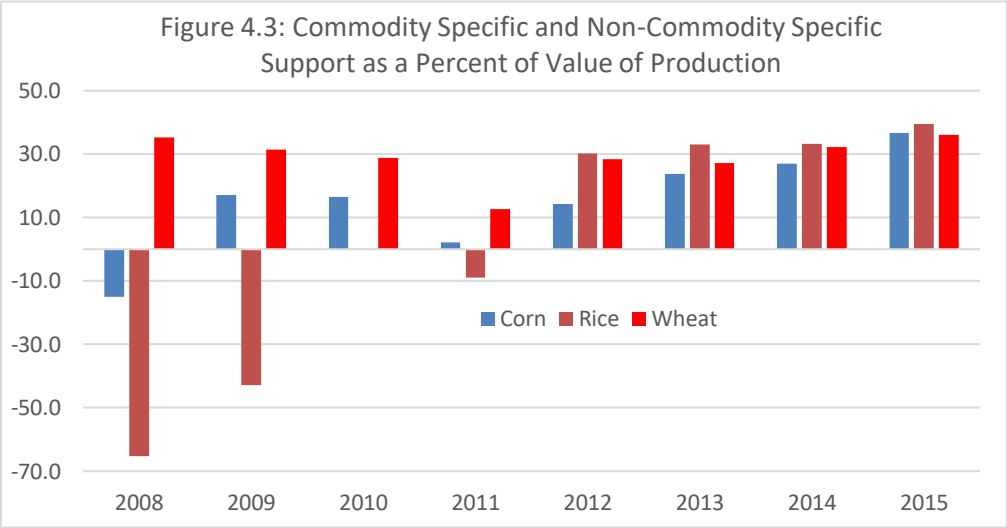


Figure 4.2: Commodity Specific, Non-Commodity Specific and General Services Support Estimates as a Percent of Value of Production (OECD)

In the graphs, grains include only wheat, rice and corn; oilseeds include soybeans, rapeseed and peanuts; Non-MPS commodities are all products for which OECD does not calculate commodity specific market price support; Other includes refined sugar, cotton and apples; Livestock includes pork, beef and veal, sheep meat, poultry meat, dairy, and eggs.

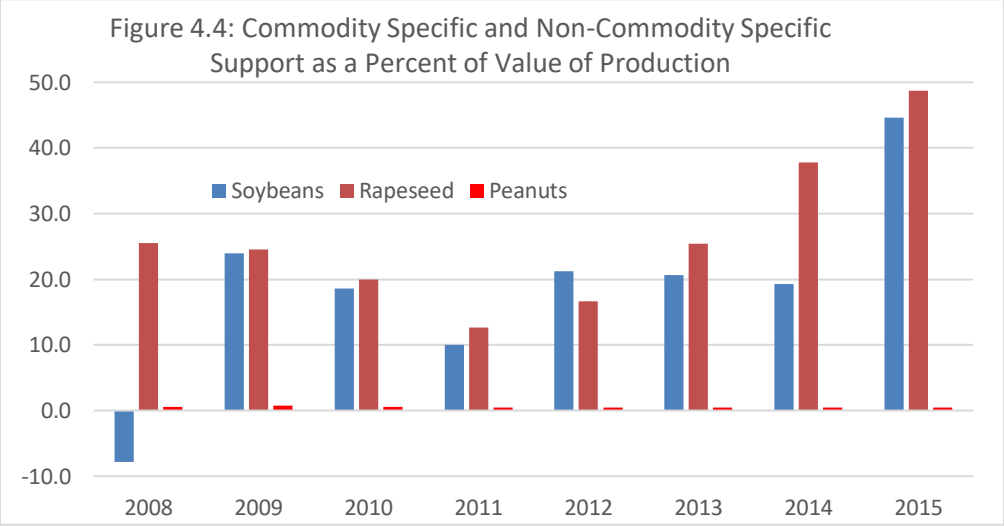
The NRPS are calculated in different ways from both OECD's Nominal Assistance Coefficient (NAC) and its Nominal Protection Coefficient (producer NPC). The NAC and NPC only measure the commodity specific measures of support. The NRPS includes an approximation of all support to a commodity using a methodology similar (but not identical) to that used by Anderson *et al*. (2008, 2016).

From the graphs, grains show a higher NRPS than other commodity groups in the final two years, while livestock shows the lowest NRPS in the last four years (2012-2015). Support for oilseeds has increased markedly over the last five years.



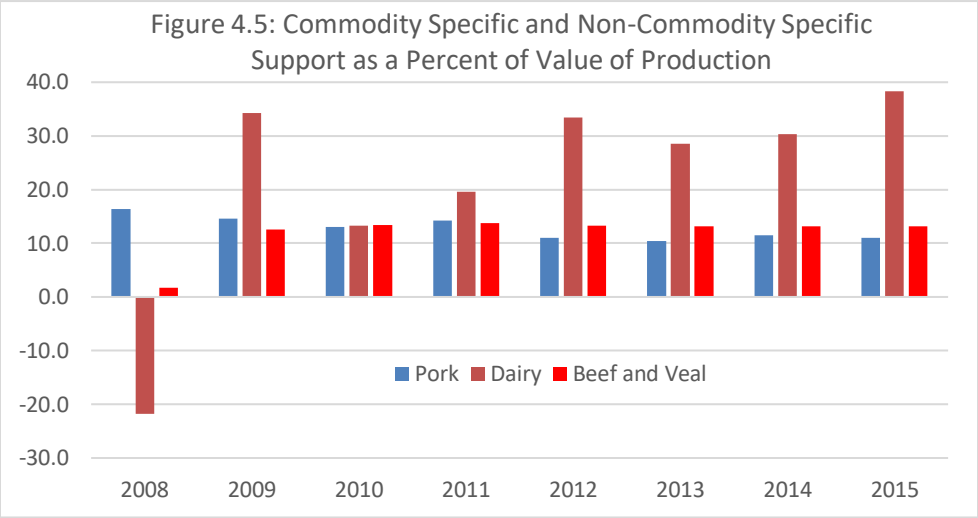
For the grains, from 2012 to 2015, rice and wheat received roughly the same support, while support for corn increased in each of the years, to the levels provided to wheat and rice.

Including the allocations for GSSE does not change the pattern show in the graph.



For the oilseeds, peanuts receive little support compared to rapeseed and soybeans. For both rapeseed and soybeans, the NRPS has risen sharply over the years 2011 to 2015. Rapeseed support has been higher than soybean support for the last three years shown in the graph.

For the livestock group, support for pork and beef and veal are constant between 10-13 percent NRPS for the period 2009 to 2015, while support for dairy is substantially higher at 29 to 38 percent over the 2012-2015 period.



In all of the graphs, the policies for these products demonstrate the approaches in place for the 12th Five year Plan (2011-2015) for agriculture in China, with marked differences from the previous period.

China's Tariffs

The box below explores tariff levels for selected products of interest in this study from the WTO. Carcass and half carcass of bovines carry higher tariffs than smaller cuts, whether fresh, chilled or frozen. For pork, tariffs are higher for fresh or chilled products than frozen carcasses and cuts. For sheep and lambs, the highest tariffs are for fresh, chilled or frozen sheep carcasses (excluding lambs), and lower tariffs for lamb carcasses and cuts, as well as cuts of sheep.

Tariffs for the major grains, rice, wheat, corn/maize and durum, have bound tariffs of 65 percent for over quota imports although Gale suggests the applied tariff is considerably less for corn.[21] Soybeans and rapeseed/canola/colza have substantially lower tariffs, 3 percent for soybeans, and 0-9 percent for rapeseed.

In dairy, products consisting of natural milk constituents, whether or not sweetened, n.e.s., (includes milk protein concentrates) have a 20 percent tariff while milk protein isolates have a 3-8 percent tariff.

By calculating the export price, transport, insurance and interest costs, and tariff, the domestic prices in China for corn, soybeans and rapeseed appear to be very close to the landed cost of these products in the past. This implies that the NRPS calculated above appears to capture the impact of the tariff for the period shown. However, with the target price and deficiency payment approach for grains and oilseeds, further analysis will be needed as soon as the detailed arrangements are available for 2016 and beyond. China has tariff rate quotas for wheat, corn, rice, sugar, wool and cotton. With the exception of sugar, wool, and cotton, the imports within quota have not been filled. The tariff rate quota for corn imports to

[21] Interestingly, the tariff rate quota for corn imports to China is 7.2 million tonnes and has not been filled in recent years. The US corn exports to China in 2011 were 2.73 million tonnes, yet the amount of corn imported under the tariff rate quota was only 1.75 million tonnes (China's WTO notification on tariff quotas for 2011), forcing at least a million tonnes to be imported from the USA at the applied over quota tariff rate.

China is 7.2 million tonnes and has not been filled in recent years. The US corn exports to China in 2011 were 2.73 million tonnes, yet the total amount of corn imported from all countries under the tariff rate quota was only 1.75 million tonnes (China's WTO notification on tariff quotas for 2011), forcing at least a million tonnes to be imported from the USA at the applied over quota tariff rate.

Box 4.1: Tariff Rates for Selected Products

HS Code	MFN Applied Maximum Ad Valorem Tariff	HS Code Description
020110	20	Carcases or half-carcases of bovine animals, fresh or chilled
020120	12	Fresh or chilled bovine cuts, with bone in (excl. carcases and 1/2 carcases)
020130	12	Fresh or chilled bovine meat, boneless
020210	25	Frozen bovine carcases and half-carcases
020220	12	Frozen bovine cuts, with bone in (excl. carcases and half-carcases)
020230	12	Frozen, boneless meat of bovine animals
020311	20	Fresh or chilled carcases and half-carcases of swine
020312	20	Fresh or chilled hams, shoulders and cuts thereof of swine, with bone in
020319	20	Fresh or chilled meat of swine (excl. carcases and half-carcases, and hams, shoulders and cuts thereof, with bone in)
020321	12	Frozen carcases and half-carcases of swine
020322	12	Frozen hams, shoulders and cuts thereof of swine, with bone in
020329	12	Frozen meat of swine (excl. carcases and half-carcases, and hams, shoulders and cuts thereof, with bone in)
020410	15	Fresh or chilled lamb carcases and half-carcases
020421	23	Fresh or chilled sheep carcases and half-carcases (excl. lambs)
020422	15	Fresh or chilled cuts of sheep, with bone in (excl. carcases and half-carcases)
020423	15	Fresh or chilled boneless cuts of sheep
020430	15	Frozen lamb carcases and half-carcases
020441	23	Frozen sheep carcases and half-carcases (excl. lambs)
020442	12	Frozen cuts of sheep, with bone in (excl. carcases and half-carcases)

020443	15	Frozen boneless cuts of sheep
040410	6	Whey and modified whey, whether or not concentrated or containing added sugar or other sweetening matter
040490	20	Products consisting of natural milk constituents, whether or not sweetened, n.e.s.
040510	10	Butter (excl. dehydrated butter and ghee)
100119	65	Durum wheat (excl. seed for sowing)
100199	65	Wheat and meslin (excl. seed for sowing, and durum wheat)
100590	65	Maize (excl. seed for sowing)
1006	65	Rice, all forms
120190	3	Soya beans, whether or not broken (excl. seed for sowing)
120510/120590	0-9	Rape or colza seeds, whether or not broken. Low and high erurcic acid
350400	3-8	Peptones and their derivatives; other protein substances and their derivatives, n.e.s.; hide powder, whether or not chromed (excl. organic or inorganic compounds of mercury whether or not chemically defined)

Exploring the OECD and WTO Notification Data

This section on China begins with an exploration of the data available in both the OECD database and WTO notifications by China. References are also used from USDA and other sources for confirmation. China has provided notifications for the years 2002 to 2010 as well as information tables for the years 1999 to 2001. The OECD database provides complete information for China for the years 1993 to 2015.

China acceded to the WTO in 2002. The bound total AMS for China is zero, hence commodity specific subsidies must remain below 8.5 percent of the value of production, the *de minimis* level established for China. Non-commodity specific subsidies in aggregate are also limited to 8.5 percent of total value of agricultural production. As well, China agreed to forego access to the "developing country" rules, thus denying its use and reporting on "developmental support", a category exempt from AMS calculations.

Assembling the information from China's notifications begs certain questions. The only entries from notifications for "applied administered prices" for corn are for the years 1999-2003; no information is provided in subsequent notifications.[22] There is no information on applied administered prices for rapeseed/colza and soybeans in any of the notifications. The only fixed external reference price in the notifications is for corn over the years 1999-2004; none is given for rapeseed and soybeans for any years.[23] Eligible production is provided for only corn for the years 1999-2004, however these data differ substantially from USDA and OECD production numbers. Clearly, the notifications of eligible production

[22] Because the fixed reference price is unchanged from year to year, one can assume that the fixed reference price is accurate for all subsequent years; even though it is not used or reported by China in its notifications.

[23] China used data for the period 1996 to 1998 for calculation of the fixed reference price, not 1986 to 1988 used by the original members of the WTO 1994.

refer to some amount different than actual total production in China, representing the governmental purchases at the administered prices according to several authors.

Year	Corn Production from OECD Data (1000 T)	Eligible Corn Production WTO Notifications (1000 T)
1999	128,086	53,500
2000	106,000	37,250
2001	114,088	31,100
2002	121,308	21,190
2003	115,830	13,040

Production and value of production data also differ substantially between the OECD/USDA data and the data notified by China; China's notifications for corn and soybean production and value of production are provided for the years 2002 to 2010; for rapeseed data are provided only for 2005 to 2010.

Comparison of OECD and WTO Notifications of Value of Production

	OECD Data (RMB Million)			China Notifications (RMB million)		
	Corn	Soybeans	Rapeseed	Corn	Soybeans	Rapeseed
2002	101,462	33,611	19,475	137,440	43,210	na
2003	109,320	40,930	27,047	145,250	50,120	na
2004	129,375	43,687	35,781	196,340	62,780	na
2005	142,988	39,631	29,310	199,300	64,570	95,790
2006	166,245	37,305	25,621	208,650	53,070	87,430
2007	191,471	43,527	32,336	236,720	49,460	122,620
2008	232,810	55,281	60,182	262,040	62,030	156,470
2009	248,190	52,447	48,199	258,420	57,310	51,080
2010	314,362	55,892	52,304	303,010	61,490	72,120

OECD gives "NBSC (National Bureau of Statistics of China), China Rural Statistical Yearbook, various editions" and "NBSC (National Bureau of Statistics of China), China Statistical Yearbook, various editions" as the source of its information for value of production and budgetary outlays.

In the examination of the three commodities, corn, soybeans and rapeseed/canola below, several data sets are used to calculate the transfers from consumers to producers, under the assumptions of:

- the most complete dataset to use is the OECD PSE tables, supplemented with USDA and published data by China,
- the price gap between support prices and landed prices is multiplied by total domestic production to calculate the transfer, not some lesser number such as government procurement for stocks,
  the fixed reference price for the commodities is taken from the years 1996-98; while the data to calculate the fixed reference price for the 1986-88 may be possible to find, the results from the use of 1996-98 prices would not change the outcome, except possibly to show greater transfers than calculated below.[24]

The complete tables showing the calculations are provided in Annex 2.

Corn

The study of corn pricing and the differences between the WTO and OECD calculations of the market price support measurements in China is instructive. To begin with, the differences in the MPS calculations need to be fully explored.

The OECD measures MPS as the sum of market based transfers from consumers to producers of a product, plus the budgetary transfers from government to producers of a product, minus any fees paid by producers in accessing the market and pricing arrangements. If consumption of the product is greater than the production in the importer, the transfers from consumers to producers represents the difference between the current landed reference price of a product in the importing country and the current price obtained by producers in the importing country, multiplied by the production of the product in the importing country. If consumption is less than production in the importer, then the price difference is multiplied by the consumption in the importing country. The rationale is that the MPS is calculated only on the direct transfers to the producer for the product consumed directly, not the transfers from consumers to producers of other products derived from the commodity, e.g., pork produced with corn.

The table below shows the data and calculation of the MPS for corn in China.

Table 4.1: MPS Calculation with OECD Method

Year	Producer Price	Reference Price	Production	Consumption	Transfers Consumers to Producers	Budgetary Transfers	Market Price Support

[24] The OECD data for China do not extend earlier than 1993.

	CNY/Tonne		1000 Tonnes		Billion CNY		
2010	1,773.60	1,491.58	177,245	178,110	49,986	0	49,986
2011	2,104.60	2,070.61	192,781	187,644	6,378	175	6,552
2012	2,268.00	1,955.63	205,614	183,350	57,273	6,955	64,228
2013	2,163.80	1,658.60	218,489	181,980	91,936	18,444	110,380
2014	2,196.80	1,615.14	215,646	170,012	98,889	26,543	125,433
2015	2,119.91	1,352.51	224,580	179,500	137,748	34,594	172,343

Source: OECD PSE Tables for China

The price gap has been widening over the period causing the transfers from consumers to producers to increase sharply, and the budgetary transfers have increased substantially starting in 2011. It is noted that consumption exceeded production in 2010, so that the price gap is multiplied by the production; for other years the price gap is multiplied by consumption.

The calculation of MPS by OECD does not require that an administered price in the importer exists; simply it captures the difference between landed and domestic prices regardless of why the gap exists. In this case, the import tariff is the principal cause of the gap. The MPS represents 36.2 percent of the value of corn production in 2015.

Turning to the WTO notification by China for corn, the transfers from consumers to producers are measured as the difference between the support price and the fixed external reference price for the period 1986-88, although in China's case, the country uses 1996-98.[25] The most recent notification by China is for the years 2009 and 2010. There is no calculation of market price support in the notifications for corn; the only product specific notification on corn is because of subsidies for improved crop strains and seeds of RMB 5,994 million, representing 1.98 percent of the value of production. The value of production is shown in the notification for 2010 as RMB 303,010 million, as compared to the OECD data showing RMB 476,089.84 million. Regardless of which value of production is used, the subsidy notified by China for corn remains *de minimis*.

To notify MPS under the WTO, an administered price must exist, provided by government or enabled by government action. The table below is an attempt to calculate the share of the value of production

[25] One can interpret the intention of the crafters of the AoA to set a fixed period for the reference price in a couple of ways. The overriding vision in the AoA was "to provide for substantial progressive reductions in agricultural support and protection sustained over an agreed period of time, resulting in correcting and preventing restrictions and distortions in world agricultural markets". With inflation in virtually all prices over time, this inflation effect increases the reportable MPS, and leads to greater pressure to limit MPS provided by a country to stay within the AMS limits, as an objective of the AoA. It also yields the result that when farm prices rise sharply, the countries using a fixed value support system will see their MPS rise substantially, suggesting that constant support levels need to be tailored to actual needs of the farm community. That is, rises in prices should result in lower subsidy needs.

represented by the transfers from consumers to producers provided to corn. It uses several sources of information to explore Chinese support. The difficulty is that considerable support is provided by purchase and storage programs, but these programs are exempted by Paragraph 3 of the AoA Annex 2 as public stockholding for food security purposes. However, in China's case, the public purchases and stockholding seem to be open ended and appear to be designed primarily to maintain a government established floor price, with considerably less concern for food security purposes. If one interprets the floor price as an administered price that supports the domestic price across all production, calculations can be made to determine the actual transfer from consumers to producers as a result of government action.[26]

The first row is a reproduction of the OECD methodology to calculate the transfers. The second row in the table calculates the price gap as the difference between the domestic price of corn reported by OECD and the support price established by China for corn. The third row calculates the price gap as the difference between the domestic price of corn reported by OECD and the simple average of the prices reported by OECD for the years 1996-98, an estimate of the "reference price" referred to in the WTO methodology. The fourth row calculates the price gap as the difference between the support price in China and the "reference price", the simple average of the prices reported by OECD for the years 1996-98. The final row calculates the price gap as the difference between the reference price provided by China and the simple average of the prices in 1996-98 reported by OECD. The fourth and fifth rows are as close to the WTO methodology as can be determined from the available data sources.

Three observations can be made. First, the level of transfers measured as a proportion of the value of production is rising across the years 2008-13 in all methods shown in the table.[27] Second, the levels of transfers are well above the *de miminis* limit allowed by China (8.5 percent) in almost all years and methodologies. Third, China has been raising the support prices fairly rapidly over the time period. When the current reference price is used (from current year OECD price data) the estimate of transfers is above the 8.5 *de minimis* limit, but considerably lower than when the reference price for the 1996-98 period (from OECD data) are used. The question that remains is whether China is correct in claiming exemption from reporting these transfers from consumers to producers under AoA.

[26] For the tables for corn, soybeans and rapeseed, data are drawn from the OECD PSE database, China notifications to the WTO, ComTrade, Pacific Exchange Rate Service, USDA ERS publication: Gale, Fred, 2013. Growth and Evolution of China's Agricultural Support Policies. USDA, Economic Research Service, ERR-153, and USDA FAS publication: Global Agricultural Information Network, March 2014. Peoples' Republic of China, Oilseeds and Products Annual (GAIN Report CH14010).

[27] The prices used by OECD represent "f.o.b. export unit values of maize, except seed corn (HS 1005 90) from 1993 to 2009. C.i.f. import unit values since 2010." This may account for the much lower transfer estimates in the table for the years 2008 and 2009, compared to the following years.

Table 4.2: Transfers from Consumers to Producers for Corn in China as a Percentage of Value of Production (or Consumption)[6]						
	2008	2009	2010	2011	2012	2013
OECD Methodology[1]	-13.5	15.1	15.9	1.6	12.3	19.4
OECD Domestic Price Difference from Support Price[2]	-8.5	15.6	18.6	-4.4	7.2	26.1
OECD Domestic Price Difference from OECD Reference Price[3]	31.2	36.2	45.5	54.1	57.4	55.4
Support Price Difference from OECD Reference Price[4]	38.2	35.5	48.2	48.1	50.9	58.1
Support price difference from China's reported WTO reference price	21.5	20.1	35.1	37.0	40.6	47.3
[1] Methodology taken from OECD manual						
[2] The price difference used is calculated as the reported OECD domestic price minus the domestic support price						
[3] The price difference used is calculated as the reported OECD domestic price minus the simple average prices reported by OECD for the years 1996-98.						
[4] The price difference used is calculated as the domestic support price minus the simple average prices reported by OECD for the years 1996-98.						
[5] The price difference used is calculated as the domestic support price minus the reference price 1996-98 reported to WTO in earlier years. This method approximates the WTO calculation method.						
[6] The price difference is multiplied by production to calculate the transfer except for the OECD methodology which uses either the production or consumption levels depending on which is lower.						

In September 2016, the USA requested discussions with China on rice, wheat and corn under the AoA of the WTO agreement 1994. Canada, Thailand, EU and Australia have requested (and been accepted by China) to be part of these discussions. The documentation suggests that the question noted above is central to the challenge the USA is raising.

China announced in March 2016 that it is halting its corn stockpiling program and allowing prices to be set by the domestic market for the 2016-17 marketing year starting in October. With almost one year of domestic market corn supplies in storage, prices can be expected to fall in the Chinese market as the stocks are reduced. This effectively eliminates the floor price that the purchase and stockholding program defended, removing an “administered price” for corn in China, and seemingly removing any reason to calculate the consumer to producer transfers as a subsidy to the corn industry in China under the WTO rules.

Is there a case for price suppression? The support price administered through purchase and stockholding of corn is likely to generate more corn in China than if no purchase program existed, putting downward pressure on corn prices generally. However, during this period, China was increasing corn stockholding thereby taking corn off the domestic market which can be expected to have the opposite price effect. Equally, the growth in corn imports by China over this period would have tended to strengthen world prices. Adding up these price effects would require use of one or more large scale models to determine the net price effects on world markets for corn. As China moves in the 2016-17 year to bring down stocks to a more normal level, the additional corn will tend to lower prices until a normal stock level is reached and reduce imports during this period, assuming that China’s intent to move to market established corn prices within China is realized.

Soybeans

The approach described above for assessing corn subsidies in China can also be applied to the soybean market. The table below provides the same information as in the table above for corn.[28] The interpretation of each of the rows is identical to that for corn. The level of transfers from consumers to producers rises through the years 2008 to 2013. Also, the levels of support as a percentage of the value of production lie well above the *de minimis* level for China. Because there is no "reference price" available publicly, the last row of the table cannot be calculated.

Table 4.3: Transfers from Consumers to Producers for Soybeans in China as a Percentage of Value of Production (or Consumption)[6]

	2008	2009	2010	2011	2012	2013
OECD Methodology[1]	-8.4	23.3	18.0	9.5	20.8	20.2
OECD Domestic Price Difference from Support Price[2]	-7.2	26.8	20.5	9.8	19.3	21.9
OECD Domestic Price Difference from OECD Reference Price[3]	39.5	40.5	41.9	46.0	53.9	52.4
Support Price Difference from OECD Reference Price[4]	40.7	44.0	44.4	46.3	52.4	54.1
Support price difference from China's reported WTO reference price	na	na	na	na	na	na

[1] Methodology taken from OECD manual

[2] The price difference used is calculated as the reported OECD domestic price minus the domestic support price

[3] The price difference used is calculated as the reported OECD domestic price minus the simple average prices reported by OECD for the years 1996-98.

[4] The price difference used is calculated as the domestic support price minus the simple average prices reported by OECD for the years 1996-98.

[5] The price difference used is calculated as the domestic support price minus the reference price 1996-98 reported to WTO in earlier years. This method approximates the WTO calculation method.

[6] The price difference is multiplied by production to calculate the transfer except for the OECD methodology which uses either the production or consumption levels depending on which is lower.

China has dropped its use of a support price for soybeans, with the intent of allowing prices to be established within the domestic market, assuming a continued level of imports. It is being replaced by direct subsidy payments in some states and a "target price" arrangement. As in the case of corn, the price effects on world markets of Chinese programs for soybeans would require the use of large scale models. The same three observations made for corn can be made for the case of soybeans.

[28] The prices used by OECD are: "C.i.f. import unit values of soybean, whether or not broken (HS 1201 00)."

The rationale for dropping the use of a support price for soybeans (and rapeseed) is that the intention of the program up to 2015 was to increase domestic production to offset the required imports. However, even with sharp increases in the support prices, production peaked in 2004, and has trended downward in the following years. In the most recent years, the support price was high enough that crushers could access imported beans more profitably than buying domestic soybeans.

Rapeseed/Colza/Canola

Applying the same calculations for rapeseed (canola)[29] that were used above for corn and soybeans, similar results are found.[30] The support levels exceed the 8.5 percent *de minimis* limit in all calculation methods and years. All three observations made for corn and soybeans apply to rapeseed.

Table 4.4: Transfers from Consumers to Producers for Rapeseed in China as a Percentage of Value of Production (or Consumption)[6]

	2008	2009	2010	2011	2012	2013
OECD Methodology[1]	24.8	23.8	19.4	12.2	16.2	25.0
OECD Domestic Price Difference from Support Price[2]	13.3	28.7	16.9	12.2	17.5	20.7
OECD Domestic Price Difference from OECD Reference Price[3]	66.7	53.0	58.5	64.0	66.4	68.7
Support Price Difference from OECD Reference Price[4]	55.1	57.9	56.1	64.0	67.7	64.3
Support price difference from China's reported WTO reference price	na	na	na	na	na	na

[1] Methodology taken from OECD manual

[2] The price difference used is calculated as the reported OECD domestic price minus the domestic support price

[3] The price difference used is calculated as the reported OECD domestic price minus the simple average prices reported by OECD for the years 1996-98.

[4] The price difference used is calculated as the domestic support price minus the simple average prices reported by OECD for the years 1996-98.

[5] The price difference used is calculated as the domestic support price minus the reference price 1996-98 reported to WTO in earlier years. This method approximates the WTO calculation method.

[6] The price difference is multiplied by production to calculate the transfer except for the OECD methodology which uses either the production or consumption levels depending on which is lower.

[29] Rapeseed data from OECD represents both rapeseed and mustard seed.

[30] The prices used by OECD are "C.i.f. import unit values of rape or colza seed, whether or not broken."

China has dropped its use of a support price for rapeseed, with the intent of allowing prices to be established within the domestic market, assuming a continued level of imports (Pratt). It is being replaced by direct subsidy payments in some states and a "target price" arrangement. Again, the support price had risen rapidly in the most recent years, and crushers could access imported canola more profitably than buying domestic production (AgCanada 2013, ChinaAg 2015).

A recent paper by Brink and Orden explores the rationale for and precedents regarding the USA challenge on rice, wheat and corn. Several issues are raised regarding the way in which China has calculated the MPS for the three commodities. The first issue is whether the total production or some lesser amount such as the amount of actual purchases by government under a price support arrangement can be used to calculate the MPS. The second issue is China's use of milled rice volumes and rough rice prices used for MPS calculations. The third issue relates to the appropriate reference years for calculation of the fixed reference price. China's accession agreement to the WTO does not specify the years to use, although China, since its accession, has used 1996-98 rather than the 1986-88 period specified in the AoA. Pursuing the challenge through to a panel and all appeals, would certainly help to clarify many of these interpretation issues, as well as bringing greater rigour and clarity to China's WTO notifications.

Regarding Canada's interest in the dispute, while having little interest in rice, it certainly has a stake in the clarification of the AoA interpretations, not only for corn and wheat, but by precedent, the extension of the outcomes to soybeans and canola. However, there is very little information on the new arrangements for oilseeds in China starting under the 13th Five Year Plan (at least to this author), so re-examination will be required as soon as the state subsidies and target price program are published and implemented.

Part of the chapter on agriculture in 13th Five Year Plan for the period 2016 to 2020 is excerpted in the Annex 1. It demonstrates the recognition that substantial change in the support arrangements for grains and oilseeds is needed.

A recent news report indicates that China appears to have dropped its policy of 90 percent self-sufficiency, and abandoned minimum prices for corn, but maintaining them for rice and wheat. There are also indications that China is more open to relying on imports of feed and foodstuffs to assure adequate supplies to meet consumer and industrial demand.[31] Because of the high level of stocks of corn, China is encouraging greater use of corn for ethanol production.[32]

China's Resources

Broadly designed, there are four resources in agricultural production: water, arable land, production technology including genetics, and the fuels and chemicals for crop and livestock production. Both water and land are of critical importance in China. There is less than 0.1 hectares of arable land per person in China (World Bank, 2011). Water resources, particularly in the northern plains, are very limited and

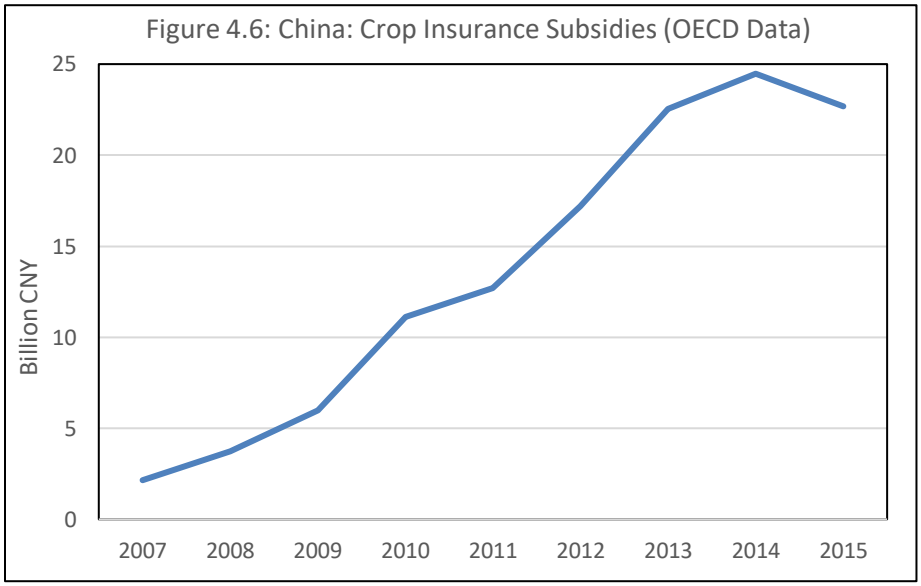
[31] Reuters, 2017.
[32] ChinaAg, 2017.

sporadic. China has invested heavily in water infrastructure, linking watersheds to provide more predictable water supplies across eastern China for urban, industrial and agricultural use.

Imports of agricultural products contain "virtual water", the water used to produce the commodity in the exporting country, e.g., corn, soybeans and rapeseed. There is considerably more virtual water in meat and dairy products, adding not only the water used to produce feed but also the cost of raising and maintaining animals and the meat and dairy processing. It has been surprising that China has pursued growth in livestock production supported by imported grains and oilseeds.

China's Policy Space

Policy space in the context of WTO refers to what policies and programs can be used by a country that would maintain CTAMS to remain at or less than BTAMS. China has indicated that it will be changing course in the transfers to agriculture, based on the 13th Five Year Plan. Two possibilities have been discussed in the press, strengthening and expanding crop insurance, and a target price and deficiency payment scheme, although such an arrangement may only be applicable to some provinces and regions. Underlying the transfers was the goal of attaining and maintaining 90 percent of food self-sufficiency.[33]



The crop insurance program in China has been increasing markedly over the past ten years, and various authors have indicated that it is now the second largest crop insurance program in the world. (Ye et al.; Wang, et al.; Zhang) The use of a target price and deficiency payment approach (a commodity specific transfer) will likely exceed the BTAMS for China, unless it remains below 8.5 percent of the value of production. If it represents a generally available direct payment based on income/revenue (whole farm payment, non-product specific), then the transfers must remain below 8.5 percent of the value of total production.

[33] There is no clearly defined way indicated for measuring this goal, value, volume or some other aggregate measure.

These options appear to be very limiting for China if China wishes to maintain the level of transfers experienced in the years 2012 to 2015.

Observations and Conclusions

One obviously missing element of the 2010 notification is the subsidies for crop insurance. The crop insurance program in China is considered the second largest such program in the world and still growing, with over US$3 billion in subsidies in recent years.

There is a considerable lack of clarity in the accession protocol and working party documents covering China's accession to the WTO. However, understanding the rules on AMS calculations for public stock holding, there is appears to be a gap in China's notifications to the WTO. One interpretation is that China simply neglected to report stock holding costs for corn, soybeans and canola, assuming that the stock purchase prices are current market prices and do not represent support prices. In this case, it makes no difference since the costs of stock holding are exempt from calculation of the AMS. The other interpretation is that the stock purchase prices are *de facto* support prices, and hence the price gap between the external reference prices and the support prices must be included in the calculation of the AMS as market support, whether China is a developed or a developing country. Clearly, legal interpretations may find alternative views than those in this paper and that may be found within the conflicting rules across the various documents of accession and the Agreement on Agriculture.

On the basis that the purchase prices for corn, soybeans and rapeseed/canola are *de facto* support prices administered by government, estimates of the levels of support for the three commodities are calculated and compared to the bound total AMS (nil) and the conformity with the 8.5 percent *de minimis* limit, i.e., the estimated support as a percent of value of production. Part of the rationale for proposing that the purchase prices are administered support levels is the WTO notifications in early years of market price support for these three commodities, with no change in the underlying programs thereafter except for substantial increases in the announced support/purchase prices in the most recent years. In all three commodities, the estimated support levels are substantially above the *de minimis* level of 8.5 percent of the value of production. Limiting the value of production in the AMS calculation to only those volumes actually purchased, does not consistently reduce the estimated support below the *de miminis* level, particularly in the most recent years.[34]

A watching brief on China's emerging support policies will be needed as they are announced and implemented. The most recent information on the changes in agricultural support policy can be found in the USDA Gain Report by Lisa Anderson; both the USDA assessment and the full text of the Document 1 Policy Statement are available in the GAIN Report.

[34] The authors of this chapter stumbled on to the fact that others (Brink and Orden) were carrying out virtually identical calculations about the time that both groups had completed their calculations. The results in this chapter vary only very slightly from the Brink Orden results, based on slight differences in the currency exchange rates employed.

References

AgCanada, 2013. China's Sinograin eyes rapeseed crushers on alleged subsidy violation. Accessed at: http://www.agcanada.com/daily/chinas-sinograin-eyes-rapeseed-crushers-on-alleged-subsidy-violation

Anderson, Lisa, 2017. China's Annual Agricultural Policy Goals: The 2017 No. 1 Document of the CCCPC and the State Council. GAIN Report Number CH17001, 15 February 2017. Available at: https://gain.fas.usda.gov/Recent%20GAIN%20Publications/China%27s%202017%20Agricultural%20Policy%20Goals_Beijing_China%20-%20Peoples%20Republic%20of_2-15-2017.pdf

Anderson, K, and Jensen, H.G., 2016. "How Much Government Assistance Do European Wine Producers Receive?" Journal of Wine Economics, Volume 11, Number 2, 2016, Pages 289–305. doi:10.1017/jwe.2016.16

Anderson, K., Kurzweil, M., Martin, W., Sandri, D., and Valenzuela, E. (2008). Measuring distortions to agricultural incentives, revisited. World Trade Review, 7(4), 675–704.

Brink, Lars, and David Orden, 2016. US WTO Complaint on China's Agricultural Domestic Support: Some Preliminary Observations on the Case and its Context. Draft paper presented at the IATRC Meeting, Scottsdale, Arizona, 11-13 December 2016.
Available: https://www.researchgate.net/publication/312611277_The_United_States_WTO_Complaint_on_China%27s_Agricultural_Domestic_Support_Preliminary_Observations

China, 2016. The 13th Five year Plan for Economic and Social Development of the Peoples' Republic of China (2016-2020).

ChinaAg, 2015. Chinese Rapeseed (Canola) Production May Follow a Similar Path as Soybeans. http://chinaag.org/2015/10/13/chinese-rapeseed-canola-production-may-follow-a-similar-path-as-soybeans/

ChinaAg, 2017. China to consider changing the minimum purchasing price for wheat and rice in 2017. Available at: http://www.chinaag.org/2017/01/17/china-to-consider-changing-the-minimum-purchasing-price-for-wheat-and-rice-in-2017/

Gale, Fred, 2013. Growth and Evolution of China's Agricultural Support Policies. USDA, Economic Research Service, ERR-153. Accessed at: http://en.ndrc.gov.cn/policyrelease/201612/P020161207645766966662.pdf

Gale, Fred, 2015. China's grain stockpiling distorts market. Nikkei Asian Review. March 17, 2015. Available at: http://asia.nikkei.com/Viewpoints-archive/Perspectives/China-s-grain-stockpiling-distorts-market

Gale, Fred, 2017. China's Pork Imports Rise Along with Production Costs. USDA, Economic Research Service, Document LDPM-271-01. Available at: https://www.ers.usda.gov/webdocs/publications/ldpm27101/ldpm-271-01.pdf?v=42745

OECD PSE Database. Producer and Consumer Support Estimates Database. Accessed at: http://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm

Pratt, Sean, 2015. China scraps domestic rapeseed support plan. Western Producer. 9 July 2015.

Reuters, 2017. China's latest farm policy shifts focus from output to demand. Commodities, 6 February 2017. Available at: http://www.reuters.com/article/us-china-policy-agriculture-demand-idUSKBN15L12C

Wang, Ming, Peijun Shi, Tao Ye, Min Liu, and Meiqin Zhou, 2011. Agriculture Insurance in China: History, Experience, and Lessons Learned. Int. J. Disaster Risk Sci. 2011, 2 (2): 10–22 doi:10.1007/s13753-011-0007-6

World Bank, 2011. Data from: http://www.tradingeconomics.com/china/arable-land-hectares-per-person-wb-data.html.

WSJ, 2016. China's Corn Mountain. 6 October. http://www.wsj.com/articles/chinas-corn-mountain-1475798395

WTO Notifications for China of Domestic Subsidies. Accessed at: https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=(%20@Symbol=%20g/ag/n/chn/*)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChanged=true#

WTO. Tariff Rates by Country and HS Code (6 digit, HS 12 Version). Accessed at: https://www.wto.org/english/res_e/doload_e/doload_e.htm#Downloadingfiles

WTO, 2001a. Working Party Report on the Accession of China. Document WT/MIN(01)/3. 10 November 2001.

WTO, 2001b. Protocol on the Accession of the People's Republic of China. Document WT/L/432 23 November 2001.

Ye, Helen and Vergara, Oscar, 2009. Agricultural Risk and the Crop Insurance Market in China. AirCurrents. http://www.agriskmanagementforum.org/sites/agriskmanagementforum.org/files/Documents/AIR_Currents-_Agricultural_Risk_and_the_Crop_Insurance_Market_in_China.pdf

Zhang, Wendong, 2017. What's going on in China: GMO, Crop Insurance and High Speed Rails. http://www.card.iastate.edu/products/presentations/files/zhang_jan17_cas_china_ag.pdf

Annex 1: Excerpt of 13th Five Year Plan

THE 13TH FIVE-YEAR PLAN FOR ECONOMIC AND SOCIAL DEVELOPMENT

OF THE PEOPLE'S REPUBLIC OF CHINA

(2016–2020)

http://en.ndrc.gov.cn/policyrelease/201612/P020161207645766966662.pdf

Chapter 21

Improve Systems for Providing Support and Protection for Agriculture

With an emphasis on ensuring the supply of major agricultural products, promoting increases in rural incomes, and achieving sustainable agricultural development, we will improve policy support aimed at strengthening agriculture, benefiting farmers, and raising rural living standards and raise our level of support and protection for agriculture.

Section 1

Increased Investment in Agriculture

We will establish a mechanism for steadily increasing investment in agriculture and rural areas. In the area of agricultural investment, we will improve the government spending mix, create new ways of investing and operating government funds, promote the integration of investment projects, and improve the efficacy of subsidy policies. We will progressively increase the range and scale of green box subsidies while adjusting and improving amber box policies. The subsidies for food crop production, for promoting superior grain crop varieties, and for supporting the purchase of agricultural supplies will be combined into a single agricultural support and protection subsidy. We will improve subsidy policies for the purchase of agricultural machinery and tools, and give priority to grain crop producers, new types of agribusinesses, and major agricultural production areas in the allocation of these subsidies. We will establish a system of protection and compensation for arable land.

Section 2

Pricing, Purchasing, and Stockpiling Systems for Agricultural Products

We will ensure equal emphasis is placed on both carrying out market- oriented reforms and protecting the interests of farmers, and improve the system for regulating the market for agricultural products and the market system itself. We will continue to implement and improve the minimum purchase price policy for rice and wheat, and deepen reform of the program for guaranteeing base prices for cotton and soybeans. We will explore the possibility of trialing base price insurance for agricultural products. We will actively and prudently carry out reform of the price-setting mechanism and the purchasing and stockpiling systems for corn, and establish a system for subsidizing corn producers. We will implement a project to ensure security of the purchase, stockpiling, and supply of grain crops, research and determine the optimum scale of reserves of grain crops and other important agricultural products, reform and improve the grain crop reserve management system as well as mechanisms for grain crop regulation and adjustment, and guide a diverse range of market entities—such as distribution and processing businesses—in participating in the purchase and stockpiling of agricultural products. We will move forward with the development of intelligent storage facilities for grain crops and work to conserve grain crops and reduce waste.

Annex II: Calculation of Levels of Support, Corn, Soybeans and Rapeseed

Corn

Year	Support Price (RMB/T)	Reference Price 1996-98 used by China RMB/T	OECD Reference Price 1996-98 RMB/T	**OECD Domestic Producer Price (RMB/T)**	**OECD Reference Price RMB/T**	Production '000 T	Consumption '000 T	**OECD Price Difference RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption	**Actual Transfer under OECD RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	1,501	1,199	966	1,403.20	1,620.90	165,913.96	144,602.00	-217.70	-36,120	-31,480	-31,480	232,810	-13.5
2009	1,503	1,199	966	1,513.60	1,266.75	163,973.62	151,630.00	246.85	40,476	37,429	37,429	248,190	15.1
2010	1,821	1,199	966	1,773.60	1,491.58	177,245.00	178,110.00	282.02	49,986	50,230	49,986	314,362	15.9
2011	1,978	1,199	966	2,104.60	2,070.61	192,781.00	187,644.00	33.99	6,552	6,378	6,378	405,727	1.6
2012	2,120	1,199	966	2,268.00	1,955.63	205,614.00	183,350.00	312.37	64,228	57,273	57,273	466,333	12.3
2013	2,223	1,199	966	2,163.80	1,658.60	218,489.00	181,980.00	505.20	110,380	91,936	91,936	472,766	19.4
2014	2,250	1,199	966	2,196.80	1,615.14	215,646.00	170,012.00	581.66	125,433	98,889	98,889	473,731	20.9
2015	2,250	1,199	966	2,119.91	1,352.51	224,580.00	179,500.00	767.40	172,343	137,748	137,748	476,090	28.9

Year	**Support Price (RMB/T)**	Reference Price 1996-98 used by China RMB/T	OECD Reference Price 1996-98 RMB/T	OECD Domestic Producer Price (RMB/T)	**OECD Reference Price RMB/T**	Production '000 T	Consumption '000 T	**OECD Reference Price Difference from Support Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Support Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	1,501	1,199	966	1,403.20	1,620.90	165,913.96	144,602.00	-119.8	-19,875	-17,322	-19,875	232,810	-8.5
2009	1,503	1,199	966	1,513.60	1,266.75	163,973.62	151,630.00	236.1	38,711	35,797	38,711	248,190	15.6
2010	1,821	1,199	966	1,773.60	1,491.58	177,245.00	178,110.00	329.3	58,373	58,658	58,373	314,362	18.6
2011	1,978	1,199	966	2,104.60	2,070.61	192,781.00	187,644.00	-92.6	-17,854	-17,378	-17,854	405,727	-4.4
2012	2,120	1,199	966	2,268.00	1,955.63	205,614.00	183,350.00	164.2	33,752	30,098	33,752	466,333	7.2
2013	2,223	1,199	966	2,163.80	1,658.60	218,489.00	181,980.00	564.1	123,240	102,647	123,240	472,766	26.1
2014	2,250	1,199	966	2,196.80	1,615.14	215,646.00	170,012.00	634.9	136,905	107,934	136,905	473,731	28.9
2015	2,250	1,199	966	2,119.91	1,352.51	224,580.00	179,500.00	897.5	201,558	161,099	201,558	476,090	42.3

Year	Support Price (RMB/T)	Reference Price 1996-98 used by China RMB/T	**OECD Reference Price 1996-98 RMB/T**	**OECD Domestic Producer Price (RMB/T)**	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**OECD Domestic Price Difference from OECD Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	1,501	1,199	966	1,403.20	1,620.90	165,913.96	144,602.00	437.4	72,577	63,255	72,577	232,810	31.2
2009	1,503	1,199	966	1,513.60	1,266.75	163,973.62	151,630.00	547.8	89,831	83,069	89,831	248,190	36.2
2010	1,821	1,199	966	1,773.60	1,491.58	177,245.00	178,110.00	807.8	143,186	143,884	143,186	314,362	45.5
2011	1,978	1,199	966	2,104.60	2,070.61	192,781.00	187,644.00	1,138.8	219,547	213,696	219,547	405,727	54.1
2012	2,120	1,199	966	2,268.00	1,955.63	205,614.00	183,350.00	1,302.2	267,759	238,766	267,759	466,333	57.4
2013	2,223	1,199	966	2,163.80	1,658.60	218,489.00	181,980.00	1,198.0	261,759	218,019	261,759	472,766	55.4
2014	2,250	1,199	966	2,196.80	1,615.14	215,646.00	170,012.00	1,231.0	265,469	209,292	265,469	473,731	56.0
2015	2,250	1,199	966	2,119.91	1,352.51	224,580.00	179,500.00	1,154.2	259,199	207,170	259,199	476,090	54.4

Corn

Year	**Support Price (RMB/T)**	Reference Price 1996-98 used by China RMB/T	**OECD Reference Price 1996-98 RMB/T**	OECD Domestic Producer Price (RMB/T)	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**Support Price Difference from OECD Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	1,501	1,199	966	1,403.20	1,620.90	165,913.96	144,602.00	535.3	88,822	77,412	88,822	232,810	38.2
2009	1,503	1,199	966	1,513.60	1,266.75	163,973.62	151,630.00	537.1	88,066	81,437	88,066	248,190	35.5
2010	1,821	1,199	966	1,773.60	1,491.58	177,245.00	178,110.00	855.2	151,573	152,312	151,573	314,362	48.2
2011	1,978	1,199	966	2,104.60	2,070.61	192,781.00	187,644.00	1,012.2	195,141	189,941	195,141	405,727	48.1
2012	2,120	1,199	966	2,268.00	1,955.63	205,614.00	183,350.00	1,154.0	237,283	211,590	237,283	466,333	50.9
2013	2,223	1,199	966	2,163.80	1,658.60	218,489.00	181,980.00	1,256.9	274,618	228,730	274,618	472,766	58.1
2014	2,250	1,199	966	2,196.80	1,615.14	215,646.00	170,012.00	1,284.2	276,941	218,336	276,941	473,731	58.5
2015	2,250	1,199	966	2,119.91	1,352.51	224,580.00	179,500.00	1,284.2	288,415	230,521	288,415	476,090	60.6

Year	**Support Price (RMB/T)**	**Reference Price 1996-98 used by China RMB/T**	OECD Reference Price 1996-98 RMB/T	OECD Domestic Producer Price (RMB/T)	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**Support Price Difference from China Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	1,501	1,199	966	1,403.20	1,620.90	165,913.96	144,602.00	302.1	50,124	43,685	50,124	232,810	21.5
2009	1,503	1,199	966	1,513.60	1,266.75	163,973.62	151,630.00	303.8	49,821	46,071	49,821	248,190	20.1
2010	1,821	1,199	966	1,773.60	1,491.58	177,245.00	178,110.00	621.9	110,232	110,770	110,232	314,362	35.1
2011	1,978	1,199	966	2,104.60	2,070.61	192,781.00	187,644.00	779.0	150,176	146,175	150,176	405,727	37.0
2012	2,120	1,199	966	2,268.00	1,955.63	205,614.00	183,350.00	920.8	189,326	168,825	189,326	466,333	40.6
2013	2,223	1,199	966	2,163.80	1,658.60	218,489.00	181,980.00	1,023.7	223,657	186,285	223,657	472,766	47.3
2014	2,250	1,199	966	2,196.80	1,615.14	215,646.00	170,012.00	1,051.0	226,644	178,683	226,644	473,731	47.8
2015	2,250	1,199	966	2,119.91	1,352.51	224,580.00	179,500.00	1,051.0	236,034	188,655	236,034	476,090	49.6

Soybeans

Year	Support Price (RMB/T)	Reference Price 1996-98 used by China RMB/T	OECD Reference Price 1996-98 RMB/T	**OECD Domestic Producer Price (RMB/T)**	**OECD Reference Price RMB/T**	Production '000 T	Consumption '000 T	**OECD Price Difference RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Actual Transfer under OECD RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	3600		2,152.60	3,556.20	3,856.49	15,545.00	51,610.00	-300.29	-4,668	-15,498	-4,668	55,281.13	-8.4
2009	3743		2,152.60	3,617.00	2,774.84	14,500.14	58,650.00	842.16	12,211	49,392	12,211	52,447.01	23.3
2010	3798		2,152.60	3,705.60	3,038.43	15,083.00	65,340.00	667.17	10,063	43,593	10,063	55,891.56	18.0
2011	4001		2,152.60	3,989.80	3,610.09	14,485.00	70,600.00	379.71	5,500	26,807	5,500	57,792.25	9.5
2012	4599		2,152.60	4,665.80	3,697.42	13,050.00	74,500.00	968.38	12,637	72,145	12,637	60,888.69	20.8
2013	4600		2,152.60	4,522.40	3,608.18	11,950.00	79,480.00	914.22	10,925	72,662	10,925	54,042.68	20.2
2014	4600		2,152.60	4,194.00	3,403.02	12,154.00	84,250.00	914.22	11,111	77,023	11,111	50,973.88	21.8
2015			2,152.60	4,139.48	2,579.49	11,000.00	91,000.00	914.22	10,056	83,194	10,056	45,534.26	22.1

Year	**Support Price (RMB/T)**	Reference Price 1996-98 used by China RMB/T	OECD Reference Price 1996-98 RMB/T	OECD Domestic Producer Price (RMB/T)	**OECD Reference Price RMB/T**	Production '000 T	Consumption '000 T	**Domestic Price Difference from Support Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Support Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	3600		2,152.60	3,556.20	3,856.49	15,545.00	51,610.00	-256.6	-3,989	-13,244	-3,989	55,281.13	-7.2
2009	3743		2,152.60	3,617.00	2,774.84	14,500.14	58,650.00	968.6	14,045	56,808	14,045	52,447.01	26.8
2010	3798		2,152.60	3,705.60	3,038.43	15,083.00	65,340.00	759.1	11,450	49,600	11,450	55,891.56	20.5
2011	4001		2,152.60	3,989.80	3,610.09	14,485.00	70,600.00	391.2	5,666	27,616	5,666	57,792.25	9.8
2012	4599		2,152.60	4,665.80	3,697.42	13,050.00	74,500.00	901.8	11,768	67,181	11,768	60,888.69	19.3
2013	4600		2,152.60	4,522.40	3,608.18	11,950.00	79,480.00	991.8	11,852	78,830	11,852	54,042.68	21.9
2014	4600		2,152.60	4,194.00	3,403.02	12,154.00	84,250.00	1,196.98	14,548	100,845	14,548	50,973.88	28.5
2015			2,152.60	4,139.48	2,579.49	11,000.00	91,000.00					45,534.26	

Year	Support Price (RMB/T)	Reference Price 1996-98 used by China RMB/T	**OECD Reference Price 1996-98 RMB/T**	**OECD Domestic Producer Price (RMB/T)**	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**Domestic Price Difference from Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	3600		2,152.60	3,556.20	3,856.49	15,545.00	51,610.00	1,403.6	21,819	72,440	21,819	55,281.13	39.5
2009	3743		2,152.60	3,617.00	2,774.84	14,500.14	58,650.00	1,464.4	21,234	85,887	21,234	52,447.01	40.5
2010	3798		2,152.60	3,705.60	3,038.43	15,083.00	65,340.00	1,553.0	23,424	101,473	23,424	55,891.56	41.9
2011	4001		2,152.60	3,989.80	3,610.09	14,485.00	70,600.00	1,837.2	26,612	129,706	26,612	57,792.25	46.0
2012	4599		2,152.60	4,665.80	3,697.42	13,050.00	74,500.00	2,513.2	32,797	187,233	32,797	60,888.69	53.9
2013	4600		2,152.60	4,522.40	3,608.18	11,950.00	79,480.00	2,369.8	28,319	188,352	28,319	54,042.68	52.4
2014	4600		2,152.60	4,194.00	3,403.02	12,154.00	84,250.00	2,041.4	24,811	171,988	24,811	50,973.88	48.7
2015			2,152.60	4,139.48	2,579.49	11,000.00	91,000.00	1,986.9	21,856	180,806	21,856	45,534.26	48.0

Soybeans

Year	**Support Price (RMB/T)**	Reference Price 1996-98 used by China RMB/T	**Reference Price 1996-98 from OECD Data RMB/T**	OECD Domestic Producer Price (RMB/T)	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**Support Price Difference from Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	3600		2,152.60	3,556.20	3,856.49	15,545.00	51,610.00	1,447.3	22,498	74,694	22,498	55,281.13	40.7
2009	3743		2,152.60	3,617.00	2,774.84	14,500.14	58,650.00	1,590.8	23,067	93,302	23,067	52,447.01	44.0
2010	3798		2,152.60	3,705.60	3,038.43	15,083.00	65,340.00	1,644.9	24,810	107,480	24,810	55,891.56	44.4
2011	4001		2,152.60	3,989.80	3,610.09	14,485.00	70,600.00	1,848.6	26,778	130,514	26,778	57,792.25	46.3
2012	4599		2,152.60	4,665.80	3,697.42	13,050.00	74,500.00	2,446.6	31,928	182,269	31,928	60,888.69	52.4
2013	4600		2,152.60	4,522.40	3,608.18	11,950.00	79,480.00	2,447.4	29,246	194,519	29,246	54,042.68	54.1
2014	4600		2,152.60	4,194.00	3,403.02	12,154.00	84,250.00	2,447.4	29,746	206,193	29,746	50,973.88	58.4
2015			2,152.60	4,139.48	2,579.49	11,000.00	91,000.00					45,534.26	

Year	**Support Price (RMB/T)**	**Reference Price 1996-98 used by China RMB/T**	Reference Price 1996-98 from OECD Data RMB/T	OECD Domestic Producer Price (RMB/T)	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**Support Price Difference from Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	3600		2,152.60	3,556.20	3,856.49	15,545.00	51,610.00					55,281.13	
2009	3743		2,152.60	3,617.00	2,774.84	14,500.14	58,650.00					52,447.01	
2010	3798		2,152.60	3,705.60	3,038.43	15,083.00	65,340.00					55,891.56	
2011	4001		2,152.60	3,989.80	3,610.09	14,485.00	70,600.00					57,792.25	
2012	4599		2,152.60	4,665.80	3,697.42	13,050.00	74,500.00					60,888.69	
2013	4600		2,152.60	4,522.40	3,608.18	11,950.00	79,480.00					54,042.68	
2014	4600		2,152.60	4,194.00	3,403.02	12,154.00	84,250.00					50,973.88	
2015			2,152.60	4,139.48	2,579.49	11,000.00	91,000.00					45,534.26	

Rapeseed

Year	Support Price (RMB/T)	Reference Price 1996-98 used by China RMB/T	Reference Price 1996-98 from OECD Data RMB/T	**OECD Domestic Producer Price (RMB/T)**	**OECD Reference Price RMB/T**	Production '000 T	Consumption '000 T	**OECD Price Difference RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Actual Transfer under OECD RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	4,399	2,330	1,658	4,973	3,737	12,102	13,600	1,235.61	14,953	CNY million	14,953	60,181.56	24.8
2009	3,702	2,330	1,658	3,529	2,690	13,657	17,020	838.97	11,458	142,793	11,458	48,198.81	23.8
2010	3,899	2,330	1,658	3,998	3,223	13,082	14,310	775.53	10,146	110,979	10,146	52,304.45	19.4
2011	4,602	2,330	1,658	4,602	4,040	13,426	15,500	562.33	7,550	87,160	7,550	61,791.82	12.2
2012	5,003	2,330	1,658	4,939	4,139	14,007	17,150	800.03	11,206	137,206	11,206	69,186.18	16.2
2013	5,060	2,330	1,658	5,288	3,967	14,458	18,250	1,320.33	19,089	240,961	19,089	76,451.01	25.0
2014	5,000	2,330	1,658	5,224.80	3,271.83	14,772.00	19,600.00	1,952.97	28,849	382,782	28,849	77,180.75	37.4
2015		2,330	1,658	5,266.60	2,723.70	14,300.00	18,900.00	2,542.90	36,363	480,607	36,363	75,312.36	48.3

Year	**Support Price (RMB/T)**	Reference Price 1996-98 used by China RMB/T	Reference Price 1996-98 from OECD Data RMB/T	OECD Domestic Producer Price (RMB/T)	**OECD Reference Price RMB/T**	Production '000 T	Consumption '000 T	**OECD Domestic Price Difference from Support Price RMB/T**	Consumer to Producer Transfer OECD Production RMB milliom	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Support Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	4,399	2,330	1,658	4,973	3,737	12,102	13,600	661.69	8,008	89,989	8,008	60,181.56	13.3
2009	3,702	2,330	1,658	3,529	2,690	13,657	17,020	1,012.22	13,824	172,279	13,824	48,198.81	28.7
2010	3,899	2,330	1,658	3,998	3,223	13,082	14,310	676.40	8,849	96,793	8,849	52,304.45	16.9
2011	4,602	2,330	1,658	4,602	4,040	13,426	15,500	562.33	7,550	87,161	7,550	61,791.82	12.2
2012	5,003	2,330	1,658	4,939	4,139	14,007	17,150	863.57	12,096	148,103	12,096	69,186.18	17.5
2013	5,060	2,330	1,658	5,288	3,967	14,458	18,250	1,092.69	15,798	199,415	15,798	76,451.01	20.7
2014	5,000	2,330	1,658	5,224.80	3,271.83	14,772.00	19,600.00	1,728.17	25,529	338,721	25,529	77,180.75	33.1
2015		2,330	1,658	5,266.60	2,723.70	14,300.00	18,900.00					75,312.36	0.0

Year	Support Price (RMB/T)	Reference Price 1996-98 used by China RMB/t	**Reference Price 1996-98 from OECD Data RMB/T**	**OECD Domestic Producer Price (RMB/T)**	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**OECD Domestic Price Difference from OECD Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	4,399	2,330	1,658	4,973	3,737	12,102	13,600	3,315.33	40,121	450,885	40,121	60,181.56	66.7
2009	3,702	2,330	1,658	3,529	2,690	13,657	17,020	1,871.53	25,560	318,535	25,560	48,198.81	53.0
2010	3,899	2,330	1,658	3,998	3,223	13,082	14,310	2,340.53	30,619	334,930	30,619	52,304.45	58.5
2011	4,602	2,330	1,658	4,602	4,040	13,426	15,500	2,944.73	39,536	456,434	39,536	61,791.82	64.0
2012	5,003	2,330	1,658	4,939	4,139	14,007	17,150	3,281.73	45,967	562,817	45,967	69,186.18	66.4
2013	5,060	2,330	1,658	5,288	3,967	14,458	18,250	3,630.13	52,484	662,499	52,484	76,451.01	68.7
2014	5,000	2,330	1,658	5,224.80	3,271.83	14,772.00	19,600.00	3,567.13	52,694	699,158	52,694	77,180.75	68.3
2015		2,330	1,658	5,266.60	2,723.70	14,300.00	18,900.00	3,608.93	51,608	682,088	51,608	75,312.36	68.5

Rapeseed

Year	**Support Price (RMB/T)**	Reference Price 1996-98 used by China RMB/T	**Reference Price 1996-98 from OECD Data RMB/t**	OECD Domestic Producer Price (RMB/T)	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**Support Price Difference from OECD Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	4,399	2,330	1,658	4,973	3,737	12,102	13,600	2,741.41	33,176	372,832	33,176	60,181.56	55.1
2009	3,702	2,330	1,658	3,529	2,690	13,657	17,020	2,044.78	27,926	348,021	27,926	48,198.81	57.9
2010	3,899	2,330	1,658	3,998	3,223	13,082	14,310	2,241.40	29,322	320,745	29,322	52,304.45	56.1
2011	4,602	2,330	1,658	4,602	4,040	13,426	15,500	2,944.74	39,536	456,434	39,536	61,791.82	64.0
2012	5,003	2,330	1,658	4,939	4,139	14,007	17,150	3,345.27	46,857	573,714	46,857	69,186.18	67.7
2013	5,060	2,330	1,658	5,288	3,967	14,458	18,250	3,402.49	49,193	620,954	49,193	76,451.01	64.3
2014	5,000	2,330	1,658	5,224.80	3,271.83	14,772.00	19,600.00	3,342.33	49,373	655,097	49,373	77,180.75	64.0
2015		2,330	1,658	5,266.60	2,723.70	14,300.00	18,900.00					75,312.36	0.0

Year	**Support Price (RMB/T)**	**Reference Price 1996-98 used by China RMB/T**	Reference Price 1996-98 from OECD Data RMB/T	OECD Domestic Producer Price (RMB/T)	OECD Reference Price RMB/T	Production '000 T	Consumption '000 T	**Support Price Difference from China Reference Price RMB/T**	Consumer to Producer Transfer OECD Production RMB million	Consumer to Producer Transfer OECD Consumption RMB million	**Transfer Using Reference Price RMB million**	Value of Production RMB million	Transfer as percent of Production Value
2008	4,399	2,330	1,658	4,973	3,737	12,102	13,600	2,069.08	25,039	281,395	25,039	60,181.56	41.6
2009	3,702	2,330	1,658	3,529	2,690	13,657	17,020	1,372.44	18,744	233,590	18,744	48,198.81	38.9
2010	3,899	2,330	1,658	3,998	3,223	13,082	14,310	1,569.07	20,527	224,534	20,527	52,304.45	39.2
2011	4,602	2,330	1,658	4,602	4,040	13,426	15,500	2,272.40	30,509	352,223	30,509	61,791.82	49.4
2012	5,003	2,330	1,658	4,939	4,139	14,007	17,150	2,672.94	37,440	458,409	37,440	69,186.18	54.1
2013	5,060	2,330	1,658	5,288	3,967	14,458	18,250	2,730.15	39,473	498,253	39,473	76,451.01	51.6
2014	5,000	2,330	1,658	5,224.80	3,271.83	14,772.00	19,600.00	2,670.00	39,441	523,320	39,441	77,180.75	51.1
2015		2,330	1,658	5,266.60	2,723.70	14,300.00	18,900.00					75,312.36	0.0

Chapter 5: European Union

Introduction

The European Union (EU) currently consists of 28 countries (Belgium, France, Germany, Italy, Luxembourg and the Netherlands, Denmark, Ireland, the UK, Greece, Spain and Portugal, Austria, Finland, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Malta and Cyprus, Bulgaria, Romania and Croatia)[35]. In June 2016, the UK in a referendum voted in favour of leaving the EU but it will take some years before the arrangements for withdrawal are finalized.

The agriculture policy of EU is commonly known as common agriculture policy or CAP. The present agriculture policy of EU consists of three main elements: market management, farm income support (provided through single direct payments as well as border protection) and rural development. The rural development programs include support measures for human resources development, farm improvement and food processing sector development, environment-climate and land management programs. The funding for rural development is shared between EU and budget of member countries. On the regulatory side, agriculture is regulated by CAP and Common Commercial Policy (CCP) related regulations.

The CAP was initiated in 1962 and since then, it has been subjected to various reforms (Table 5.1). The main instruments of the CAP include agricultural price supports, direct payments to farmers, supply controls, and border measures. The CAP used to provide farm support coupled with production and price support measures in place for wheat, barley, rye, oats, sorghum, triticale, rice, sugar, milk, beef and olive oil. The post 2003 reforms of CAP focused more on income support for farmers and assistance for agricultural practices, market support measures, and rural development measures.[36] CAP reforms introduced in 2003 require EU farmers to comply with environmental, animal welfare, food safety, and food-quality regulations in order to receive direct payments. These payments account for about 70 percent of the CAP budget. Under the 2013 CAP reforms, 30 percent of direct payments will be linked to European farmers' compliance with sustainable agricultural practices, such as soil quality, biodiversity, crop diversification and the maintenance of permanent grassland or the preservation of ecological areas on farms. The rural development component has been given high priority in recent CAP reforms. EU expects to invest €100 billion on rural development programs during the period of 2014 to 2020. The EU's framework for rural development relies heavily on agriculture development and the main components of the programs include fostering innovation, enhancing competitiveness, promoting food chain organization and environmental conservation.[37,38]

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[35] "Old Member States" refers to the EU-15 while "New Member States" refers to the ten countries that acceded to the EU in 2004, Bulgaria and Romania which acceded in 2007, and Croatia which acceded in 2013.

[36] http://ec.europa.eu/agriculture/cap-history_en

[37] The program includes 335,000 agricultural holdings with rural development support for investments in restructuring or modernization (2.8% of holdings) and 75,500 agricultural holdings with rural development supported business development plan/investments for young farmers (1.5% of holdings).

[38] https://ec.europa.eu/agriculture/rural-development-2014-2020_en

Table 5.1 Summary of CAP reforms

Year	Main Focus of CAP Reforms
1960s	Price support, Productivity improvement, Market stabilization
1970s/80s	Over production and supply control
1992	Price cuts, Compensatory payments, Surplus reduction, Income stabilization
2000	Rural development
2003	Market orientation, decoupling, cross compliance, consumer concerns, environment Decoupled direct payments and introduced Single Farm Payment Scheme with the policy objectives of market orientation, consumer concerns and environment. The 2003 CAP reform allowed EU Member States to retain up to 10% of their previously coupled payment for specific supports to farming and quality production (Article 69 of Council Regulation (EC) No. 1782/2003).
2008 (CAP Health Check)	Reinforcing 2003 reforms, Dairy premia was added into the single farm payment after 2007.
2013 (Implemented from 2015)	Greening, Targeting, End of production constraints, Food Value chain development, Research and Innovation. **Farm payments**: Single Payment Scheme is replaced by the Basic Payment Scheme (BPS), green payment top-up and various targeted measures for young farmers, small farmers, farmers in areas of natural constraints and coupled payments.
	Production control: End production control for dairy and sugar. Decoupling of at least 75 percent of payments in the crop sector and at least 50 percent in the beef and sheep sectors **Market Intervention**: Common wheat, dairy products, beef and veal, poultry meat, sugar, potatoes, tomatoes, and some other horticultural products still depend on the intervention prices. **Incentives**: Promotion of sustainable agricultural practices through incentives (Green direct payments), support for value chain development, investments on research and innovation, support for business development (improve competitiveness). **Boarder Measures**: Preferential access is provided to some countries. Imports may not be sold in domestic market below the intervention prices set by CAP. Protect internal prices through import quota and minimum import price **Environmental and Animal welfare**: CAP reforms require producers to adhere to environmental and animal welfare as well as food safety standards **Rural Development**: Innovation, competitiveness, food chain improvement and environmental conservation **Other support mechanisms**: Subsidies to assist with surplus storage and consumer subsidies to encourage local consumption.

Source: The common agricultural policy (CAP) and agriculture in Europe – Frequently asked questions, http://europa.eu/rapid/press-release_MEMO-13-631_en.htm. https://ec.europa.eu/agriculture/sites/agriculture/files/cap-history/cap-history-large_en.png, USDA, DG AGRI(2016)

The member states of EU have flexibility in applying different models of payment schemes and therefore, the implementation of CAP reforms vary from one Member State to another[39]. This consists of a mixture of payments for arable land, permanent pasture and livestock, calculated differently for

[39] Fact Sheet, Single Payment Scheme, http://ec.europa.eu/agriculture/sites/agriculture/files/direct-support/pdf/factsheet-single-payment-scheme_en.pdf

land types (arable/pasture land) as well as some payments based on historical individual entitlements. The decoupled payments are bound with additional requirements (environmental conservation, cultivation restrictions of permanent crops and vegetables) to keep land in good agricultural and environmental condition. In all options, the payment of the premium depends upon a cultivated area. All options have included set-aside payments, calculated according to historical set-aside obligations. Some payments remain coupled to commodities or cultivation area of some crops (durum wheat, protein crops, rice, nuts, energy crops, starch potatoes, dried fodder) [40].

Financing for Agriculture

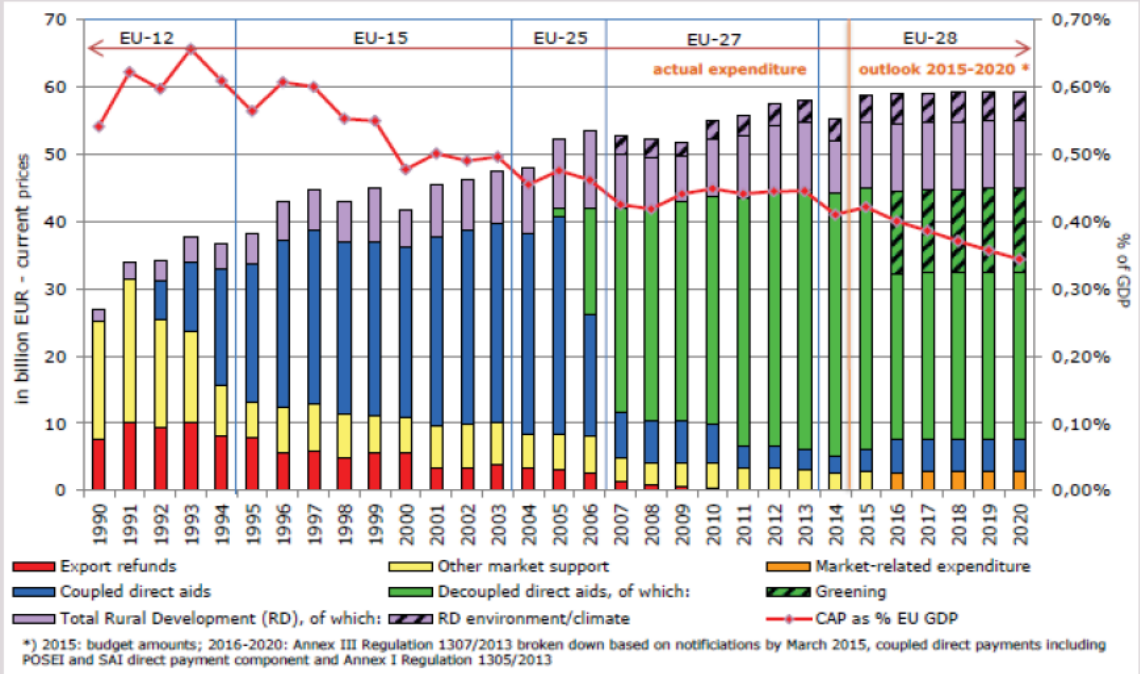
Agricultural spending of EU comprises of EU budget expenditure and financing by Member States. The CAP spending is disbursed through two agricultural funds; European Agricultural Guarantee Fund (EAGF) (€43,447 million in 2015) and European Agricultural Fund for Rural Development (EAFRD) (€64,692 million in 2015). The EAGF financed by the EU budget mainly for market management and direct support for farmers while EAFRD is co-financed by Member State for rural development programmes. The pattern of expenditure has changed with CAP reforms. The expenditure on coupled direct payments, market support and export subsidies have replaced with decoupled direct payments and rural development. The share of expenditure on rural development expected to take about quarter of total financing for EU agriculture during the period of 2014-2020 (Figure 5.1).

In addition to transfers from the EU budget, EU farmers receive transfers from national budgets. The financing form national budgets can be either top-up for EAGF, co-financing for EAFRD and other state aids. In 2014, agricultural state aids reported to the EC amounted to €7.6 billion and France (15%), Germany (13%) and Finland (13%) and Italy (8%) accounted for half of the state financing for agriculture[41].

Figure 5.1 Agriculture and Rural Development Support Measures of EU

[40] Fruits and vegetables may only be planted with previous approval. Tobias Reichert 2006

[41] European Commission - DG Competition, http://ec.europa.eu/eurostat/tgm_comp/table.do?tab=table&init=1&plugin=1&language=en&pcode=comp_ag_01

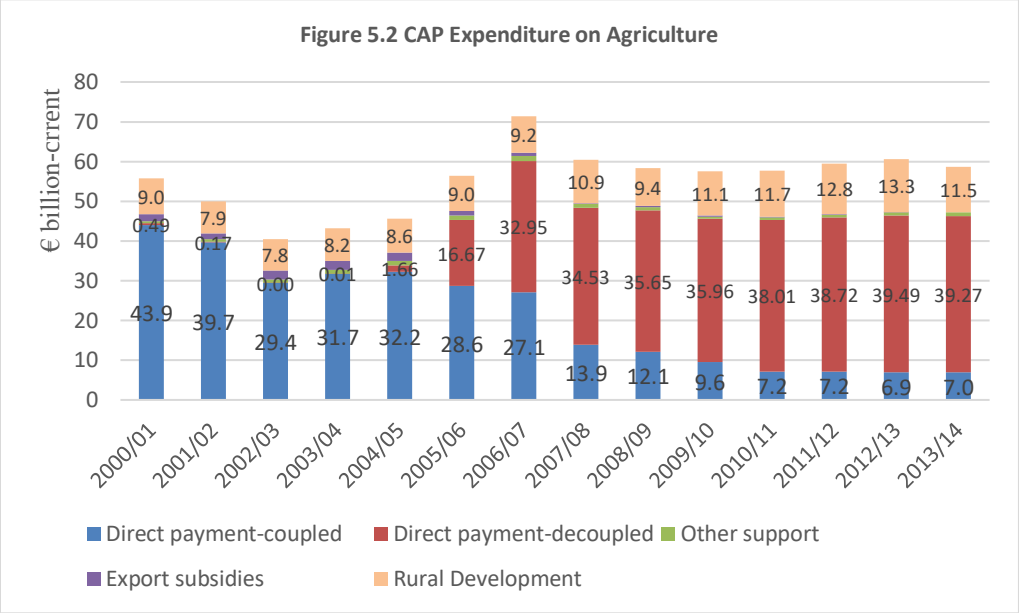


Source: DG AGRI, http://ec.europa.eu/agriculture/cap-post-2013/graphs/index_en.htm

Direct Payments

Direct payments have been fundamental part of the CAP. The amount, intensity, and types of direct payments are varied among the EU member states. In the EU-15 countries, decoupled direct payments are realized through the Single Payment Scheme (SPS). In most of the Member States that joined the EU in 2004 (EU-N10) and 2007 (Bulgaria and Romania), direct payments have been phased in to a flat rate area-based payment, named the Single Area Payment Scheme (SAPS). The level of EU direct payments in those Member States is progressively increasing from 25% of EU-15 level in 2005 financial year to 100% in the 2014 financial year (2017 for Bulgaria and Romania). The SAPS is based on the direct payments and EU farmers may receive direct payment based on the historical reference period or averaged out over a region. In regional model, the number of beneficiaries could be compared with that in the reference period model. The presence of different models for implementation of SAPS may have yielded different levels payments per farm.

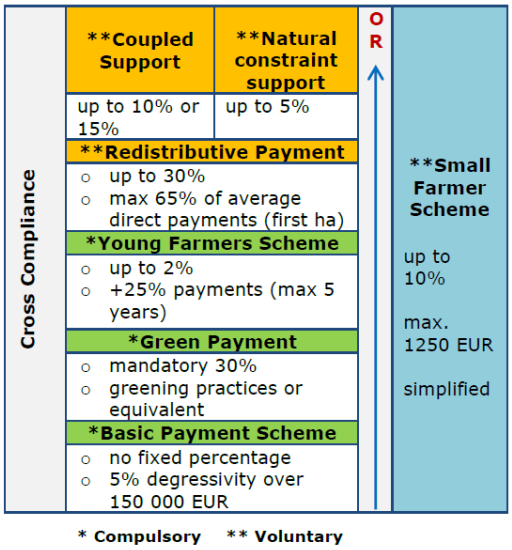
Many coupled schemes that prevailed during 2003 and 2008 reforms have now been decoupled. In 2006, direct payments reached €33.7 billion (65% of the total), and only 4% of them were decoupled. In financial year 2015, direct payments represented 74% of the whole CAP expenditure and 93% of them were decoupled (Figure 5.2). The remaining coupled payments include suckler cows, sheep and goat and cotton schemes.



Note: Rural development expenditure includes regional development aid and environmental payments. Payment under other support includes insurance, interest and other general support measures. Data source: WTO

The flexibility offered to Member States to implement the new direct payments means that the share of funding allocated to different schemes can potentially vary significantly throughout the EU. The level of direct payments per hectare, which is currently based on historic parameters in many countries, will be progressively adjusted with the introduction of a minimum national average direct payment per hectare across all Member States by 2020 (Figure 5.3).

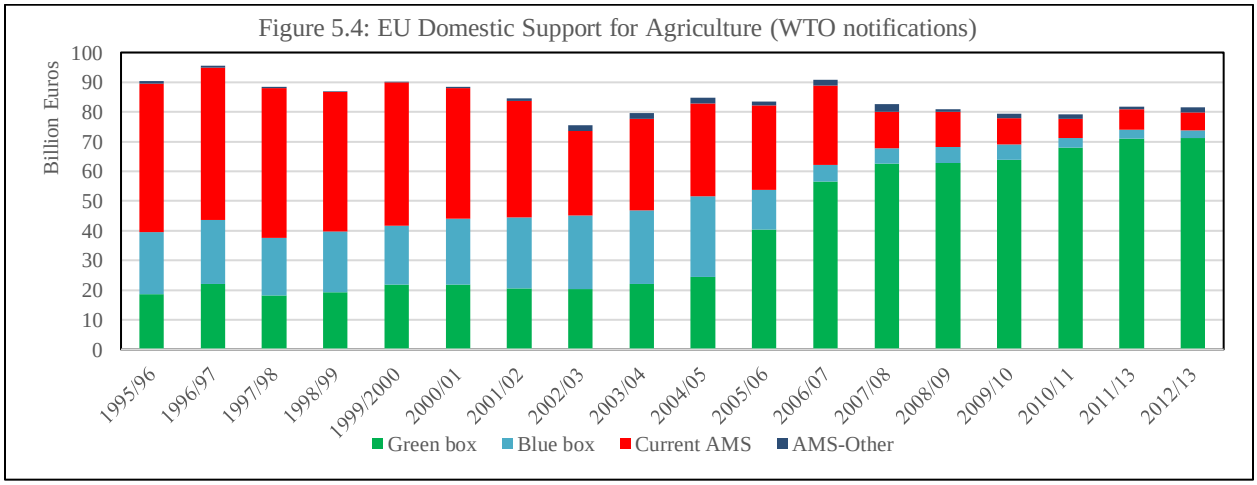
Figure 5.3: EU Farm Payment Scheme



Source: DG Agriculture and Rural Development.

CAP Reforms and Trade

These CAP reforms have largely shifted the trade distorting coupled payments (amber box support) to decoupled payments (green box support). Consequently, green payments (particularly the payments under investment support, income stabilization, environmental payments) have increased from €17.7 billion in 1995/96 year to €71 billion in 2012/13 (Figure 5.4).



The other green box compoents with a significant increase in payments include domestic food aid, income insurance support, environmental programs, regional assistance program, structural adjustments program and general support (Figure 5.5).

Figure 5.5 Green Box Subsidies-EU

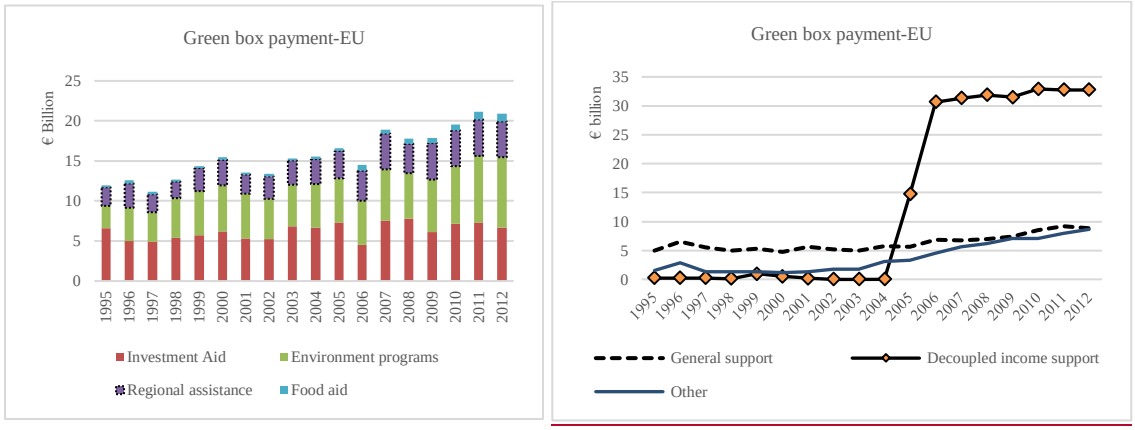


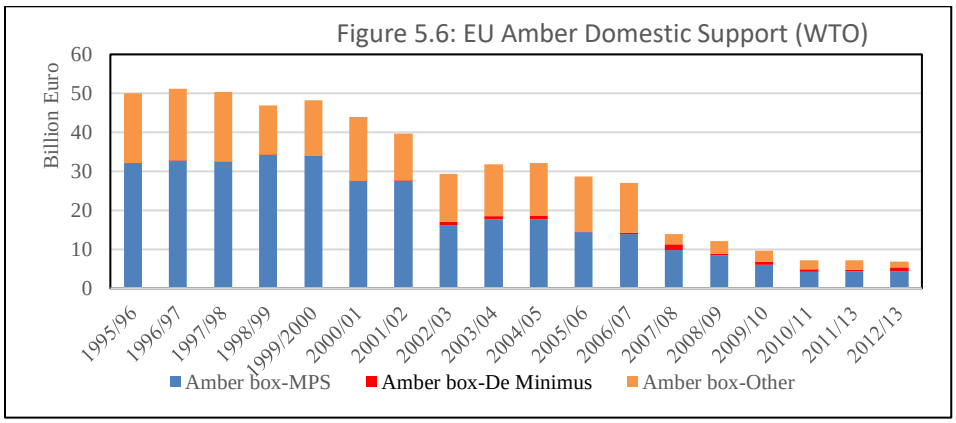
Figure -A Figure -B

Source: WTO

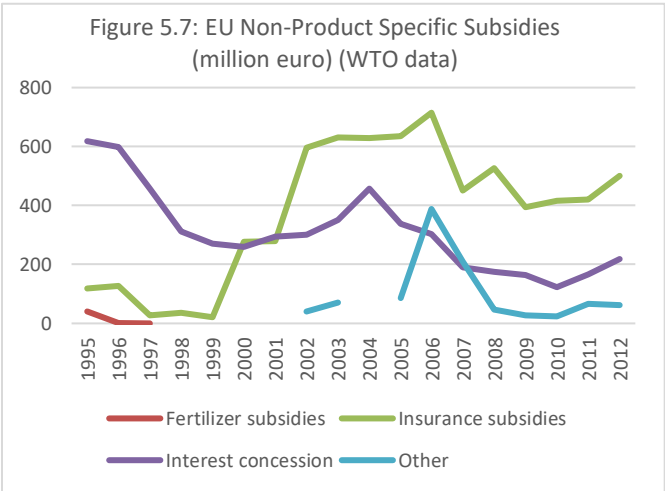
EU's trade distorting product specific amber box support (amber box support) has been declining over time (Figure 5.6). The expenditure on amber box support has decreased from €50.7 billion in 1995 to

€7.7 billion in 2012. The CAP reforms have removed production restrictions imposed on many commodities to improve competitiveness of supply managed products, such as milk, wine, and sugar. Further, market price support measures imposed on many agricultural products have been withdrawn and currently they are maintained only for milk and wheat.

The share of Current Total AMS (CTAMS) compared to the maximum AMS commitment level has fallen from 67% in 1995 to about 10% in 2012. This lower figure indicates the presence of adequate room for reintroduction of trade distorting domestic support for EU farmers. The share of support claimed as *de minimis* compared to total AMS remained high throughout this period ranging from 77% (2012/13) to 99% (1997/98) during the period of 1995 to 2012. The high CTAMS to maximum AMS commitment ratio indicates that commodities with trade distorting support have received trade distorting domestic support more than the five percent *de minimis* level of support.



The main non-product specific trade distorting supports available for EU farmers are insurance subsidies and interest subsidies. Interest subsidy was a prominent type of support during mid 1990s and steadily replaced after 1996 by insurance subsides (Figure 5.7). This policy shift as well as other green box support measures, such as increases in support levels for natural disasters and decoupled income support, etc., indicates the nature of the change in the CAP towards farm risk management as a basis of providing incentives for agricultural production.



Commodity level market support

The trade distorting policies related to selected commodities (milk, wheat and corn) are analyzed using available data on commodity specific amber box support. In WTO notifications, members provide details of product specific direct producer transfers and they are grouped under the product specific AMS.

WTO members report commodity specific transfers as market price support (MPS) for commodities with applied administered prices. The MPS is expressed as the price difference between administered price and a reference price multiplied by the production (or administered) volume. The reference price is a base year price[42] and some countries have opted to report MPS using administered volume, not the total volume of production.[43]

OECD estimate of Producer Single Commodity Transfers (PSCT) is also utilized to assess commodity specific support. The PSCT represents the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policies linked to the production of a single commodity such that the producer must produce the designated commodity to receive the transfer. The PSCT is a measure of overall welfare change to producers and it represents the total of direct budgetary transfers plus the MPS. The OECD's MPS measures the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, arising from policy measures that create a gap between domestic market prices and current border prices of a specific agricultural commodity, measured at the farm gate level. Therefore, this measure can be influenced by the changes in exchange rate, applied tariff level and world market price of the commodity.

Support levels for milk, wheat and corn

Milk

The EU dairy market is regulated by the Common Market Organisation for milk and milk products through the CAP (import duties, export refunds, and intervention stockholding for butter and skimmed milk powder). These measures are aimed at supporting dairy product prices, raw milk price and the incomes of dairy farmers. The private sector's stockholding role has been stimulated by private storage aid for butter, skim milk powder and cheese. In order to stimulate the demand for dairy products, disposal aids for butter, cream and skim milk powder have been used.

The 2003 CAP reforms switched some income support out of market prices into a direct payment for milk producers and introduced a Single Payment Scheme (SPS) of decoupled income support. These CAP reforms have reduced direct supports for milk farmers. As a percentage of gross farm receipts, support for EU milk producers has fallen substantially over time, from about 45 percent in 2004 to one percent in 2011.

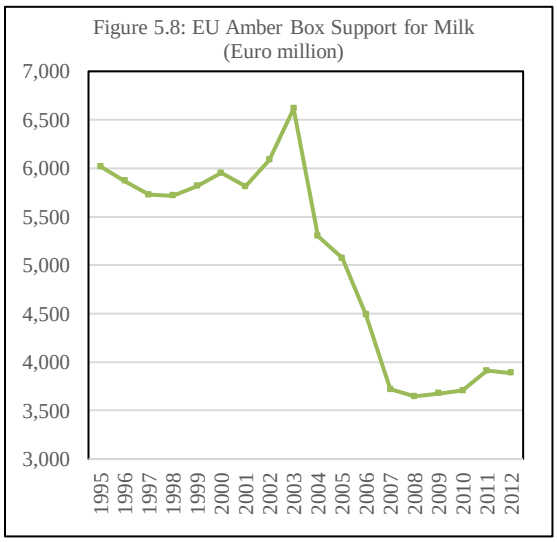
EU abolished the milk quota system in 2015. This policy change is expected to increase EU's milk supply by four to five percent and exports by 10 percent.[44] The CAP reforms that have taken place over the last few decades have not changed substantially the import access for milk and milk products. The milk

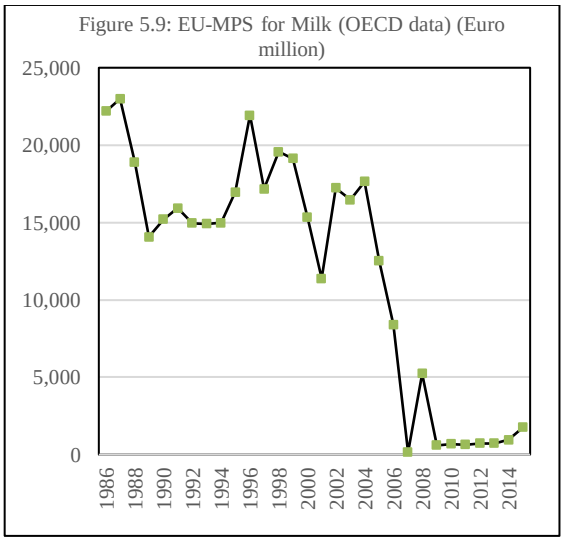
[42] The fixed external reference price shall be based on the years 1986 to 1988 and shall generally be the average f.o.b. unit value for the basic agricultural product concerned in a net exporting country and the average c.i.f. unit value for the basic agricultural product concerned in a net importing country in the base period.
[43] Orden et al., have questioned whether this methodology is consistent with the intention of the WTO 1994. This issue is one of the points raised in the US challenge against China on wheat, rice, and corn. See Brink and Orden, 2016.
[44] OECD/FAO Agricultural Outlook, 2015-2024. http://www.fao.org/3/a-i4738e.pdf

market access to EU is regulated through TRQs for milk products (cheese 83,000 mt, skimmed milk 68,000 mt and butter 10,000 mt).

The EU's trade distorting amber box support for milk shows continuous decline over time, around €6 billion in late 1990s to about €4 billion during 2010-2012 period (Figure 5.8). This reduction in amber box support for milk was mainly through reductions in the administered prices of skim milk powder and butter. The administered price of butter has declined by 38%, from €3562/tonne in 1988 to €2217.5 in 2013. During the same period, the administered price of SMP has declined 14%, from €1979.3/tonne to €1698/tonne.

The OECD's PSE indicate that producer support available for milk producers has substantially reduced during the period of 2004-2006 from €17.6 billion to €153.9 million and since then it shows gradual increase and reach to €1.75 billion in 2015.





However, milk still accounts for large portion (20% in 2015) of EU's coupled voluntary support of Member states. In 2015, EU members (19 members) were providing €846 million of voluntary coupled support for dairy producers.

In response to low producer price of milk, EU decided to double the butter public intervention volume (from 50 000 tonnes to 100 000 tonnes) and skim milk powder (from 109 000 tonnes to 350 000 tonnes) in 2016. Further, a separate support package of €500 million was presented for dairy farmers in September 2015. In July, 2016 EU introduced a EU-wide dairy intervention plan to incentivise a supply control of milk production (€150 million), conditional adjustment aid to be defined and implemented at Member State level out of a menu proposed by the Commission (€350 million that Member States will be allowed to match with national funds, thus potentially doubling the level of support being provided to farmers). Further, the new support measures include a range of technical measures to provide flexibility and reinforce the safety net instruments (by prolonging intervention and private storage aid for skimmed milk powder). In terms of additional financial resources, during the period of 2015 and 2016, the EU has mobilised in excess of €1 billion in new money to support dairy farmers.

Corn

In 2015, corn accounted for 18 percent of EU's cereal production and wheat and barley accounted for 42% and 19% of EU's total cereal production respectively. EU's total corn trade for the year 2015 was 59.35 million tonnes and about 27 percent (16.27 million tonnes) of this amount was imported from non-EU countries. EU is a net importer of corn and in 2015, Spain (23%), Netherland (16%), Italy (12%), Germany (8%), UK (7%) and Portugal (6%) accounted for about 73% of EU's international corn imports (Table 5.2). Romania, France and Belgium are leading corn exporters of EU and during the period of 2011-2015, the average annual corn exports to non-EU countries was 2.5 million tonnes.

Table 5.2: EU's International trade of corn

Product	EU Internal trade (million tonnes)		Import Volume (million tonnes)		Export Volume (million tonnes)	
	2015	2011-2014	2015	2011-2014	2015	2011-2014
Corn	17.81	15.06	11.87	10.23	2.2	2.8
Mainly From	France, Hungary, Rumania, Bulgaria		Ukraine, Brazil, Russia		Romania, France, Belgium	
Mainly To	Spain, Italy, Germany, Rumania, UK		Spain, Netherland, Italy Portugal		Algeria, Egypt, Lebanon, Israel, Switzerland	

Data source: UN Comtrade and Eurostat

According to EU's WTO notifications, EU has eliminated all trade distorting amber box support for corn in 2009 and since then EU has been reporting zero market price support for corn. EU's MFN import tariff rate for corn is zero and therefore, corn price at the border closely follows the world market price (Table 5.3). The ratio of farm gate price to import price indicates the level of protection enjoyed by EU farmers. The ratio less than one indicates that local producers are not protected. However, in addition to decoupled direct payments, EU corn farmers receive general support through non-product specific interest subsidy, insurance subsidy and irrigation subsidy.

Table 5.3: EU: Corn farm gate price, import and export prices

	2011	2012	2013	2014	2015
Farm gate price (€/tonne)	206.99	235.26	196.07	158.88	165.88
Import price ((€/tonne) (CIF)	374.38	387.51	361.88	267.94	206.32
Export price ((€/tonne) (FOB)	397.35	353.39	326.59	359.99	189.83
Ratio of Farmgate price to import price	0.55	0.61	0.54	0.59	0.80

Data source: OECD, UNcomtrade, Pacific exchange rate service. Import price represents average import price from Brazil to Spain, Belgium, France and Germany. Export price: Average export price of exports from France, Romania and Serbia to Algeria. 8% freight and insurance cost is assumed in conversion of FOB prices to CIF price.

The intervention price for corn has not changed since 2001 at €101.31/tonne. The farmgate price of corn remains well below the world market prices. The liberal import policy set EU's import tariff on corn has set to zero. Both WTO and OECD data indicate removal of trade distorting production support for corn (Figure 5.10 and Figure 5.11). The EU is a net importer of feed grains and net exporter of dairy and many other value added livestock products. The low input price policy supports the EU's export promotion strategy of livestock products.

Figure 5.10: EU Amber Box Support for Corn (WTO data) (€ million)

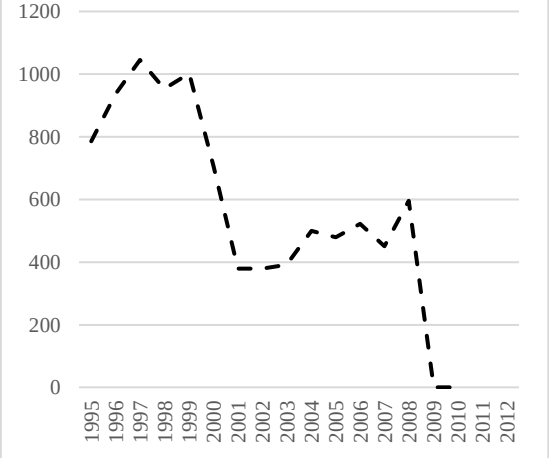
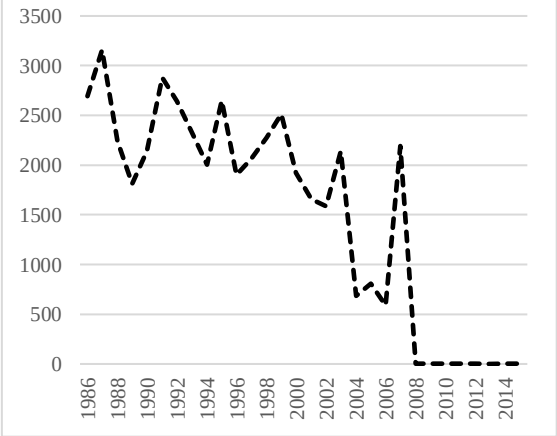


Figure 5.11: EU-MPS for Corn (OECD data) (€ million)



Wheat

In 2015, wheat accounted for 42 percent of EU's cereal production. The market access conditions for non-durum wheat differ between "high quality" and "low-to-medium quality" wheat.

The EU maintains a variable import levy system for three "categories" of durum wheat: high quality, medium quality and low quality. For each category, the import duty is calculated as the difference between a "world" price and the EU internal price. The world price is adjusted by transport and other costs to equate to a landed price in the EU. The price used for high quality durum is the current price; the prices for medium and low quality are standard discounts of 10 euros and 30 euros, respectively from the high quality price. The EU internal price is 155% of the intervention price adjusted for the "storage premium". The EU intervention price for wheat is €101.31/tonne. The "storage premia" start in November at €0.46/tonne and increase to €3.22/tonne in June of 2015. They are zero between July and October. There is an annual 300,000 tonne duty free quota (TRQ) allocated on a first come, first serve basis. The total wheat imports to EU far exceed this TRQ. The WTO bound rates of duty for durum wheat and non-durum wheat are €148/tonne and €95/tonne respectively.

Wheat Trade

Both internal and external export trade of wheat in EU are dominated by France, Germany, Poland, Czechoslovakia, Hungary and Romania. EU is a net exporter of wheat and in 2015, Zimbabwe, Albania, Georgia and Ecuador are main export destinations for wheat from EU (Table 5.4).

The main internal wheat importers, such as Italy, Spain, UK and Netherland, are the main importers of wheat from non-EU countries. Canada is the leading supplier of wheat to the EU market and in 2015, Canada accounted for 41% of EU's imports of wheat while Ukraine (25%), USA (12%) and Russia (8%) are other leading suppliers of wheat to the EU market. In 2015, Canadian wheat exports to the EU were 2.47 million tonnes and the main EU importers for Canadian wheat were Italy, UK, Belgium, Spain, Portugal and Germany.

Table 5.4: Wheat trade of EU

Product	Internal trade (million tonnes)		EU Imports (million tonnes)		EU Exports (million tonnes)	
	2015	2011-2014	2015	2011-2014	2015	2011-2014
Wheat	30.198	26.668	6.072	5.579	35.755	23.6
Mainly From	France, Germany, Czech Rep. Hungary, Romania, Poland		Canada, Ukraine, USA, Russia		France, Germany, Poland Romania, Czech Rep., Lithuania, Latvia, Bulgaria	
Mainly To	Netherlands, Germany, Italy, Spain, Belgium, Portugal, UK		Italy, Spain, UK, Netherland		2015: Zimbabwe, Albania, Georgia, Ecuador 2014: Algeria, Morocco, Saudi Arabia, Egypt, Iran	

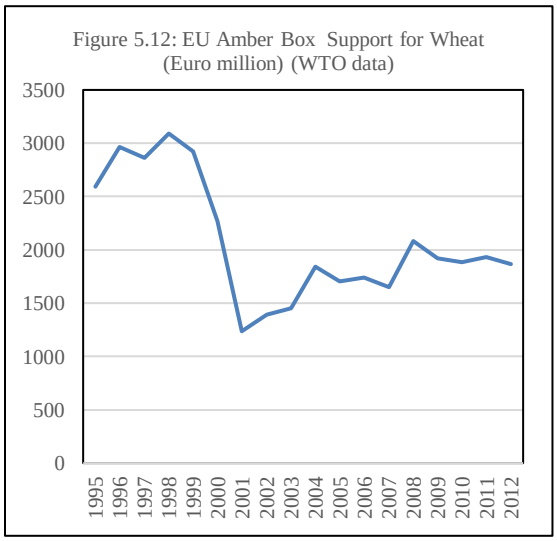
Source: UN Comtrade, Eurostat

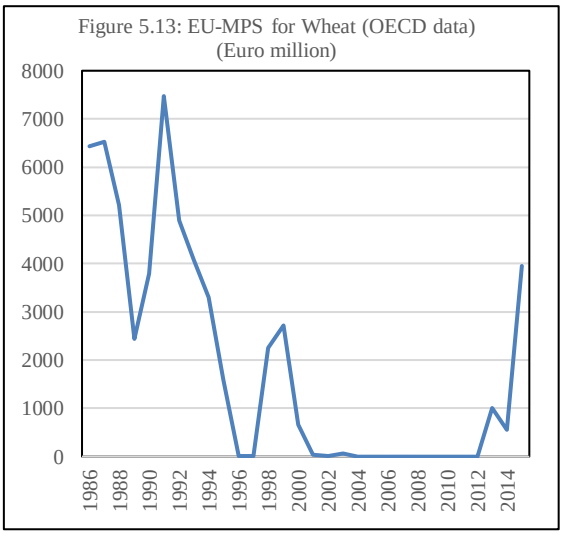
Trade distorting amber box support for wheat shows an upward trend since the early 2000s; €1.236 billion in 2001 rising to €1.864 billion in 2012 (Figure 5.12). This change is mainly associated with the adjustments made to the administered volume (the volume that is entitled for market price support) used in market price support estimates after incorporation of new members to the EU, such as Poland (2004), Romania (2007) and Hungary (2004). Consequently, the administered volume used in MPS estimate of wheat has increased from 86.5 million tonnes in 2001 to 125.9 million tonnes in 2012.

The OECD's MPS estimate shows the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, arising from policy measures that create a gap between domestic market prices and current border prices of a specific agricultural commodity. This measure omits transfers associated with some policies, such as underpricing of irrigation water, tax concessions, etc., where the policies are not commodity specific. The policy induced producer transfers for wheat had been low during the period of 2001-2012. However, it shows an increasing trend after 2012 (Figure 5.13), the same as the WTO notifications.

The changes in protection levels of EU wheat producers is evaluated using farm gate price and world market prices of wheat. The producer price of wheat remains less than imported wheat price and estimated protection ratios for past five-year period indicate that producer receive lower farmgate prices than prices for imported wheat.

The market price support estimate of OECD indicates presence of positive transfers to EU wheat producers from consumers and taxpayers. The domestic price and import price data suggest that the EU





maintains low farmgate prices through producer transfers (decoupled and coupled farm payments) and other government subsidies annexed with green box support measures. These conditions provide impetus for wheat exports from EU to remain competitive in the world wheat market.

Table 5.5: EU: Protection levels of EU wheat market

	2011	2012	2013	2014	2015
Farm gate price (€/tonne)	205.00	223.00	221.05	187.78	196.77
Import price (CIF) (€/tonne)	251.59	265.02	283.24	258.73	274.70
Import price (CIF)+ Tariff (€/tonne)	346.59	360.02	378.24	353.73	369.70
Export price (€/tonne) (FOB)	233.85	240.12	232.39	202.16	195.93
Ratio of Farmgate price to import price (CIF price)	0.81	0.84	0.78	0.73	0.72
Ratio of Farmgate price to import price +tariff	0.59	0.62	0.58	0.53	0.53

Data source: OECD, UN comtrade. Note: Pacific exchange rate service. Import price is the weighted average import price of wheat from Canada, Ukraine, USA and Russia. Export price: Weighted average export price of exports from France, Romania and Serbia. Tariff: WTO bound tariff of €95/tonne for non-durum wheat.

Oilseeds

Rapeseed, sunflower, soybean and linseed are the main oilseeds produced in the EU. During the period of 1995-2015, the oilseed area increased by 37 percent while production increased by more than 100 percent. Area expansion of oilseeds in several EU member countries, and improvement of land productivity are main contributing factors for the increase in oilseed production in the EU. Among different oilseed types, area expansion is quite significant for rapeseed and soybean.

Table 5.6 Oil Seeds production in EU (million tonnes)

	Last five year Average	2015/16	Main producers

Rapeseed	20.7	21.8	France, Germany, Poland, UK
Sunflower	8.6	7.9	Romania, Bulgaria, Spain, Hungary, France
Soybean	1.4	2.3	Italy, Romania, France
Linseed	0.1	0.1	UK, France, Sweden

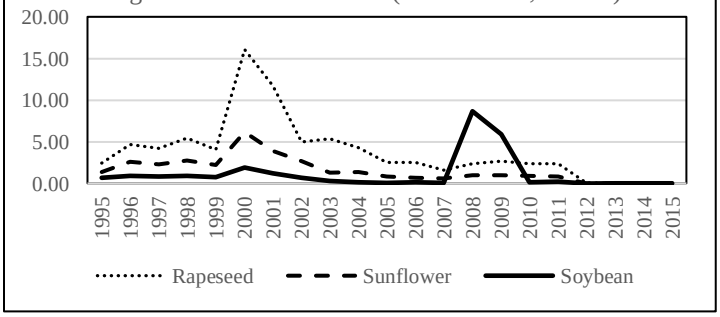
Source: Eurostat, CBI Product Factsheet

At present, about two-thirds of the total oilseed requirement is produced within the EU but the EU imports about half its oilseed meal demand for animal feed. The vegetable oil market is dominated by rapeseed oil while imported palm oil substantially augments the EU's vegetable oil supply.

According to WTO notifications, the EU has no commodity specific support measures for oilseeds. The recently introduced green box related environmental payments encourage cultivation of nitrogen fixing legumes and soybean producers are entitled to receive cultivation incentives under this program. According to the OECD data, oilseed producers have received incentives and the support levels have gradually decreased over time (Figure 5.14). The PSEs for oilseeds indicate that the CAP measures do not provide incentives for local oilseed production.

The EU is a net importer of oilseeds and oil seed meal, driven by structural deficit in the EU animal feed sector. Duty free imports are allowed for oilseeds and oilseed meal while escalation of import tariffs can be seen for vegetable oil imports. At present, vegetables oil imports are subjected to a 3.2% to 9.2% of ad valorem tariff. Oilseed imports to EU are restricted by EU's GMO policy. Even though EU is entitled to €42.7 million or 444.9 thousand tonnes of subsidized rapeseed exports, none of the past EU's WTO notifications indicate use of this entitlement.

Figure 5.14: PSE: Oilseeds (Euro million, OECD)



EU expects to reach the target of 10% renewable energy, essentially biofuel, in the EU's transport sector by 2020. In 2012, EU parliament called for a cap on conventional biofuels which use oilseeds and grains as raw materials for biofuel production and promote advanced biofuel production using plant material which does not have an alternative use as food (cereal stalks, other dry plant matter, or crops grown especially for fermentation into biofuels)[45]. This policy change is expected to reduce biofuel policy induced import demand for oilseeds in the EU.

Pork

Pork is the major type of meat produced in EU and pork production in the EU shows an increasing trend. In 2015, the total pork production in the EU was 22.4 million tonnes and Denmark (25%), Spain (15%), France (9%), Poland (8%), Italy (7%) and Germany (7%) account for more than two third of EU's pork production. Most pork consumed in the EU is from domestic production. In 2014, EU's pork imports were less than 0.1 percent of total supply and leading foreign suppliers of pork to the EU market are

[45] EU biofuels policy Dealing with indirect land use change, 2015. http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/545726/EPRS_BRI(2015)545726_REV1_EN.pdf

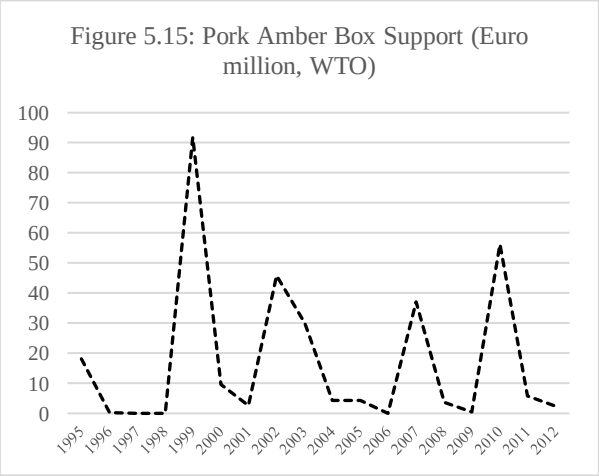
Chile, the United States, and Switzerland. EU is the world's biggest pork exporter and exports make up about 10 percent of EU's production.[46]

A notable change in the EU's swine industry is the farm integration. At present, about three quarter of pigs are reared by 1.5 percent of the largest pig farms while small scale pig producers are mostly found in the EU member states who joined the EU after 2004.

EU's cost of production of pork is relatively higher than other major pork producers in the world. In 2015, the average cost of pork production of pork ranged from £1.06 (Spain) to £1.34 (Italy) per kg (deadweight) while the comparative cost figure for Canada was £0.92 per kg. In 2015, average cost of swine production of major swine exporters of EU, compared with Canada, was 15% higher (Denmark) to 45% higher (UK).[47]

The CAP on pork covers live pigs, pork and processed pork products. Pork production in EU is not subjected to coupled payments or production quota. The pork sector receives policy support primarily through border measures. Price support for pork producers is mainly provided by the trade policy of EU, namely import tariff and TRQ and export subsidies.

Pork imports from third countries are subject to specific duties. The ad-valorem equivalent of the specific duty is estimated to be about 25 percent[10]. EU's trade agreements (WTO and bilateral trade agreements) provides a system of pork TRQs with specific country allocations and TRQ open for all. A TRQ is open to WTO members that allows imports of 70,390 tonnes of pork at specific tariffs ranging from €233 to €434 per tonne. The over quota tariff rates are much higher than in-quota tariff rates. However, the in-quota tariff rate is still relatively high and the quota fill rate was less than 12 percent in 2013[48]. Granting refunds for exports is intended to enable exports when world market prices are lower than EU prices. Since April 2012, all such export refunds for EU's pork exports have been set at zero. Private storage aid for pork is being offered in times of market surplus. Meat derived from animals treated with hormonal growth promotants or with beta-agonists having an anabolic effect are prohibitted from being imported into the EU market. There is a requirement for exporters to guarantee that animals from which the meat is derived was not treated with ractopamine. EU restrictions on beta



[46] In 2013, EU exported 2.2 million tonnes of pork and it accounted for about 30% of world pork exports
[47] AHDB Market Intelligence, 2015 Pig Cost of Production in Selected Countries, http://pork.ahdb.org.uk/media/272651/2015-pig-cost-of-production-in-selected-countries.pdf
[48] USDA, https://www.ers.usda.gov/webdocs/publications/ldpm24501/ldpm-245-01.pdf

agonists, trichinae, and other measures were found to limit pork exports to EU. The ad-valerom equivalent tariff effect of these measures on pork trade was estimated to be 81 percent.[49]

EU's WTO notifications indicate that EU maintains product specific price support mechanisms for pork farmers[50] (Figure 5.15). These support payments, designed to overcome market volatility experienced by pig farmers, consist of funding provided by the EU Commission and matching funding provided by the member states.[51]

The OECD producer support estimates for pork indicate that policy induced producer transfers from consumers and taxpayers have substantially decreased over this period (Figure 5.16). The low figure of PSE indicates that despite of having a protective import policies in the pork sector, the policy induced transfers from consumers and tax payers to pork farmers remain low in recent years. EU's pork sector shows high regional concentration and high level of integration. It seems that the EU pork sector benefits from the CAP through assured local market (protected by high import tariff and TRQ) and related industry-level economic gains through low average cost (large scale of operation, backward and forward integration of value chains, etc.).

Figure 5.16: PSE-Pork (Euro million, OECD)

The data from Eurostat and UN Comtrade[52] show that EU is a major and growing net exporter of pork and pork products (Figure 5.17) in both volume and value. The member states with the largest hog production in 2014 were Germany, Spain, France, Poland, Denmark, Netherlands, Italy, and UK.[53] The selling prices for live hogs in 2015 across EU member states varies widely from €88.76/100kg in Denmark to €202.64/100kg in Italy (Figure 5.18). However, production costs shown in Figure 5.20 for several member states, Canada, USA and Brazil suggest that costs are greater than prices at farm gate.

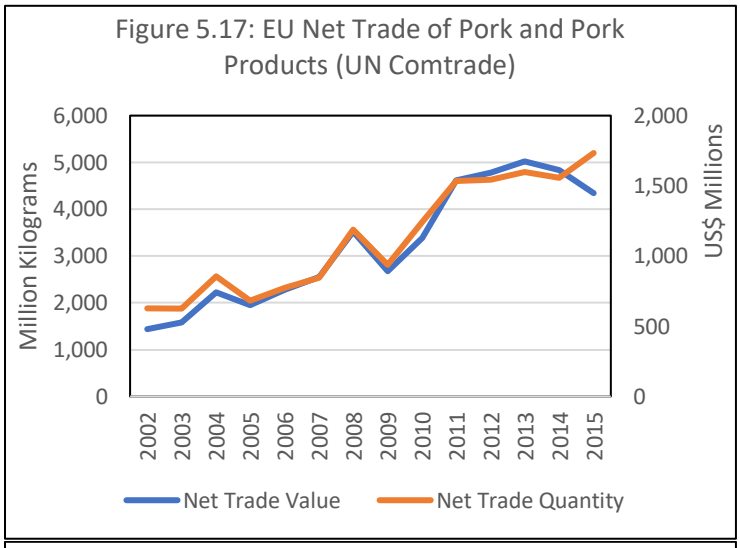
[49] Shawn Arita, Lorraine Mitchell, and Jayson Beckman (2015). Estimating the Effects of Selected Sanitary and Phytosanitary Measures and Technical Barriers to Trade on U.S.-EU Agricultural Trade. ERS, USDA. https://www.ers.usda.gov/webdocs/ publications/err199/54376 _err199_summary.pdf.

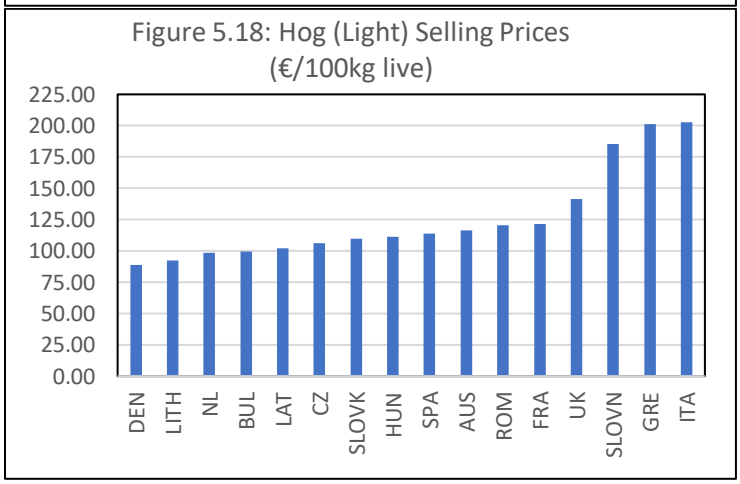
[50] EU reports pork production related amber box support as product specific equivalent measurement of support and it indicates the total product specific monetary outlays for pork producers in the EU.

[51] In response to the market volatility experienced by pig farmers in 2015, Ireland Government decided to match the EU funding for the sector.

[52] Data are from UN Comtrade, HS 0203 Meat of Swine, fresh, chilled and frozen.

[53] http://ec.europa.eu/eurostat/statistics-explained/index.php/Meat_production_statistics





Source: Eurostat

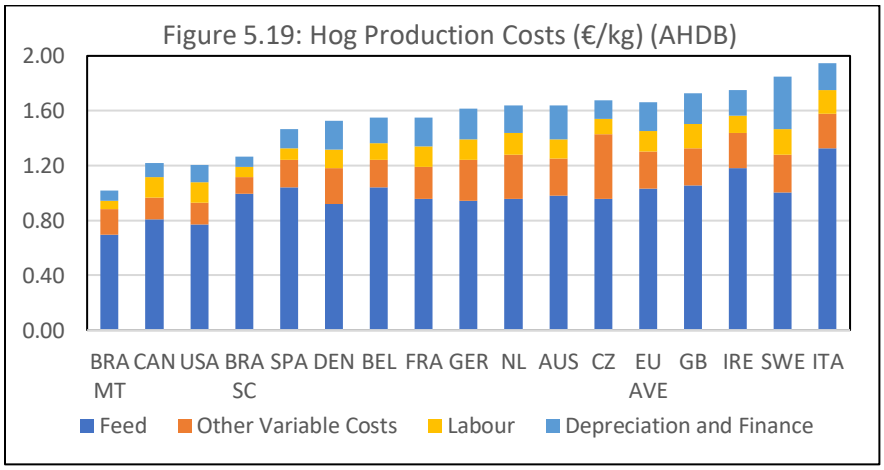
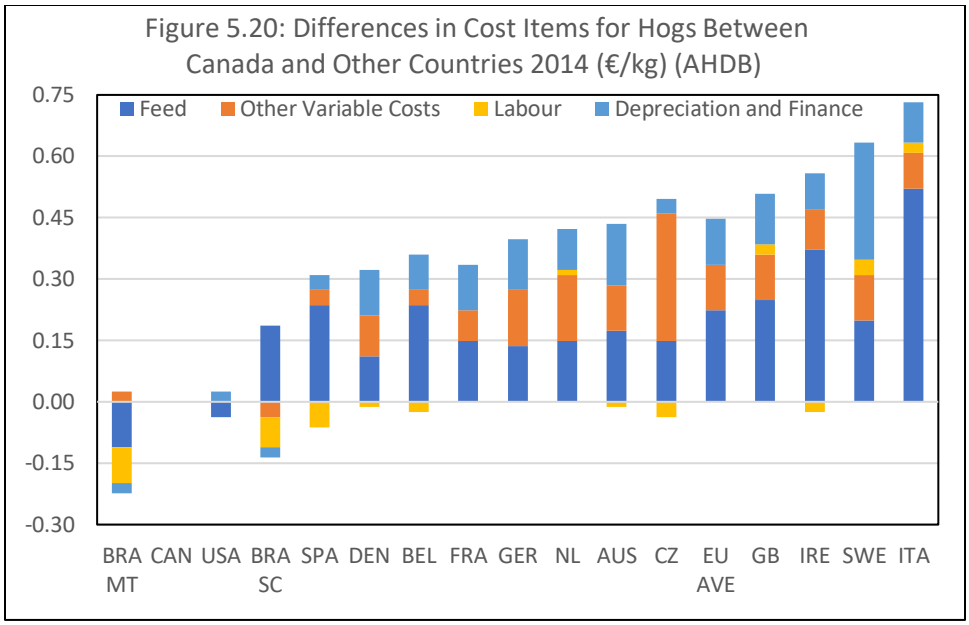
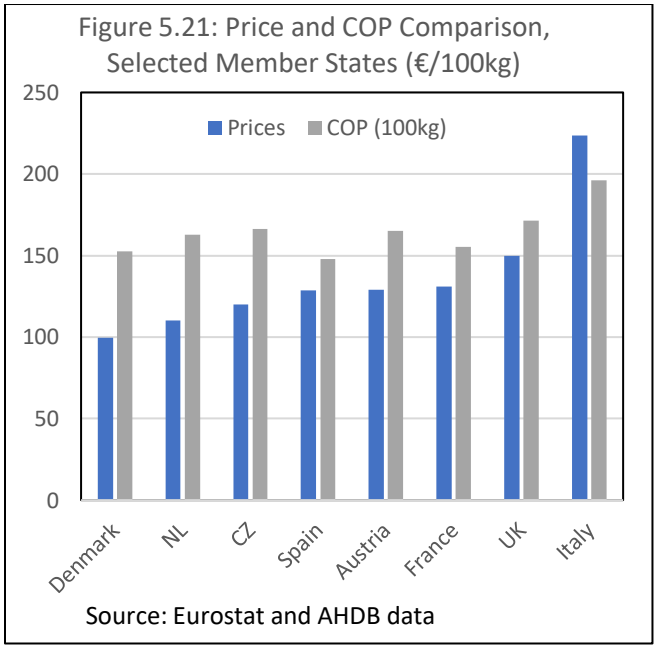


Figure 5.19 to Figure 21 offer comparisons of prices from Eurostat and production costs for some member states from AHDB[54] where the statistics are available in both datasets. Production costs exceed prices received in all cases except for Italy. Nonetheless, Italy has one of the highest prices among all member states.

[54] http://pork.ahdb.org.uk/media/74797/cost-of-production-web-2014.pdf

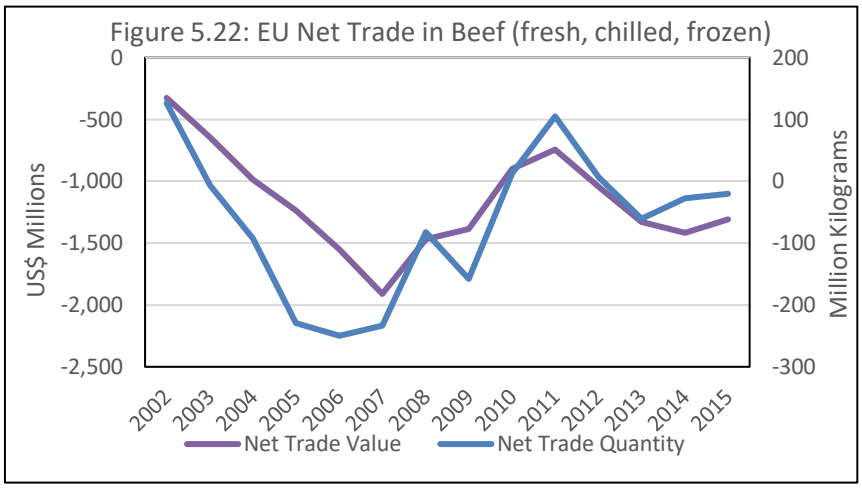




Beef

The EU is a net importer of beef and beef products (Figures 5.22 and 5.23).[55] Values of imports per kilogram are considerably higher than the value of exports per kilogram (Figure 5.23), representing the imports of high quality beef under the TRQ access arrangements ('Hilton beef').

[55] Beef and beef products are taken from HS 0201 Meat of bovine animals, fresh and chilled, and HS 0202 Meat of bovine animals, frozen. UN Comtrade dataset.



The very recent assessment of the cattle based industry in the EU provides very detailed information for all aspects of the EU cattle sector, covering beef, veal and dairy animal production and harvest. The topic of most interest in the document is the impact of the range of CAP subsidies in the industries. Table 5.7 is a reproduction of a part of Table 7: CAP Subsidies in the EU Cattle Sector (Ihle, Rico, et al., page 45) in the report.

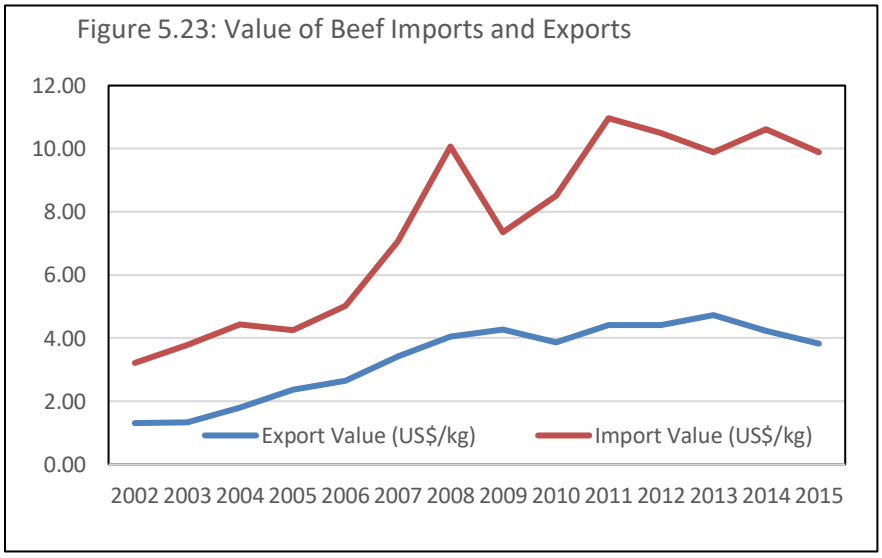


Table 5.7 CAP Subsidies in the EU Cattle Sector

Region or Sub-sector (A)	Milk Cows (B)	Other Cattle (C)	Direct Payments (D)	Other Payments (E)	Total (F)
EU Cattle Sector (€ million)	480	1,201	13,867	6,698	22,246
Share of EU dairy Sector (%)	99	26	75	72	72
Share of EU Bovine Meat Sector (%)	1	74	25	28	28

Notes: The amounts and shares are averages of the annual amounts received by all commercial farms belonging to the EU cattle sector of the years 2011 until 2013. Columns (B) and (C) display the Member State-specific support (VCS, Voluntary Coupled Support) coupled to milk production or other cattle types, respectively. Column (D) displays decoupled payments. Column (E) displays any other subsidies obtained by the commercial farms. Column (F) displays the sum of all subsidies, that is, the sum of columns (B) until (E). The percentages give the share of each subsector or regional subgroups of the MS of the amounts in the second row. The values in each column of rows 3 and 4…. add up to 100%, respectively.

"About two thirds of the support for the cattle sector is through direct payments, with about €6,228 billion for the beef sector. This amount of support from the CAP accounts for 80% of the total annual net income of cattle-keeping farms in the EU, which amounts to €27.2 billion. Farms of the EU dairy sector earn 84% of this amount".

The report also shows the income effect of the payments (Table 8, page 46):

> "Cattle support as a share of farm income:
>
> - EU cattle sector 57%
> - EU dairy sector 49%
> - EU bovine meat sector 100%"

This is calculated from the total farm income in the EU cattle sector (€27,211 million), 16 percent of which goes to the beef sector (€4,354 million). The authors calculate that there are 336,000 annual work units (AWU)[56] who share the income in the sector at €12,842 per AWU. From this they calculate "the amounts of subsidies coupled to dairy or bovine meat production (VCS) and DPs (direct payments) as a share in average farm income. For example, 84% of the total average farm income of years 2011 until

[56] "Annual work unit corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis. Full-time means the minimum hours required by the relevant national provisions governing contracts of employment. If the national provisions do not indicate the number of hours, then 1 800 hours are taken to be the minimum annual working hours: equivalent to 225 working days of eight hours each." Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Annual_work_unit_(AWU)

2013, which amounted in total to €27.2 billion, was earned by professional farms belonging to the EU dairy sector as defined at the principal farming type level." For the beef sector, the authors conclude that 100% of the total average farm income is derived from CAP support payments.

The direct payments "are support for farmers granted independently of quantities produced, that is, decoupled from production." (Ihle et al.) This places them within the green box (decoupled income support) for WTO notifications. The direct payments for meat and milk represent about 40 percent of the total direct payments notified by the EU. Other payments to the cattle sector at a cost of €1,004 million[57] include:

- Payments to producers keeping suckler cows
- Special premium for producers holding male bovine animals
- Slaughter premium within nationally fixed maximum number of head (calves and adults)

These three line items are based on "Payments based on 85% or less of the base level of production: Livestock payments made on a fixed number of head", placing them within the blue box, "Direct Payments under Production-Limiting Programmes – "Exempt Direct Payments". As well, some part of the €1,058.6 million notified within the blue box as "Payments in virtue of Art 68 of Regulation 73/2009" also goes to the beef industry for a range of activities including environmental benefits, product quality, disadvantaged farmers, restructuring, and animal welfare.[58] Beyond the above identified payments, identifying all of the payments to the beef sector from the WTO notifications is impossible, even though he authors have been able to identify the subsidies going to the beef and dairy sectors explicitly within the study.

Two paragraphs are worth citing"

> "This result allows two conclusions to be drawn with respect to the situation before the CAP reform. First, the direct payments to (specialized) dairy and beef farmers were relevant (i.e. address a clear need); without these payments, farm incomes would lag far behind the benchmark income (income earned elsewhere in the economy), irrespective to the benchmark standard that is used. Secondly, as shown in Table A5.16 till Table A5.19, the direct payments were effective in increasing farm incomes. However, in most cases the income support derived from the direct payments was insufficient to create income parity, even though the farm income situation was substantially improved in all cases (**for a few cases there even was overcompensation)**. [emphasis added]
>
> Taking into account the observed impacts of direct payments before the CAP reform on the income of specialised dairy and beef farmers and given that the **order of magnitude of the direct payments after the CAP reform is of a similar order as before the CAP reform**, there is strong evidence that the **direct payments after the CAP reform will be both relevant and**

[57] From the 2012-13 WTO notification.
[58] Article 68 of Regulation 73/2009 is available at: http://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/commonagriculturalpolicycap/CouncilReg73_2009.pdf

(partially) effective with respect to improving the income situation of dairy and beef farmers in such a way that their income is more fair (closer to the reference of benchmark income than without direct payments)." [emphasis in original text]

The conclusion is that the beef sector in the EU could not survive at its current level without the subsidies and their effects identified in the report. The WTO rules allow the high levels of subsidy under the blue box and green box title, making them exempt from calculation in the CTAMS. Consideration of adjustments to the rules for domestic subsidies by Ministers in late 2017 should include limitations on decoupled payments and blue box payments.

Pulses

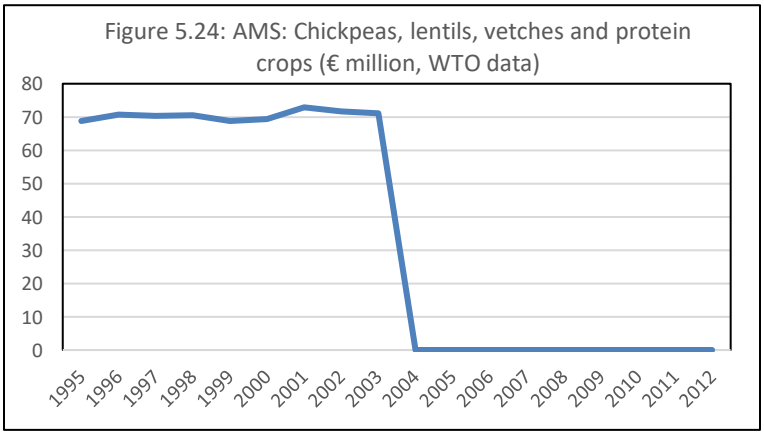
During the past ten-year period, the area under dry pulses cultivation in the EU has fluctuated between 1.5 and 2.1 million hectares. In terms of area cultivated, field peas (34%), broad and field beans (29%) and lupins (12%) are the leading pulses grown in the EU. The remaining areas under dry pulses are grown with a diverse group of dry pulses, such as lentils, chick peas, etc. The distribution of area among member states of EU shows that about 63 percent of the area under dry pulses is located in four member States; Spain (22.5 %), Poland (18.6 %), France (12.4 %) and the United Kingdom (9.8 %). In terms of production, field pea (2 million tonnes), broad and field beans (1.9 million tonnes) and lupins account for 40%, 38% and 7% of production volume respectively. Four member countries of EU produce about 60% of dry pulses production volume (3 million tonnes); France (18%), UK (18%), Poland (14%), and Spain (10%).

Dry peas, broad beans and horse beans are prominent types of pulses that are exported from the EU while peas, lentils and chickpeas are main imports. In terms of trade values, EU is a net exporter of pulses during the most years of the past ten-year period and a significant increase in exports of pulses is visible during the production years of 2014 and 2015

EU's WTO notifications indicate that EU had provided trade distorting support for chickpea, lentils, and vetches during the period of 1995 to 2003 and the annual outlay for pulses was about €70 million (Figure 5.24). EU has not been reporting any amber box support for pulses since 2004.

Dry pulse production in the EU shows substantial increase in recent years after introduction of CAP greening measures and increase in attention on nitrogen-fixing crops. For example, 16 Member States have decided to support the protein crop sector within the voluntary coupled support framework. In 2015, those member states allocated a total of €443 million to the protein crop sector, which was 11 % of the total voluntary coupled support ceiling fixed by the European Commission. Farmers

Figure 5.24: AMS: Chickpeas, lentils, vetches and protein crops (€ million, WTO data)



have responded to these measures by sowing larger areas with dry pulses. In 2015, the EU's total harvest of dry pulses was 5.1 million tonnes and this was about 65% increase when compared to the production level of 2013%[59] [60]. In 2015, subsidies provided for dry pulses was €154 million, about 12% of output value, and when compared to the average level of subsidies provided for dry pulses during 2014-2013 period (88 million), the total disbursement of subsidies for dry pulses in 2015 has increased by 75%. Out of nine member states who were registered for subsidies for dry pulses, Poland (€64.9 million) and France (€41.5 million) recorded nearly two-third of subsidy disbursements.

EU's tariffs on imports of dry pulses (14 tariff lines) show that 75% of tariff lines related to dry pulses are set as duty free, and import tariffs for dried broad beans, pigeon pea, leguminous vegetables (excluding peas, chickpea, bean, lentils, broad bean, horse bean and pigeon pea) are set at 3.2%. Some value added pulses higher tariff than others, such as lentil flour (7.7%), pulses meal (7.7%), soups/broths (11.5)% and canned pulse (19.2%).

The EU is one of Canada's top three markets for Canadian pulses exports and is valued at approximately $250 million annually. Canada exports more than 180,000 tonnes of peas and lentils to the EU each year, as well as 38% of Canadian dry bean exports directed to the EU market[61]. Under the CETA, EU has granted preferential tariff treatment for pulses and pulse based products in the EU market. Under the same agreement, tariffs for pulse flours, fiber and protein will be removed immediately, while the tariff for pulse starch will be phased out over seven years. Under the CETA, processed pulse products produced from inputs that are grown and harvested in Canada will receive preferential tariff treatment. For Canadian pulse products containing non-originating/imported material or ingredients, exporters must satisfy the applicable product-specific rule of origin.

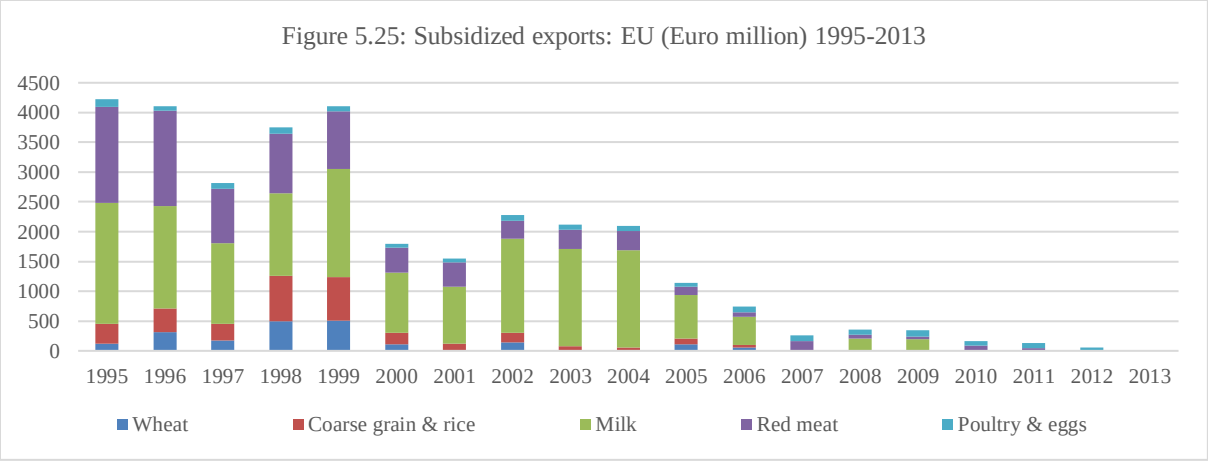
Export Subsidies

In 1995, EU's annual commitment for subsidized exports was €5.129 billion and EU's usage of that commitment for 1995/96 marketing year was €3.577 billion. In terms of value, export subsidies were mainly concentrated on milk products (43%), beef (42%) and coarse grains (8%). The other subsidized exports of the EU include sugar, pork, poultry meat, eggs, fruits and vegetables (fresh and processed), tobacco, alcohol and incorporated products. There has been continuous reduction in subsided exports from EU since 2000. The EU stopped exports of subsidized coarse grain in 2007 and milk products in 2010. For 2013/2014 marketing year, EU has indicated only sugar and poultry meat as subsidized exports (Figure 5.25). The EU is signatory to the Nairobi agreement to eliminate all export subsidies no later than 31 December 2020.

[59] Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php/Dry_pulses_in_EU_agriculture_-_statistics_on_cultivation,_production_and_economic_value

[60] Different Member States lead the production of field peas (France 24%, Spain 22%, Lithuania 11 %, Germany 11%), broad and field beans (UK 27%, France 14 %, Lithuania 10 %) and lupins (Poland 81%, Germany 12%). Other dry pulses are mainly cultivated in Spain (48%) and Poland (26%). Production in 2015 was 1.6 million tonnes higher than in 2014, an increase of 43.8 %. The 2015 dry pulse harvest was 50.6 % higher than the average production of 3.4 million tonnes registered in 2010-2014.

[61] Pulse Canada, http://www.pulsecanada.com/uploads/bd/f4/bdf45f6178d1bf8ce6d17cd467fc3512/13-Oct-18-PC-CSCA-European-Union-Comprehensive-Economic-and-Trade-Agreement.pdf



Note: Other subsidized exports include sugar, rapeseed oil, olive oil, wine, alcohol and incorporated products. Source: WTO

CAP Policy Reforms and Trade Impacts of CETA

Under CETA, the EU has committed to eliminate or reduce tariffs on goods imported from Canada. The tariffs will be eliminated primarily through the four phase-out categories, such as immediately entry into force, over three years (4 equal cuts), over five years (6 equal cuts), and over 7 years (8 equal cuts). The CETA also provides preferential market access through the establishment of tariff rate quotas (TRQs). Under the tariff elimination provisions, EU tariffs on over 95% of its agricultural tariff lines will be duty-free once the CETA is fully implemented. The following table summarizes the products mainly related to this study and the preferential treatment that Canada will enjoy upon CETA entry into force (Table 5.8).

Table 5.8 Preferential tariff treatment for Canadian Agri-food Exports to EU under CETA

Tariff treatment	Products**	Current tariff	Remarks
Duty free upon entry into Force	Vegetable oils (canola oil, soybean oil)	3.2% to 9.6%	
	Processed pulses (flour, meal, broth, canned)	7.7%	
	Baked goods	from 9%	
	Cat and dog food	€94.8/100 kg	
	Some cheeses	€23.13/100 kg	
	Processed beef and pork		
7-year transition period	durum wheat	€148/tonne	
	common wheat	€95/tonne	Subject to transitional tariff rate quota (TRQ)
	wheat starches	up to €224/tonne	
	barley	€93/tonne	
	rye	€93/tonne	
	oat	€89/tonne	
Duty free TRQs Established under CETA	High quality beef bison quota	20% in-quota tariff	TRQ-14, 950 tonnes carcass weight or 11,000 tonnes product weight
	Fresh chilled beef and veal		35,000 tonnes carcass weight. TRQ will phased in over five years 15,000 tonnes carcass weight (TRQ will phased in over five years)
	Bison		Duty free in-quota at entry into force. 3000 tonnes carcass weight.

		Full TRQ available from the beginning.
	Fresh or frozen pork	Duty-free in-quota on entry into force. 80,549 tonnes carcass weight phased-in over 5 years
	Common Wheat (transitional TRQ)	Duty-free in-quota at entry into force. 100,000 tonnes. full volume available at entry into force, duty-free and quota-free after 7 years
Origin quota (products that are covered by the alternate EU rules of origin)	High sugar containing products flavoured drink mixes, iced-tea mixes, instant hot chocolate, and instant coffee, etc.	30,000 tonnes TRQ initially with conditional growth towards 51,540 tonnes TRQ over 15 years
	Sugar Confectionery and Chocolate Preparations	10,000 tonnes TRQ
	Processed foods (baked goods, breakfast cereals, mixes and doughs, pasta, cranberry and blueberry juice, and certain jellies):	35,000 tones TRQ

Note: **Only selected agri-food products relevant to this study are presented in the table. Source: Global Affairs Canada

The producer support available for EU farmers as a share of gross farm receipts has gradually declined. This reduction reflects the impacts of CAP reforms as well as relatively high farm gate prices that prevailed during latter years, particularly after 2007. The subsidies available for consumers in EU show a clear declining trend or complete elimination. Producer support is now concentrated on a few sensitive commodities, such as beef, milk, poultry and sugar. The CAP reforms have narrowed down the price difference between domestic market and world market prices of many food commodities, such as wheat, corn, pulses and pork.

The EU acts as a large country in production and exports of many agri-food commodities and therefore, is capable of influencing the world market prices. Lower domestic market prices than the world market prices assist EU's ability to maintain its net exporter position of agri-foods. The EU has achieved this situation without significant changes to its market access policy. The protection levels of most agri-food commodities remain high. The prevalence of lower domestic market prices than those of world market prices make protective trade policies of many agri-food redundant. This situation is clearly demonstrated by the low fill rates and declining fill rates of many duty free TRQs offered by the EU. The fill rates of most of these TRQs remain low (beef) and for some TRQs such as cheese and skim milk powder, the fill rates show a declining trend. The low commodity prices, selective opening of the market for raw materials (feed ingredients), high trade barriers provide an ideal environment for promotion of domestic value addition and trade (internal or external) of primary and value added agri-food products. The decoupled farm payments, incentives for investments and behavioural changes of farm operators (attitude towards risk) would further strengthen the supply base of farm products. This policy environment would support use of local products (low cost) and imports of scarce raw materials for domestic value addition. Exports of value added generic food products from any third country to EU market therefore would face stiff price competition. Therefore, under the current CAP environment, more trade creation could be expected for supply of raw materials and value added products for niche

markets. Trade diversion from other competing trade partners could occur in products with open TRQs due to differences in in-quota tariff rates.

Natural Capital

Table 5.1 outlines the evolving philosophy regarding agricultural support. The nature, size and purpose of income support have been the subject of ongoing debate as EU policies have evolved. The 2003 reforms bringing in decoupled direct payments and the Single Farm Payment Scheme were in part reflecting environmental concerns that were addressed to a greater extent with cross compliance. Over time there has been ongoing thinking about farm income support and its relation to the environment:

> There have been two schools of thought debating the role of direct payments in the future. One school argues that they make up a necessary basic income support for farmers. Others consider that the payments should rather provide compensation for the public goods farmers deliver. Some even doubt the need of the payment altogether, considering that there is no need to distinguish between farming and other economic sectors. (http://ec.europa.eu/agriculture/sites/agriculture/files/policy-perspectives/policy-briefs/02_en.pdf)

From Chapter 3, Figure 3.14 shows clearly that the most dramatic shift in reported Green Box support occurred over 2004 to 2006 with CAP policy changes. Targeted environmental programs have grown little in absolute value suggesting a decline in the constant dollar value of spending. In essence, income support is now tied to provision of public goods, which for the most part are environmental in nature through 'cross compliance' conditions to income support.

In 2010, the EU announced that 31% of the €5 billion that was earmarked the new (mainly environmental) challenges in agriculture would be spent on protecting and promoting biodiversity in the European countryside. This money is part of the EU rural development policy, which is supporting agri-environmental projects throughout the Member States.

The 2013 reforms continued the attention to the environment with green payment incentive top-ups and continued 'cross compliance'. CAP reforms require producers to adhere to environmental and animal welfare as well as food safety standards. Related to the concern for natural capital and the environment more generally, supports focus environmental conservation in rural development reflecting a shift in thinking from development meaning expansion of quantity to the quality of the agriculture sector's practices. In sum, despite the ongoing production and trade distortions remaining, the evolving theme that values a more sustainable rural and specifically, agricultural sector, can be commended.

Figure 5.1 illustrates the explicit 'Greening' spending as part of the Direct Aid, which has further cross-compliance requirements for the environment. The Greening of direct payments is intended to strengthen the environmental sustainability of agriculture and enhance the efforts of farmers. 30% of direct payments are aimed specifically for the improved use of natural resources. Farmers will be obliged to fulfil certain criteria such as crop diversification, maintenance of permanent pasture, the

preservation of environmental reservoirs and landscapes. The rural supports also include focused spending on the environment and climate.

While the shift to supporting public goods related to the environment reflects a positive shift, the same concerns remain that were noted in Chapters 2 and 3. These include the fundamental concern that support payments are in fact offsetting production costs and therefore suppressing prices. The complexity of these programs and multi-country specifics of programs demands in depth and extensive research. The questions guiding an investigation include the ones already noted such as:

- To what extent are supports for environmental goods and services and natural capital leading to overproduction relative to a country's natural assets, or comparative advantage?
- Are related outcomes generated that reflect efficient payments or are the payments directed to other purposes thus reflecting a subsidy to production and/or price?
- Are payments doubling up on what recipients would have done otherwise or paying to avoid externalities producers should be covering according to regulations?

Some commentators have already pointed out distortions in the CAP related to natural capital including the following:

1. Between 1980 and 2009, the farmland bird population has decreased from 600 million to 300 million, implying a loss of 50%. (*EUtopia (12 July 2012). "EUtopia". Eutopia-blog.blogspot.de)* Among the species that have been hit hardest are the starling and the tree sparrow, which have both declined by 53%. The removal of hedgerows and ploughing over meadows are two significant factors that may have contributed to more efficient farming, but that also caused a decrease in farmland birds' habitats. (*Robin McKie (26 May 2012). "How EU farming policies led to a collapse in Europe's bird population". The Guardian. London. Retrieved6 November 2014.)*

2. Rules instituted in 2015 barring or reducing payments for farmed land above threshold densities of trees or canopy cover have been attacked as having perverse consequences for mature trees, biodiversity, soil erosion and downstream flooding. (*Forgrave, Andrew (2015-03-12). "Warning of chainsaw massacre over Welsh farmland's 'ineligible features'". northwales. And "Slip Sliding Away | George Monbiot". www.monbiot.com.)*

While suggestive, establishing the validity of the claims would warrant significant research. Nevertheless, these comments are just indicative of the many proposals and complaints submitted by environmental NGOs during the lead up to CAP reform.

Other, embedded policies can also appear to be positive and non-controversial given their intended aim while the effects on natural capital could be entirely negative and therefore potentially point to implicit subsidies. One example is the payment for Areas with Natural Constraints, which supports farming in locations where farming is relatively more difficult – wetlands and mountainous areas, for example. The effect of this policy is to encourage production activities in relatively unsuitable areas by reducing costs. Therefore, it props up prices by reducing costs of farming and increases depletion relative to what

comparative advantage would dictate. For example, farming on wetlands can draw a payment but wetlands have ecosystem values requiring assessment vis a vis agricultural use/development. (Alan Matthews at http://capreform.eu/designating-new-areas-with/)

The Philosophy Behind EU Income Support and Cross Compliance

Paying income support to farmers is at the same time a precondition for delivery of basic public goods through responsible land management. With the vast majority of EU territory being used for either agricultural or forestry purposes, it is important that the people managing our natural resources are provided sufficient incomes. In parallel, the link between direct payments and the fulfillment of cross compliance requirements contributes to the provision of public goods. This link is key, as there is evidence of undersupply of most important public goods, for which certain forms of land management are particularly beneficial (such as extensive livestock and mixed systems, more traditional permanent crop systems and organic systems). The public goods concerned are mostly environmental and relates for example to maintaining agricultural landscapes, farmland biodiversity, water availability, soil functionality, climate stability and air quality. However, also public goods which are not related to environment are important, where rural vitality is frequently mentioned. Cross compliance links the payments to the respect of basic rules related to environment, health and animal welfare. For instance, GAEC (Good Agricultural and Environmental Conditions) obligations are related to preserving landscape features, permanent grassland conservation and water courses, and obligations related to soil conservation. Farmers' direct payments are reduced when cross compliance obligations are not fulfilled.

Excerpted from: http://ec.europa.eu/agriculture/sites/agriculture/files/policy-perspectives/policy-briefs/02_en.pdf

The bottom line for this overview is that the sustainability philosophy is a good one and beyond attack – 'Motherhood and Apple Pie' - however, the ultimate impact on production and prices is the far more important question and this is not answerable in a comprehensive or definitive way without significant research and analysis. Attention to individual state spending would also be required and importantly, each situation in each region will require specific analysis to identify subsidies. The point we make here is that there is certainly the potential for such subsidies to be present.

Irrigation

Chapter 2 and the US Chapters introduce the idea that the way irrigation infrastructure is paid for can lead to implicit subsidies to water reducing the input price. In turn this leads to over production along with further costs related to accelerated use of water and its diversion from other beneficial uses of natural capital. Two examples are provided here from the EU. In Spain, infrastructure is paid for at rates estimated to be below capital costs. Calatrava and Garrido (2010) estimated the total subsidy related to irrigation in all Spanish river basins between 1998 and 2008, for capital costs of diversion, storage and transportation of surface water and found that subsidy rates varied across projects and basins but that they are generally set at a rate ranging from between 30 per cent to 50 per cent of the capital costs. Cost recovery rates for operating and maintenance were found to be much higher and easier to calculate ranging from 90 per cent to 99 per cent of costs. They estimated that in total, subsidies to irrigated agriculture may be between 906 million euros per year (under conservative assumptions), and €1,120 million per year. During this period there was development of large modernization projects with broad financing support from various administrations (European, national and regional) with two-thirds of the subsidies corresponding to specific programs financing the modernization of distribution

infrastructure. However, since 2008, government programs were less ambitious, and subsidy levels most likely smaller, because the bulk of irrigation modernization projects had already been carried out and the post 2008 economic crisis reduced the financial capacity of the all Spanish administrations to provide the subsidies.

The authors noted that while information is becoming easier to obtain in Spain and accounting systems are more transparent, so that it should now be easier to estimate subsidy levels, there is of less interest because national and regional governments believe the irrigation sector should have preferential treatment. Combined with this bias, the reality is that the farm sector has undergone serious financial and economic downturn in 2008 and 2009. Consequently, they say, 'no government in Spain, either national or regional, is currently eager to put pressure on the farm sector by reducing support to irrigation.'

A second example is the Irrigation Subsidy for Corn Producers in France. France has the EU's biggest grains sector and France ranks among the world's biggest exporters of cereals. According to FAO, France is the sixth largest producer of cereals after USA, China, India, Brazil and Russia. In 2013, France produced 38.6 million tonnes of wheat and 15 million tonnes of corn with exports of cereals from France to North African countries.

Based on recent CAP reforms, France has developed a unique model with a strong market support and direct payments policy, with environmental and territorial targeted subsidies. Direct payments to crop farmers are biased for irrigated farmers (56% higher than non-irrigated farmers) and about 80% of grants paid for irrigating lands are captured by corn producers. Further, public support for irrigation structures is underestimated. The agriculture sector accounts for about half of total water consumption but the sector's financial contribution to the total receipts of French Water Agencies was 6.5% and thus irrigation water in France is underpriced for agriculture. In case of drought, irrigated farmers receive higher indemnities than non-irrigated farmers. The CAP reforms initiated in 2003 leave irrigation subsidies untouched. The decoupling scheme of 2006 allows French farmers to keep up to 75% of irrigation subsidies granted during the past.[62] In 2005, the estimated irrigation subsidy grant for French farmers amounted to more than €134 million. This figure has been integrated within the French historical decoupling scheme and thus been made permanent under the present CAP policy.

[62] Pierre Boulanger (2010). Distribution of Agricultural Support: Selected French Evidences, http://www.oecd.org/agriculture/44740330.pdf

Pricing Water Efficiently

If water is used at the margin so that the marginal benefit is equal across uses and in turn equal to the marginal cost of providing the water, then we could say that the water was efficiently allocated and that there are not distortions related to over or under use, or ultimately 'subsidy'. Where water is so plentiful as to be no constraint, as in Canada on the shores of the Great Lakes, water is unpriced and it is up to irrigators to decide whether the cost of installing infrastructure is profitable for them, and the region is well endowed with water. In Spain this would relate to comparing the marginal return to water in agriculture to the marginal cost of building irrigation infrastructure with the bottom line of whether it is 'worth' the cost dictating. This boils down to pricing resources through a system where willingness to pay is related to the return to the resource in its various uses. In Australia, the willingness to pay for incremental units of water in the Murray-Darling Basin where over 70 per cent of irrigated agricultural production takes place, has been estimated since the mid 1990s by the return to water in irrigated agricultural production. The system works because water entitlements are held separately to land titles and can be traded either on a short-term lease basis or a long-term sale basis on established water markets. Water can therefore be bought and sold in such a way as to move to its relatively higher uses. Separate charges for water transmission are set by irrigation corporations and regulated by the state authorities. While this approach is likely to generate water resource prices most closely aligned with sustainable use, this only follows if the value in all uses is reflected in the market price. Since 2006 there has been a significant effort to establish banks of environmental water with purchases

Natural Capital - Future Analysis

The best approach to more detailed analysis would be one where individual case studies are developed in order to be specific about the intent of CAP spending, the use and the impact for a specific region and/or commodity.

The focus here has been on spending specifically related to environmental goals. Amber Box spending could have impacts on natural capital as well and associated distortions affecting sustainability, production and prices in the context of natural capital. Case studies would need to attempt to disaggregate effects on a case-by-case basis.

In addition, there is a plethora of programs and spending outside of the CAP that could be providing implicit subsidies to agriculture through the way that natural capital is managed. As a collective good, for example, specific public policies undertaken by government that either protect or neglect sustainable practices influence producer costs. Such policies were mentioned in Chapter 2 and include provision of irrigation infrastructure at less than cost. If producers do not bear the cost of the infrastructure then they will produce more than they would otherwise. This implies both a subsidy on the water input and over production with attendant impacts on natural capital depletion. Furthermore, Climate Change policies would need to be assessed in order to be able to comment on a net effect of the CAP programs. Otherwise, such provisions could be shown to net out distortionary impacts of the CAP, or at least send deliberations into endless effort.

The OECD maintains a database of environmental variables over time. There is the potential to assess the changes in outcomes in relation to program spending but a casual, short-term survey of impacts and estimation of implicit subsidies is beyond the scope of this initial survey.

Observations

The EU has substantially reduced trade distorting amber box support but the decline has been more than compensated through green box support. Disaggregated analysis shows the presence of trade distorting elements within green box, such as irrigation, investment aid and direct environmental payments. The conditions attached with green box support could distort trade.

The available indicators for measuring trade distortions have their own limitations. Using only a portion of total production in market price support calculations underestimates the total support received by producers. The CTAMS is a total of MPS and current value of product specific support. The WTO MPS is based on the difference between current farm prices and the average prices in 1986-1988.

The current reporting system on trade distortionary support is for the EU's 28 members. However, the concentration of support measures into a few member states (for corn, pulses, pork) and large scale operations (pork), coupling of green subsidies for crop production (pulses and soybean), presence of integrated production methods (dairy and beef) and exploitation of natural capital (water) by large scale producers underestimate the real impacts of sector focused support measures on trade.

The CAP reforms have shifted most of trade distorting amber box support into green box support measures. The EU retains a significant portion of blue box support measures that has production impact on both dairy and beef sectors. The CAP reforms have stimulated local production and supply products at much lower cost than imports. The new farm payment schemes are decoupled but it contributes to a larger portion of farm income. Under these circumstances, the possibility of supplying farm products below the cost of production cannot be ruled out. Relatively low farm product prices in the EU make EU's protective trade barriers redundant. This situation could limit the trade creation potential for Canada under the CETA.

The EU has opted to use more farm risk management tools to provide incentives for agricultural production. The delivery of risk management tools is biased towards large scale, irrigated cereal production. These measures apparently help EU to remain competitive in international cereal trade.

An issue is how and why the EU has been able to maintain growing exports of pork and pork products with reported prices below costs of production over several years. There is no identified subsidy for hogs/pigmeat in the most recent WTO notifications, and the OECD database indicates minimal support for the hog sector. This issue needs considerably more analysis and assessment of the underlying causes.

A study of the depth and completeness completed for the beef and dairy sectors would be needed to identify the reasons for the very wide range of prices within the EU for hogs at the member state level, and for the ability of the EU to successfully export pork and pork products with farm prices below cost of production, and production costs (including feed costs based on import prices) substantially above those in Canada, USA and Brazil.

References

AHDB, 2014. 2014 Pig Cost of Production in Selected Countries. AHDB Market Intelligence. Stoneleigh Park, Kenilworth, Warwickshire, UK. ISBN: 978-1-904437-96-3. Available at: http://pork.ahdb.org.uk/media/74797/cost-of-production-web-2014.pdf

Boulanger, Pierre, 2010. Distribution of Agricultural Support: Selected French Evidences, http://www.oecd.org/ agriculture/44740330.pdf

Brink, Lars, and David Orden, 2016. US WTO Complaint on China's Agricultural Domestic Support: Some Preliminary Observations on the Case and its Context. Draft paper presented at the IATRC Meeting, Scottsdale, Arizona, 11-13 December 2016.

Calatrava, Javier and Alberto Garrido 2010. *Measuring Irrigation Subsidies in Spain: An application of the GSI Method for quantifying subsidies*. The Global Subsidies Initiative, International Institute for Sustainable Development.

Cap Reform.eu, 2013. Intervention arrangements in the new CAP. Available at:

http://capreform.eu/intervention-arrangements-in-the-new-cap/

Custom Tariff 2015, Canada Border Service Agency, http://www.cbsa-asfc.gc.ca/trade-commerce/tariff-tarif/2015/01-99/01-99-t2015-2-eng.pdf

Eurostat Database. Available at: http://ec.europa.eu/eurostat/data/database?p_p_id=NavTreeportletprod_WAR_NavTreeportletprod_INSTANCE_nPqeVbPXRmWQ&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-2&p_p_col_count=1

Ihle, Rico, Liesbeth Dries, Roel Jongeneel, Thomas Venus, Justus Wesseler, 2017. RESEARCH FOR AGRI COMMITTEE - THE EU CATTLE SECTOR: CHALLENGES AND OPPORTUNITIES - MILK AND MEAT. Study for the European Parliament. IP/B/AGRI/IC/2016-014. February 2017. Available at: http://www.europarl.europa.eu/RegData/etudes/STUD/2017/585911/IPOL_STU(2017)585911_EN.pdf

Annex, available at: http://www.europarl.europa.eu/RegData/etudes/STUD/2017/585911/IPOL_STU(2017)585911(ANN01)_EN.pdf

OECD, PSE database, http://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm

OECD/FAO Agricultural Outlook, 2015-2024. http://www.fao.org/3/a-i4738e.pdf

Orden, David, David Blandford, and Tim Josling, 2011. WTO Disciplines on Agricultural Support: Seeking a Fair Basis for Trade. Cambridge University Press.

UN Comtrade. https://comtrade.un.org/data/

WTO Country Notification on Domestic Support 1995-2013, https://www.wto.org/english/thewto_e/countries_e/european_communities_e.htm

Chapter 6: USA

Introduction

From the WTO notification perspective, the US has made major changes in the structure of its support to agriculture. The level of support notified within the green box, excluding domestic food aid, has remained relatively constant since 2002. The two largest categories, again excluding domestic food aid, have been income support/insurance/safety net programs, and environmental programs. By far the largest budget item is the domestic food aid programs, growing from less than US$40 billion in 1995 to over US$100 billion in the period 2011 to 2014.

Although the green box support to agriculture has remained relatively constant over several years, the amber box support fell sharply for 2009 to 2013, and fell again for 2014. The significant change in 2014 was the shift from market price support for dairy, reported in the amber box, to an insurance style program reported as a non-exempt program commodity specific expenditure. The result was that all dairy specific non-exempt expenditures were *de minimis* and not included in the CTAMS. For 2014, the US reported a Current Total AMS (CTAMS) of US$3.8 billion compared to its Bound Total AMS (BTAMS) of US$19.1 billion. Of the CTAMS of US$3.8 billion, support for sugar and wool alone represent US$2.3 billion, 63 percent of the total.

Glauber and Sumner (2017) present a compelling case that US farm programs do not substantially affect poor Americans. However, they do point to some specific concerns. One example is the change in dairy support in the most recent farm bill eliminating the market price support for milk, replacing it with an insurance program. Nonetheless, they note that "the elaborate array of marketing regulations raises the price of milk used for beverage products and slightly depresses the price of more heavily processed dairy products and ingredients—such as cheese, milk powders, and butter—that are sold domestically or exported." Another well-known example is the US sugar policy. They argue that the farm commodity policies and programs have at most a tiny effect on domestic food prices with the exceptions of sugar, processed dairy products, orange juice and fresh tomatoes. Going further, they note that the price depressing effects of farm policies and programs are mostly offset by programs to strengthen demand for farm products, including ethanol mandates, conservation reserve and environmental requirements, and nutrition assistance programs. One caveat worth noting is that "although the environment is not a focus of this study, we note that farm subsidy programs, such as crop insurance, may increase agricultural production and facilitate production in marginal lands, with possible environmental consequences for rural populations".

Orden *et al.* (2011) identify five questionable areas not included or possibly mis-categorized in AMS notifications for the USA including disaster payments, federal tax exemptions for agriculture, crop and revenue insurance costs, irrigation and electric power, and ethanol.

Based on these reviews, a number of items in US farm programs need to be explored. In addition, grazing subsidies are explored because the budgets for the Bureau of Land Management and US Forestry Service are substantially higher than the amounts shown in the US WTO notifications. The list for exploration includes, then, grazing subsidies, crop insurance and other insurance arrangements including milk production, irrigation, and disaster payments. Tax exemptions, electric power and ethanol have not been included in this study.

Grazing Subsidies

The issue of grazing subsidies is included in this review for two reasons. First is the issue of whether the natural capital within the federal lands is being maintained. The second reason is that an explanation needed to be found for the level of subsidy notified to the WTO, because some authors suggest much larger subsidies for grazing on public lands. For example, Moskowitz and Romaniello suggest the public cost of grazing on federal lands could be as high as US$1 billion (2002); another example is that the appropriations for BLM and Forestry Service are considerably larger than the WTO notified subsidy.

Grazing subsidies on public lands in the US are noted in both the US Notifications to the WTO and the PSE calculations in the OECD. From WTO Notifications 2013 and 2014, the amounts and description are:

> "The data are net budget outlays for livestock grazing on public land in 16 Western States operated by the Forest Service and Bureau of Land Management. The net budget outlays include (as negative outlays) the receipts for fees paid by livestock producers, but do not include other "non-fee" costs paid by producers, such as building and maintaining water supplies and fences. Including the other non-fee costs could reduce the net outlay figure, perhaps to zero."

	2013	2014
Non-specific budgetary outlays ($million)	US$65.069	US$69.241
Associated fees/levies ($million)	US$19.490	US$19.415
Total Non-specific support ($million)	US$45.579	US$49.826

From OECD PSE calculations, the amounts and description are:

> "Budget expenditure for livestock grazing on public range land in 16 Western States operated by the Forest Service and Bureau of Land Management, net of fees paid by livestock producers. Payments are subject to mandatory input constraints; there are limits on animal units per acre and rates are fixed."

Grazing subsidies (US$ million)

	OECD	WTO Notification	Vincent	
2004	US$46.98	$46.979	$46.5 (BLM)	$68.5 (FS)
2009	US$45.00	$44.764	$37.4 (BLM)	$66.9 (FS)
2010	US$45.44	$45.436		
2011	US$45.44	$46.346		
2012	US$53.85	US$53.840		
2013	US$45.58	US$45.579		
2014	US$49.85	US$49.826		

2015 US$56.91

The Bureau of Land Management (BLM) is situated within the Department of the Interior, while the US Forest Service is within the US Department of Agriculture. Various laws cover the operation of the grazing activities, usually as a joint effort between the Interior and Agriculture. The Bureau of Land Management services 16 western states, while the Forest Service operates in all states with grazing operations in 29 states in 2015. The grazing permits are provided primarily for cattle, but also sheep, goats, horses and burros.

Ranchers pay fees on the basis of animal unit months (AUM) established by formula. The formula has a base level of US$1.23 (set in 1966) and adjusted annually by three factors: current private grazing land lease rates, beef cattle prices, and the cost of livestock production. The BLM website[63] indicates that the grazing fee is not a cost recovery fee, but rather a market based fee. Grazing fees in 2015 were US$1.59 per AUM and set at US$2.11 per AUM for 2016. The BLM's Budget Justifications and Performance for Fiscal 2017 indicates that a Permit Administrative Processing Fee of US$2.50 as a pilot cost recovery initiative will be charged, in addition to the grazing fees, which is expected to raise an additional US$16 million in revenues.[64]

Use rates of public land managed by the BLM and the Forestry Service for grazing have been falling for some years, from 18.2 million AUM in 1954 to 8.6 AUM in 2015. Drought, wildfires, invasive species, and competition with other uses of public land are cited as the cause of the decline.

In a report by the Congressional Research Office, Vincent[65] indicates that the BLM had appropriations of US$58.3 million with estimated revenues of US$11.8 million for grazing operations and the Forestry Service was appropriated US$74.2 million with revenues estimated at US$5.7 million in 2004 for its grazing operations. Together this amounts to appropriations of US$132.5 million and estimated receipts of US$17.5 million. Equivalent numbers for fiscal 2009 were appropriations of US$121.4 million (US$49.3 and US$72.1 million) and estimated fees of US$17.1 million (US$11.9 and US$5.2 million) for the BLM and Forestry Service respectively.

USDA has confirmed that not all of the BLM and Forestry Service appropriations are support for grazing on public lands.[66] This is supported by the Fact Sheet on the BLM's Management of Livestock Grazing (Department of the Interior, Bureau of Land Management, 2016). The Moskowitz and Romaniello study includes all expenditures on public lands under the BLM and Forestry Service, as well as other indirect programs budgeted elsewhere in the US government. Even if included in a WTO notification, virtually all of these other programs would fall under General Services, exempt under current WTO notifications.

[63] BLM website up-dated October 2016. https://www.blm.gov/wo/st/en/prog/grazing.html

[64] Bureau of Land Management Budget 2017, page VII-35 at: https://www.doi.gov/sites/doi.gov/files/uploads/FY2017_BLM_Budget_Justification.pdf

[65] Carol Hardy Vincent, 2012. Grazing Fees: Overview and Issues. Congressional Research Service, https://fas.org/sgp/crs/misc/RS21232.pdf

[66] Personal communication.

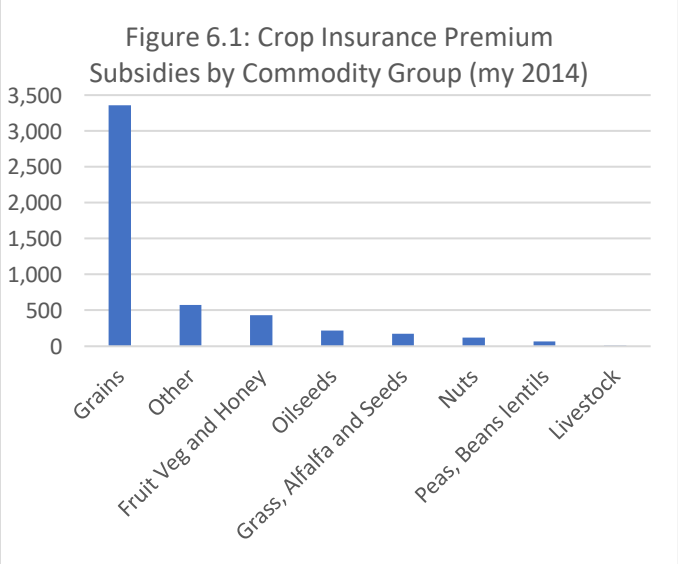
Vincent notes the strongly held views by ranchers and opposing views by others regarding continued use of public lands for grazing. Ranchers feel that others want to deny all public lands to grazing that will destroy ranching as a way of life. Those opposed argue that grazing the public lands leads to loss of soil and vegetative quality. Unsuccessful Congressional attempts have been made to raise fees to full (or greater) cost recovery for some years, although the 2017 budget appears to be leading in that direction.

The growing wild horse population on public lands is progressively reducing the budget for maintenance of public lands for pasturing ruminants. Congress agreed in the 1970s to halt harvesting of wild horses on public lands, forcing the BLM to respond with care and feeding costs for these animals, including renting private pasture land. Without budget increases, the BLM budget for maintaining the wild horse population is eroding budgets for cattle, sheep and other animals to access grazing on public lands.[67]

There is no widespread indication that the natural capital embodied in the publicly owned land and forestry resource used for grazing is being eroded. While climate change, drought, invasive species, and wildfires are affecting the resources, significant attempts to control and improve the quality of the resource is on-going. Nonetheless, the Moskowitz and Romaniello (2002) study cites substantial deterioration in the natural capital of the public lands under BLM and Forestry Service management although the websites for BLM and the Forestry Service in more recent years indicate an opposing point of view.

Crop Insurance

The US notifies crop insurance premium subsidies as commodity specific non-exempt support, detailed by each commodity for which there is a crop insurance program. Figure 6.1 shows the distribution of the crop insurance premium subsidies across commodity groups. Cereal grain crop insurance subsidies are by far the largest set of commodities in the program and clearly larger than the cereals share of value of production, confirming the concern noted by Glauber and Sumner. The next two commodity groups in size of crop insurance premium subsidies are "other commodities" (almost entirely cotton in the group), and fruits, vegetables and honey. Crop insurance subsidies are by far the largest single component of the non-exempt commodity specific programs in agriculture (Figure 6.2). The three largest components are crop insurance, market price support for sugar, and non-exempt direct payments for tree nuts and peanuts.



[67] See for example, the video: https://www.nytimes.com/video/booming/100000002284527/wild-horses-no-home-on-the-range.html

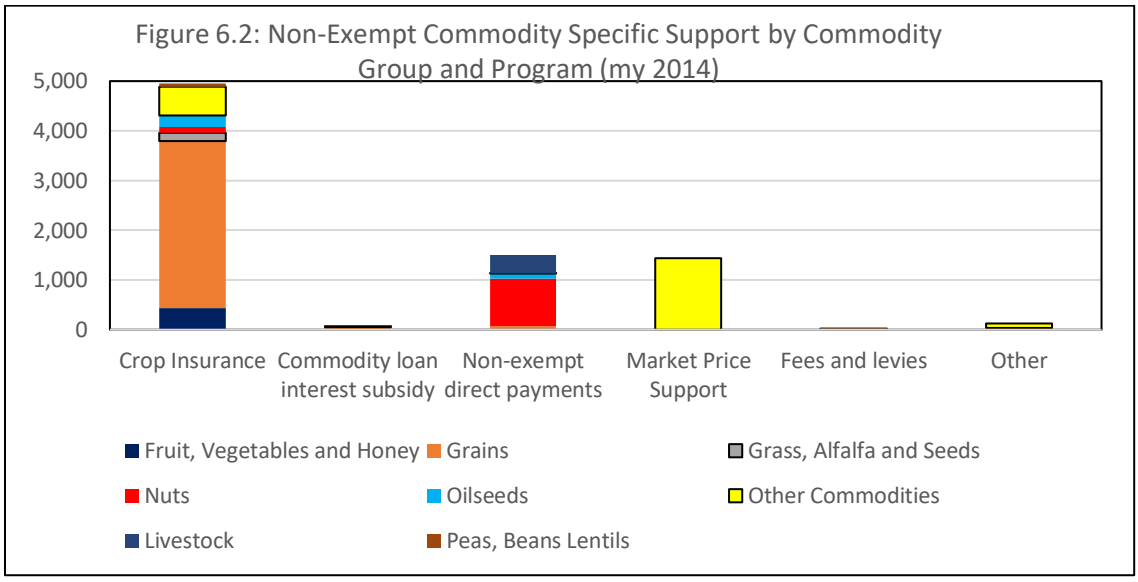


Table 6.1 shows the distribution of payments an support by commodity group. The "other commodities" include sugar, cotton, tobacco, and coffee.

Table 6.1: Distribution of Non-exempt Commodity Specific Support (marketing year 2014, US$ billion)

	Crop Insurance	Commodity loan interest subsidy	Non-exempt direct payments	Market Price Support	Fees and levies	Other	Total
Fruit, Vegetables and Honey	436.555	0.074	22.685		0.019		459.295
Grains	3,359.592	29.631	57.484		7.601		3,439.106
Grass, Alfalfa and Seeds	170.496	0.000	0.000		0.000		170.496
Nuts	116.666	9.223	943.554		3.756	33.054	1,098.741
Oilseeds	221.418	4.853	103.689		2.069		327.891
Other Commodities	578.784	30.866	4.165	1,433.433	14.958	86.412	2,118.702
Livestock	6.512	0.000	371.704		0.000		378.216
Peas, Beans Lentils	66.853	0.069	0.000		0.013		66.909
Total	4,956.876	74.716	1,503.281	1,433.433	28.416	119.466	8,059.356

Thirteen commodities[68] have total AMS exceeding the *de minimis* level of 5 percent of value of production. With two exceptions, sugar and peanuts, the crop insurance premium subsidies alone exceed the *de minimis* level. Based on the 2008 WTO draft modalities to reduce *de minimis* by some percentage (e.g., 2.5 percent of the value of production), an additional eleven commodities[69] would have exceeded have this level of AMS, ten of which would be based on crop insurance premium

[68] The 13 commodities are canola, cotton, dry beans, flaxseed, millet, peanuts, popcorn, sesame, sorghum, sugar, sunflower, tangelos and wheat.

[69] The eleven commodities are barley, buckwheat, corn, dry peas, grapefruit, green peas, honey/apiculture, mustard, onions, safflower, and tobacco.

subsidies alone (the exception is honey/apiculture). Lowering the *de minimis* level to 2.5 percent would have added US$2.4 billion to current total AMS for marketing year 2014.

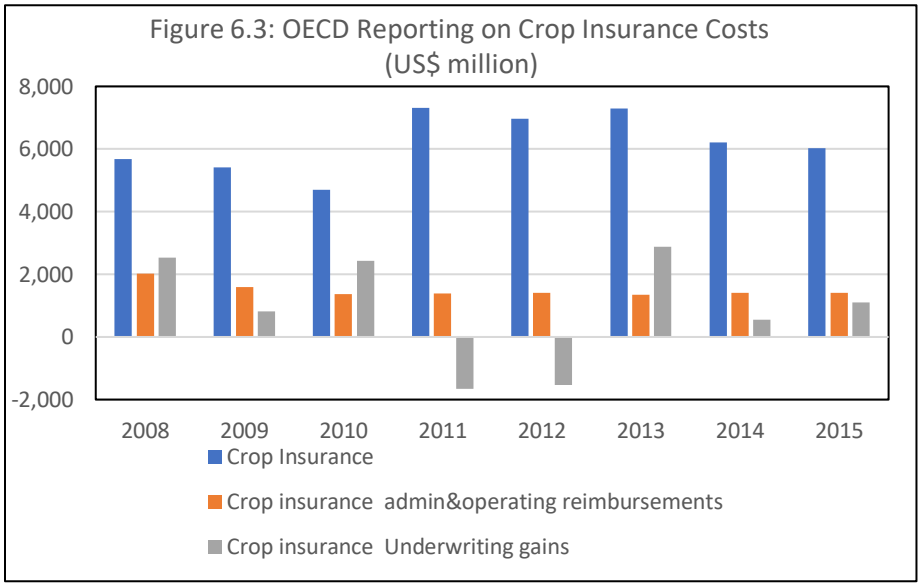
Two additional items in the US WTO notification related to crop insurance can be noted. First, under General Services (exempt under the WTO), the Farm Service Agency spent US$1.407 billion in 2014 on "Reimbursements for certain administrative and operating expenses of insurance companies delivering Federal crop insurance". Second, the Farm Service Agency provided US$560 million for "Underwriting gains provided to insurance companies under the Standard Reinsurance Agreement".[70] These funds for program delivery and reinsurance costs for the private sector delivery of the program are not included in the premium subsidy. This is in addition to the US$67 million for administration and management of the program within government. The total cost of the program (premium subsidy, internal management and administration, private sector delivery costs and reinsurance costs) was US$6.991 billion with overhead and delivery at 29 percent of the total program costs. Although the internal and external delivery costs are high, the question is whether the reinsurance costs should be included in the calculation of non-exempt support in the AMS. Payment by government of the reinsurance costs essentially means that funds have been paid to producers as crop insurance indemnities that are in excess of the total premiums (farmer and government shares). However, the arrangements for crop insurance also includes a provision for repayment of gains by the crop insurance companies. (See Figure 6.3 below for the years 2011 and 2012.)

Interestingly, Canada does not report crop insurance premium subsidies as non-exempt commodity specific subsidies; rather crop insurance premium subsidies are shown in Non-Product Specific AMS. Premium loadings in the years following an increase in the indemnity to premium ratio (loss ratio) are used to bring the ratio back toward one. The federal Act allows a repayable reinsurance arrangement for provinces administering the crop insurance program. Generally, program administrative costs are not reported; only operating costs for research, extension and inspection are included in WTO notifications.

The US changed the way in which it notified crop insurance expenditures beginning in the 2011 year. In prior years, crop insurance premium subsidies were notified as a lump sum under non-exempt and non-commodity specific expenditures. With the change starting in 2011, the subsidies were notified as non-exempt commodity specific. The change allowed the US to reduce its CTAMS since the crop insurance premium subsidy for many commodities, along with any other commodity specific subsidy for the commodity, fell under the five percent *de minimis* level. The result is that the US included only US$1.754 billion for crop insurance premium subsidies in the CTAMS calculation for 2014, instead of the total premium subsidies of US$4.950 billion. If the *de minimis* level falls in the future by 50 percent, the additional amount of crop insurance premium subsidies in the CTAMS calculation for 2014 would have been US$2.362 billion for a total of US$4.116 billion, but still below the actual premium subsidy of US$4.957 billion.

[70] For background on the Standard Reinsurance Agreement, see: Vedenov et al., 2013.

Figure 6.3 shows the amounts reported by the OECD for the US crop insurance program. For the years 2010 to 2013, the premium subsidies are nearly identical to the amounts notified to the WTO. However, the OECD includes the expenditures for the reinsurance arrangement under the General Services Support Estimates (Institutional Infrastructure), as well as the payments for program delivery to the private service providers.



The most recent farm bill in the US has clearly shifted the commodity support toward the crop insurance program. Given the variation in notifications of crop insurance support, greater clarity in the way in which crop insurance costs are notified appears to be needed. The Ministerial Meeting planned for late 2017 to address domestic subsidies may offer a venue to achieve greater clarity and uniformity in reporting across countries.

Finally, the preponderance of payments under crop insurance for cereals needs further explanation and analysis.

Disaster Payments

The discussion of disaster payments is included because Orden et al. 2011, flagged these payments as a concern. The US has notified WTO of several disaster payments:
General Services

- Payments for relief from natural disasters:
  - Non-insured Crop Disaster Assistance Program (NAP, crop year)[71]
  - Emergency loans[72]
- Environmental payments:
  - Emergency Conservation Program[73]

Product-Specific Aggregate Measurements of Support: Non-Exempt Direct Payments

[71] Under the 1994 Federal Crop Insurance Reform Act (P.L.103-354), producers of crops not currently insurable under other programmes received benefits if it was determined by the USDA that there had been yield losses greater than 35% for the area, and greater than 50% for the individual farm. The area loss requirement was eliminated per Section 109 of the Agricultural Risk Protection Act of 2000 (P.L. 106-224). The 50% loss requirement for each producer has been continued.
[72] Emergency loans provide emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland damaged by natural disasters and for carrying out emergency water conservation measures in periods of severe drought.
[73] Assists in funding emergency conservation measures necessary to restore farmland damaged by natural disasters.

- Emergency livestock assistance (ELAP) (US$ million)[74]
- Livestock forage payments (LFP) (US$ million)[75]
- Tree assistance (TAP) (US$ million)[76]
- Livestock indemnity payments (LIP) (US$ million)[77]

Table 6.2: WTO Notification of Disaster Payments			
General Services		2014	2013
	Non-insured Crop Disaster Assistance Program (NAP, crop year)	124	172
	Emergency Conservation Program	23	2
	Total	147	174
Product-Specific Aggregate Measurements of Support: Non-Exempt Direct Payments			
Beef cattle and calves	Emergency livestock assistance (ELAP)	18.956	0.51
Livestock	Emergency livestock assistance (ELAP)	5.366	3.803
Honey/Apiculture	Emergency livestock assistance (ELAP)	10.421	14.488
Livestock	Livestock forage payments (LFP)	908.407	1,638.18
Orchards, vineyards, nursery	Tree assistance (TAP)	12.264	3.374
Sheep and lambs	Livestock indemnity payments (LIP)	0.8	0.651
Poultry	Livestock indemnity payments (LIP)	0.492	0.283
Llamas	Livestock indemnity payments (LIP)	0.001	0.002
Dairy	Livestock indemnity payments (LIP)	2.438	0.741
Deer (in captivity)	Livestock indemnity payments (LIP)	0.005	0.003
Equine	Livestock indemnity payments (LIP)	0	0.312
Emus	Livestock indemnity payments (LIP)	0.018	0
Goats	Livestock indemnity payments (LIP)	0.181	0.023
Hogs and pigs	Livestock indemnity payments (LIP)	0.11	0.147
Beef cattle & calves	Livestock indeminity payments (LIP)	18.956	55.731
Bison	Livestock indemnity payments (LIP)	0.014	0.055
Alpacas	Livestock indemnity payments (LIP)	0.001	0.001
	Total	978.43	1718.307

[74] Emergency Livestock Assistance Program (ELAP) payments were reauthorized by the 2014 Farm Act. ELAP provides emergency relief to eligible producers of livestock, honey bees, and farm-raised fish for losses due to disease, adverse weather, or other conditions not covered by other Supplemental Agricultural Disaster Assistance programs. Data indicating the share of payments going to different categories of eligible livestock is not available except for honeybees and farm-raised fish (not reported here).
[75] Livestock Forage Disaster Program (LFP) payments were reauthorized by the 2014 Farm Act. LFP provides payments to eligible producers of covered livestock for grazing losses due to drought or fire (on public managed land). Data indicating the share of payments going to different categories of eligible livestock is not available.
[76] Tree Assistance Program (TAP) payments were reauthorized by the 2014 Farm Act. TAP provides assistance to eligible orchardists and nursery tree growers to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters. Data indicating the share of payments going to different categories of eligible trees, bushes and vines is not available.
[77] Livestock Indemnity Program (LIP) payments were reauthorized by the 2014 Farm Act. LIP provides payments to eligible producers for livestock death losses in excess of normal mortality due to adverse weather.

For the most part, the expenditures are small both absolutely, and in relation to value of production, with a single exception: the livestock forage payments for loss of grazing due to fire or drought on public lands for the two years shown in Table 6.2. In the 2012 year, expenditures were also large at US$2.58 billion, although in 2010 and 2011, expenditures were US$33.6 million and US$279 million respectively.

There is no apparent reason to flag disaster payments for concern. The high expenditure years reflect the drought through the western states; expenditures fluctuate with the extent of damage to grazing capacity on public lands. The only query would be why these costs are not included in the costs associated with the grazing subsidies on public land.

US Irrigation Subsidy

The US notified irrigation subsidies to the WTO within the category of General Services, non-product specific AMS (Supporting Table DS-9 2013) as US$167.31 million. The program description is: "Based on a "debt financing method". The OECD database provides the same data, although it is included within the PSE estimate, not General Services. The program description for the OECD is:

> "Irrigators are obligated to pay a share of the long-term debt for construction of reclamation projects from which they benefit, but pay no interest on that debt. The Government cost of financing the debt is considered support and is calculated using a "debt financing method." A long-term interest rate (30-year Treasury bond) is applied to the outstanding unpaid balance of capital investment by the Government to obtain the support level. Payments are not subject to input constraints or to production limits and payment. Payment rates are fixed."

US Irrigation Subsidies (million US$)

2009	203.83
2010	203.83
2011	188.73
2012	188.73
2013	167.31
2014	167.31
2015	167.31

Source: OECD

This program covers projects in 17 western US states, primarily based on surface water capture and redistribution mostly for agricultural irrigation and some power generation, through the Bureau of Reclamation. The further distribution of water is through farmer/rancher cooperatives or community organizations to deliver water locally. The local delivery systems are supported by fees from users.

For ground water in several states, the right to pump water is attached to the ownership of land; in other cases, surface and ground water is public property with rights granted for beneficial use. In some cases, water use is regulated in terms of quantity and seasonal timing. In other cases, there is no limit on the amount pumped, and in still others, the amount pumped is limited to "reasonable use", although apparently not uniformly monitored. Over the years, the depth of wells has increased markedly (although not uniformly) signaling that the underground aquifers are being depleted more rapidly than recharge from surface water, resulting in subsidence of the surrounding land as the underground cavities for water shrink. The recharge rate can vary considerably within the same aquifer; Scanlon (2012) notes that the northern portion of the Ogallala aquifer (high plains aquifer) has a recharge rate sufficient for current levels of use, while the central and southern areas of the aquifer have substantially lower and possibly zero recharge rates, indicating that a drawdown in the aquifer is well underway. Indeed, well depth has increased in some areas so that the cost of pumping and distribution exceeds the

additional revenue from irrigation. He estimates that ~330 km^3 of water has been drawn down in the high plains aquifer (8 percent) and ~140 km^3 of water has been drawn down from the aquifer (14 percent) in the central valley of California. The drawdown in the two aquifers represents 51 percent of the estimated storage declines in aquifers from 1900 to 2008 in the USA (Konikow). Konikow also indicates that the world-wide drawdown in ground water has grown substantially since 1950, with the highest rate in the period 2000-2008 at ~145 km^3 per year.

Suarez *et al*. point out that the average area of irrigated land as a share of planted area in the five states over the high plains aquifer increased sharply from the late 1960s to the mid 1980s to about 30 percent, but has barely increased since that time period. They found that yield increases averaged 48 to 50 percent with irrigation, indicating revenue increases on the order of US$130/acre to US$199/acre. Across all the counties examined in the study, the additional revenue from irrigation ranged from US$72/acre to US$229/acre in 2007 dollars. In 2015, soybean yields under irrigation were between 61 and 95 percent higher than non-irrigated soybeans in Kansas; corn yields increased by 34 to 163 percent with irrigation.[78] For winter wheat, yields increased by 62 to 118 percent with irrigation. Similar yield increases can be found in Nebraska, with corn yields increased by 32 to 163 percent in the regions with irrigation in 2015.[79] Table 6.3 shows example data for corn production and yields in three states for irrigated and non-irrigated areas.

Table 6.3: Production and Yields for Irrigated and Non-Irrigated Corn

Corn 2015	Kansas	Nebraska	Texas
Acres Harvested	3,920,000	9,150,000	1,970,000
Production (bu)	580,160,000	1,692,750,000	265,950,000
Yield (bu/A)	148	185	135
Irrigated Acres Harvested	1,402,000	5,367,000	1,085,000
Irrigated Production (bu)	289,354,000	1,111,426,000	199,550,000
Irrigated Yield (bu/A)	206.4	207.1	183.9
Non-Irrigated Acres Harvested	2,518,000	3,783,000	885,000
Non-Irrigated Production (bu)	290,806,000	581,324,000	66,400,000
Non-Irrigated Yield (bu/A)	115.5	153.7	75.0

The topic of drawing down groundwater supplies in the US and other countries is gaining considerable emphasis in professional journals, noting the relationship between food production and trade. See Dalin et al., 2017 for example.

One can conclude that:

- The irrigation subsidies apply primarily to surface water catchment and distribution.

[78] https://quickstats.nass.usda.gov/results/A83C94F5-8406-395D-BE72-7CB11E079926#D2076CDF-4622-3B21-990D-1D5B9DFB597E
[79] https://www.nass.usda.gov/Statistics_by_State/Nebraska/

- Ground water is essentially a common property resource, owned and allocated by the state in some cases, and attached to land in other states.
- Ground water irrigation is drawing down the fossil water in almost all areas of the high plains and the central valley in California in the USA. Recharge of the ground water supply cannot offset current use rates in most areas.
- In some cases, recharge may be impossible because of the land subsidence, shrinking the space available for the water for recharge.
- Drawing down the water faster than recharge rates increases surface water on the earth, causing some of the rise in ocean levels (Kanikow).
- The irrigated crops use more fertilizer and pesticide than non-irrigated crops, potentially leading to additional plant nutrient and pesticide runoff into water courses and eventually oceans.
- The aquifers have limited amounts of water; eventually the ground water will be fully mined or too expensive to pump for agriculture or any other use of the water.
- Irrigated crops provide higher yields than non-irrigated crops across the high plains in the USA, with the return to irrigation exceeding the costs of pumping and distribution.
- Limiting ground water use to recharge rates would lower yields and production as well as cause shifts in cropping patterns to crops with less intensive water requirements.

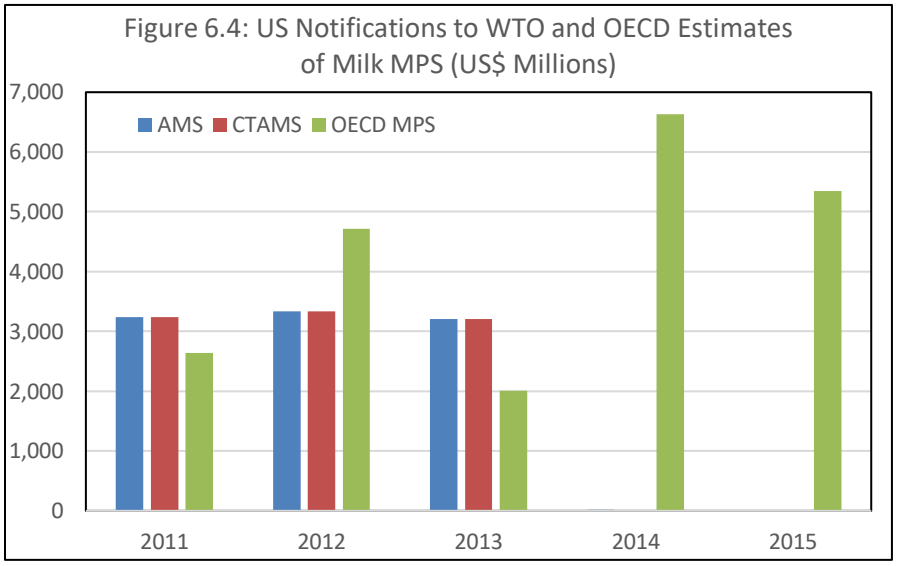
From an environmental perspective, continued use of the ground water supply at current levels is unsustainable and contributing to pollution, salinity in soils and waterlogging. From an economic point of view, it is under-priced as a common property resource, increasing total production of some crops and decreasing production of other crops that have lower moisture requirements. Equally, the greater production is lowering prices of the irrigated crops locally, nationally and internationally. While clearly this is the case, actual measurement of the price effects of limiting ground water use to sustainable levels for agriculture and all other uses into the future would be exceedingly difficult. Current trade agreements can deal with price suppression from domestic subsidies, but they remain silent on environmental externalities in production as well as on the steady erosion in the finite factor endowment represented by ground water.

Milk

Support to dairy has been a very large element of US product specific AMS historically. This was consistent with a period in which the US operated an effective support price program for butter, non-fat dry milk, and cheese, in addition to a range of deficiency payment programs. In the 2014 Farm Bill, important programming changes were made that impact levels of support to dairy. The Dairy Product Price Support Program was terminated, along with the Milk Income Loss Contract (a deficiency payment scheme) and the Dairy Export Incentive Program (an export subsidy program). At the same time, the Margin Protection Program (MPP), a type of income insurance product, was launched. This leaves MPP and Federal Milk Marketing Orders as the major elements of US dairy policy; payments under MPP will not show up in WTO notifications until the US provides data beyond 2014.

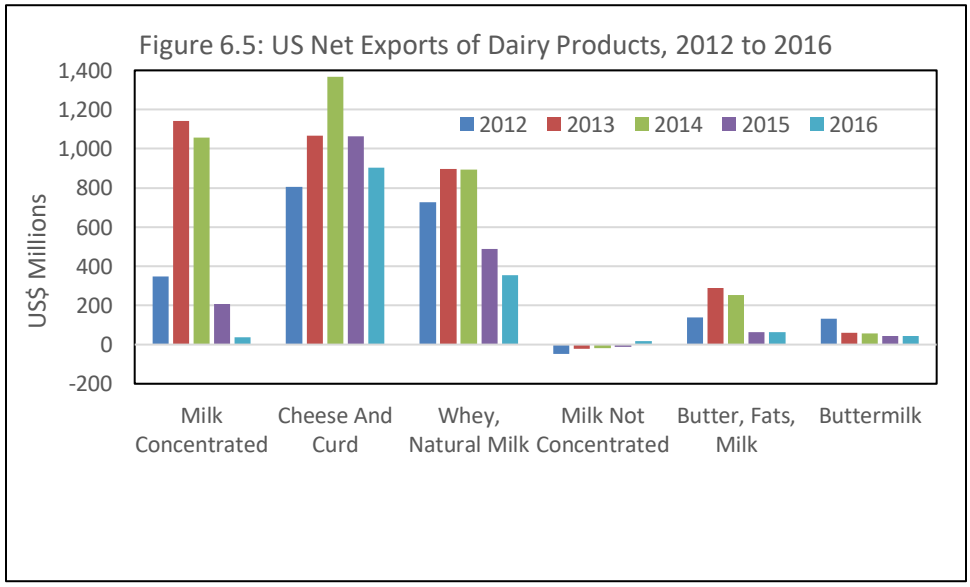
Figure 6.4 below presents recent US notifications to the WTO of AMS and CTAMS for dairy, along with OECD estimates of Market Price Support (MPS) for US dairy. The WTO notifications illustrate the

dramatic change associated with the 2014 Farm Bill. Prior to 2014, the US notified US$3.2 to 3.3 billion in AMS which exceeded the *de minimis* level and was counted in CTAMS. This is consistent with the Dairy Product Price Support Program and relatively small payments under the Milk Income Loss Contract. For 2014 (the most recent year notified), the US reported only US$14 million in AMS, which did not exceed the *de minimis* threshold and was not counted as CTAMS. This is consistent with the elimination of the Dairy Product Price Support Program and conversion of the Milk Income Loss Contract to MPP.



Meanwhile, the MPS reported for US dairy by the OECD increased from $US 2.6 billion in 2011 to $US 5.3 billion in 2015- a divergent trend compared to the US WTO notifications. The OECD MPS measure is based on current US farm-level milk prices versus a constructed reference milk price, derived from world dairy product prices for the 1986-1998 period and yield and manufacturing cost factors. The level of MPS is consistent with US milk prices exceeding reference price levels- due to the protective effect of US tariffs, the prices supporting effect of Federal Milk Marketing Orders, or both.

Figure 6.5 below presents net exports of dairy products by the US according to 4-digit HS code. It shows that the US is trade surplus in all major dairy product categories with the exception of milk, not concentrated.



US dairy thus presents some notable divergences which merit further investigation. While AMS for milk notified to the WTO has dramatically declined, the MPS estimated by OECD has been increasing. What is remarkable about the sharp decline in AMS notified to

the WTO for dairy in the US is how little actually changed when the Dairy Product Price Support Program was eliminated. For its last several years, there was very little or even zero product purchased under the price support program, however the US notified AMS based on the differential between its support prices and historical reference prices, multiplied by total production. In effect, when the program was discontinued, no less dairy product was purchased by the US government, but US notification to the WTO of the AMS declined almost to zero.

Secondly, while the OECD's MPS for the US has been significant and increasing, the US has also been heavily trade surplus in dairy products. This contradicts accepted wisdom that pricing is an important element in export competition. It also suggests that classified pricing under Federal Milk Marketing Orders in the US has been successful in both increasing relative milk pricing in the US (as measured in MPS) and facilitating dairy exports.

Natural Capital in the USA

It is possible to disaggregate the spending reported to the WTO in country Notifications to get a better idea of the kind of support that is provided. This allows for a more detailed analysis of whether or not natural capital is being affected in a way that could be interpreted to be distortionary. To illustrate our point and to test a process, below we undertake a trial of analyzing the Green Box programs for the US.

While the aim may be to concentrate on what would be Environment Programs, spending officially reported under 'Environment Programs' in Notifications to the WTO may not represent what could be called 'total' spending on environment and natural capital efforts. For this analysis, programs were considered under General Services, Green Box categories (a), and (h), Structural Adjustment Through Resource Retirement Programs, that we here define to be 'environment and natural capital' spending. The aggregates resulting from our analysis are given in Figure 6.4 below.

Figure 6.4 shows the sum of the General Services spending allocated to 'environment spending'. The category includes spending on National Institute for Food and Agriculture (NIFA), Biomass Research and Development, Rural Energy for America Program (Formerly Renewable Energy Program and moved in 2011 to Non-Product Specific AMS in 2007); Conservation Reserve Programme Technical Assistance; Natural Resource Conservation Service (NRCS) Conservation Operations and Resource Conservation and Development. Further analysis is warranted here especially given the movement of some program spending across categories over time and the introduction and replacement of other programs.

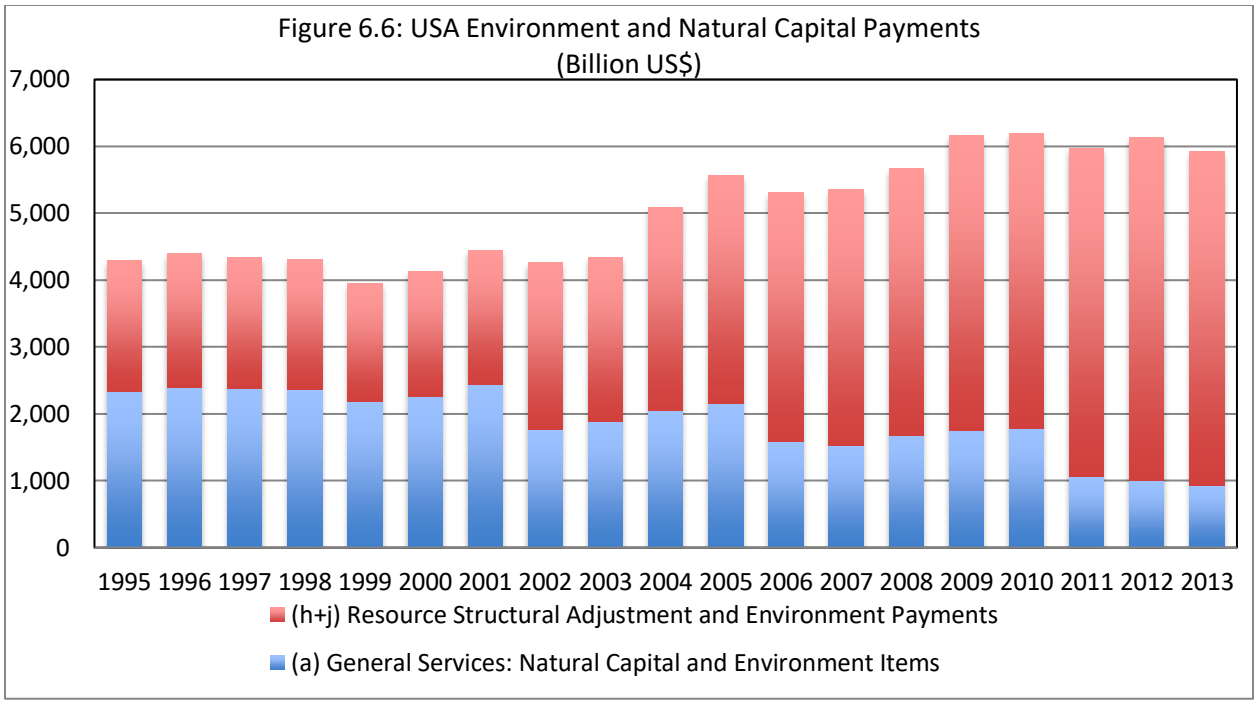


Figure 6.6 illustrates that more recently the greater share of total Environmental and Natural Capital Payments has been the sum of Green Box category (j), Environment Payments and (h) Structural Adjustment Through Resource Retirement Programs, which includes Commodity Credit Corporation (CCC) Conservation Reserve Program payments and Conservation Reserve Program Technical Assistance payments (CCC part).

As a share of total green box payments, the program spending isolated and defined here as Environment and Natural Capital Payments, has been declining (Figure 6.5 below). This is not because program spending on the environment has declined, as shown in Figure 6.4 above, but because other Green Box categories such as Domestic Food Aid have risen sharply. This is a result of definitions and inclusions.

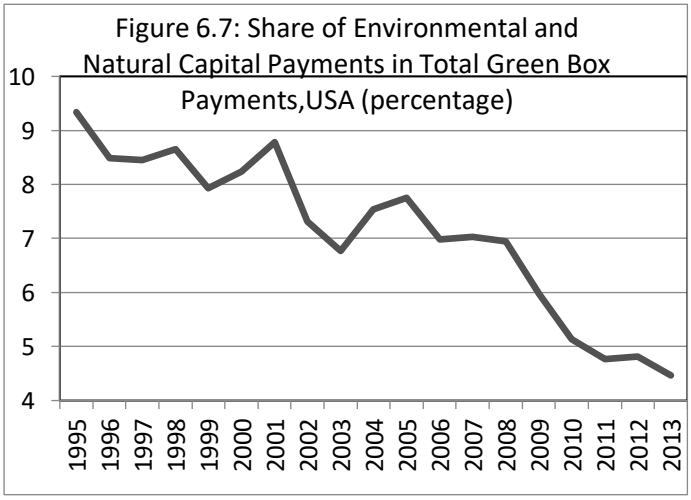
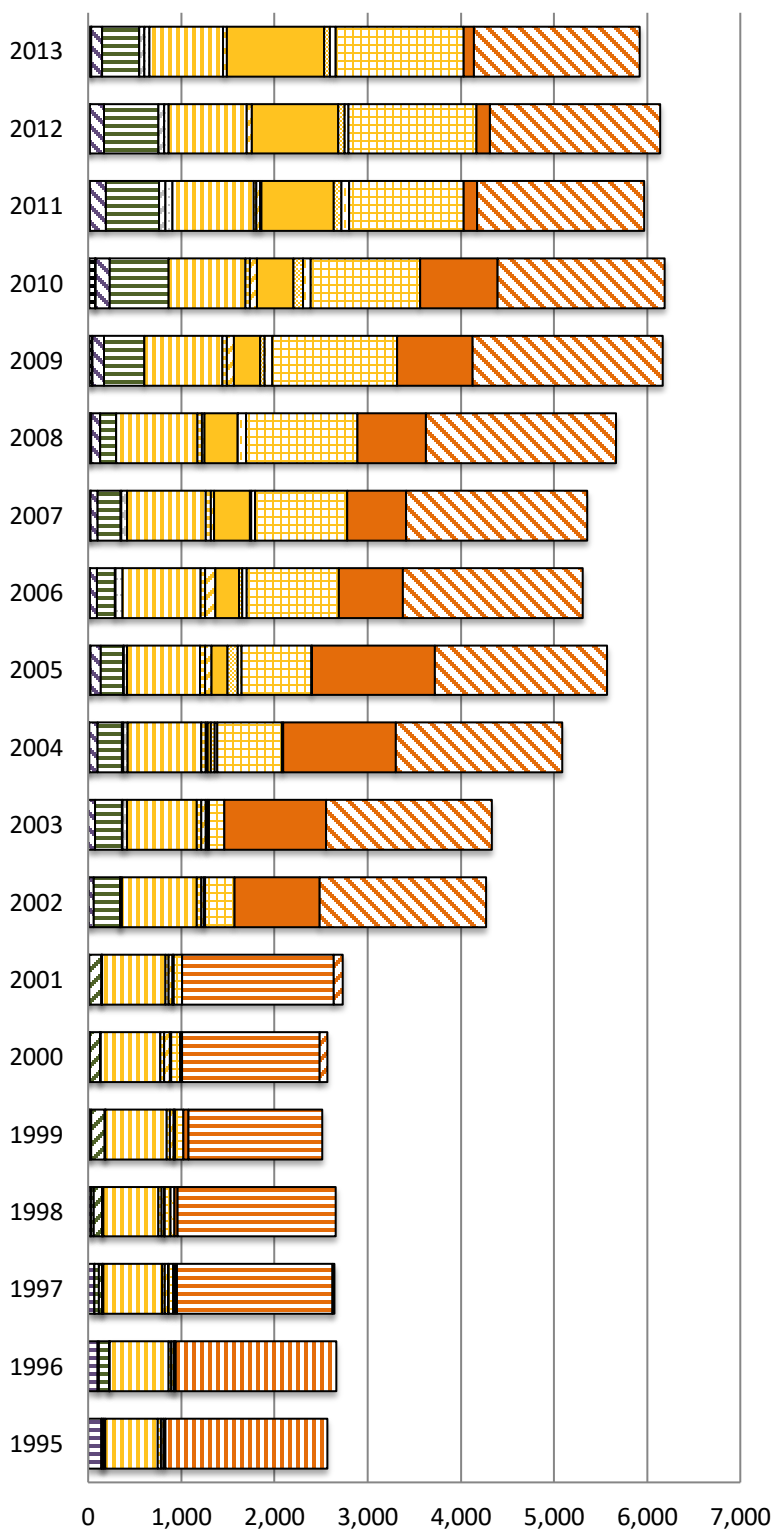


Figure 6.8 below itemizes the various programs included in the Environmental and Natural Resource categories. While specific programs have changed, the emphasis has been on payments for conservation. In comparison, very little is focused on energy, salinity and wetlands. Not surprisingly, the detail makes it hard to see trends. The color coding for the categories helps us relate to the following table (6.7) that aggregates programs according to seven program 'types' that we identify and use for this exercise.

Figure 6.8: USA Green Box Environmental and Natural Resource Categories - Details
(Billion US$)



- Biomass Research and Development combined agencies
- Rural Energy for America Program
- Renewable Energy Program
- Conservation loans
- Agricultural Conservation Program
- Farms for the Future
- Agricultural Management Assistance Programme
- Farmland Protection Programme
- Wetland Reserve Program description for pre 2001
- Wetland Reserve Programme See also CCC part in early years
- Wetland Reserve Program (also see NRCS part)
- Colorado River Basin Salinity Control
- Water Bank Program
- Klamath Basin 2007
- Ground and Surface Water 2007
- Agricultural Water Enhancement Programme
- Chesapeake Bay Watershed Initiative
- Natural Resource Conservation Service NOTE 3
- Resource Conservation and Development
- Emergency Conservation Programme
- Voluntary Public Access and Wildlife Habitat Incentives (VPA-WHIP)
- Great Plains Conservation Program NOTE 9
- Conservation Stewardship Programme NOTE 5
- Grassland Reserve Programme
- Wildlife Habitat Incentives Programme
- Environmental Quality Incentives Programme (EQIP)
- Conservation Innovation Grants
- Conservation Program Technical Assistance
- Conservation Reserve Programme Technical Assistance NOTE 2
- Commodity Credit Corporation (CCC) Conservation Reserve Program
- Conservation Reserve Programme FSA
- Conservation Reserve Programme Technical Assistance CCC part NOTE 2
- Conservation Reserve Programme

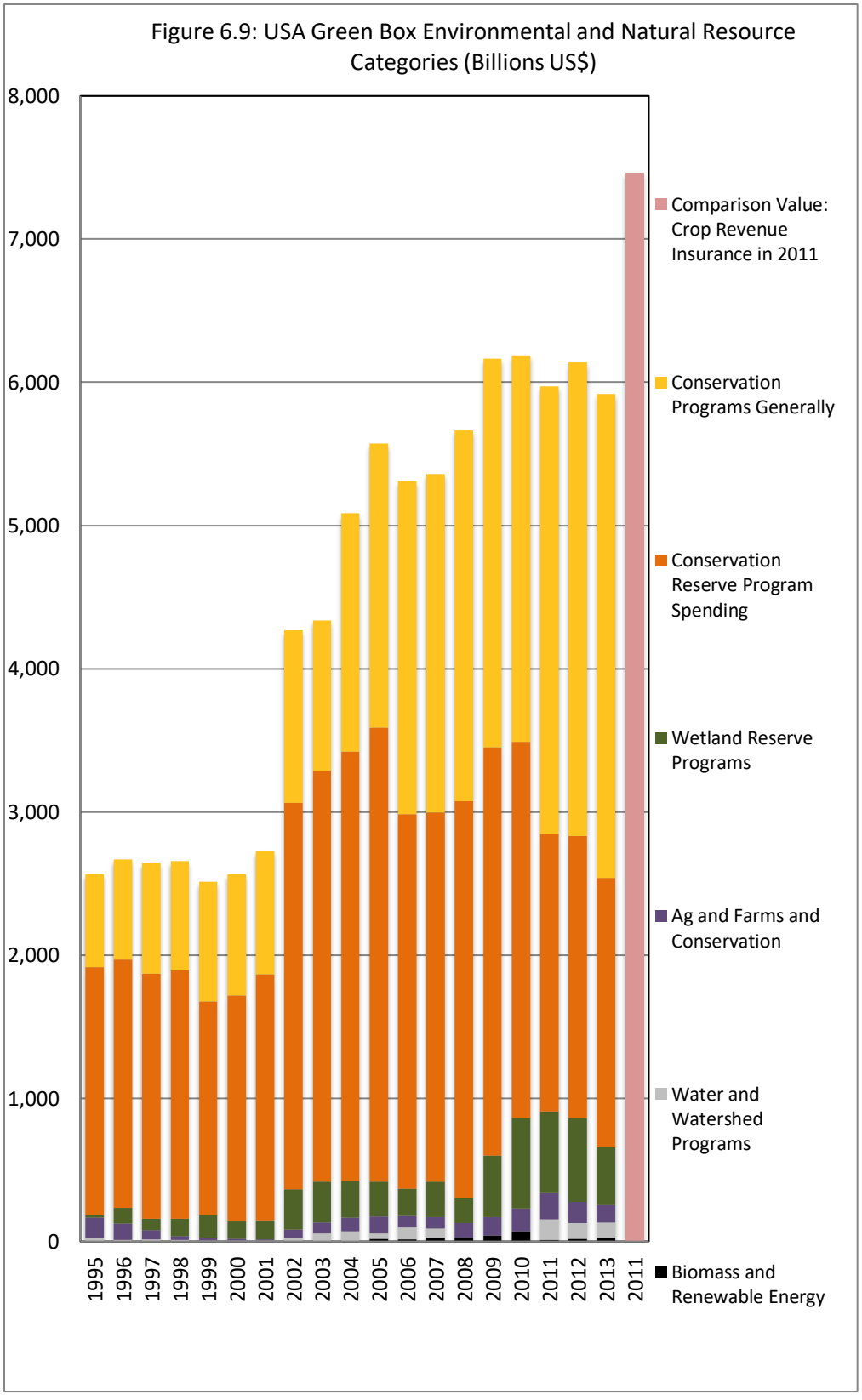
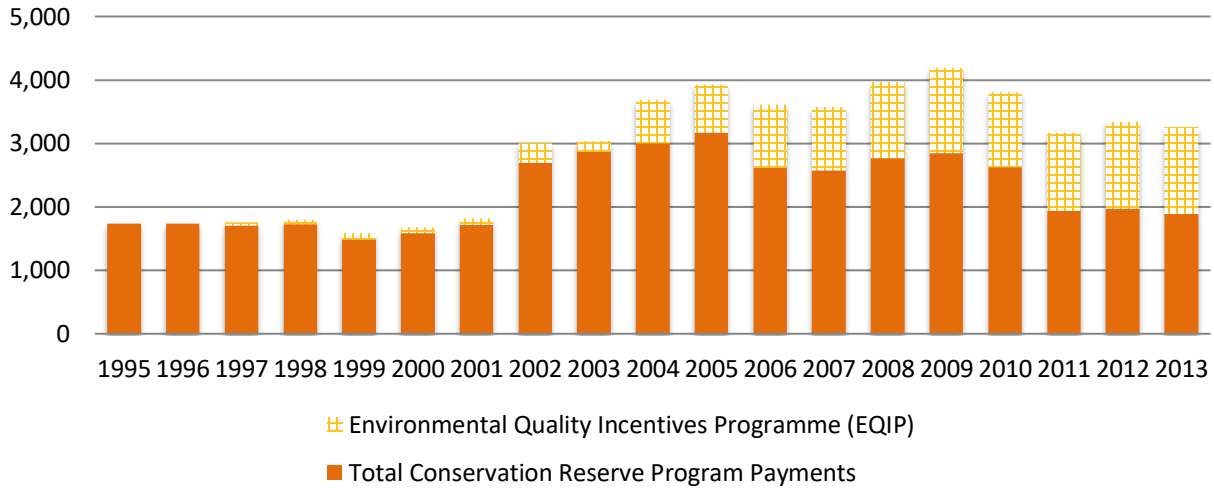


Figure 6.9, which aggregates the individual programs according to our definitions, and continues the colour coding, thus illustrates more clearly the focus on conservation. While programs now spend about US$6 billion on these programs, this total amounts to less than the more than $7 billion USD spent on Crop Revenue Insurance in 2011 and approximately $110 billion USD spent on domestic food aid. While we are not suggesting tradeoffs across programs, we are providing the food aid spending as a reference value to illustrate that the environment and natural resource categories in aggregate amount to less than these other two programs.

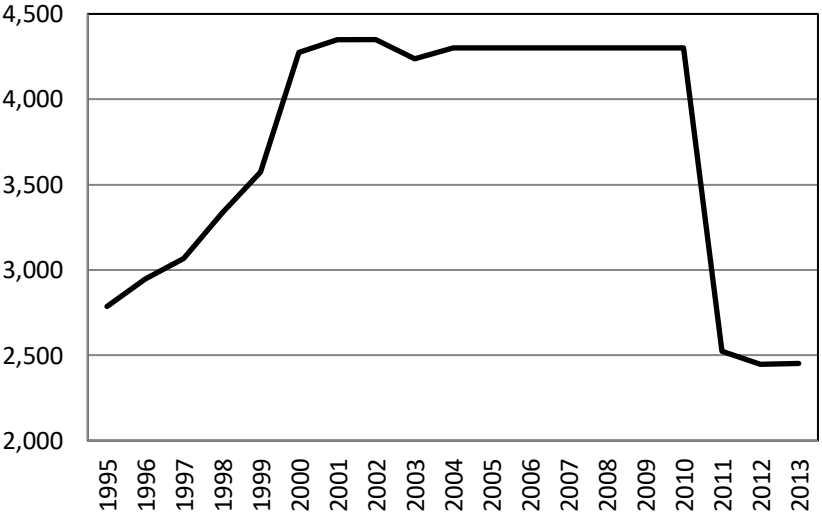
The two main programs in the conservation category are the Conservation Reserve Program and the Environmental Quality Incentives Programme with their relative size illustrated in Figure 6.10 below.

Figure 6.10: Major Categories of US Natural Capital and Environmental Payments (a, h, j Green Box) (Billion US$)



The programs illustrated above reflect federal spending. State spending is reported as an aggregate. Further details should be sought on these programs so as to gain a fuller understanding of support. In aggregate the sums are non-trivial as illustrated in Figure 6.11.

Figure 6.11: Green Box General Services State Programs for Agriculture (Million US$)



The programs, their intent and their success all have a bearing on whether they lead to natural capital stock effects. For the most part the programs for the US trialed here for further analysis are conservation programs that have the intention to correct past over-use of natural capital. Payments are made from the governments to producers who rationally disregarded the externalities of their production activities in the past. Here the 'polluter is not paying'.

Some detail is needed to gain a deeper understanding and intent of programs as background on how and why it is aggregated in this manner. This is provided in Table 6.4 but provides only an overview. More analysis and discussions is required to better understand the programs and what dimension of natural capital they pay for – compensation for remediation; prevention of further loss, etc.

In summary, any analysis of distortion would need to take a detailed look at the two considerations raised earlier in Chapter 3:

1. Activities are being paid for by taxpayers that should be paid for by producers.
2. Activities that impose costs over time and space are not being paid for.

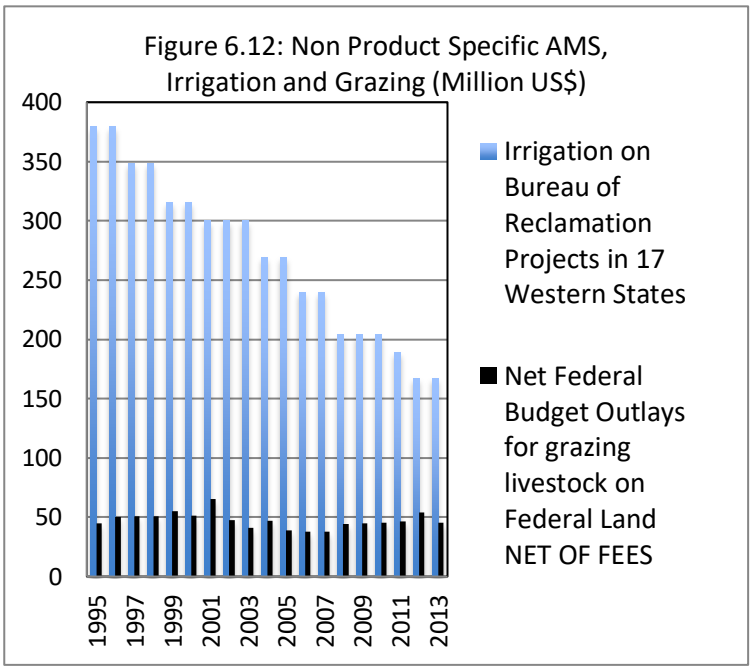
Table 6.4: USDA Conservation Reserve Program

Program	Time Frame	Cumulative Payments	
Conservation Reserve Program (CRP) [1]	1995-2015	$34,946,643,858	Provides money and technical help to producers who agree to take environmentally sensitive land out of crop production and plant permanent vegetation.
Environmental Quality Incentives Program (EQIP)	1997-2015	$7,956,149,352 Environmental Working Group estimates allocate the funding to the following major categories. The goal is to indicate the distribution of the environmental outcomes. $1.6 billion on irrigation systems $1.2 billion on Water Control and Management $1.3 billion on Grazing Management	Provides money and technical help to agricultural producers as they plan and implement conservation practices on agricultural land and non-industrial private forestland.
Conservation Stewardship Program (CSP)	2011-2014	$2,176,535,388	Money and technical help to agricultural producers as they plan and implement conservation practices on agricultural land and non-industrial private forestland. CSP differs from other USDA conservation programs in important ways: Growers must already be implementing conservation practices that meet a specified "stewardship level" to be eligible to participate in CSP; Participants are paid to maintain existing conservation practices; Entire farm operations must be registered.
Wildlife Habitat Incentives Program (WHIP)In 2014, Congress merged WHIP with EQIP	2004-2015	$319,442,546	Money and technical assistance to landowners developing a wide variety of habitats for fish and wildlife, including threatened and endangered species. Landowners entered into multi-year contracts to receive WHIP payments. WHIP payments are still being made to producers with active contracts, but are declining rapidly after the EQIP merger. 5 percent of EQIP funds must be used for wildlife habitat related projects.

https://conservation.ewg.org/region.php?fips=00000&regionname=theUnitedStates

[1] Includes active projects and not ones that may have been retired after their 10-year project length.

In comparison, there are two programs in Non-Product Specific AMS that were discussed in some detail above and that are of concern as well for their effect on natural capital depletion and their effect on production levels - Irrigation on Bureau of Reclamation Projects in 17 Western States and Net Budget Outlays for grazing livestock on Federal Land (net of fees). Their relative sizes are shown in Figure 6.10. These programs are small starting at around half a billion US dollars in 1995 and steadily declining to less than half that recently. This is significantly less than spending on the conservation programs.



While relatively small, it is still the case that this spending can cause distortions in both agricultural production and resource use. Producers are not paying enough for the input if they are subsidized. It is efficient to use an input up to the point where the marginal return, or value of its marginal product, to using the input is equal to the marginal cost of another unit used. If the input price is subsidized, then too much irrigation water will be used and therefore too much output produced if the input cost is subsidized as it is here. Furthermore, the scale of irrigation infrastructure, if efficiently built will match the value of the scale. In other words, if the present value of the costs of the infrastructure cannot be covered by returns to the infrastructure in agricultural production then the scale is too large. Clearly, a full evaluation of the extent of an implicit subsidy to irrigated agriculture would be required to assess whether or not material subsidies are being provided here.

Figure 6.13 puts the relative size of the grazing and irrigation payments into perspective. Clearly these payments are both relatively small up to 2011 because up until that time crop insurance and SURE payments (for disaster counties) dominate the value of US non-product specific AMS. SURE program payments end after the 2011 crop year and, as noted above, the US changed the way in which it notified crop insurance expenditures beginning in the 2011 year. These changes give rise to the apparently large change in shares of non-product specific AMS programs in Figure 6.11 However these jumps in share are artifacts of the way that crop insurance is reported. This adds to the difficulty of interpreting the size and distribution of subsidies and reinforces what we recommend above that, given the variation in notifications of crop insurance support, greater clarity in the way in which crop insurance costs are notified appears to be needed.

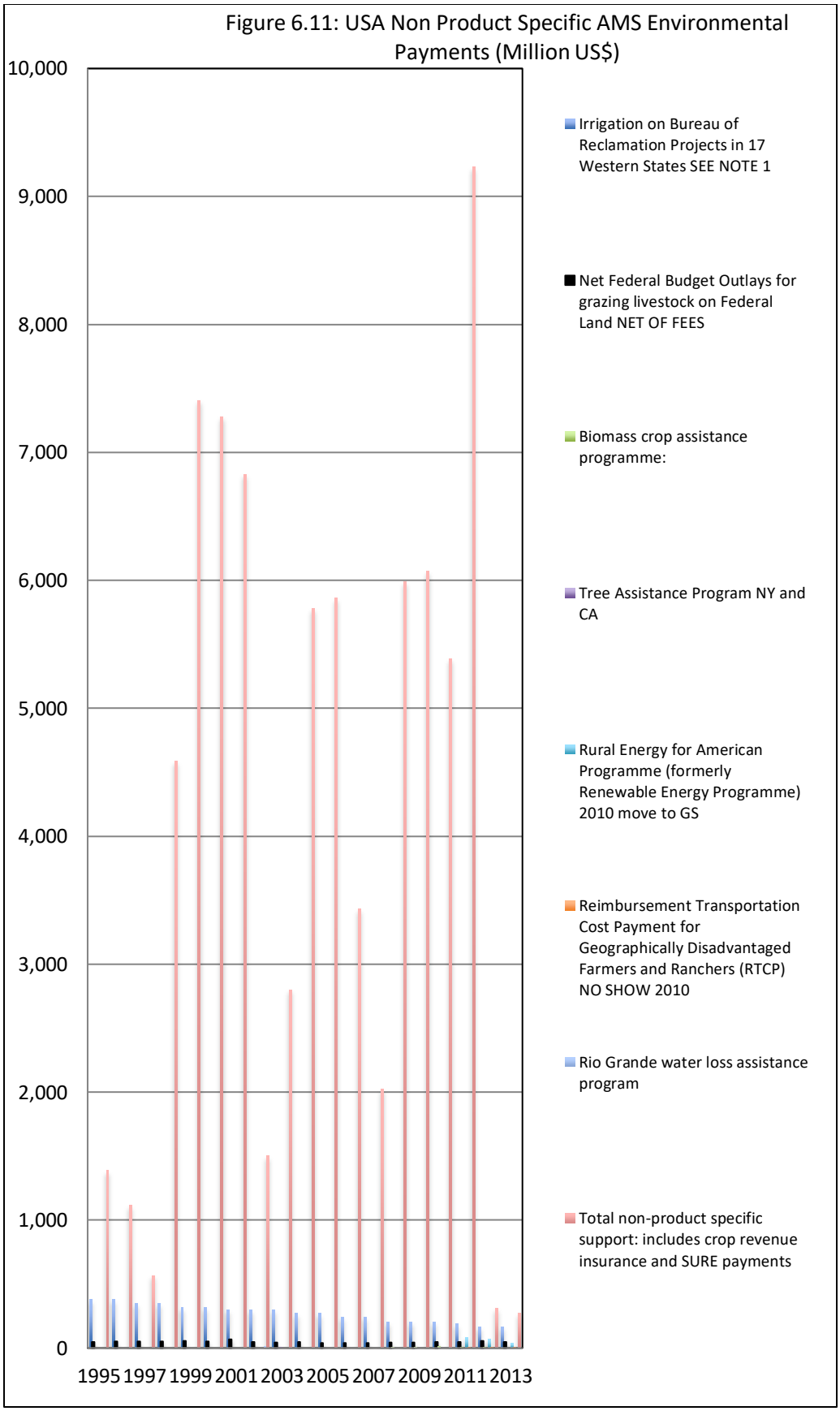


Figure 6.11: USA Non Product Specific AMS Environmental Payments (Million US$)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1995 1997 1999 2001 2003 2005 2007 2009 2011 2013
Irrigation on Bureau of Reclamation Projects in 17 Western States SEE NOTE 1
Net Federal Budget Outlays for grazing livestock on Federal Land NET OF FEES
Biomass crop assistance programme:
Tree Assistance Program NY and CA
Rural Energy for American Programme (formerly Renewable Energy Programme) 2010 move to GS
Reimbursement Transportation Cost Payment for Geographically Disadvantaged Farmers and Ranchers (RTCP) NO SHOW 2010
Rio Grande water loss assistance program
Total non-product specific support: includes crop revenue insurance and SURE payments

References

Bureau of Land Management Budget, 2017 (Page VII-35)
https://www.doi.gov/sites/doi.gov/files/uploads/FY2017_BLM_Budget_Justification.pdf

Dalin, Carole, Yoshihide Wada, Thomas Kastner & Michael J. Puma, 2017. Groundwater depletion embedded in international food trade. Nature 543. Pg. 700-704.

Department of the Interior, Bureau of Land Management Budget 2017. At:
https://www.doi.gov/sites/doi.gov/files/uploads/FY2017_BLM_Budget_Justification.pdf

Department of the Interior, Bureau of Land Management, 2016. Fact Sheet on the BLM's Management of Livestock Grazing. At https://www.blm.gov/wo/st/en/prog/grazing.html

Easter, William K. and Yang Liu. "Cost recovery and water pricing for irrigation and drainage projects." Agricultural and Rural Development Discussion Paper 26, Washington D.C.: World Bank, 2003.

Federico Garcia Suarez, Lilyan Fulginiti, Richard K Perrin, 2015. The Value of Water in Agriculture: The U.S. High Plains Aquifer. Presentation at the ICAE 2015, Milan, Italy.

Glauber, Joseph W., and Daniel Sumner, 2017. Poverty, Hunger and US Agricultural Policy: Do Farm Programs Affect the Nutrition of Poor Americans? American Enterprise Institute.

Konikow, L.F. (2011) Contribution of global groundwater depletion since 1900 to sea level rise. Geophys Res Lett, 38:L17401.

Moskowitz Karyn, and Chuck Romaniello, 2002. "Assessing the Full Cost of the Federal Grazing Program". Prepared for the Center for Biological Diversity, Tucson, Arizona in cooperation with American Lands, Western Watersheds Project, Oregon Natural Desert Association, Forest Guardians, Committee for Idaho's High Desert and the National Public Lands Grazing Campaign October 2002

National Resource Defense Council. Energy down the drain: The hidden costs of California's water supply. 2004. Oakland, CA: Pacific Institute. 30 September 2008.
http://nrdc.org/water/conservation/edrain/edrain.pdf

Organization for Economic Co-operation and Development (OECD). Transition to full-cost pricing of irrigation water for agriculture in OECD countries. Paris: Environment Directorate and Directorate for Food, Agriculture and Fisheries, 2002.

OECD PSE tables and program descriptions. Accessed at https://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm

Orden, David, David Blandford, and Tim Josling, 2011. WTO Disciplines on Agricultural Support: Seeking a Fair Basis for Trade. Cambridge University Press.

Rogers, P., Bhatia, R. and Huber, A. "Water as a social and economic good: How to put the principle into practice." TAC Background Papers no. 2. Stockholm, Sweden: Global Water Partnership, Stockholm, 1998.

Scanlon, B. R., C. C. Faunt, L. Longuevergne, R. C. Reedy, W. M. Alley, V. L. McGuire, and P. B. McMahon (2012). Groundwater depletion and sustainability of irrigation in the U.S. High Plains and Central Valley. *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1200311109.

Steenblik, R. P., 2003. "Subsidy measurement and classification: Developing a common framework." In Organization for Economic Co-operation and Development, Environmentally Harmful Subsidies: Policy issues and challenges. Paris: Organization for Economic Co-operation and Development, 2003.

United States Fish and Wildlife Service. (n.d.) From 1994 to present by water year. Department of the Interior Water Acquisition. Retrieved November 4, 2008 from: http://www.usbr.gov/mp/cvpia/3406b3_wap/docs/latest_water_acq_sum.pdf

United States General Accounting Office, 2000. "Report to the Chairman, Subcommittee on Water and Power, Committee on Resources, House of Representatives." March 2000. 4 November 2008. http://www.gao.gov/archive/2000/ai00114.pdf

United States Government Accountability Office. "Financial management: Bureau of Reclamation sources and uses of funds." 1999. GAO/AIMD-99-200R Washington DC, United States. 30 September 2008. http://archive.gao.gov/paprpdf2/162236.pdf

USDA, Forest Service Range Management, March 2016. Grazing Statistical Summary, FY2015 http://www.fs.fed.us/rangeland-management/documents/grazing-stats/2010s/GrazingStatisticalSummaryFY2015.pdf

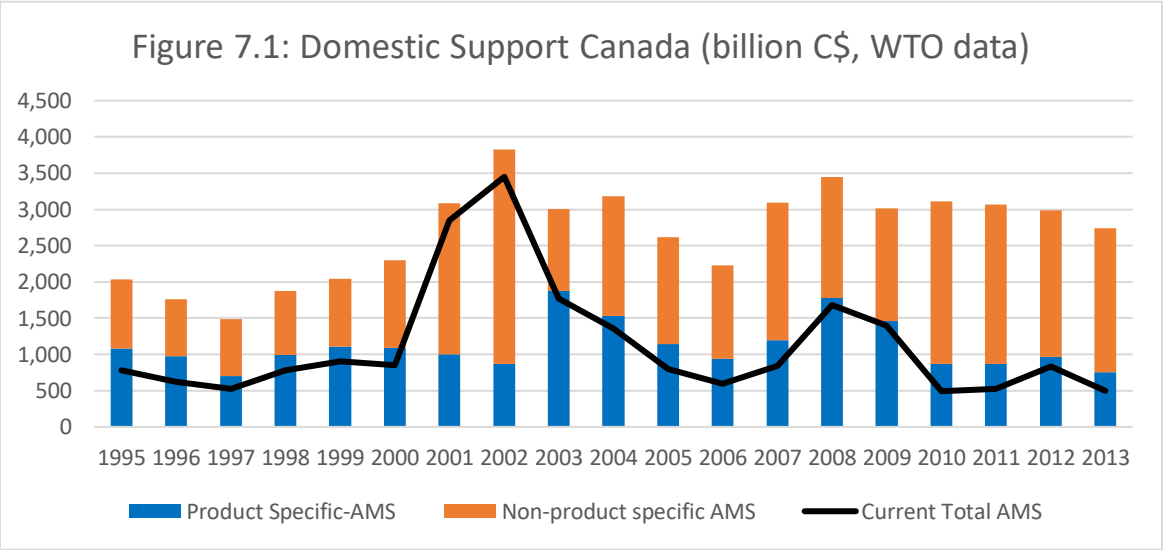
Vedenov, Dmitry V., Mario J. Miranda, Robert Dismukes, and Joseph W. Glauber, 2013. Economic Analysis of the Standard Reinsurance Agreement. Agricultural Finance Review 2013. Available at: http://www2.econ.iastate.edu/classes/econ642/Babcock/vedenov%20et%20al.pdf

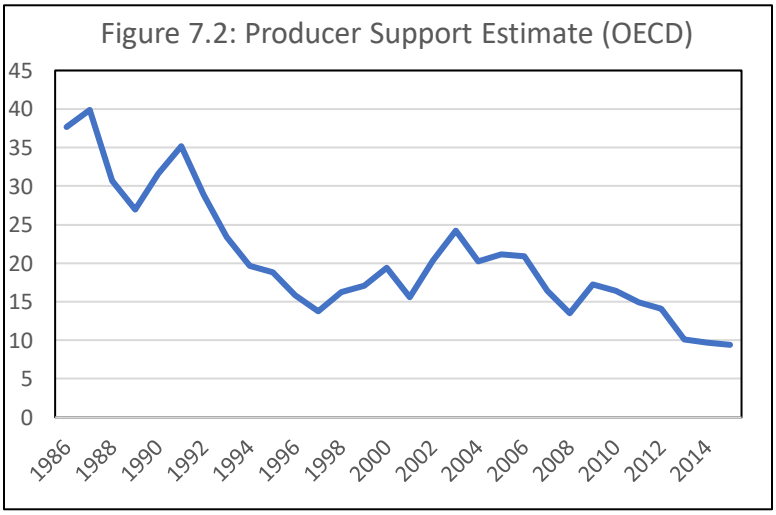
Vincent, Carol Hardy, 2012. Grazing Fees: Overview and Issues. Congressional Research Service. https://fas.org/sgp/crs/misc/RS21232.pdf

Chapter 7: Canada

Introduction

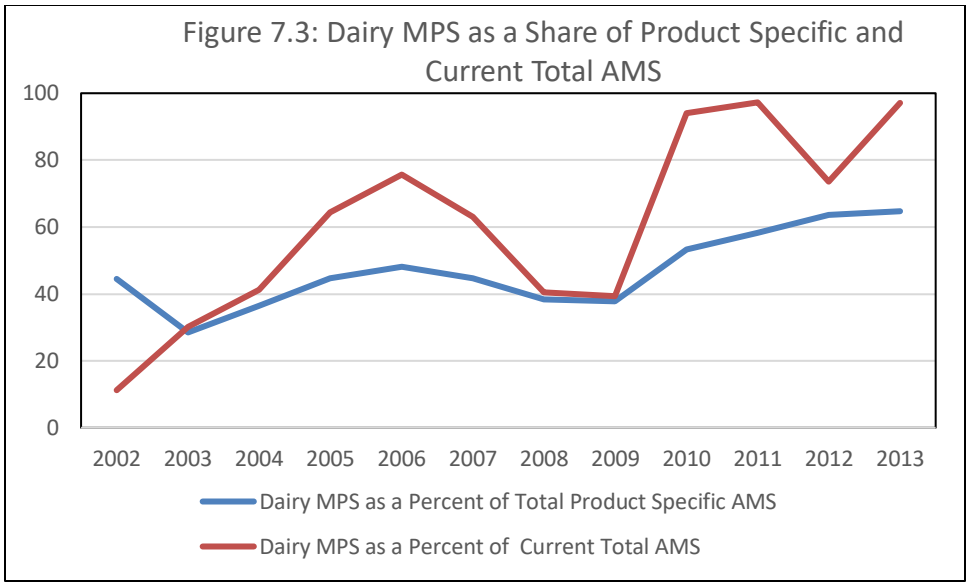
The domestic support structure for agriculture in Canada has remained relatively stable over the past decade, contrary to the other three regions in this study. The shares of calculated AMS have changed somewhat, with the non-product specific support share growing and the product specific support share falling. The Current Total AMS (CTAMS) has been falling since 2002 returning to levels seen in the period 1995 to 2000 (Figure 7.1). The most recent notification (2013) shows the CTAMS at 11.6 Percent of the Bound Total AMS (C$4.3 billion).





From the OECD database, the Percent Producer Support Estimate (%PSE) has been falling for more than a decade, down sharply from the late 1980s. Interestingly, the PSE percentage is almost the same as the share of the CTAMS of the Bound Total AMS. Equally, the Market Price Support (MPS) arising from the administered prices for butter and skim milk powder is a rising and large proportion of the Current Total AMS and a high share of the total product specific AMS (Figure 7.3).

The high share of the CTAMS calculation for the MPS for dairy presents a concern for potential reductions in Bound Total AMS, and/or *de minimis* levels at the December 2017 meeting of Ministers.



The Major Farm Support Programs

The major budgetary support programs for agriculture are shown below in Table 7.1, with expenditures notified to WTO for 2012 and 2013. Also shown are the exempt and non-exempt status for inclusion in AMS calculations. Five direct subsidy programs represent the major expenditures: AgriStability, AgriInvest, AgriInsurance, Provincial programs, and interest rate concessions on lending to producers.

AgriInsurance (crop and livestock insurance) is notified as a non-product specific subsidy, contrary to the way the USA notifies its crop insurance program as commodity specific support. Given that insurance contracts are specific to a commodity, it should be possible to notify these payments as product specific support. The provincial programs include among others the ASRA program in Quebec and the Ontario Risk Management Program; while these programs collectively are notified as non-commodity specific, a breakdown by commodity is entirely possible, allowing notification of the support as commodity specific. The OECD data clearly show that expenditures under these provincial programs and AgriInsurance can be identified by commodity.

The intent here is to add to the earlier discussion in the US Chapter of the apparent flexibility of countries to notify what are commodity specific expenditures as either commodity specific or non-commodity specific. The US switched notifying crop insurance from non-commodity specific to commodity specific; presumably the US could switch back in the future. If a country is faced with the sum of non-commodity specific subsidies reaching or exceeding the *de minimis* level, shifting some payments to commodity specific support may allow the country to maintain non-commodity specific support to remain below *de minimis*. Alternatively, if the country is faced with support for a number of commodities exceeding *de minimis*, shifting notification of expenditures to non-commodity specific support may lower the reported Current Total AMS. This discussion raises another issue addressed in

the final chapter about double counting of value of production in calculation of commodity and non-commodity specific support.

The great majority of the expenditures under AgriStability are shown as “exempt” from AMS calculation, citing paragraph 7 of the AoA Annex 2. The balance of AgriStability funding is shown as non-exempt because part of the payments exceeds the boundaries set in paragraph 7. The AgriInvest program payments are linked contemporaneously to current farm income and hence do not qualify as AMS exempt “decoupled income support” status.

Table 7.1: WTO Notifications of Major Support Programs

		2012	2013	
AgriStability				
	Income insurance and income safety-net programmes	537.5	444.9	Ex, para 7, SY
	Stabilization Component of AgriStability	62.3	65.9	NEx, NPS, SY
	AgriStability enhancements	-0.2	-1.1	NEx, NPS, SY
AgriInsurance	AgriInsurance	1,032.2	1,167.2	NEx, NPS, CY
	Production Insurance Premium Adjustment	6.0	4.9	NEx, NPS, CalY
AgriInvest		345.2	267.5	NEx, NPS, SY
AgriRecovery		48.9	2.2	NEx, NPS, FY
AgriFlexibility[1]		49.2	18.9	NEx, NPS, FY
Advance Payment Program		15.8	20.1	NEx, NPS, PP
Federal Credit Concessions		40.8	60.7	NEx, NPS, FY
Provincial Credit Concessions		12.7	25.1	NEx, NPS, FY
Provincial Programs		318.5	269.0	NEx, NPS, FY
GF and GF 2 non Business Risk Management Initiatives		54.1	63.5	NEx, NPS, FY
EcoAgriculture Biofuels Capital Initiative (ecoABC)		2.4	2.3	NEx, NPS, FY
Structural adjustment assistance				
	Federal, federal/provincial	0.0	0.0	Ex, para 11, FY
	Provincial	0.3	0.3	Ex, para 11, FY
Environmental Programs				
	Federal, federal/provincial	60.5	23.1	Ex, para 12, FY
	Provincial	29.7	25.5	Ex, para 12, FY
Regional assistance programmes				
	Federal, federal/provincial	0.1	0.0	Ex, para 13, FY
	Provincial	2.3	1.8	Ex, para 13, FY
Notes:				
NEx: Non-exempt; Ex: exempt; NPS: Non-product specific;				
"Para" refers to paragraphs in the WTO AoA, Annex 2				
SY: Stabilization Year; CY: Crop Year; FY: Fiscal year; CalY: Calendar year				
[1] Program ended 31 March 2014				

References

AAFC Departmental Performance Reports, 2013-14 and other years. Available at: http://www.agr.gc.ca/eng/about-us/planning-and-reporting/departmental-performance-reports/?id=1219248798716, and http://www5.agr.gc.ca/eng/about-us/planning-and-reporting/departmental-performance-reports/2012-13-departmental-performance-report/?id=1410216561008#s1.3c

Chapter 8: Observations and Conclusions

Approach

This chapter is intended to consolidate the findings in the country chapters into three different groupings. The first section explores specific rule changes on definitions of exempt and non-exempt payments and the accounting for them in notifications. This work will draw heavily on the country chapters, particularly on the rules in the Agreement on Agriculture, including Annex II, that have enabled countries to shift from non-exempt payments to exempt payments. The second section identifies specific concerns by country that need considerably more work to fully understand the impacts of programs and the potential for challenges to these programs. The third section explores the role that natural capital depletion in agricultural resources has played and continues to play in the potential for over production in agriculture.

Issues with the Rules on WTO Notifications

The establishment of rules and limitations on domestic subsidies through the WTO 1994 and the Agreement on Agriculture was a major positive step forward based on the experience of developed and developing countries. The draft modalities penned in 2008 represented significant additional steps to rein in domestic support that was distorting production, trade and prices. With another nine years of experience since 2008, another round of attention to the rules regarding domestic subsidies for agriculture is needed. The shift, for example, from commodity-specific subsidies in the EU to exempt decoupled single farm payments with roughly the same level of non-exempt expenditures as in earlier periods raises questions about the open-endedness of so-called decoupled payments. Similarly, the nuances in the way in which support measures are notified to the WTO need careful attention; an example would be the ways in which *de minimis* is calculated.

The topics below cannot be considered exhaustive; only three regions apart from Canada have been considered in this effort. Several authors have raised other concerns regarding the rules on domestic subsidies.

Calculation of *de minimis*: Double Counting of Value of Production

This topic is exceedingly complex and nuanced. This attempt to explain the issue starts with the interpretation of *de minimis* and the intention in the Agreement on Agriculture (AoA), and uses an example to explain the issue as carefully as possible.

Each member country initially notified the WTO of the "Total AMS Commitment"[80] taken on by the member. For consistency, this text uses the title Bound Total AMS (BTAMS). For many countries, the BTAMS Commitment was zero or nil, e.g., China. For others, a non-zero positive amount was notified. The interpretation of the *de minimis* rules differs between these two cases. For countries with a nil BTAMS Commitment, the *de minimis* represents a hard limitation on any support above the *de minimis*

[80] The title "Total AMS Commitment" is given in Table DS:1 in notifications.

rate across both commodity-specific and non-commodity specific calculations. For countries with a non-zero positive amount of BTAMS Commitment, the *de minimis* can be interpreted as a threshold; for commodity-specific or non-commodity specific support when less than five percent of the value of production, the support is not counted in CTAMS. For commodity-specific support greater than five percent of the value of production, all of the support is included in CTAMS. Similarly, for non-commodity specific support greater than five percent of value of production, all of the support is included in CTAMS. As a result, if all commodity-specific support is at or near five percent, and non-commodity specific support is at or near five percent, the apparent hard cap is ten percent of the value of production (compared to only five percent for member countries with zero or nil BTAMS Commitment.

However, in drafting the rules for calculation of CTAMS, only two possibilities were envisaged: commodity-specific support and non-commodity specific support; the latter normally seen as "general" support across the full range of commodities. However, experience has shown that some support is provided to a group of commodities (but not all), and the allocations of the support for each commodity separately cannot be determined. There is no apparent resolution of whether such support is notified as product specific or non-product specific. If it is included as product specific support, measured against the value of production for the group of commodities as a whole, then the overall level of support can be greater than ten percent, when some or all of the commodities in the group also have individual commodity-specific support.[81] If the support is included in non-product specific support for the calculation of *de minimis*, this issue may not occur so long as the value of production is the total value of production across all of agriculture.

Using an example from the US notification (2014), commodity-specific support is shown separately for several individual livestock species included in the Table DS:6, and another commodity "livestock" is also shown for which support is provided through the Emergency livestock assistance (ELAP) and the Livestock forage payments (LFP) as well as the Livestock Indemnity Program that covers "cattle and calves, sheep and lambs, poultry, swine, goats, llamas, alpacas, emus, deer, elk, reindeer, and equine".[82] Of this list, all of these commodities with the exception of elk, reindeer and equine are shown separately with product specific support. The *de minimis* calculation uses the sum of support across the programs compared to the value of production of all the species in the group listed.[83] Livestock is not the only group of commodities in the DS:6 Table. The other two cases noted are the "Orchards, vineyards, nursery category includes trees, bushes and vines eligible for TAP" (Tree Assistance Program), and the Poultry category.[84]

[81] Other authors have identified this issue without measuring its impact nor suggesting a method to resolve the issue. See Orden et al., 2011, pg. 119, and Blandford and Orden, 2008, pg. 14.

[82] The footnote to Table DS:4 (2014) shows: "Livestock category includes all species eligible for LFP program and livestock eligible for ELAP and LIP for which commodity-specific data are not available and LIP: cattle & calves, sheep & lambs, poultry, swine, goats, llamas, alpacas, emus, deer, elk, reindeer, and equine. Value of production includes all eligible species for which data are available (does not include reindeer)."

[83] One of the anomalies in the approach used, is that the "Livestock" group is included in the product specific support, while another program that covers all of the ruminant species (grazing subsidies) is placed in the non-product specific category. Using BLM data, one can find the equivalent animal units across the species grazed, as well as a break down of the units by species.

[84] The footnotes to US Table DS:4 indicate that for the three identified cases, expenditure data cannot be identified by individual commodities.

By adding value of production across all commodities in US Table DS:4 (2014) the total value of production is US$550.3 billion, whereas the value of production shown in Table DS:4 is US$405.6 billion. The implication, based on the footnotes, is that the value of production by commodity is used more than once to calculate the level of support. Even by eliminating these entries from the total value of production in adding the commodity-specific entries in US Table DS:4, the sum is still above the reported total value of production. The conclusion is that there may be other unidentified double counting in the commodity-specific values of production in the table. All of this appears to be entirely within the rules of the *de minimis* rules in the AoA.

The materiality of the impact on the US notifications is most likely negligible. The dollar amounts are small, and could not possibly increase the CTAMS for the US above its Bound Total AMS. Even if the expenditures could be identified by individual commodity, or reporting of the expenditures was included in non-commodity specific support, the same conclusion of negligible materiality holds. Rather, the US case does draw attention to how the rules could be exploited to remain under the *de minimis* caps.

In exploring the China and EU notifications, the sum of the reported value of production across individual commodities in Table DS:4 shows a smaller number than the total value of production reported in both countries. The conclusion in these cases is that there is no way to determine if there is use of double counting of the individual commodity values of production. The Canada notification appears unique among the four regions; the sum of the individual commodity values of production is exactly equal to the total value of production notified in Table DS:4. In this case, there cannot be any double counting in calculating the individual commodity support levels.

From the above discussion, the rules on *de minimis* are considerably more open and flexible than one would have reason to expect. Any discussion of tightening the rules on domestic subsidies may wish to consider more detailed arrangements on calculating support under the *de minimis* limitations.

From the above discussion, the rules on *de minimis* are considerably more open and flexible than one would have reason to expect. Any discussion of tightening the rules on domestic subsidies may wish to consider more detailed arrangements on calculating support under the *de minimis* limitations.

A straightforward way of eliminating is apparent loophole is to assure that the value of production is only “used” once in calculating *de minimus* levels. For example, if the support for a commodity is two percent of the value of production, then two fifths (two percent divided by five percent) of the value of production for the commodity is deducted from the total value of production used to calculate the non-product specific support regarding the *de minimis* level. This assures a hard cap of five percent support level across the sector, and encourages member states to move toward non-product specific programming.

Crop Insurance

As noted in Chapter 6 (USA), given the variation in notifications of crop insurance support, greater clarity in the way in which crop insurance costs are notified appears to be needed. The Ministerial Meeting planned for late 2017 to address domestic subsidies may offer a venue to achieve greater clarity and

uniformity in reporting across countries. Glauber (2016) has already noted the various ways crop insurance subsidies have been notified, including the rapid rise in crop insurance in China even though there is no notification in its most recent notification.

Whole Farm Decoupled Payments

The significant shifts from commodity-specific support toward decoupled single farm payments, most notably in the EU, and whole farm programs in Canada (AgriStability and AgriInvest) need some exploration. The US notified decoupled income support for some years although the most recent Farm Bill has terminated the program. The issue is whether there are or could be impacts on production, prices and trade.

Starting with a simple example of a farm with two commodities shown in the table below, one with a high margin (e.g., 40 percent of gross income from the commodity), and another with a low margin (e.g., 5 percent of the gross income from the commodity). "Margin" is taken to mean the difference between variable expenses and revenue in production. The difference represents the return to household labour and capital. Assume that the whole farm payment is calculated based on current gross income from the farm operation in a growing cycle, say 2 percent, and that the production and price risks for the two commodities are similar. For simplicity, assume that the gross value of production of each commodity is the same before the program begins. In response to the program, one would expect that the producer would respond by producing more of the low margin commodity, since the increase in the return to the margin is 40 percent, while the high margin commodity would increase the return by only 5 percent.

	Commodity 1	Commodity 2
Gross Income	100	100
Variable costs	60	95
Fixed Costs (Margin)	40	5
Payment	2	2
Increase in Margin (%)	5	40

One can also consider the case where a producer has a choice between producing two commodities, one high valued crop, and one low valued crop. The higher valued crop would be preferred, because it would increase the payment under the program, assuming that production and price risk is similar between the two commodities.

Another case to consider would be one in which the producer has a choice between a commodity with high production and/or price risk, and another with low risks. The risk averse producer, (e.g., highly leveraged), would prefer the lower risk alternative, while a less risk averse producer may prefer producing more of the higher risk commodity. The low risk/highly leveraged producer would be responding to short term pressures of cash flow, while the less risk averse producer would be responding to the expected value of the payments over a longer period of time under the program.

Payments from government based on a percentage of farm sales can affect the price of fixed assets, land in particular. The effect on asset values from small payments, for example two percent of sales, are unlikely to be empirically identifiable within the background noise of fluctuating prices and crop or

livestock yields. Nonetheless, some portion of the payments would be attributable to returns on asset values, based on factor shares of capital and labour.

Finally, where payments are made in return for maintaining or improving environmental or food safety and quality attributes in commodity production, the effects of the payment may offer some societal or economic benefit beyond the farm gate, overriding (or amplifying) to some degree the static economic effects within the individual farm examples outlined above. Overall, the effects of whole farm payments are unlikely to be completely neutral in the mix of enterprises, the risk profile of the operator, and the willingness to meet environmental or food safety requirements. The higher the payments, the less neutral the effects would be. The WTO agreement recognized this in the AoA Annex 2, that whole farm payments have limited effects on production, prices, and trade in keeping with the chapeau in Annex 2, although no limits were placed on the amount of direct whole farm payments, even though the greater the magnitude of payments, the greater is the likelihood that some effects on prices, production and trade will occur.

The difficulty is that unbounded decoupled income support has escaped recent scrutiny and assessment of its effects at the WTO, although several analysts have questioned its impacts (Goodwin and Mishra, 2006, Hendricks and Sumner, 2014, Anderson et al., 2006). Also, other authors have proposed ways to strengthen the limitations on decoupled payments and to rethink the ways to measure impacts of these subsidies (Josling, 2015, and Glauber, 2016). The EU Chapter raises questions about the extent of whole farm decoupled payments in the beef and milk sectors. Although no public databases breakdown the decoupled single farm payments by farm/commodity, the study commissioned by the European Parliament was able to do so. Similar work is needed for other major commodities in the EU.

Blue Box Support

Based on the examination of the EU use of blue box support, this mechanism enables an unbounded level of support, exempt from inclusion in AMS and CTAMS. Consideration needs to be given to limiting or eliminating the blue box exemption.

Natural Capital

The Agreement on Agriculture is silent on the rates of utilization of natural capital, specifically water, soils, and the genetic base within plant and animal agriculture, as well as the negative externalities that come from under-priced resources used in agriculture. Under-pricing in this context means that the utilization of the stock of natural capital is priced to agricultural users at a level that erodes the capital stock over time at rates that are not recoverable with time. This is particularly important for finite capital stocks. It can also refer to the pricing of a resource to the agricultural sector at rates well below the prices charged to users in other sectors including industry, households, and public and private recreational uses. Finally, under-pricing can refer to the use of resources that create negative externalities for others in society, including pollution, increased soil salinity, nutrient runoff and the

like.[85] In this case, the costs of resource use are not fully borne by agricultural producers in production systems, with remaining costs left to other parts of society, both public and private, to cover.

This issue will continue to grow in importance over time as specific supplies of resources dwindle, particularly ground water, in all three of the countries examined. Equally, the negative externalities of pollution, soil degradation, air quality, and greenhouse gases emitted by agriculture will face growing political pressure for change. Globally, the demand growth for food over the next several decades will put pressure to further erode natural capital in the near term, creating longer term pressure on food supply.

One can look at the architecture of international agreements for directions in placing boundaries on the rundown of natural capital. Certainly, additions to the Agreement on Agriculture could be considered. Equally, sub-agreements within broader trade agreements specifically regarding the use and pricing of endowed capital in agriculture could be considered, in parallel with environmental sections, and clauses regarding treatment of labour. Finally, agreements or guidelines completely separate from existing trade and related agreements could be considered.

There is a dearth of trade litigation regarding the use and pricing of natural capital, wherein specific impacts of running down natural capital within a country can be demonstrated to impact prices, production and/or trade. The only apparent recourse within existing agreements would be the Subsidies and Countervail Measures in the GATT for price suppression. Nonetheless, a growing body of literature is documenting the connection between trade and natural resource drawdown, particularly regarding water.[86]

Specific Areas of Concern by Country

China

The US challenge to China's programs for wheat, rice and corn has focused attention on the role that the government has played in supporting prices through stock purchases, nominally for food security, but with the effect of a support price across all production. The specific issues raised in the challenge are outlined very well by the Brink Orden paper for wheat, rice and corn. The Chapter on China extends the analysis beyond wheat, rice and corn to soybeans and canola, indicating that the concerns raised by the US challenge extend directly to other commodities of particular concern to Canada, canola.

The difficulty is that China appears to have abandoned the stock purchases for food security arrangements, indicating in an number of news reports and Chinese government announcements that new arrangements for support are being developed. Detailed information on these new arrangements is

[85] For negative externalities within a country, domestic legislation or regulation would appear appropriate. However, where the impacts of the negative physical (e.g., pollution) or economic (e.g., prices, production and trade) externalities affect other nations, an international approach needs to be considered.
[86] One of the most recent, and pointed, articles linking trade in agricultural and food products with water use in agriculture is by Dalin et al.

not available so far. The issue then is whether and how a successful challenge can be based on previous policies and carried over into a completely new set of domestic support arrangements.

Further study will be needed as the detail regarding the new arrangements for domestic support become available.

European Union

The report commissioned by the EU Parliament on the overall cattle sector with breakdowns into dairy and beef provides considerable information on the impact of the exempt decoupled payments that have arisen in the CAP policies over the past 8-10 years. Effectively, the commodity-specific support arrangements have been abandoned for the most part and replaced with decoupled payments to farms with at least as much funding as in the earlier periods for agriculture. The general conclusion in reading the commissioned paper is that the beef industry in its current form in the EU is not sustainable without the decoupled payments; indeed, virtually all of the net income for beef farms is provided by the decoupled payment. In the dairy industry, greater than 50 percent of the net income from the decoupled payments is provided by the decoupled payments.

For both the beef and dairy sectors, considerably more detailed work is needed. One aspect is the measurement of supply responses of each of the commodities generated from the payments. Based on the Brazil cotton case, the basic issue is whether the rise in exports of dairy products is causing price suppression in world dairy markets based on the single farm payment approach. For the beef sector, the issue is that while Europe is a net importer, the payments may be suppressing import levels into Europe. Another is that the EU provides no evidence that the payments meet the criteria laid out in Annex II of the AoA that the payments have no or minimal effect on prices, production and trade.

For pork in the EU, the fundamental anomaly is that the EU is a major and growing exporter of pork while at the same time demonstrating production costs well in excess of the lowest cost producers in the world, Canada, USA and Brazil. There is no breakdown available in public databases of the proportion of the single farm payment attributable to pork (as in the cases of beef and dairy). Considerably more work is needed to model the EU pork sector to understand and identify the basis on which the EU is a growing exporter of pork at production costs sharply above other much lower cost of production countries.

USA

Dairy

The biggest single concern in the milk programs in the US is the dramatic changes in the WTO notifications for dairy. The programs before the 2014 Farm Bill showed non-exempt payments for the dairy industry exceeding US$3 billion. The elimination of those programs and the shift to an insurance type arrangement (Margin Protection Program). In the most recent notification (2014), non-exempt payments dropped to US$14.17 million (*de minimis*). This compares to the OECD estimate of market price support at US$5.3 to US$6.6 billion for dairy, based on US milk prices exceeding reference price

levels- due to the protective effect of US tariffs, the price supporting effect of Federal Milk Marketing Orders, or both.

While AMS for milk notified to the WTO has dramatically declined, the MPS estimated by OECD[87] has been increasing. What is remarkable about the sharp decline in AMS notified to the WTO for dairy in the US is how little actually changed when the Dairy Product Price Support Program was eliminated. For its last several years, there was very little or even zero product purchased under the price support program, however the US notified AMS based on the differential between its support prices and historical reference prices, multiplied by total production. In effect, when the program was discontinued, no less dairy product was purchased by the US government, but US notification to the WTO of the AMS declined almost to zero.

Additionally, while the OECD's MPS for the US has been significant and increasing, the US has also been heavily trade surplus in dairy products. This contradicts accepted wisdom that pricing is an important element in export competition. It also suggests that classified pricing under Federal Milk Marketing Orders in the US has been successful in both increasing relative milk pricing in the US (as measured in MPS) and facilitating dairy exports.

Considerably more work is needed on understanding and measuring the structure and impact of US programs in the dairy industry.

Irrigation Subsidies

Continued use of the ground water supply at current levels in US agriculture is unsustainable and contributing to pollution, salinity in soils and waterlogging. From an economic point of view, it is under-priced as a common property resource, increasing total production of some crops and decreasing production of other crops that have lower moisture requirements. Equally, the greater production is lowering prices of the irrigated crops locally, nationally and internationally. While clearly this is the case, actual measurement of the price effects of limiting ground water use to sustainable levels for agriculture and all other uses into the future would be exceedingly difficult. Current trade agreements can deal with price suppression from domestic subsidies, but they remain silent on environmental externalities in production as well as on the steady erosion in the finite factor endowment represented by ground water.

Grazing Subsidies

Grazing fees for ruminants on public lands managed by the Forestry Service and the Bureau of Land Management are below private sector rates. Unsuccessful Congressional attempts have been made to raise fees to full (or greater) cost recovery for some years, although the 2017 budget appears to be leading in that direction.

[87] An anomaly in the OECD estimates of MPS for dairy is that current border prices are not used for butter, as one would expect in the IECD database. The OECD manual rep0rts that "The border price of butter is the unit c.i.f. import value for the period 1986-1997 and the unit f.o.b. export value from 1998 (code HS040510)."

There is no widespread indication that the natural capital embodied in the publicly owned land and forestry resource used for grazing is being eroded. While climate change, drought, invasive species, and wildfires are affecting the resources, significant attempts to control and improve the quality of the resource is on-going. Nonetheless, the Moskowitz and Romaniello (2002) study cites substantial deterioration in the natural capital of the public lands under BLM and Forestry Service management although the websites for BLM and the Forestry Service in more recent years indicate an opposing point of view.

Although further work on this issue is desirable, it appears to be a low priority compared to other concerns in US policy and programs.

Crop Insurance

There are four elements that are explored in the US crop insurance program. First, the US changed the way in which it notified crop insurance expenditures beginning in the 2011 year. In prior years, crop insurance premium subsidies were notified as a lump sum under non-exempt and non-commodity specific expenditures. With the change starting in 2011, the subsidies were notified as non-exempt commodity specific. The change allowed the US to reduce its CTAMS since the crop insurance premium subsidy for many commodities, along with any other commodity-specific subsidy for the commodity, fell under the five percent *de minimis* level. The result is that the US included only US$1.754 billion for crop insurance premium subsidies in the CTAMS calculation for 2014, instead of the total premium subsidies of US$4.950 billion. If the *de minimis* level falls in the future by 50 percent, the additional amount of crop insurance premium subsidies in the CTAMS calculation for 2014 would have been US$2.362 billion for a total of US$4.116 billion, but still below the actual premium subsidy of US$4.957 billion.

Second, under General Services (exempt under the WTO), the Farm Service Agency spent US$1.407 billion in 2014 on "Reimbursements for certain administrative and operating expenses of insurance companies delivering Federal crop insurance". The crop insurance program is delivered by private sector companies; assuring federal payments for private administration of the program is essentially a transfer that may have the effect of lowering premium rates for insurance contracts.

Third, the Farm Service Agency provided US$560 million for "Underwriting gains provided to insurance companies under the Standard Reinsurance Agreement".[88] These funds for program delivery and reinsurance costs for the private sector delivery of the program are not included in the premium subsidy. This is in addition to the US$67 million for administration and management of the program within government. The total cost of the program (premium subsidy, internal management and administration, private sector delivery costs and reinsurance costs) was US$6.991 billion with overhead and delivery at 29 percent of the total program costs. Although the internal and external delivery costs are high, the question is whether the reinsurance costs should be included in the calculation of non-exempt support in the AMS. Payment by government of the reinsurance costs essentially means that funds have been paid to producers as crop insurance indemnities that are in excess of the total

[88] For background on the Standard Reinsurance Agreement, see: Vedenov et al., 2013.

premiums (farmer and government shares). However, the arrangements for crop insurance also includes a provision for repayment of gains by the crop insurance companies.

The OECD includes premium subsidies, underwriting gains and program management and administration internal to government and payments to private delivery in its estimates of transfers under the crop insurance program.

Fourth, the US crop insurance program has become the primary agricultural support mechanism, particularly for grains. As a result, it needs careful analysis on an on-going basis. Section 2 of this chapter suggests directions for strengthening the notification requirements for crop insurance generally.

Disaster Payments

Expenditures on disaster payments by the US are small both absolutely, and in relation to value of production, with a single exception: the livestock forage payments for loss of grazing due to fire or drought on public lands for the two years shown in Table 6.2. In the 2012 year, expenditures were also large at US$2.58 billion, although in 2010 and 2011, expenditures were US$33.6 million and US$279 million respectively.

There is no apparent reason to flag disaster payments for concern. The high expenditure years reflect the drought through the western states; expenditures fluctuate with the extent of damage to grazing capacity on public lands. The only query would be why these costs are not included in the costs associated with the grazing subsidies on public land.

Further Work

This study was designed to identify support policies in three countries that may be materially affecting Canada's competitive position in global markets. It was not designed to measure or estimate the economic impact of such policies in terms of prices, production and trade flows. To estimate these economic impacts, the use of large scale models would be required. Two potential models may be considered, the AgLink model of which there is a Canadian component, and the FAPRI model housed at the University of Missouri. An alternative would be to pursue the modeling used in the Brazil cotton case, or the Canada-US Cool case. In parallel, legal opinion and discussion also needs to consider whether or not any justification exists to mount challenges in some of the cases described above.

In terms of priority for further analytical work, the following cases would be worthwhile exploring. Other cases described in this study may also be considered but of lesser priority based on the findings.

- Canola in China: the use of stock holding to support domestic rapeseed/canola prices. The parallel between China's use of stock holding and the current challenge by the USA to stock holding (and related issues) on rice, wheat and corn is strong enough to explore much more thoroughly.
- The beef, dairy and hog markets in EU: the evidence from the EU Parliamentary study provides ample evidence that the decoupled whole farm payments along with other payments are having a significant effect on production and prices for beef and dairy in the EU. A significant share of

net income in dairy and beef sectors is coming from these decoupled payments. In the face of low global prices for dairy products, for example, production is rising. In the hog sector, the prices and costs and costs of production suggest that considerably further analysis is needed.

- The grain-livestock sector in the USA: the crop insurance subsidies for feed grains which in turn fuel the livestock industry need to be examined carefully.
- The dairy industry in the USA: although the most recent farm bill changed the way in which the support payments for dairy are made, the complex of marketing arrangements along with payment support needs considerable analysis. It is striking that while the dairy industry is receiving lower direct support payments under the new arrangements, milk production in the US is rising during a period of globally low prices for dairy products.
- Natural capital: the overuse of ground water has received increasing attention in the professional literature as well as in media. The associated problems of mining ground water that is unlikely to be fully or even partially recharged include soil salinity, pollution from run off, and the conversion of sensitive soils to annual arable cropping. All three countries are investing in recovery and conservation, although the drawdown of ground water is continuing.

References

Blandford, David, and David Orden, 2008. Shadow WTO Agricultural Domestic Support Notifications. IFPRI Discussion Paper 00821, International Food Policy Research Institute.

Dalin, Carole, Yoshihide Wada, Thomas Kastner & Michael J. Puma, 2017. Groundwater depletion embedded in international food trade. Nature 543. Pg. 700-704.

Glauber, Joseph W. 2016. Unfinished business in agricultural trade liberalisation. Presented on 24 November 2016 to Cairns Group Farm Leaders seminar. http://cairnsgroup.org/DocumentLibrary/Unfinished%20Business%20Nov%202016.pdf

Goodwin, B. and A. Mishra. 2006. "Are 'Decoupled' Farm Program Payments Really Decoupled?" *American Journal of Agricultural Econo*mics 88(1): 73–89.

Hendricks, N.P., and D.A. Sumner. 2014. "The Effects of Policy Expectations on Crop Supply, with an Application to Base Updating." *American Journal of Agricultural Economics* 96(3): 903-923.

Josling, T. 2015. *Rethinking the Rules for Agricultural Subsidies*. E15 Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum. February.

Orden, David, David Blandford, and Tim Josling, 2011. WTO Disciplines on Agricultural Support: Seeking a Fair Basis for Trade. Cambridge University Press.