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# Agricultural Industry Support and Structural Adjustment

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**Rural Industries Research and  
Development Corporation**

# **Agricultural Industry Support and Structural Adjustment**

by David Harris

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# Foreword

Reductions in support for agricultural products are a long standing issue that has again been evident in the Doha WTO trade negotiations. There is a reluctance to lower trade barriers and reduce support for highly protected industries because of the adjustment pressures that may arise. Concerns are often raised about the threat to small scale farmers.

These concerns ignore the widespread evidence that farmers are highly resilient and have proven to be quite capable of adjusting to changing market circumstances. Farmers in highly protected industries cope with the pressures for change caused by internal market developments. If this is the case then concerns about the ability of farmers to adjust to policy reforms may be overly pessimistic.

Import protection and domestic support dilutes the competitive pressures that drive long term gains in efficiency and farm performance. Over time this can have a detrimental effect on the development of the protected industry. Structural changes in these industries also raise equity considerations in the distribution of support. Where support is linked to farm output the implicit income assistance will be directed more towards larger scale farms with high incomes.

This study was undertaken to investigate the relationship between industry support and structural change in the major developed economies. It considers the capacity of farmers in supported industries to adjust to market developments. It also examines the equity considerations in providing high levels of support in situations where the structural profile of the industry is changing. The study should be a useful contribution to international discussions on policy reforms that lead to reductions in support.

The project was funded from RIRDC core funds provided by the Australian Government. The project was funded through the Global Competitiveness program that aims to identify impediments to the development of a globally competitive Australian agricultural sector and supports investments on options and strategies for removing these impediments.

This report is an addition to RIRDC's diverse range of over 1800 research publications. Most of our publications are available for viewing, downloading or purchasing online through our website <[www.rirdc.gov.au](http://www.rirdc.gov.au)>.

**Peter O'Brien**

Managing Director

Rural Industries Research and Development Corporation

# Acknowledgements

The author has been involved in economic research on the effects of trade related policy reforms on rural industries for many years. He has an extensive background in quantitative analysis of the impact of trade restrictions on global commodity markets. His professional experience was developed during periods of employment at the Australian Bureau of Agricultural and Resource Economics (ABARE), the Centre for International Economics (CIE), Bonlac Foods Ltd and the OECD Secretariat in Paris.

In recent times the author has published two reports on industry adjustment to policy reform. The first report, *Industry Adjustment to Policy Reform: A case study on the Australian dairy industry*, reviewed farm level adjustment issues associated with the over-night deregulation of the Australian dairy market. A second report, *Rural Industry Adjustment to Trade Related Policy Reform*, examined some Australian experiences of industry adjustment to major policy reforms using four case studies – dairy, citrus fruit, pig meat and rock lobsters.

This report examines an issue of interest to the Doha Round of WTO trade negotiations. In recent times the author has published reports on other issues associated with multilateral trade negotiations that may be of interest to the reader. These studies were funded by the *Rural Industries Research and Development Corporation (RIRDC)*. They include a report on *Technical Issues Affecting Trade in Agricultural Products* that examines non-tariff barriers incorporated in tariff-quota administration. More recently the author prepared a report on *Food Aid and Agricultural Trade Reform* and a further study on *Special Safeguards and Agricultural Trade Liberalisation*. Copies of the reports are available on the RIRDC web site.

Financial support for this project was provided by RIRDC and is gratefully acknowledged. The content of this report was guided by the comments and advice provided by several individuals. The contributions of Simon Winter (Rural Research and Development Corporation – RIRDC), Jeff Davis (Australian Centre for International Agricultural Research – ACIAR), Nick Blong and Tim Crowe (Department of Agriculture, Fisheries and Forestry – DAFF), Ken Gordon (Department of Foreign Affairs and Trade – DFAT), Linda Falzari (Australian Bureau of Statistics – ABS), Warren Males (Queensland Sugar Ltd – QSL), Eric Danzi (Queensland Cane Growers Ltd), Chris Philips (Dairy Australia – DA), Scott Mitchell (National Farmers Federation – NFF) and Ian Shaw (Australian Bureau of Agricultural and Resource Economics – ABARE) were valuable and greatly appreciated.

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# Executive summary

## What the report is about

Reductions in support for agricultural products are a long standing issue that has again been evident in the Doha WTO trade negotiations. There is a reluctance to reduce support for protected industries because of concerns about the adjustment pressures that may arise. These concerns seem unwarranted because there has been substantial structural change occurring in these industries despite the provision of high levels of support.

Structural change raises some important equity issues in the continued provision of support. Over time many small scale low income farmers have exited the supported industries. The physical performance of farms remaining in these industries has significantly improved.

The report examines the relationship between industry support and structural adjustment to assess the validity of concerns about the capacity of farmers to adjust to phased reductions in support. It also looks at the equity considerations in providing support to industries with a declining number of beneficiaries and a growing contribution from large scale farms. Structural changes have altered the circumstances that were originally used to justify the support in the first place.

## Who is the report targeted at?

This report examines the implications of structural change in highly supported industries. It considers the concerns that are often raised about the capacity of farmers to adjust to reductions in support. It highlights the equity considerations with the provision of long term support in the context of structural change.

The study shows how the distribution of support becomes increasingly concentrated in the hands of large scale producers. It was undertaken as a contribution to considerations about providing support linked to output and the capacity of farmers to cope with the effects of phased reductions in support. It was aimed at policy advisors in developed and developing countries.

## Background

The issue of agricultural support is largely focused on the support measures used by some of the major developed economies for some highly protected industries. A common claim by those resisting reform is that farmers will be unable to cope with the financial pressures of reductions in support. Concerns are often raised about potential impact on small scale, low income farmers in the affected industries.

This perspective paints a static picture of the capacity of farmers to adjust. It ignores the evidence that farmers in general are continually adapting to changing market circumstances. There is also evidence that major policy reforms do not necessarily lead to long term industry disruptions. In general farmers are highly resilient and adaptable to changes in their income situation.

Structural change affects the distribution of different scale farming operations in protected industries. The assertion that small scale farms dominate these industries and receive most of the support does not reflect the structural characteristics of these industries. Over time there are anecdotal indications of a shift towards larger scale farms. This has implications for the distribution of assistance and the on-going need for industry wide support measures.

## **Aims/Objectives**

This study examined the relationship between industry support and structural change in some highly protected industries in the major developed economies. It was undertaken to consider concerns about the capacity of farmers to cope with the effects of reduced support in highly protected industries. A second objective was to examine the implications of providing long term support to industries experiencing structural change. Specifically the study examined:

- developments in the provision of support by the major developed economies;
- some examples of structural change in highly supported industries and their implications for the capacity of farmers to cope with reductions in support; and
- equity considerations in the way structural change affects the distribution of support.

The study reviewed industry adjustment with a focus on developments since the Uruguay Round Agreement on Agriculture (AoA) was implemented in 1995. The scope of the study was limited to some case study examples of highly supported industries in the major developed economies. But the findings are generally applicable in both developed and developing country situations.

## **Methods used**

The study made extensive use of OECD estimates of agricultural support in the major developed economies. Indicators of longer term structural adjustment and changes in farm performance were developed for the case study dairy and sugar industries in the US, Canada, Japan and Australia. The study involved an extensive analysis of industry performance data for these industries. It has applied economic principles to an assessment of the structural changes that have occurred and the implications of providing high levels of support.

## **Key findings**

In this study the dairy and sugar industries were used to investigate the relationship between industry adjustment and high levels of support. They are among the most highly supported industries in OECD economies. Despite high levels of protection, internal market developments have generated economic pressures for change in these industries.

Structural change in three dairy industries – the US, Canada and Japan – and one sugar industry – the US – were examined. Farmers in each of these industries have shown a capacity for coping with the adjustment pressures from internal market developments. They would suggest they may be capable of using similar adjustment strategies for coping with phased reductions in support.

There has been considerable adjustment in the US, Canadian and Japanese dairy industries over the past 25 years. Farm numbers have declined substantially and producers have made significant changes to the physical performance of their farm operations. This is reflected in large increases in per farm output of milk and much higher gross farm incomes.

The structural profile of all three dairy industries has changed considerably. Industry adjustment has seen the distribution of support become more concentrated among a smaller group of beneficiaries:

- US dairy support policies currently provide implicit income assistance to around 71,500 farms compared with more than 300,000 farms in 1982;
- Canadian support policies currently assist less than 15,000 dairy farms – in 1982 there were more than 52,500 farms benefiting from the support;
- Japan's support policies assist just over 25,000 dairy farms compared with almost 100,000 farms in 1982.

Resistance to reductions in dairy support are often based on concerns about the adjustment pressures for small scale, low income farmers. But the number of these farms has diminished in the three dairy industries that were examined. In general there has been a shift towards larger scale dairy farms that are experiencing significant growth in farm revenues in comparison:

- the average gross income for a dairy farm in the United States was close to US\$500,000 in 2007, a rise of 250% since 1995;
- over the same period average dairy farm income in local currency terms has increased by almost 150% in Canada and by 64% in Japan.

The increased gross earnings of dairy farms in the economies that were examined raises questions about the continued need for support in pursuit of income objectives defined more than 30 years ago. The structural changes also brings into focus the growing equity issue associated with the monetary transfers under the support policies:

- it highlights the need for support policies to be periodically reviewed to assess their on-going applicability because of changing circumstances.

There have been similar developments in the US sugar industry. The sugar beet sector has experienced significant structural change over the past decade with a large number of industry exits by diversifying into alternative crops and a shift towards larger scale farming operations. Structural change in the US sugar industry has not been as great but the income generating capacity of US sugar cane farms is substantial. Sugar cane growers benefit most from the industry support measures because the farms are bigger, have higher sugar yields and much higher farm output:

- in 2002 the average gross income for a sugar beet farm was around US\$230,000;
- the average gross income for a sugar cane farm was more than US\$1.1 million.

US sugar beet farmers have demonstrated their capacity to make changes that lead to increased output and farm income. Concerns about the ability of these farmers to cope with the adjustment pressures from phased reductions in support would seem to be overly pessimistic. The decline in the number of small scale low income farms suggests that short term, targeted transitional assistance may be an option for facilitating reform.

The structural changes also bring into focus the growing equity issue associated with the monetary transfers under the respective support policies. The dairy and sugar support policies provide a level of implicit income assistance to individual farmers that depend on how much they produce. Distribution of support will vary with the size of individual farming operations:

- the bigger the farm output the more support received in absolute terms.

Despite high levels of support, the pressures for economic change have been continually reshaping the structural characteristics of farms in these industries. Farm level adjustment has altered the number, size and physical performance of individual operations when compared with the situation when the policy measures were first introduced.

Over time the structural features of the US, Canadian and Japanese dairy industries has changed. The number of small scale dairy farms with low incomes has declined. This means the distribution of dairy support has become more concentrated in the hands of large scale producers:

- per farm dairy support in Canada is currently averaging around US\$159,000 per farm;
- in Japan is currently more than US\$110,000 per farm;
- in the US it currently averaging around US\$41,000 per farm.

Large scale dairy farms gain most of the implicit income assistance because of their large contribution to industry output. In the US there are currently about 17,500 farms with herds of more than 100 cows. They receive about 80% of the benefits of the industry support measures. Around 35,400 small scale farms (< 50 head) receive about 6% of the benefits (see table 21). This seems to be an inequitable situation that will be amplified if similar structural changes were to occur in the future:

- 1,443 dairy farms with herds of 1,000 cows or more gain 38% of the US support benefits;
- the implicit income support is averaging more than US\$800,000 per farm.

The situation is similar in the US sugar industry. The distribution of support is concentrated in the hands of large scale sugar cane producers. In 2002 average per farm support for a sugar cane farm was around US\$627,000 – average support for a sugar beet farm was US\$130,000. But it is the larger scale sugar cane farms that gain most of the implicit income assistance:

- 620 sugar cane farms received almost 50% of the benefits of total US sugar support in 2002;
- about 500 large scale cane farms (> 404 ha) received an average benefit of almost US\$2.3 million from the support measures;
- there are significant equity considerations in providing large amounts of assistance to large scale high income farmers.

## Implications for relevant stakeholders

Structural change raises questions about the on-going need for high levels industry wide implicit income assistance in the industries that were examined. Many years ago the original objective of the support policies was to raise farm incomes when there were large numbers of small scale low income farms in the industries that were examined. Growth in gross earnings of farms in protected industry suggests the need for non-targeted industry wide support measures is no longer appropriate:

- policy support measures should be reviewed from time to time to ensure they remain relevant to the evolving circumstances in the industry;

The analysis of the case study industry examples shows that:

- farmers in highly supported industries have demonstrated a capacity to cope with the pressures of economic change;
- there have been gains in on-farm performance and a shift towards larger scale farms;
- many small scale farms have exited these industries and those remaining have a substantially increased revenue earning capacity;
- the number of beneficiaries of the support policies has diminished;
- support benefits mostly flow to large scale, high income farmers.

## Recommendations

The recommendations from this study relate to policy reform. The analysis shows that concerns about the adjustment pressures from reduced support may be unduly pessimistic. The structural features of highly protected industries in the major developed economies have changed. Equity considerations have grown and become even more acute.

Resisting reductions in agricultural support in the WTO trade negotiations is equivalent to protecting the high incomes of a relatively small, select group of farmers at the expense of the rest of the community. The adjustment capacity that was evident in these case study examples should alleviate some of the concerns about the capacity of producers to cope with phased reductions in support.

# 1. Introduction

Reductions in domestic support for agriculture are an on-going issue in multilateral trade negotiations. Governments are reluctant to lower trade barriers and reduce support for highly protected industries because of concerns about the adjustment pressures that may arise. This resistance has been evident in the Doha WTO trade negotiations.

The issue of agricultural support is largely focused on the support measures used by some of the major developed economies for some highly protected industries. A common claim by those resisting reform is that farmers will be unable to cope with the financial pressures of reductions in support. Concerns are often raised about potential output reductions and the exiting of large numbers of small scale farmers from the affected industries.

This perspective paints a static picture of the capacity of farmers to adjust. It ignores the widespread evidence that farmers are continually adapting to changing market circumstances. There is also evidence that major policy reforms do not automatically lead to major industry disruptions. This is especially the case when transitional measures are used to help farmers cope with the pressures for change (OECD 2006; Blandford & Hill 2006a; Harris 2005b).

In general farmers are highly resilient and adaptable to the pressures of economic change. If their income situation is negatively affected some farmers will choose to leave agriculture for alternative employment. But most will make physical adjustments to land use (ie enterprise selection) and farm management to compensate. These changes generally lead to gains in farm performance and it is not unusual to find productivity increases after a reform is implemented (Blandford & Hill 2006b).

The farm level adjustments that are observed are a natural and inevitable feature of the longer term economic development of the agricultural sector. It is part of the wider changes in the use of resources such as land, labour and capital both within agriculture and between different sectors of the economy.

Several major developed economies still provide high levels of support to agriculture despite the adoption of the *Agreement on Agriculture (AoA)* in the Uruguay Round of trade negotiations. The OECD provides ample evidence of this in their annual assessments of support in member countries. The support is mostly concentrated in several highly protected industries.

Substantial reductions in support are likely to lead to adjustment pressures in these industries. Claims that farmers will not cope with pressure for change are not supported by experiences of policy reform in other situations. It also ignores the evidence of the structural change that has been occurring within these industries despite the provision of high levels of support.

## Structural change and the distribution of support

The impact on small scale farmers is often a central feature of concerns about reductions in support. It is often implied that supported industries are dominated by small scale farms and they gain most of the assistance. But this is not consistent with the fact that over time, structural change alters the mix of different scale farming operations. It is also inconsistent with the way much of the support is delivered – the distribution of assistance often depends on the amount produced.

Farmers in the protected industries have been adjusting to the pressures for change caused by internal market developments. If this is the case then phased reductions in support should be manageable as the income effects are equivalent. Policy reform is simply another factor driving economic change.

There are anecdotal indications of changes in the distribution of different scale farming operations in protected industries. The assertion that small scale farms dominate these industries and receive most of the support may not be an accurate representation of the situation. Over time farm numbers are declining and there are indications that farm exits may be greatest among small scale operators:

- declining farm numbers in a highly supported industry would mean the assistance is going to a smaller and smaller group of individuals at the expenses of the wider community;
- a trend towards large scale farms could mean the assistance is also becoming more and more concentrated in the hands of a small group of high income farms.

If the structural composition of supported industries is changing in this way then concerns about the impact of policy reform may not be as great as some fear. Larger scale, high income farms may not be as vulnerable to the effects of a phased reduction in support. It also raises questions about the income objectives that were the central feature of the justification for industry support. A gradual evolution towards higher income farms could mean there is no longer an need for industry wide assistance.

## **Costs and benefits of agricultural support**

Agricultural support is a form of direct assistance to a select group of people in the community. It favours some farmers over others through their participation in a highly protected industry. In general the benefits are obtained in the form of implicit income assistance. In recent times there has been a shift towards direct payments in some cases which makes the income assistance explicit.

Most of the policy measures are a crude way of giving assistance to industry participants. There is generally no capacity for targeting the assistance to those who may be considered in need of help. To put it another way, there is no capacity for limiting the assistance given to those with high incomes and/or high levels of accumulated wealth.

The original justification for providing support to particular industries was generally associated with concerns about the income position of individual farm operators. Income improvement objectives were a common feature of the support policies. To some extent this was related to farm scale – small farms had a limited income generating capacity.

Over time governments usually review their policy measures to assess their applicability to current circumstances. The support policies in the major developed economies have been in place for some time. Structural change will almost certainly have implications for the equity considerations in the continued provision of high levels of support. A growing contribution from larger scale, higher income farms would suggest an increasing need for policy reform.

Political considerations will obviously play a role in decisions about policy reform in highly supported industries. The beneficiaries will incur private costs if there are phased reductions in support. Those with the most to lose will be larger scale high income farmers, especially if the distribution of support is linked to output. Well organised vested interests will resist the change – they often draw attention to the plight of smaller scale operators on lower incomes.

The arguments for resisting reform have to be considered against the costs of providing the support. The support imposes a cost on other groups in the community. It is an income transfer paid for by tax payers and/or an implicit tax on consumers. High levels of support and import protection also has a cost through the distortion in resource use in the economy:

- in considering the case for reform it would seem to be important to know how the income situation of industry participants has evolved and how structural change has affected the distribution of assistance.

A further possibility worth considering is that over time high levels of support could mean industry participants have not had a strong incentive to develop and adopt new technologies and introduce more efficient farm management practises. It dilutes the competitive pressures that drive long term gains in farm performance in other countries where farmers in the same industry are exposed to global market conditions. This could lead to slower rates of productivity improvements in comparison to industry developments in other countries where protection and support is not provided.

## **Project aim and objectives**

The aim of this study is to examine some key elements of the relationship between industry support and structural change in the major developed economies. It was undertaken to consider concerns about the capacity of farmers to adapt to the effects of reduced support. A second objective was to examine the equity considerations in the provision of support for industries experiencing significant structural change. Specifically the study will examine:

- developments in the provision of support by the major developed economies;
- some examples of structural change in highly supported industries and their implications for the capacity of farmers to cope with policy reform; and
- equity considerations in providing support for industries experiencing structural change in the context of the income objectives of the support policies.

The study has considered long term industry adjustment with a focus on developments since the AoA was implemented in 1995. It uses examples of highly supported industries in the major developed economies as case studies to investigate the relationship between structural change and support. But the findings are generally applicable in developed and developing country situations:

- in this study the distinction between amber, blue and green box support was not considered – aggregate support levels were sufficient for the issues examined.

In part the analysis relies on OECD estimates of agricultural support. These estimates are generally accepted as a reasonably good measure of the value of support policies used by OECD Member countries. They contain a large amount of detail on the different support measures as well as estimates of the implicit assistance from border protection and internal price support arrangement.

An alternative source of estimates of agricultural support is available through WTO notifications on domestic support commitments. The notifications provide monetary values of support programs and policies against AMS (*Aggregate Measurements of Support*) commitments. It includes estimates of the market price support from border protection and internal price support arrangements.

For the purposes of this study the OECD estimates of support were used because they offered a consistent set of up-to-date time series data that could be used for other aspects of the study. A further consideration was the availability of some WTO notifications for recent years. The results of the study will not be materially different using either data source.

The analysis has also used farm survey results to develop a longer term perspective of structural change in the case study industries. This was supplemented by data that enabled indicators of farm performance and farm level adjustment to be developed. To some extent the scope of the study was guided by data availability. However, the available information was sufficient to provide a reasonable assessment of the issues related to the relationship between agricultural support and structural change.

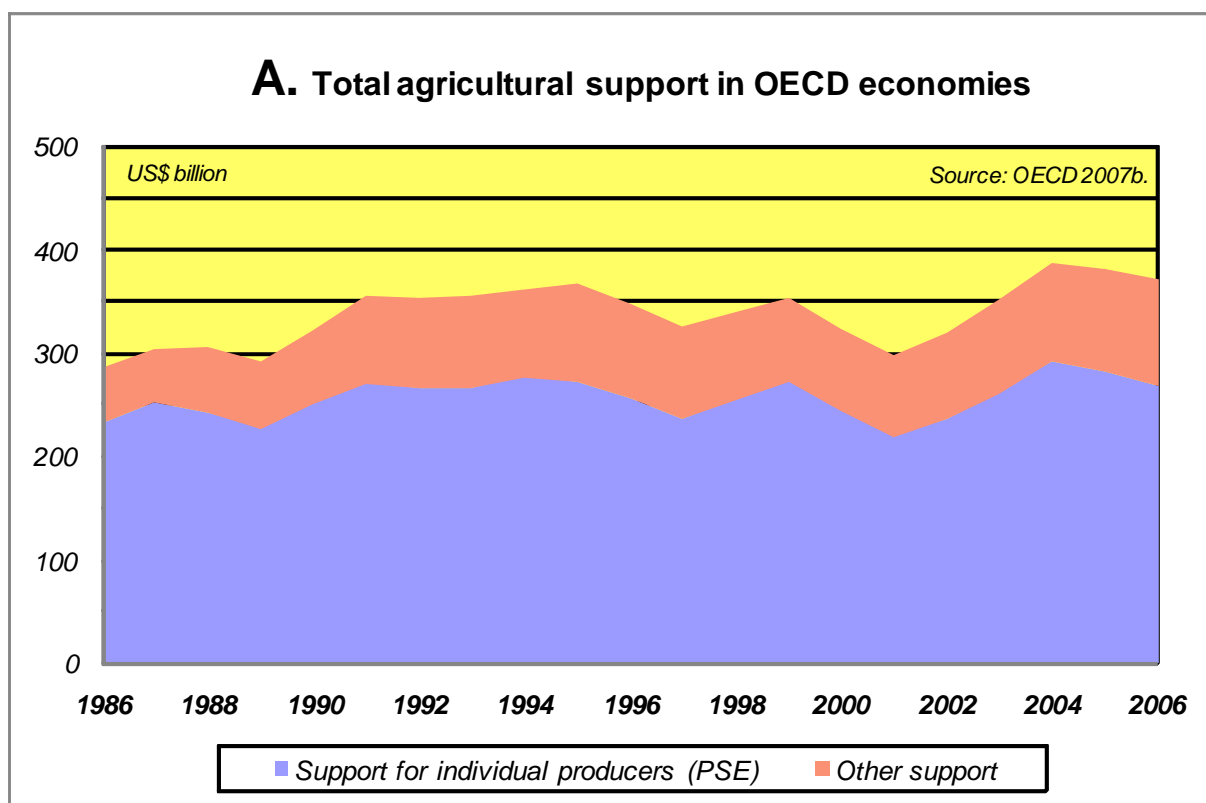
## 2. Agricultural support in OECD countries

Agriculture benefits from high levels of support in several of the world's major developed economies. In 2006 total agricultural support in OECD countries was estimated at US\$372 billion (OECD 2007b). This is a substantial amount of assistance especially when considering that much of the support is concentrated in particular industries. More than 70% of the support was provided by measures that directly assisted individual farmers (chart A).

High levels of agricultural support have been a feature of several of the major developed economies for some time. In OECD countries the traditional emphasis of support policies has been price support and improved farm incomes (Blandford & Hill 2006a). The specific policy measures have varied over time. But in general it has typically involved a combination of import protection and domestic price support arrangements that linked the support to farm output.

It is generally accepted that high levels of agricultural support are not in the best interests of the wider economy. Support policies are discriminatory and can have unintended consequences. They provide financial assistance to a particular group in the economy and impose costs on others. It distorts the allocation of resources which limits the rate of wealth creation in the national economy.

Most support policies have trade distorting effects which impose costs on producers in exporting countries. They also have a domestic effect which is equivalent to imposing an implicit tax on other sectors of the economy. Consumers face higher prices and there may be related downstream industries that face higher input costs. If there are policy measures involving government payments, the general community will face higher rates of taxation or budget implications that limit government spending in other areas of the economy.





## Income objectives in agricultural support

The policy objectives of agricultural support are often described in very broad terms (OECD 2007c). Historically they have typically made reference to improving farmer incomes. From time to time other generalised objectives have been included as justification for providing farm support. But in general the principle concern of raising farm incomes has been a central feature of the objective of agricultural support (Johnson 1973).

The income objectives of agricultural support were mostly described in rather loose terms. In some cases they referred to notions of equality with non-farm incomes or 'adequate' incomes in comparison to the rest of society. For example the original description of agricultural support policy objectives in Japan in the early 1960s included a specific reference to 'increased farm income to attain an equal standard of living with those in other industries' (OECD 1995).

The vague definition of the incomes objectives made it difficult to evaluate the support measures. It also discouraged periodic reviews of the on-going need for support which is a typical aspect of long term policy interventions in most developed economies. The inference behind these loosely defined income objectives were concerns about small scale farmers and their standard of living.

In general the income support objective was pursued through measures linked to production that supported higher returns. Concerns about the transfer efficiency of these forms of support and the trade distorting impacts have seen a change in approach. In some countries there has been some re-instrumentation towards more direct forms of support such as direct income payments.

It seems reasonable to describe the current situation as one where:

- farm income remains a central feature of the objectives of agricultural support;
- the shift away from production linked support has not been embraced by all economies; and
- in the developed economies there are several highly protected industries that remain largely tied to production linked support policies.

An accurate assessment of the extent of farm income gains from agricultural support is a non-trivial exercise for individual industries. The policies involve income transfers from consumer and tax payers to farmers in the supported industries. Production linked support is a crude form of income assistance that increases gross farm revenues. But the income objective can only be properly assessed through consideration of the effects on net farm income.

In OECD economies there is no evidence that farm incomes are systematically lower than other household incomes (OECD 2003). This raises questions about the on-going need for agricultural support to achieve an 'improvement in farm incomes'. There may be some farmers in some industries where this objective remains a relevant consideration. But this finding would suggest the need for industry wide support is difficult to justify.

A further consideration is the way structural change in supported industries affects the distribution of the income assistance provided by the support measures. Larger scale farms get most of the assistance from production linked support. Small to medium sized farms gain a relatively small benefit (OECD 2007c). Over time the structure of the supported industries will have changed and this has implications for the equity in providing high levels of industry wide support

At the same time it seems likely that farmers in supported industries have been adopting technical innovations and making efficiency improvements. The farm level productivity gains that have been achieved will be contributing to higher incomes. If the scale and income levels of industry participants has increased it raises further questions about the on-going need for high levels of support.

## Resistance to reductions in support

There is a long history of resistance to reductions in support because of political concerns about the adjustment pressures that would flow from the initial impact on farm incomes. This perspective takes a static view of farmer responses to a change in income. It is not consistent with the evidence of farmers adjusting to market returns in unsupported industries. It also fails to recognise the adjustment that occurs in the industries that actually receive the support.

Past experiences in the way farmers have coped with the effects of policy reform show the dynamic responses that can occur (Blandford & Hill 2006a). There are numerous examples of agricultural industries in OECD countries successfully adjusting to major policy reforms that initially had a negative impact on farm incomes (OECD 2006; Harris 2005a, 2005b).

Concerns about the ability of farmers to cope with policy reform are often overly pessimistic. When market prices decline farmers react like individuals and small businesses in other sectors of the economy (Harris & Rae 2004). They assess the implications of the change on their income situation and make adjustments to improve their financial position.

The adjustment pressures from reductions in support will initially have short term adverse effects on farm households in the industries affected. But past experiences with policy reform has demonstrated the capacity of farmers to transform changes in market conditions into new opportunities (OECD 2006). In some cases this has been facilitated by phasing the policy change and using other short term transitional assistance measures:

- adjustment assistance has also been used in response to political economy factors that often emerge to reduce the private costs of the reform (Blandford & Hill 2006b).

It is important not to underestimate the capacity for individuals to adjust. In some situations targeted, short term transitional assistance measures have been used to help facilitate farm level changes. The risk of farmers being forced to exit an industry in financial distress can be a factor in the resistance to reform. In some situations exit assistance has been used to address these concerns.

## Measuring changes in agricultural support

Despite many years of negotiations in multilateral trade talks, efforts to reduce support appear to have had very little success. The AoA negotiated in the Uruguay Round imposed limits on the amount of agricultural support. But the agreement has failed to achieve any significant reductions in support. In monetary terms total farm support in OECD countries has averaged around:

- US\$299 billion per year over the 1986-88 period;
- US\$357 billion per year in the 1992-94 period just before the AoA was implemented; and
- US\$381 billion per year over the 2004-06 period.

The EU, the United States and Japan account for most of the agricultural support in OECD countries (table 1). Collectively they accounted for more than 80% of total support in 2006. South Korea also provides a significant amount of support but Canadian support levels are small in comparison to the other major developed economies.

The rise in support since the AoA was implemented reflects a 42% increase in US support levels and a 9% rise in EU support – EU membership changes would account for some of this increase. Japanese support has halved during this period – a reduction of US\$49 billion. Korean support is marginally higher and Canadian support is up by more than 75%.

## 1. Agricultural support provided by the major OECD economies #

	<i>European Union *</i>	<i>United States</i>	<i>Canada</i>	<i>Mexico</i>	<i>Japan</i>	<i>South Korea</i>	<i>Other countries</i>	<i>OECD total</i>
	<i>US\$ billion</i>							
<b>1986</b>	107.6	66.5	7.6	1.5	52.7	10.2	39.3	285.5
<b>1990</b>	125.2	65.8	9.1	5.7	52.4	21.9	41.1	321.2
<b>1995</b>	143.5	68.0	5.7	-0.1	97.6	28.6	23.8	367.1
<b>2000</b>	100.7	95.9	5.9	7.0	67.9	22.1	23.2	322.7
<b>2005</b>	153.1	105.4	9.1	6.2	54.7	27.1	26.6	382.2
<b>2006 p</b>	156.5	96.9	10.1	7.9	48.9	29.1	22.7	372.0
<b>1986-88</b>	115.5	64.1	7.6	1.3	58.3	13.2	38.7	298.7
<b>2004-06</b>	159.2	101.5	9.0	6.8	54.2	26.6	23.6	380.8

# Monetary value of all transfers to support agriculture (TSE).

Sources: OECD 2004, 2007a & b.

Based on OECD measurement of producer support estimates (PSEs), transfers to support agricultural services (GSSes) & consumer transfers (CSEs).

\* EU12 for 1986-94 including ex-GDR from 1990, EU15 for 1995-2003 and EU25 from 2004.

p - provisional.

The OECD devotes considerable resources to assessing agricultural policy developments in member countries. The monetary value of total transfers to agriculture from support policies has been a focus of these efforts. The most important OECD indicator of support is the *Producer Support Estimate* (PSE). It allows cross country comparisons of the monetary transfers from policy measures that directly assist individual producers (OECD 2004).

Assistance measured by the PSE covers three broad categories of policies (OECD 2007a):

- market price support that maintains returns above those on the world market;
- budgetary payments made to farmers; and
- implicit budgetary support through tax or fee concessions that lower input costs.

Expressing the monetary value of the PSE as a percentage of farm income is one way of showing the extent of the assistance provided. In 2006 about 27% of gross farm revenue in OECD countries came from budgetary assistance and market support policies (OECD 2007b). This is a small decline on estimates of recent years which partly reflects a switch in the basis of support in some countries. Over the past 5 years the contribution of support to farm income has averaged around 30%.

The absolute size of the financial transfers measured by the PSE is of some interest especially in the context of the distribution of support among individuals. The 2006 estimate of US\$268 billion is a small decline in support from the most recent peak of US\$292 billion in 2004 (OECD 2007b).

The size of the revenue transfers raises some obvious equity issues. Agricultural support involves a redistribution of income within the economy. The need to give income support to high income farmers is difficult to justify – if there are no targeting conditions all farmers benefit from the support. It is inconsistent with the principles applied to the provision of welfare assistance to individuals in other parts of the economy:

- welfare assistance is generally restricted by conditions such as eligibility rules, payment caps, time limits on receiving assistance, income and wealth tests, etc.

## 2. Industry specific assistance in producer support #

		2004	2005	2006	2004-06
<b>United States</b>					
Producer support *	US\$ billion	43	42	29	38
Commodity specific support **	US\$ billion	19	16	8	14
	% share	45.1	38.7	26.7	38.0
<b>European Union ^</b>					
Producer support *	US\$ billion	149	134	138	140
Commodity specific support **	US\$ billion	101	77	68	82
	% share	68.0	57.3	49.4	58.5
<b>Canada</b>					
Producer support *	US\$ billion	6	7	8	7
Commodity specific support **	US\$ billion	3	3	4	4
	% share	60.9	51.7	57.7	56.7
<b>Mexico</b>					
Producer support *	US\$ billion	4	5	7	6
Commodity specific support **	US\$ billion	1	3	4	3
	% share	38.0	50.0	58.0	50.6
<b>Japan</b>					
Producer support *	US\$ billion	48	45	41	45
Commodity specific support **	US\$ billion	45	42	38	42
	% share	93.7	93.2	93.1	93.4
<b>South Korea</b>					
Producer support *	US\$ billion	21	24	25	23
Commodity specific support **	US\$ billion	19	22	23	22
	% share	93.5	92.6	92.2	92.7

# Based on the value of transfers to support producers - excludes other components of support.

Source: OECD 2007b.

\* OECD producer support estimates (PSEs).

\*\* Gross transfers linked to a specific commodity (SCTs) - excludes non-commodity specific producer support.

^ Estimates for 25 EU member states.

The annual PSE assessments by the OECD are generally accepted as a reasonably good reflection of the monetary transfers involved in supporting agriculture. Policy changes in more recent times created complications for the original approach to measuring PSE categories. To accommodate the evolution in policy interventions the PSE measurement was revised (OECD 2007a). Currently there are four mutually exclusive categories in the PSE:

- *Single Commodity Transfers (SCT)* which account for the monetary value of policies linked to the production of a single commodity;
- *Group Commodity Transfers (GCT)* which account for the monetary value of policies linked to the production of a designated list of commodities;
- *All Commodity Transfers (ACT)* which account for the monetary value of policies that place no restrictions on the commodity produced; and
- *Other Transfers to Producers (OTP)* which account for the monetary value of policies that do not require any commodity production at all.

The aim of the study is to examine some key elements of the relationship between industry support and structural change. But the revisions in PSE measurement mean the estimates are no longer published on an industry basis. An alternative approach is to use the estimates of *Single Commodity Transfers (SCT)* as a measure of industry support.

For most OECD economies the SCTs provide a good reflection of the amount of industry assistance. Industry specific SCTs include estimates of these key components of support – market price support and commodity specific budgetary transfers. But in some cases it will underestimate industry support because of assistance obtained from the non-commodity specific transfers.

The EU and the US cereal industries would be a notable example because of the re-instrumentation of support policies. This can be observed in the contribution of SCTs to the total PSE for agriculture (table 2). In the US about 38% of the PSE came from SCTs in the 2004-06 period and the rest came from other transfers. In the EU the SCTs were around 59% of the PSE. It contrasts with the situation in Japan and Korea where SCTs were more than 90% of the PSE.

## Industry support in OECD economies

Industry specific SCT estimates for the major developed economies show a high level of support for some commodities (table 3). The dairy industry has the highest level of support. In 2006 the EU, US, Canada, Japan and Korea collectively contributed almost US\$22 billion to the gross incomes of their dairy farmers.

In some cases the level of dairy support looks to have declined since the AoA was first implemented. For example, between 1995 and 2006 dairy support has halved in Japan and declined by 43% in the EU. But to some extent this comparison is misleading as it partially reflects the unusually strong world market prices for dairy products in 2006 (USDA 2007a). A moderation in the strength of world prices in the future is likely to see a rise in the level of support.

After the AoA was implemented US dairy industry support increased to a peak of US\$12.5 billion in 1998. Support remained at relatively high levels until 2001 and then began to decline. By 2006 US dairy support was 36% below 1995 assistance levels. In contrast the fluctuations in dairy support in Japan have been less pronounced and a downward trend has been evident (see appendix A):

- assistance for Canadian dairy farmers is currently 78% above 1995 levels of support;
- Korean dairy support has increased by 50% and is currently close to US\$1 billion.

The dairy industry is heavily supported in most OECD economies. Sugar is another industry that benefits from high support levels. In 2006 the EU, US and Japan collectively contributed about US\$3.6 billion of assistance to the gross incomes of sugar farmers. But the amount of sugar support has fluctuated considerably since the AoA was first implemented.

For example, in the first five years of the AoA sugar support in the EU increased to between US\$3.5 and US\$4 billion (see appendix A). It then declined for a short period before rising to US\$4.8 billion in 2004. In the US sugar support was in excess of \$US1 billion during the 1998-2004 period but it has declined since then. To a large extent the fluctuations in support reflect movements in the world sugar price which contributes to market price support estimates.

Other commodities also continue to benefit from high levels of support. In 2006 the EU, Japan and Korea collectively contributed almost US\$18.6 billion to the gross incomes of their beef farmers. EU beef support has fluctuated around relatively high levels ever since the AoA was implemented. Japan has provided a relatively constant level of support. Beef support in Korea has been rising and in recent years it has exceeded the amount of support provided by Japan.

### 3. Industry specific support in selected OECD economies #

	<i>European Union *</i>	<i>United States</i>	<i>Canada</i>	<i>Mexico</i>	<i>Japan</i>	<i>South Korea</i>
<i>US\$ million</i>						
<b>Dairy industry</b>						
<b>1986</b>	22 122	6 711	1 725	846	3 853	286
<b>1990</b>	20 532	7 490	1 744	187	3 822	543
<b>1995</b>	22 006	4 783	1 385	- 221	5 895	650
<b>2000</b>	12 747	10 423	1 790	966	4 454	811
<b>2005</b>	12 977	5 144	1 913	472	3 429	877
<b>2006 p</b>	12 461	3 047	2 467	628	2 861	975
<b>Sugar industry</b>						
<b>1986</b>	3 023	1 011	<i>na</i>	126	518	<i>na</i>
<b>1990</b>	3 248	715	<i>na</i>	211	464	<i>na</i>
<b>1995</b>	3 499	760	<i>na</i>	- 37	635	<i>na</i>
<b>2000</b>	2 924	1 004	<i>na</i>	750	510	<i>na</i>
<b>2005</b>	4 051	896	<i>na</i>	583	508	<i>na</i>
<b>2006 p</b>	2 632	549	<i>na</i>	428	437	<i>na</i>
<b>Beef industry</b>						
<b>1986</b>	12 830	275	- 53	- 288	2 198	478
<b>1990</b>	13 351	262	30	247	1 377	882
<b>1995</b>	16 680	- 8	44	- 476	1 998	1 611
<b>2000</b>	14 646	0	61	134	1 245	1 212
<b>2005</b>	17 838	0	110	200	1 153	1 742
<b>2006 p</b>	15 737	0	106	202	1 003	1 909
<b>Wheat industry</b>						
<b>1986</b>	7 589	5 354	1 222	- 81	803	<i>na</i>
<b>1990</b>	6 656	3 805	1 454	105	824	<i>na</i>
<b>1995</b>	3 320	1 213	33	- 146	595	<i>na</i>
<b>2000</b>	2 059	1 124	73	113	811	<i>na</i>
<b>2005</b>	734	129	49	67	948	<i>na</i>
<b>2006 p</b>	186	675	87	62	860	<i>na</i>
<b>Rice industry</b>						
<b>1986</b>	351	990	<i>na</i>	- 26	18 606	4 552
<b>1990</b>	630	791	<i>na</i>	- 30	16 440	7 935
<b>1995</b>	476	490	<i>na</i>	18	27 299	7 986
<b>2000</b>	120	628	<i>na</i>	145	18 217	7 825
<b>2005</b>	330	138	<i>na</i>	91	14 762	6 622
<b>2006 p</b>	222	20	<i>na</i>	91	12 377	6 045

# Includes market price support & other commodity specific transfers.

Sources: OECD 2004, 2007a & b.

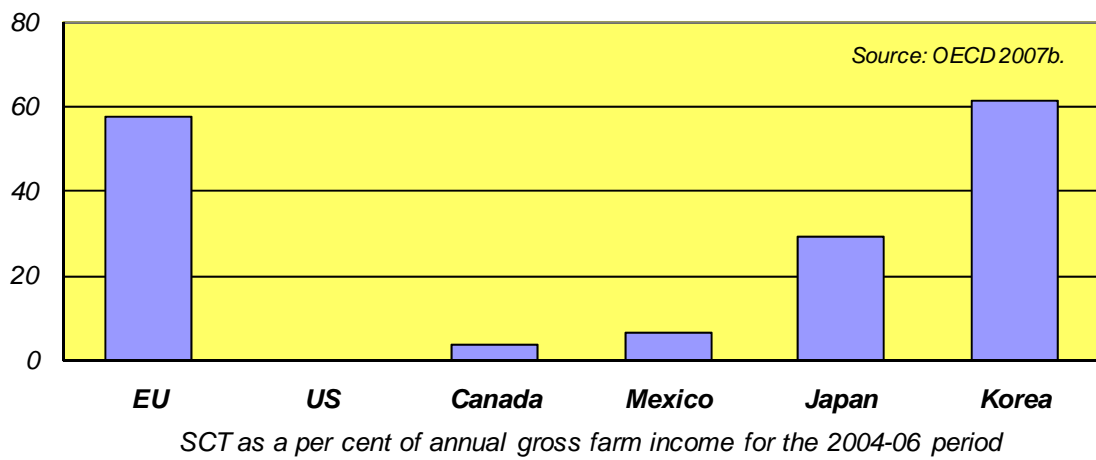
Based on OECD estimates of the monetary value of gross transfers linked to a specific commodity (SCT).

Excludes non-commodity specific producer support, general services support (eg inspection services, infrastructure, marketing & promotion, public stockholding, R&D, etc) & the value of transfers from taxpayers to consumers.

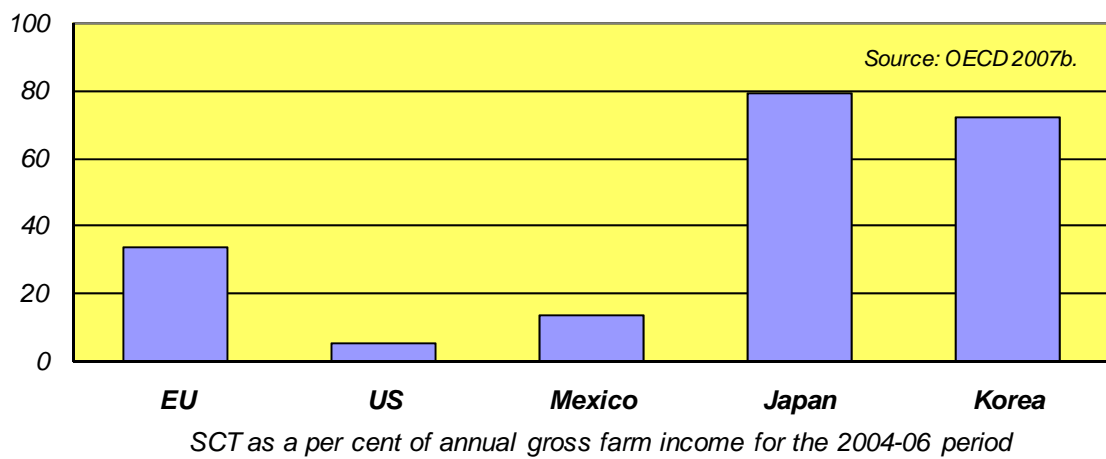
\* EU12 for 1986-94 including ex-GDR from 1990, EU15 for 1995-2003 and EU25 from 2004.

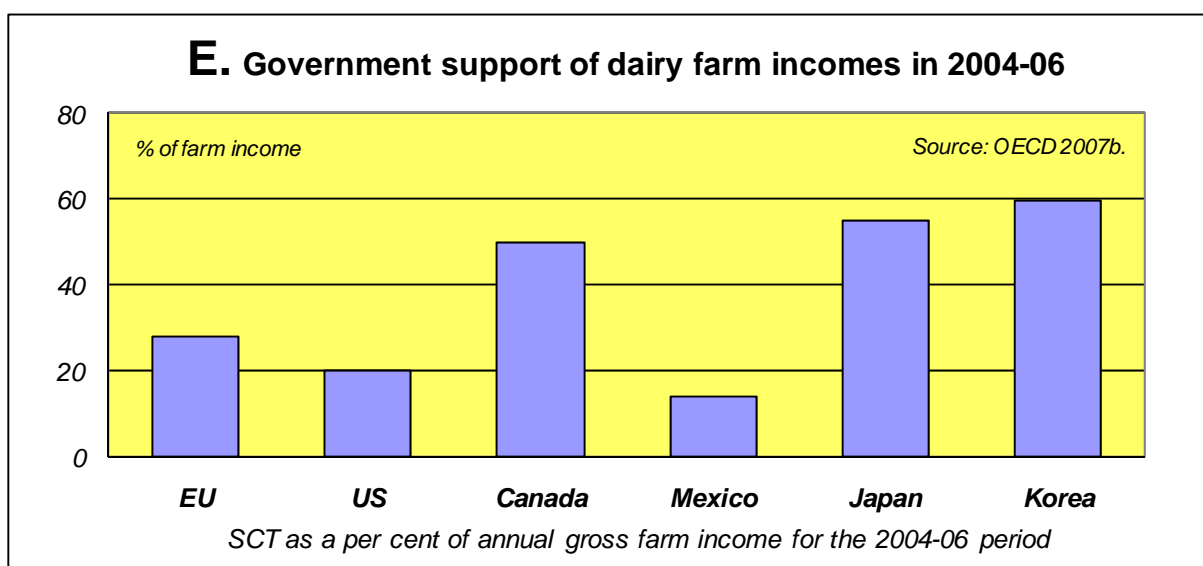
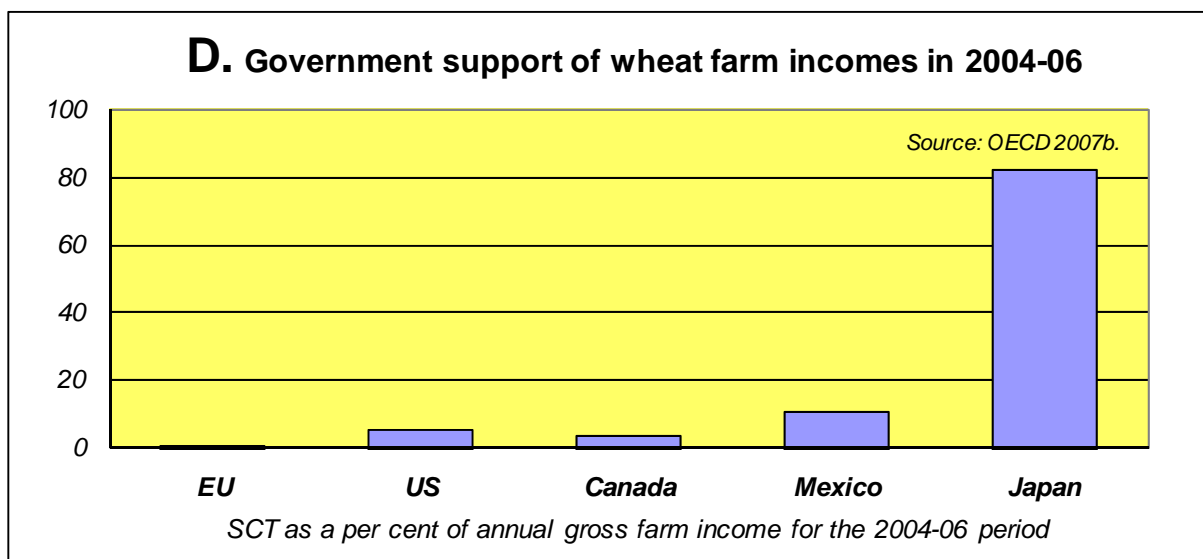
p - provisional.

### B. Government support of beef farm incomes in 2004-06



### C. Government support of rice farm incomes in 2004-06





Rice is another highly supported commodity. In 2006 Japan and Korea collectively contributed almost US\$18.4 billion to the gross incomes of their rice farmers. There has been a modest reduction in Japanese rice support since 1995 while Korean support has remained largely unchanged.

The EU, US, Canada and Japan have historically provided significant support to their wheat farmers. In Japan support has been rising since the AoA was implemented but it has declined in the other three economies. These estimates of wheat support should be treated with caution. In some cases the re-instrumentation has shifted the basis of support away from commodity specific assistance.

To a large extent the monetary value of support in each economy will reflect differences in the size of the industry and in domestic pricing conditions. The transfers can be expressed as a proportion of gross farm income to show how much is attributable to government policies. It is a useful way to make comparisons of assistance across different economies. For example:

- close to 60% of beef farm income in the EU and Korea is attributable to industry support policies – in Japan the contribution is just under 30% (chart B);



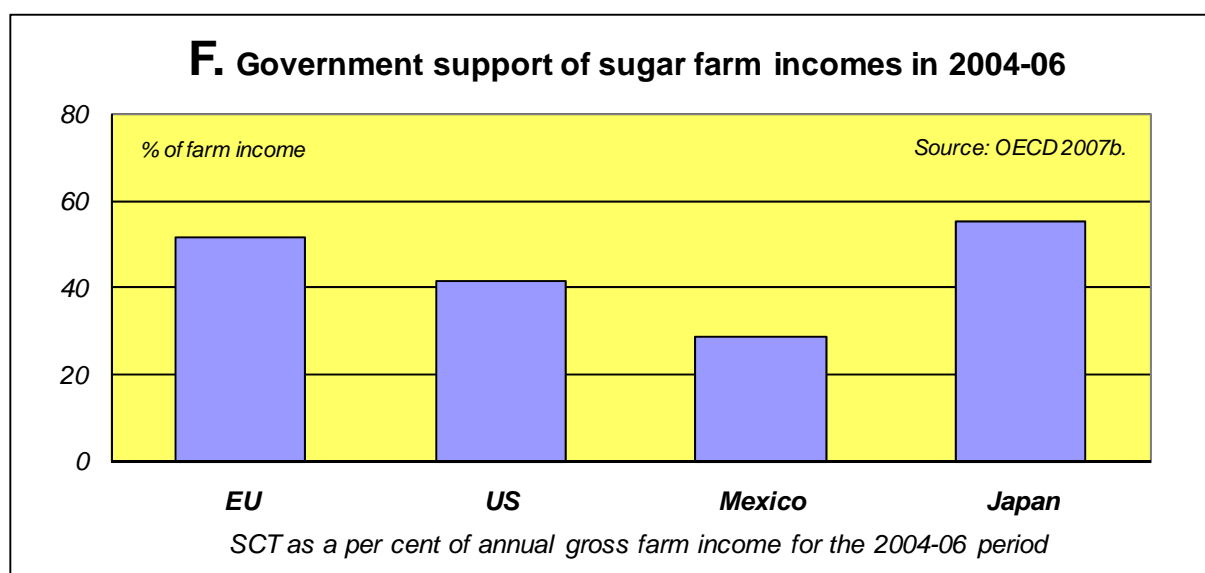
- almost 80% of rice farm income in Japan and more than 70% of Korean rice income is attributable to support policies – in the EU the contribution is 33% (chart C); and
- more than 80% of wheat farm income in Japan is due to industry support (chart D).

Dairy has high levels of support in OECD economies and is a large contributor to farm income. In Korea, Japan and Canada more than half of the dairy gross farm income is derived from support policies (chart E). In the EU support policies currently account for about 28% of dairy farm income in the United States they contribute about 20% of farm income.

Sugar is another industry with high levels of support in OECD economies. More than 50% of farm income in the Japanese and EU sugar industries is currently derived from government support (chart F). In the US around 42% of sugar farm income is obtained through industry support.

## Case study examples of industry adjustment and support

In this study the dairy and sugar industries are used to investigate the relationship between structural change and support policies. Several economies have a long history of providing support and it allows the analysis to consider a livestock and cropping example.



Dairy and sugar industry support in OECD economies is still essentially based on a combination of import protection and price support arrangements. Currently, dairy support in Canada, Japan and Korea is entirely based on measures that support market prices and the same situation applies to sugar support in Japan:

- in the EU and the US less than 1% of the dairy and sugar industry support as measured by SCTs is obtained from budgetary payments.

Over time there have been significant fluctuations in the contribution of support to dairy farm income among the major OECD economies (table 4). In the EU and Japan there has been a decline in the role of support since the AoA implementation in 1995:

- in the EU it has fallen from 52% in the 1992-94 period to 28% in the 2004-06 period;
- in Japan the contribution has fallen from 75% to 55% over the same period.

In other OECD economies changes in the income contribution of dairy support has been mixed. In the US the contribution increased from 35% in 1992-94 to a peak of 53% in 1998 but it has declined in recent years. In Canada and Korea there has been a modest decline in the role of support from 59% and 66% respectively in 1992-94 but the contribution remains high.

Support for sugar farm income in the OECD economies that are assessed has fluctuated over the post 1995 period. In the US the contribution of support reached a peak of 67% in 1999 and remained at high levels for several years (see appendix A). It has also remained at relatively high levels in the EU – it was more than 50% of sugar farm income until 2006. In Japan the contribution has fluctuated between 50% and 60% throughout the post 1995 period.

The nature of the support policies for dairy and sugar means the provision of assistance is linked to output. Individual farmers share in the monetary transfers according to the amount they produce. This means the distribution of support will vary with the size of individual farming operations. The bigger the farm output the more support received in absolute terms:

- the key variable will be the primary production resource – harvested land areas in the case of sugar support and the number of milking cows in the case of dairy support;
- the productivity of these resources will also be a factor in the distribution of support.

#### 4. Contribution of support to dairy and sugar farm incomes #

	<b>European Union *</b>	<b>United States</b>	<b>Canada</b>	<b>Mexico</b>	<b>Japan</b>	<b>South Korea</b>
	% of gross revenue					
<b>Dairy industry</b>						
<b>1986</b>	71	36	70	78	88	68
<b>1990</b>	50	37	55	13	75	60
<b>1995</b>	44	24	48	- 16	76	61
<b>2000</b>	37	50	63	36	71	67
<b>2005</b>	24	19	46	17	56	58
<b>2006 p</b>	24	13	56	21	52	61
<b>Sugar industry</b>						
<b>1986</b>	64	58	na	25	68	na
<b>1990</b>	48	35	na	26	60	na
<b>1995</b>	47	38	na	- 4	60	na
<b>2000</b>	55	48	na	52	60	na
<b>2005</b>	54	44	na	31	54	na
<b>2006 p</b>	37	26	na	25	53	na

# SCT expressed as a percentage of total gross farm income (revenue).

Sources: OECD 2004, 2007a & b.

SCT (single commodity transfers) refers to gross transfers from policies linked to the production of a single commodity.

The SCT includes policies where payments are specified on a per-commodity basis. The SCT is one of four categories included in the revised calculation of PSEs (producer support estimates) - it include market price support.

\* EU12 for 1986-94 including ex-GDR from 1990, EU15 for 1995-2003 and EU25 from 2004.

p - provisional.

Despite the high levels of support, the pressures for economic change have continued to reshape the structural characteristics of the farms in these industries. Farm level adjustment has probably altered

the number, size and physical performance of individual operations when compared with the situation when the policy measures were first introduced.

The monetary transfers in the annual support levels can be expressed on a per farm basis. This would provide an indication of how structural change has altered the distribution of the assistance in these industries. Changes in the diversity of support recipients are relevant in assessing the on-going need for support in the context of the income objectives.

The structural changes will also be relevant for judging the capacity of these industries to adjust to future changes in economic conditions. Policy reform such as phased reductions in support would create financial pressures for farm level changes. Past behaviour does not automatically mean all industry participants would cope with the effects of the reform. But it would be an indicator of the dynamic nature of industry adjustment:

- evidence of substantial adjustment in the past would suggest there is likely to be a capacity for these industries to adjust to a phased reduction in support;
- it would allay some of the concerns raised by those resisting reform.

### 3. Adjustment and dairy industry support

Pressure to adjust to changing economic conditions is an inherent aspect of agricultural production. Farmers are continually faced with decisions about adjusting the physical aspects of their farming operations in order to maintain a satisfactory farm income. It is an inevitable outcome of the way market developments affect farm returns.

Structural change is often portrayed as a negative development involving farmers being forced to leave their farms due to unreasonable financial pressures. In reality it is a process that has more to do with self-improvement. At the farm level there are two aspects of the adjustment process that leads to longer term structural change:

- operational changes to improve physical and financial farm performance; and
- individuals entering or leaving agriculture after assessing investment risks and returns.

From an industry perspective the changes are often incremental in the short term. But over time the effects are generally observed through changes in productivity and farm performance as well as changes in the number of farmers and farm holdings. These farm level changes are reflected in the longer term expansion or contraction of different industries.

To varying degrees farmers in highly supported industries are insulated from market developments that could reduce returns and farm incomes. Import protection and price support measures are often used to limit the external competitive pressures. But internal market developments such as changes in demand and policy changes can still generate farm level adjustment pressures.

OECD dairy industries are not immune to these pressures for change. If farmers in supported dairy industries have been able to cope with market related adjustment pressures it would suggest they may be able to cope with policy reforms. A phased reduction in support will initially have a negative effect on farm incomes. But if there's evidence of successful adjustment experiences in the past, similar strategies could emerge as farmers adapt to the effects of the policy reform:

- for example, changes in input use and farm management can lead to efficiency gains;
- there could also be changes in enterprise selection, farm size or off-farm income.

An assessment of adjustment and structural change in the dairy industries of three OECD economies are examined as case studies. The assessment looks at some of the key physical indicators of industry performance. The dairy industries of the US, Canada and Japan are examined because they offered a diversity in the structural characteristics of dairy production.

The rate of change in physical performance indicators for these industries is also compared. This was done to consider the proposition that high levels of support could dilute the incentive to rapidly adopt developments that drive long term gains in efficiency and farm performance. The Australian industry was included in the comparison to reflect developments in an industry that experienced a progressive reduction in support:

- industry performance in Australia includes a period where dairy farmers became fully exposed to global market conditions.

This comparison will not provide any definitive conclusions on this proposition. There are various reasons why the rate of change in physical performance indicators could be faster or slower in a particular country. But it is worthwhile examining the data to see if there are systematic differences that may suggest the issue should be examined in a more comprehensive analysis.

## 5. Adjustment in the US dairy industry

Year ending 31 December		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	307 920	227 880	170 500	123 700	91 240	71 510
	<i>change</i>	..	-80 040	-57 380	-46 800	-32 460	-19 730
<b>Milk production</b>	<i>'000 tonnes</i>	61 464	64 732	68 423	70 802	77 139	84 186
	<i>% change</i>	..	5.3	5.7	3.5	9.0	9.1
<b>Farm output of milk</b>	<i>tonnes/farm</i>	200	284	401	572	845	1 177
	<i>% change</i>	..	42.3	41.3	42.6	47.7	39.2
<b>Farm herd size **</b>	<i>head/farm</i>	36	46	57	75	100	128
	<i>% change</i>	..	28.7	24.2	32.0	32.5	27.9
<b>Milk yield</b>	<i>kg/head</i>	5 595	6 185	7 034	7 598	8 471	9 222
	<i>% change</i>	..	10.5	13.7	8.0	11.5	8.9

\* Farms with at least one milk cow on hand anytime during the year.

Sources: USDA 2008a, b & e.

\*\* Milk cows & heifers that have calved as at 1 January.

## Adjustment in the US dairy industry

There has been considerable adjustment in the US dairy industry over the past 25 years. Farm numbers have declined from 307,920 in 1982 to 71,510 in 2007 (table 5). The reduction in labour resources has been accompanied by a rise in milk output. There has been a substantial change in the scale of US dairy farming operations. Average per farm output of milk increased from around 200 tonnes per farm in 1982 to 1,177 tonnes per farm in 2007.

Gains in per farm performance have been evident in the period since the AoA was implemented. For much of this time there were higher levels of support which continued to make a sizeable contribution to gross farm income. Farm numbers continued to decline and there were further rises in average per farm output. In fact the rate of change accelerated:

- between 1997 and 2007 average per farm milk output increased by 605 tonnes;
- in the previous 10 ten year period (1987 to 1997) it increased by 288 tonnes.

The continuing decline in farm numbers and increased farm output are symptomatic of the adjustment response to the economic pressures for change in agriculture. Farmers can make changes to their farm business to expand output and generate more farm revenue. The observed changes probably reflect a combination of scale expansions, efficiency gains from better management and more intensive production to increase per cow performance:

- the average herd size increased by 52 head between 1997 and 2007 – it rose by 29 head in the previous ten year period (1987-1997);
- milk yields increased by 1,623 kg per head compared with 1,413 kg in 1987-1997.

Higher milk output has contributed to a noticeable growth in farm revenues (table 6). Since 1995 the average gross income for a US dairy farm has increased by 250%. It was almost US\$500,000 in 2007 compared with just over US\$140,000 in 1995(see Appendix B for further information).

## 6. Developments in US dairy farm incomes #

Year ending 31 December		1993-95	1996-98	1999-01	2002-04	2005-07
<b>Farm price of milk *</b>	US\$/tonne	283	321	306	299	347
	% change	..	13.5	- 4.8	-2.3	16.0
<b>Average gross farm income</b>	US\$'000/farm	133	184	220	270	384
	% change	..	38.2	19.8	22.5	42.3
<b>Average net farm return **</b>	US\$/tonne	39	52	87	84	76
	% change	..	31.6	68.6	-4.2	-9.6

# Estimated gross farm revenue based on the average farm price of all milk.

Sources: USDA 2008a, e, f & g.

\* Average price of all milk.

\*\* Average net farm return based on ERS estimates of farm level costs & returns developed from farm survey data.

Derived as average gross value of farm output (including milk sold, cattle sales and other income) less average gross operating costs (including hired labour, taxes & insurance and general farm overhead). As the methodology for cost estimates differed in some years the data is not directly comparable and should be only be viewed as indicative.

These estimates do not reflect the average net income position of US dairy farmers which requires data on dairy enterprise costs. But the growth in gross farm income is not suggestive of a widespread farm income problem. Per farm output and revenues has been rising, farm cost inflation has been moderate and feed costs have not been an issue for much of this time. An investigation of changes in the cost structure of US dairy farms would allow a more definite conclusion to be reached.

Indicative estimates of net farm returns also suggest there is no widespread farm income problem (table 6). The average income of dairy farm households was slightly lower than the average income for all farm households in the 10 years to 2001 (Miller & Blayney 2006). But it was close to the average income of all US households. The wealth of dairy farm households was also found to be among the highest in comparison to other farm households.

Over time the structural profile of the US dairy industry has changed considerably. Technological innovations and a shift from pasture-based production systems to feedlot operations were key drivers of the industry transformation (Blayney 2002). The structural changes that have occurred will have affected the way industry support has been distribution among the beneficiaries.

Currently the support policies provide income assistance to around 71,500 dairy farmers. This is a much smaller group of beneficiaries than the 300,920 dairy farms that were supported in 1982. If the level of support remains unchanged, a decline in farm numbers will increase the amount of support received on a per farm basis. The change suggests this could be the case in the US dairy industry.

Over time similar farm level structural changes may continue in the future. If this proves to be the case the distribution of support could become further concentrated in the hands of fewer beneficiaries. A smaller group of larger scale beneficiaries with growing farm revenues would amplify the equity issues that are apparent in the existing circumstances.

The increased gross earnings of US dairy farms raises questions about the continued need for support in pursuit of income objectives defined more than 30 years ago. The structural changes also brings into focus the growing equity issue associated with the monetary transfers under the support policies:

- it highlights the need for support policies to be periodically reviewed to assess their on-going applicability because of changing circumstances.

## 7. Adjustment in the Canadian dairy industry

Year ending 31 July		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	52 567	40 072	31 200	23 818	18 673	14 660
	<i>change</i>	..	-12 495	-8 872	-7 382	-5 145	-4 013
<b>Milk production</b>	<i>'000 tonnes</i>	7 686	7 551	7 319	7 559	7 524	7 686
	<i>% change</i>	..	- 1.8	- 3.1	3.3	- 0.5	2.2
<b>Farm output of milk</b>	<i>tonnes/farm</i>	146	188	235	317	403	524
	<i>% change</i>	..	28.9	24.5	35.3	26.9	30.1
<b>Farm herd size **</b>	<i>head/farm</i>	34	36	41	52	58	69
	<i>% change</i>	..	5.6	15.0	25.7	12.3	18.1
<b>Milk yield</b>	<i>kg/head</i>	4 318	5 271	5 707	6 140	6 941	7 649
	<i>% change</i>	..	22.1	8.3	7.6	13.0	10.2

\* Farms with shipments of milk or cream to processors.

Sources: AAFC 2008; CDC 2007; Statistics Canada 2007.

\*\* Dairy cows at 1 January.

Resistance to reductions in support often focus on concerns about the adjustment pressures on small scale, low income farmers. But in the US dairy industry the number of these types of farms has declined because of technological developments. Per unit cost savings from economies of scale with larger herds have been a factor in the long term trend of fewer farms milking more cows (Manchester & Blayney 1997).

The structural shift to larger scale farms has still been evident in the post 1995 period. On average dairy farms are running larger herds and gaining higher milk yields. They are generating more revenue because the dairy enterprise is producing more milk. It suggests the number of small scale farms that might have a low income problem have probably diminished in comparison to 10-20 years ago.

The farm performance indicators show the historical capacity of US dairy farmers to adjust to the economic pressures for change. Adjustment pressures have still been part of the industry operating environment despite the provision of relatively high levels of support. It suggests they may be able to cope with a phased reduction in support using similar adjustment strategies:

- the changes that have occurred do not appear to support the concerns that are often raised about policy reform – the capacity of farmers to adapt and adjust;
- this is supported by the evidence of farm level adjustment to the dairy policy reforms that were implemented in Australia.

### Adjustment in the Canadian dairy industry

Adjustment in the Canadian dairy industry has not been as pronounced as developments in the US. Farm numbers declined from 52,567 in 1982 to 14,660 in 2007 (table 7). Growth in milk output has been constrained by supply management policies. But in general there is evidence of structural change and adjustments affecting the operational performance of Canadian dairy farms:

- average per farm output of milk increased from 146 tonnes in 1982 to 524 tonnes in 2007.

## 8. Developments in Canadian dairy farm incomes #

Year ending 31 July		1993-95	1996-98	1999-01	2002-04	2005-07
<b>Farm price of milk *</b>	US\$/tonne	363	361	352	403	559
	C\$/tonne	487	509	530	570	640
	% change	..	4.5	4.3	7.5	12.3
<b>Average gross farm income</b>	US\$'000/farm	96	115	130	174	280
	C\$'000/farm	129	162	196	245	321
	% change	..	25.6	20.6	25.0	30.9
<b>Average net farm income **</b>	US\$'000/farm	34	36	44	52	81
	C\$'000/farm	45	51	67	74	95
	% change	..	11.2	31.8	11.0	28.3

# Estimated gross farm revenue based on the average farm price of all milk.

Sources: SC 2008; AAFC 2008; CDC 2007.

\* Weighted average price paid by processors for all milk (3.6% butter fat).

\*\* Estimate of average net operating income for dairy cattle and milk production. Calculated as total operating revenues less total operating expenses (excluding depreciation). Estimates derived from a sample of income tax returns of dairy farmers and are reported on a tax year basis. The average for 2005-07 excludes 2007 as the data was unavailable.

The gains in average farm performance were just as evident in the post 1995 period. During this time the number of farms continued to decline and average per farm output increased:

- between 1997 and 2007 per farm milk output increased by 207 tonnes;
- this compares with the previous 10 ten year period (1987 to 1997) when per farm output increased by 129 tonnes.

Supply management policies have restricted the opportunities for industry output growth. But average farm output has significantly increased. The farm performance gains are evident in per cow milk yields which increased by 1,509 kg per head between 1997 and 2007. This compares favourably with the 870 kg increase in milk yields between 1987 and 1997.

The observed changes are probably more of a reflection of efficiency gains from better management and more intensive production to increase per cow performance. The effect of scale expansion through larger dairy herds has not been evident as it was in the structural changes of the US dairy industry. In Canada the size of the average dairy herd increased by just 17 head between 1997 and 2007.

The average gross income of a Canadian dairy farm has substantially increased because of the higher milk output and higher returns (table 8). Between 1995 and 2007 average gross farm income increased by almost 150% in Canadian dollar terms. In 2007 the average gross income was almost C\$350,000 compared with just over C\$140,000 in 1995 (see Appendix B for further information):

- farm revenue growth has been especially evident in recent years;
- average gross farm income in 2005-07 increased by 31% over the 2002-04 period – the average farm price of milk was 12% higher over this period.

These estimates do not reflect the average net income position of Canadian dairy farmers so it is not possible to draw any definitive conclusions about financial performance. But the growth in revenues is not suggestive of a widespread problem of low farm incomes. An analysis of dairy enterprise costs would be necessary before any definite conclusions could be reached.



Estimates of the average net farm income position of Canadian dairy farms do not suggest there is a widespread farm income problem. In 1995 the average net operating income of a Canadian dairy farm was estimated to be around C\$49,000. Since then net farm income has progressively increased to around C\$96,000 by 2006 (SC 2008). This compared favourably with a net farm income estimate of about C\$30,000 for all types of farms.

Over time there have been substantial changes in the structural profile of the Canadian dairy industry. Technological innovations have contributed to significant improvements in farm performance. The industry is largely composed of family owned farms where the owners have built up considerable equity in their operations (AAFC 2005).

Since the mid 1990s the level of industry support has gradually increased and it continued to make a sizeable contribution to gross farm income. In part support levels have been rising because of higher prices associated with supply management policies. The distribution of this support among the beneficiaries has been affected by the structural changes that have occurred.

The decline in farm numbers has probably increased the amount of support received on a per farm basis. Over time it seems likely the distribution of support has become concentrated in the hands of fewer beneficiaries:

- currently the Canadian dairy support policies provide income assistance to less than 15,000 farmers – in 1982 there were 52,567 farms benefiting from the support policies;
- a declining group of beneficiaries with growing farm revenues raises equity issues;
- the net equity position of Canadian dairy farmers seems favourable – farm debt averaged around C\$620,000 in 2003-05 and net farm equity was C\$1.9 million (AAFC 2007).

The increased gross earnings of Canadian dairy farms raise questions about the continued need for support in pursuit of income objectives defined many years ago. The structural changes also affects the equity considerations associated with the monetary transfers under the support policies:

- support policies should be periodically reviewed against their objectives because changing circumstances will affect their on-going applicability.

Concerns about reductions in support have typically focused on the adjustment pressures for small scale, low income producers. But it seems likely the number of these types of farms has diminished over the past 10-20 years. There would also seem to be some scope for growth in the scale of dairy farming operations to accommodate the effects of economic change:

- sole operators in the US, Australia and New Zealand are managing larger scale dairy herds.

The farm performance indicators show the historical capacity of Canadian dairy farmers to adjust to the economic pressures for change. Adjustment pressures have still been evident despite the provision of high levels of support and the use of supply management policies. It suggests they may be able to cope with a phased reduction in support using similar adjustment strategies:

- concerns raised about the capacity of farmers to adjust to reform may be overly pessimistic.

## **Adjustment in the Japanese dairy industry**

A considerable amount of adjustment has occurred in the Japanese dairy industry over the past 25 years. Farm numbers have declined from 98,900 in 1982 to 25,400 in 2007 (table 9). During this time there was a period of growth in milk production followed by a decline over the past decade. There is evidence of structural changes improving the operational performance of Japanese dairy farms.

## 9. Adjustment in the Japanese dairy industry

Year ending 31 March		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	98 900	74 500	55 100	39 400	31 000	25 400
	<i>change</i>	..	-24 400	-19 400	-15 700	-8 400	-5 600
<b>Milk production</b>	<i>'000 tonnes</i>	6 612	7 359	8 343	8 659	8 312	8 088
	<i>% change</i>	..	11.3	13.4	3.8	-4.0	-2.7
<b>Farm output of milk</b>	<i>tonnes/farm</i>	67	99	151	220	268	318
	<i>% change</i>	..	47.8	53.3	45.1	22.0	18.8
<b>Farm herd size **</b>	<i>head/farm</i>	13	17	23	31	36	40
	<i>% change</i>	..	29.3	35.6	31.4	18.8	9.6
<b>Milk yield</b>	<i>kg/head</i>	5 039	5 758	6 508	7 186	7 382	8 000
	<i>% change</i>	..	14.3	13.0	10.4	2.7	8.4

\* Number of dairy farms at 1 February. Includes farms only rising dairy calves.

Source: ALIC 2008.

\*\* Includes cows in milk & dry at 1 February.

Dairy farms in Japan are generally smaller in comparison to many other countries but there have still been significant gains in on-farm performance. Average farm output of milk has increased from 67 tonnes in 1982 to 318 tonnes in 2007. This is partly due to an increase in the average herd size but it mostly reflects a significant rise in per cow milk yields:

- yields increased by almost 3,000 kgs per cow (58%) between 1982 and 2007;
- the average yield is higher than in Canada but 14% lower than US milk yields.

The herd growth and yield gains from management improvements and more intensive production have contributed to a significant improvement in average farm performance. The gain in farm performance was just as evident in the post 1995 period:

- between 1997 and 2007 per farm milk output increased by almost 100 tonnes;
- in the previous 10 ten year period (1987 to 1997) farm output increased by 121 tonnes.

Japan has a highly protected dairy industry that is insulated from global market developments. The support policies include supply controls based on estimates of demand (JDC 2008). Since 1995 the level of support has gradually declined and the contribution of support to farm income has fallen. But the supply management policies have limited the opportunities for greater scale expansions that would enable farmers to generate more output and farm revenue from their dairy enterprise.

There has been some growth in the average gross revenues generated by a dairy farm (table 10). Between 1995 and 2007 average farm income increased by 64% in Japanese yen terms. In 2006-07 a Japanese dairy farm generated around 24.6 million yen in income from milk sales. This compares with 15 million yen in 1994-95 (see Appendix B for further information).

These estimates of farm revenue do not reflect the average net income position of Japanese dairy farmers. But the revenue growth is not suggestive of a widespread problem of low farm incomes. An analysis of dairy enterprise costs would be necessary before any definite conclusions could be reached about financial performance.

## 10. Developments in Japanese dairy farm incomes #

Year ending 31 March		1993-95	1996-98	1999-01	2002-04	2005-07
<b>Farm price of milk *</b>	US\$/tonne	740	747	686	665	707
	'000 yen/tonne	83	80	80	80	79
	% change	..	-4.2	0.4	0.3	-2.0
<b>Average gross farm income</b>	US\$'000/farm	133	160	175	187	222
	'000 yen/farm	14 603	17 473	20 161	22 539	24 719
	% change	..	19.7	15.4	11.8	9.7

# Estimated gross farm revenue based on the average farm price of all milk.

Source: ALIC 2008.

\* Average price for all milk.

It was not possible to obtain estimates of changes in average net farm income of a Japanese dairy farm for this study. However, estimates of production costs for Japanese dairy farms do not indicate any appreciable increase. Government surveys showed total production costs in 1995 were around 75,000 yen/tonne of milk produced. In 2006 the production costs were estimated to be around 76,000 yen/tonne (MAFF 2007):

- given the growth in dairy farm revenues this would suggest there has been an improvement in the net income position of Japanese dairy farms in the period since 1995.

The Japanese dairy industry is largely composed of family owned farms (JDC 2008). But high levels of support have not prevented a large reduction in the number of farms. This would indicate there has been an increase in the amount of support received on a per farm basis. As with the US and Canadian dairy industries, it seems likely the distribution of support has become more concentrated among a smaller group of beneficiaries:

- currently the support policies provide income assistance to 25,400 farmers – in 1982 there were almost 100,000 farms benefiting from the support;
- these producers gain substantial benefits from the support arrangements – they currently contribute about half of the average gross farm income from milk sales;
- the declining group of beneficiaries with growing farm revenues raises the same sorts of equity issues that are apparent in the US and Canadian industries (see appendix B).

The growth in earnings raise questions about an on-going need for support based on income objectives defined many years ago. It suggests the policy arrangements should be reviewed to assess their on-going applicability. While structural change have not been as great as in the US industry, it seems likely they have affected the equity considerations associated with the support policies.

Japanese dairy farms are mostly located in narrow mountain valleys and this is often raised as a constraint on industry adjustment (JDC 2008). While resistance to reductions in support generally focus on concerns for small scale producers it seems likely the number of these farms has declined. There would appear to be some scope for increasing the scale of dairy farms as an adjustment strategy for the effects of reductions in support.

Structural change has been evident despite high levels of support and the use of supply management policies. Farm performance indicators show the capacity of farmers to adjust to the pressures for economic change. It suggests concerns about adjustment pressures may be overly pessimistic and that farmers could cope with a phased reduction in support using similar adjustment strategies.

## 11. Adjustment in the Australian dairy industry

Year ending 30 June		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	20 201	17 736	14 760	13 753	11 048	8 055
	<i>change</i>	..	-2 465	-2 976	-1 007	-2 705	-2 993
<b>Milk production</b>	<i>'000 tonnes</i>	5 416	6 358	6 934	9 307	11 609	9 870
	<i>% change</i>	..	17.4	9.1	34.2	24.7	- 15.0
<b>Farm output of milk</b>	<i>tonnes/farm</i>	268	358	470	677	1 051	1 225
	<i>% change</i>	..	33.7	31.0	44.1	55.3	16.6
<b>Farm herd size **</b>	<i>head/farm</i>	90	97	112	144	192	221
	<i>% change</i>	..	7.9	15.8	28.4	33.7	15.1
<b>Milk yield</b>	<i>kg/head</i>	2 990	3 707	4 195	4 708	5 468	5 540
	<i>% change</i>	..	24.0	13.1	12.2	16.2	1.3

\* Number of registered dairy farms by State Milk Authorities.

Sources: ABS 2008b; DA 2007.

\*\* Includes cows in milk & dry at 30 June - prior to 1999-00 inventory as at 31 March.

Herd inventories for 2006-07 were adjusted for a change in the frame used by ABS for the 2005-06 census.

An ABS splicing factor is applied to the new series to make it comparable with the old series.

## Adjustment in the Australian dairy industry

As a point of comparison it is worthwhile examining the adjustment that has been observed in the Australian dairy industry. Historically the Australian dairy market was highly regulated and provided significant support to producers based on trade barriers and price support arrangements. However, the industry began a phased reduction in support in the mid 1980's that culminated in the over-night deregulation of the dairy market in July 2000 (Harris 2005a).

During the 15 year policy reform period a considerable amount of structural change occurred in the industry. A large number of producers left the industry and the decline in farm numbers continued after all price support arrangements were terminated on 1 July 2000. In 1982 there were around 20,200 dairy farms. By 2007 the industry was composed of just over 8,000 farms (table 11).

The farm level response to deregulation was an increase in the average herd size and improved milk yields. Improved herd and pasture management as well as the increased use of high energy feed rations were key factors in raising herd productivity. This enabled farmers to increase farm output and strengthen their income position. The changes were especially evident in the 1 to 2 years immediately following deregulation:

- the average herd size increased by 34% between in 1997 and 2002;
- per cow milk yields increased by 16% over the same period;
- this contributed to a 55% expansion of farm output of milk.

Milk production increased for much of the time the industry was adjusting to the phased reduction in support. In more recent times milk production has declined. To a large extent this reflects the effects of the long running drought conditions that have affected Australian agriculture over the past 7 years. The Australian dairy industry is a pasture based production system and in some areas is heavily reliant on irrigation water for feed supplies.

## 12. Adjustment in farm numbers for selected dairy industries #

		<i>US</i>	<i>Canada</i>	<i>Japan</i>	<i>Australia</i>
<b>1982 to 1991</b>	<i>total net change</i>	-139 520	-22 802	-46 200	-5 783
	<i>average annual change</i>	-13 952	-2 280	-4 620	-578
	<i>average annual % change</i>	-5.6	-5.2	-5.6	-3.2
<b>1992 to 2001</b>	<i>total net change</i>	-83 180	-13 315	-27 600	-3 147
	<i>average annual change</i>	-8 318	-1 332	-2 760	-315
	<i>average annual % change</i>	-6.0	-5.1	-6.0	-2.3
<b>2002 to 2007</b>	<i>total net change</i>	-25 950	-4 703	-6 800	-3 784
	<i>average annual change</i>	-4 325	-784	-1 133	-631
	<i>average annual % change</i>	-5.0	-4.5	-3.9	-6.2

# Total change and average annual rate of adjustment in farm numbers.

Sources: As per tables 4, 5, 6 & 7.

US year ended 31 December, Canada year ended 31 July, Japan year ended 31 March & Australia year ended 30 June.

The farm level adjustments that occurred in Australian are highly relevant for considering the effects of phased reductions in support for the dairy industries of other economies. It shows that while some farmers left the industry there were significant improvements in on-farm performance across the industry. The adjustment strategies and industry developments are much the same as the responses to the pressures of economic change in the dairy industries of the US, Canada and Japan.

The bleak picture that is often painted about the impact of reductions in agricultural support needs to be considered from a rational economic perspective. There are political and community concerns about the potential consequences which are amplified by industry representations. But farmers are highly adaptable, dynamic respondents to the pressures of economic change:

- in the case of the Australian dairy industry there is clear evidence of the capacity of farmers to cope with the effects of phased reductions in high levels of support;
- there is evidence of farmers that remain in the industry making adjustments that lead to significant gains and in farm and industry level performance.

### Comparisons of dairy industry adjustment

An issue of interest is the potential for high levels of support to slow the rate of longer term efficiency gains in the use of economic resources. Productivity gains are the primary source of wealth creation in the economy. High levels of support may have implications for the rate of efficiency improvements.

In protected industries the support policies give producers a benefit in the form of higher incomes. But from a long term perspective it may be counter-productive for industry development. Support policies distort price signals to farmers and dilute the competitive pressures that drive gains in efficiency and farm performance. This could mean that over time the industry will tend towards a higher cost and more resource intensive production base in comparison to situations of no support.

Over time industry competitiveness may be deteriorating in comparison to other countries. This would mean the cost of the distortion effect on resource use for the economy may be growing while support measures are in place. A growing divergence in the rate of industry performance improvements would mean the cost of forgoing potential welfare gains in the economy is increasing.

### 13. Rates of change in farm performance for selected dairy industries #

	<i>US</i>	<i>Canada</i>	<i>Japan</i>	<i>Australia</i>
	<i>average annual % change</i>			
<b>Average milk output per farm</b>				
1982 to 1991	7.0	5.4	8.4	5.5
1992 to 2001	7.6	5.4	6.7	7.6
2002 to 2007	7.4	5.3	3.4	5.1
<b>Average herd size per farm</b>				
1982 to 1991	5.0	2.5	5.7	2.3
1992 to 2001	5.5	3.4	5.0	5.4
2002 to 2007	5.2	3.3	2.2	3.3
<b>Average milk yield per cow</b>				
1982 to 1991	2.0	2.9	2.5	3.2
1992 to 2001	2.0	2.0	1.6	2.2
2002 to 2007	2.0	1.9	1.1	1.9

# Average of the annual per cent change for each indicator.

Sources: As per tables 4, 5, 6 & 7.

US year ended 31 December, Canada year ended 31 July, Japan year ended 31 March & Australia year ended 30 June.

It was beyond the scope of this study to undertake a quantitative analysis of the comparative rates of efficiency gains in the four dairy industries that have been examined. One way to see if this issue is worth examining is to compare the rate of change in some key indicators of farm performance across different economies.

A comparison of the change in performance indicators for the US, Canadian and Japanese dairy industries with Australia may reveal some differences that are worthwhile investigating. Australia offers a point of comparison as a dairy industry that implemented phased reduction in support and the eventual shift to an industry entirely exposed to the competitive pressures of world market conditions. Dairy farmers in the US, Canadian and Japanese industries have been largely insulated from global trading conditions and enjoyed high levels of support:

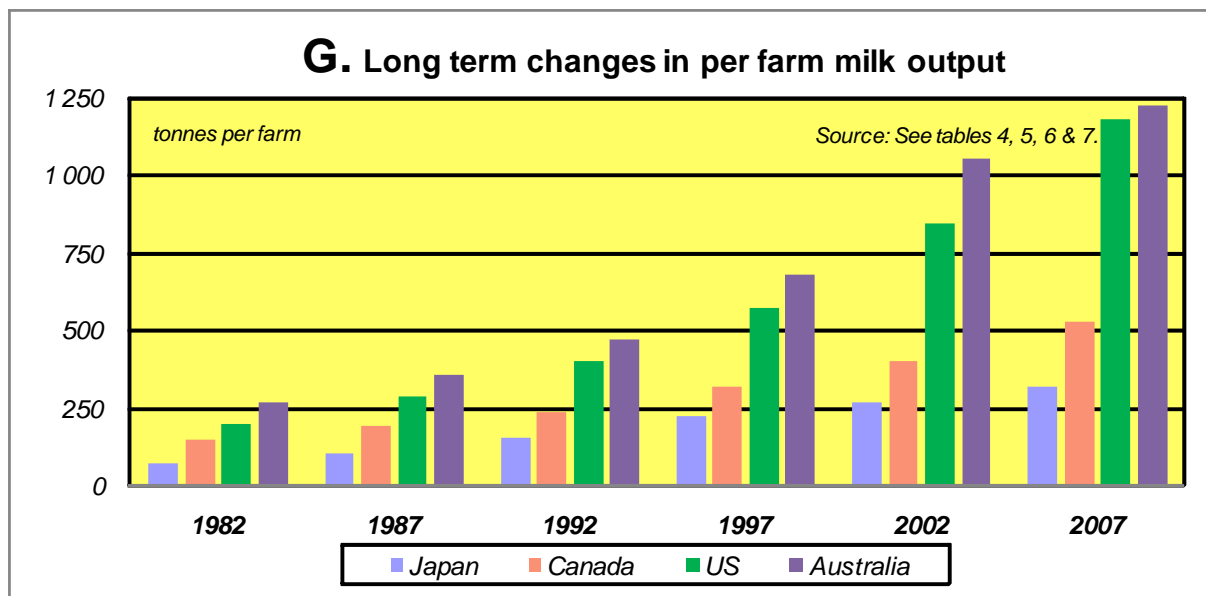
- the Canadian and Japanese dairy industries have especially high levels of support and output controls that may have contributed to slower rates of farm performance gains.

It is generally accepted that competitive pressures are the key to encouraging innovation and improved management that leads to a more efficient use of resources. This applies to industries throughout the economy and dairy farming is no exception. If dairy farmers are slower to improve the performance of their farming operations there may be opportunity costs for the wider economy in resource use.

Anecdotal claims made by those that resist reductions in dairy support in these economies often claim the industry is innovative and experiencing gains in productivity. In general there has been significant structural change in the US, Canadian and Japanese dairy industries. While all three industries have experienced a sizeable reduction in the number of farms there is no discernable difference in the rate of change (table 12).

Comparisons of the rate of change in farm performance indicators reveal some interesting differences among the four economies (table 13):

- the growth rate in per farm output in Japan has slowed in recent years – this could suggest a weakening incentive for scale expansions but it is not materially different from Australia;



- in the US there has been a consistently high rates of growth in output per farm that are greater than or equal to the rates of change in Australia – this does not suggest a weakening incentive for scale expansions but it may be explained by other factors;
- Canada has a consistently lower rate of growth in per farm output than the US but the rate of change is similar to Australian developments – this does not suggest a weaker incentive for scale expansions;
- the rate of growth in Australian per farm output accelerated during the final stages of policy reform (1992-2001) – the slower growth rate in recent decline will to some extent reflect the long running drought conditions.

The rate of growth in per farm output could be affected by other factors apart from changes in scale. The key variables that drive changes in farm performance are the herd size and milk yields. In all four economies the rate of improvement in milk yields has been similar. But it is worth noting that in Japan the rate of growth milk yields has slowed in recent times and is lower than the rate of change in the other three economies:

- the growth in the average herd size in the US has been at a consistently high rate;
- Canada has a consistently lower growth rate in the average herd size compared to the US;
- in Japan the growth rate in the average herd size has slowed in recent years;
- the growth rate in the average herd size in Australia increased in the final stages of policy reform (1992-2001) but has declined in more recent times in line with the extended period of poor seasonal conditions.

In general the differences in the rate of farm performance improvements between dairy industries with high support and those without are limited. Japan and Canada have highly protected dairy industries and farmers receive substantial amounts of income support. The US industry is not supported to the same extent. It is not possible to make any substantive conclusions from comparing the performance indicators during the period when support policies were in place in all four economies.

There are significant changes in the rate of average herd growth and farm output growth in the final stages of policy reform in Australia – the 1992-2001 period. To some extent this is likely to reflect

farm level adjustment strategies to the reductions in support. But global market conditions in the manufacturing milk sector would also be a contributing factor.

Comparing rates of change in performance indicators during the 2002 to 2007 period is an indicator of developments for dairy industries with and without support. Unfortunately the extended period of poor seasonal conditions in Australia for most of the post deregulation period makes it difficult to make any tentative conclusions about the effect of competitive pressures on the incentives to implement farm level changes that improve efficiency and farm performance:

- a quantitative analysis of productivity developments in the four industries during the period since the year 2000 could be a worthwhile exercise;
- it would test the validity of the proposition that high levels of support slows the rate of industry efficiency gains.

A notable feature of the comparison in the 2002-2007 period is the rate of performance improvements in the Japanese industry. There has been a discernable slowing in the rate of change in comparison to the other dairy industries. This could indicate that industry development is stagnating due to policy constraints but it could also be due to other factors:

- Japan's dairy market is highly regulated and fully insulated from global market conditions – exposure to global market conditions is likely to stimulate gains in farm performance;
- the scale of Japanese dairy farming operations is small and it is often claimed this is due to the limitation on land resources;
- land constraints are not a major issue for industries based on feedlot production processes.

The change in per farm milk output is a reasonable indicator of the net effect of on-farm adjustments in response to the economic pressures for change. The Australian and the US dairy industries have made considerable advances in comparison to Canada and Japan (chart G). It seems likely this reflects the use of supply management policies. These policy arrangements may have restricted opportunities for efficiency gains from structural changes in the use of resources by the industry:

- there has been a substantial increase in average farm output in the US and Australian dairy industries since 1997;
- over the past 10 years milk output per farm in the US has more than doubled.

Developments in per farm output of milk in Australia would suggest that reductions in support can have a significant effect on industry performance. In the five years between 1997 and 2002 average per farm output in Australia increased by 55%. This includes the post market deregulation period (from July 2000) when pricing developments in the fluid milk sector triggered substantial adjustment pressures:

- the subsequent period (2002 to 2007) was affected by production difficulties from an extended period of poor seasonal conditions but there was still some gains in average farm output.



## 4. Adjustment and sugar industry support

Sugar is commonly cited as another agricultural industry that receives high levels of support in both developed and developing countries. In many of the major developed economies the sugar market is insulated from global market developments. The import protection is typically combined with price support measures to limit the external competitive pressures on farm incomes.

However, internal market developments such as changes in demand, competition from substitutes and policy change in areas linked to industry performance still generate pressures for change. OECD sugar industries with high levels of support are not immune to these pressures for change. The production base can involve cane sugar, sugar beet or a combination of the two. In general the policy measures have an equivalent income supporting effect for types of sugar production.

If farmers in these industries have shown a capacity to cope with internal market related adjustment pressures it would suggest they may be able to cope with policy reforms. A phased reduction in support will initially have a negative effect on farm incomes. But if there's evidence of successful adjustment experiences in the past, similar strategies could emerge as farmers adapt to the effects of the policy reform

An assessment of structural adjustment in the US sugar industry was undertaken to examine this issue from another industry perspective. As for the dairy industry cases studies the rate of adjustment is also important. A comparison with adjustment in the Australian sugar industry may reveal some issues in industry competitiveness.

### Adjustment in the US sugar industry

The US sugar industry includes both cane and sugar beet production. Sugar cane currently accounts for around 45% of industry output. There is a striking contrast in the adjustment that has occurred in the two sectors of the industry over the past 25 years. Historically there have always been a much larger number of sugar beet farms. This sector of the industry has experienced considerable structural change over the past decade with a large number of farm exits (table 14). In comparison the change in sugar cane farm numbers has been limited:

- sugar beet farm numbers declined from almost 8,950 in 1982 to just over 5,000 in 2002;
- farm exits in the sugar cane sector have been limited – farm numbers declined from just over 1,100 in 1982 to around 950 in 2002 (table 15).

Annual data on the total number of sugar beet and cane farms is not available. US agricultural census data is available for selected years but the results for the 2007 census had not been released at the time this study was completed (USDA 2002). Estimates of 2007 farms numbers are based on indicative data for farm numbers in the Louisiana sugar industry (ASCL 2008). It suggests there has been a further decline in farm numbers:

- more precise estimates of current farm performance can be calculated when the 2007 census results are released.

The movement of farmers out of the sugar beet industry has been accompanied by a rise in sugar beet production and significant changes to the physical aspects of sugar beet farm operations. Average per farm output of raw sugar has increased from around 337 tonnes per farm in 1982 to around 1,000 tonnes per farm in 2007. The growth in output from cane farms over the same period has been limited – it increase from around 2,270 tonnes per farm in 1982 to about 3,600 tonnes in 2007.

## 14. Adjustment in the US sugar beet industry #

Year ended 30 September		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	8 942	8 307	8 754	7 057	5 027	4 514
	<i>change</i>	..	- 635	447	- 1 697	- 2 030	- 513
<b>Sugar beet production</b>	<i>'000 tonnes</i>	24 982	22 827	25 586	24 204	23 373	30 903
	<i>% change</i>	..	- 8.6	12.1	- 5.4	- 3.4	32.2
<b>Farm size **</b>	<i>ha/farm</i>	56	58	64	76	100	117
	<i>% change</i>	..	4.4	10.5	18.4	31.9	16.8
<b>Sugar beet yield</b>	<i>tonnes/ha</i>	50	47	46	45	46	59
	<i>% change</i>	..	- 5.8	- 3.7	- 0.9	2.8	26.1
<b>Raw sugar production</b>	<i>'000 tonnes</i>	3 010	3 314	3 488	3 641	3 551	4 543
	<i>% change</i>	..	10.1	5.3	4.4	- 2.5	27.9
<b>Raw sugar recovery rate</b>	<i>%</i>	12.0	14.5	13.6	15.0	15.2	14.7
	<i>% change</i>	..	20.5	- 6.1	10.3	1.0	- 3.2
<b>Raw sugar yield</b>	<i>tonnes/ha</i>	6.1	6.9	6.2	6.8	7.1	8.6
	<i>% change</i>	..	13.5	- 9.6	9.4	3.8	22.0
<b>Farm output of raw sugar</b>	<i>tonnes/farm</i>	337	399	398	516	706	1 006
	<i>% change</i>	..	18.5	- 0.1	29.5	36.9	42.5

# Data for sugar beet only - excludes cane sugar.

Source: USDA 2002, 2008c & d.

\* Farm numbers were obtained from US Census results which is conducted every 5 years. Census results for 1987 & 1992 were adjusted for the difference in Census coverage by a splicing factor for 1997 census results. Census data for 1982 and 2007 were unavailable - estimates were based on the per cent change in Louisiana farm numbers.

\*\* Based on area harvested for crushing - excludes cane grown for other purposes.

The substantial gains in per farm performance of sugar beet producers have mostly occurred in the period since the AoA was implemented in 1995. For much of this time there were higher levels of support. Domestic market developments have driven the pressures for change:

- farm level adjustment in the sugar cane sector has been less evident;
- there are substantially fewer sugar cane farms and the average farm output level is much higher in comparison to sugar beet farms;
- the average gross income for sugar cane farms is four to five times higher than the income generated by sugar beet farms.

The decline in sugar beet farms and increased farm output are symptomatic of the adjustment response to the economic pressures for change. Some growers have left the industry and others have made changes to their farm business to generate more revenue. The on-farm adjustments largely reflect an expansion in the scale of the sugar beet enterprise:

- the average size of a sugar beet farm increased by 41 ha between 1997 and 2007;
- this compares with a 20 ha increase over the 1982 – 1997 period.

## 15. Adjustment in the US sugar cane industry #

Year ended 30 September		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	1 131	1 097	1 143	1 079	953	856
	<i>change</i>	..	- 34	47	- 64	- 126	- 97
<b>Sugar cane production</b>	<i>'000 tonnes</i>	23 737	26 251	26 273	25 118	29 733	25 367
	<i>% change</i>	..	10.6	0.1	- 4.4	18.4	- 14.7
<b>Farm size **</b>	<i>ha/farm</i>	256	277	301	311	412	400
	<i>% change</i>	..	8.2	8.6	3.5	32.4	- 2.8
<b>Sugar cane yield</b>	<i>tonnes/ha</i>	82	86	76	75	76	74
	<i>% change</i>	..	5.4	- 11.6	- 2.1	1.2	- 2.2
<b>Raw sugar production</b>	<i>'000 tonnes</i>	2 570	2 977	3 111	2 954	3 611	3 111
	<i>% change</i>	..	15.8	4.5	- 5.0	22.2	- 13.8
<b>Raw sugar recovery rate</b>	<i>%</i>	10.8	9.8	9.0	11.8	12.1	12.3
	<i>% change</i>	..	- 9.5	- 7.7	30.0	3.3	1.0
<b>Raw sugar yield</b>	<i>tonnes/ha</i>	8.9	9.8	9.0	8.8	9.2	9.1
	<i>% change</i>	..	10.4	- 7.7	- 2.7	4.5	- 1.2
<b>Farm output of raw sugar</b>	<i>tonnes/farm</i>	2 272	2 714	2 721	2 738	3 789	3 636
	<i>% change</i>	..	19.4	0.3	0.6	38.4	- 4.0

# Data for sugar cane only - excludes beet sugar.

Source: USDA 2002, 2008c & d.

\* Farm numbers were obtained from US Census results which is conducted every 5 years. Census results for 1987 & 1992 were adjusted for the difference in Census coverage by a splicing factor for 1997 census results. Census data for 2007 were unavailable - an estimate was based on the per cent change in Louisiana sugar farm numbers.

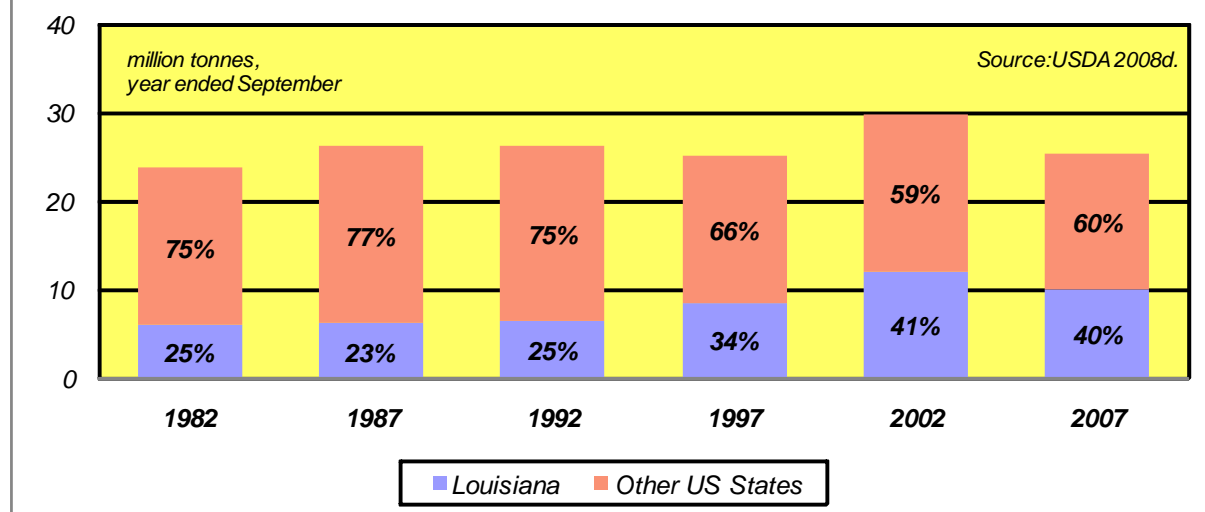
\*\* Based on area harvested for crushing - excludes cane grown for other purposes.

There have been improvements in the raw sugar yields from sugar beet farms. Sugar yields are currently around 8.6 tonnes per ha. This is 42% higher than the yield achieved in 1982 and the gains have been especially evident over the past decade. Yield changes are an indicator of the productive performance of farms although estimates for individual years are vulnerable to unfavourable seasonal conditions and disease outbreaks. In general there has been a rising trend in the average yields for US sugar beet farms.

Over time there has been considerable growth in the scale of sugar cane farms. The current average farm size of around 400 ha is more than 50% higher than the scale of cane farms in 1982. But raw sugar yields have shown little improvement over the same period. Average yields are currently around 9.1 tonnes per ha which is similar to the average yield achieved over the past decade.

Long term changes in raw sugar yields for a sugar cane farm suggest little improvement. This may be due to a number of factors. It may indicate a mature industry that has approached a maximum in the productive performance of the farm land. On the other hand the lack of any significant gains in farm yields could reflect the limited competitive pressures that encourage performance improvements. US sugar farms are insulated from world market conditions.

## H. Louisiana share of US sugar cane production



## 16. Adjustment in the Louisiana sugar industry

Year ended 30 September		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	800	715	800	802	773	694
	<i>change</i>	..	- 85	85	2	- 29	- 79
<b>Sugar cane production</b>	<i>'000 tonnes</i>	6 033	6 142	6 432	8 480	12 102	10 031
	<i>% change</i>	..	1.8	4.7	31.8	42.7	- 17.1
<b>Farm size **</b>	<i>ha/farm</i>	125	140	162	169	241	236
	<i>% change</i>	..	12.3	15.7	4.1	42.5	- 1.9
<b>Sugar cane yield</b>	<i>tonnes/ha</i>	60	61	50	63	65	61
	<i>% change</i>	..	1.4	- 19.1	26.3	3.9	- 5.9
<b>Raw sugar production</b>	<i>'000 tonnes</i>	646	609	693	957	1 433	1 198
	<i>% change</i>	..	- 5.8	13.8	38.1	49.8	- 16.4
<b>Raw sugar recovery rate</b>	<i>%</i>	10.7	9.9	10.8	11.3	11.5	11.9
	<i>% change</i>	..	- 7.4	8.6	4.8	1.7	4.0
<b>Raw sugar yield</b>	<i>tonnes/ha</i>	6.5	6.1	5.3	7.1	7.7	7.3
	<i>% change</i>	..	- 6.1	- 12.1	32.4	9.1	- 5.1
<b>Farm output of raw sugar</b>	<i>tonnes/farm</i>	807	851	866	1 193	1 854	1 726
	<i>% change</i>	..	5.4	1.7	37.8	55.4	- 6.9

\* Farm numbers for the crop year ended 30 September.

Sources: USDA 2008d; ASCL 2008.

\*\* Based on area harvested for crushing - excludes cane grown for other purposes.

One of the features of structural change in the sugar industry is that average yields from sugar beet farms has significantly improved and reached levels that are approaching the yields achieved by cane farms. This development highlights the way economic pressures for change can lead to significant gains in farm performance. There has been no reduction in support and it reflects a response to changes in market conditions.

Sugar beet farmers have demonstrated a capacity for adjustment to increase output and the revenue generated by their farm business. Over time some growers have left the industry despite the provision of high levels of support. Others have sought to improve the productive performance of their farms using a variety of adjustment strategies. The changes that have been observed would suggest US sugar farmers are capable of adjusting to the effects of phased reductions in support.

To consider this issue more closely the structural changes that have occurred in the Louisiana sugar industry were examined. Around 70% of US sugar cane farms are located in Louisiana and they account for about 40% of cane sugar production (chart H). Adjustment in the number of Louisiana cane farms has been limited which is consistent with wider industry developments (table 16). But there have been more significant on-farm changes in comparison to other producing states:

- the average size of a Louisiana cane farm has increased by 111 ha over the past 25 years;
- sugar yields have increased significantly – up 21% over the same period; and
- there has been a substantial rise in output per farm – between 1982 and 2007 average farm output has increase by 114%.

The average gross revenue generated by sugar beet farms has substantially increased over the past 15 years (table 17). Between 1992 and 2007 average per farm income has increased by around 85%. In 2007 average gross income was almost US\$235,000. This compares with an average per farm income of just over US\$126,000 in 1992. The income position of sugar cane growers over the same period has fluctuated. Per farm income rose to very high levels in 2002 but has since declined:

- sugar cane farms are much larger than sugar beet farms, have higher raw sugar yields and much higher levels of farm output;
- in 2007 average per farm output was more than 3,600 tonnes for a cane farm and around 1,000 tonnes for a sugar beet farm.

Sugar cane farms generate a great deal more gross income than sugar beet farms. The difference is substantial. Average gross farm revenue for a cane farm was more than US\$1.1 million in 2002 (see Appendix B for further information).

These estimates do not reflect the average net income position of US sugar farmers which requires data on enterprise costs. But the high level of gross farm income in the sugar cane industry is not suggestive of a widespread farm income problem. The growth in farm income of sugar beet farms is also not suggestive of an income problem. An investigation of changes in the cost structure of US sugar farms would allow a more definite conclusion to be reached.

Over time the structural profile of the US sugar beet and sugar cane industries has changed. Structural change affects the way industry support is distributed among the beneficiaries. If the level of support remains unchanged, a decline in farm numbers will increase the amount of support received on a per farm basis. The distribution of support is heavily concentrated among cane growers. In the sugar beet industry the reduction in farm numbers suggest a greater concentration in the distribution of support:

- in 2002 the support policies provide a substantial amount of income assistance to less than 6,000 farmers – the number of beneficiaries declined even further in 2007
- in 1982 there were almost 9,900 farms benefiting from the support.

## 17. Developments in US sugar farm incomes #

Year ending 31 September		1987	1992	1997	2002	2007
<b>Farm price of sugar *</b>	US\$/tonne	306	316	311	294	234
	% change	..	3.2	- 1.5	-5.5	- 20.5
<b>Average gross farm income</b>						
<b>Sugar cane farms</b>	US\$'000/farm	830 623	858 960	851 181	1 113 335	849 248
	% change	..	3.4	- 0.9	30.8	- 23.7
<b>Sugar beet farms</b>	US\$'000/farm	122 098	125 796	160 389	207 572	235 145
	% change	..	3.0	27.5	29.4	13.3

# Estimated gross farm revenue based on the average farm gate price of sugar.

Sources: USDA 2008c & d; OECD 2007b.

\* Implicit average farm gate production price received for cane and beet sugar in raw sugar equivalent.

The increased gross earnings of US sugar beet farms and the high level of gross farm income in the sugar cane industry raises questions about the continued need for support in pursuit of income based policy objectives defined many years ago. The structural changes also brings into focus the growing equity issue associated with the monetary transfers under the support policies:

- in the sugar cane industry there are currently less than 1,000 beneficiaries that share around US\$220 million worth of income assistance through the transfers from the support policies;
- it highlights the need for support policies to be periodically reviewed to assess their on-going applicability because of changing circumstances.

Resistance to reductions in support often focus on concerns about the adjustment pressures on small scale, low income farmers. But the structural change in sugar beet industry seems to indicate the number of these types of farms has declined in comparison to 10-20 years ago. In the sugar cane sector the high level of average per farm revenues generated would suggest this concern is misplaced.

In general developments in both industries suggest the number of small scale farms that might have a low income problem have probably diminished. Farm performance indicators also show the historical capacity of US sugar farmers to adjust to the economic pressures for change. Adjustment pressures have still been evident despite the provision of relatively high levels of support. It suggests they may be able to cope with a phased reduction in support using similar adjustment strategies.

### Adjustment in the Australian sugar industry

As a point of comparison it is worthwhile examining the adjustment that has occurred in the Australian sugar industry. Historically Australian sugar growers received some limited income assistance from support measures based on trade barriers. However, the industry began a phased reduction in trade protection in 1989 that culminated in the removal of import tariffs in July 1997.

Some growers left the industry in the lead up to the elimination of import tariffs. But most of the change has occurred in the post reform period (table 18). In 1982 there were around 6,150 growers in the industry. By 2007 the industry was composed of less than 4,000 farms:

- the reduction in the number of sugar growers was symptomatic of the continual adjustment to the economic pressures for change in agriculture;
- some sugar growers switched into other forms of agriculture and others left the sector.

## 18. Adjustment in the Australian sugar industry

Year ending 30 June		1982	1987	1992	1997	2002	2007
<b>Number of farms *</b>	<i>number</i>	6 153	5 620	4 950	5 023	4 747	3 968
	<i>change</i>	..	- 533	- 670	73	- 276	- 779
<b>Sugar cane production</b>	<i>'000 tonnes</i>	25 094	25 413	21 367	38 633	31 424	37 154
	<i>% change</i>	..	1.3	- 15.9	80.8	- 18.7	18.2
<b>Farm size **</b>	<i>ha/farm</i>	51	55	69	78	90	104
	<i>% change</i>	..	7.4	24.9	12.7	15.6	16.3
<b>Sugar cane yield</b>	<i>tonnes/ha</i>	79	82	63	99	74	90
	<i>% change</i>	..	3.2	- 23.6	58.1	- 25.5	21.6
<b>Raw sugar production</b>	<i>'000 tonnes</i>	3 329	3 268	3 016	5 301	4 987	4 722
	<i>% change</i>	..	- 1.8	- 7.7	75.8	- 5.9	- 5.3
<b>Raw sugar recovery rate</b>	<i>%</i>	13.3	12.9	14.1	13.7	15.9	12.7
	<i>% change</i>	..	- 3.1	9.8	- 2.8	15.7	- 19.9
<b>Raw sugar yield</b>	<i>tonnes/ha</i>	10.5	10.5	8.8	13.6	11.7	11.4
	<i>% change</i>	..	0.1	- 16.1	53.7	- 13.9	- 2.6
<b>Farm output of raw sugar</b>	<i>tonnes/farm</i>	541	581	609	1 055	1 051	1 190
	<i>% change</i>	..	7.5	4.8	73.2	- 0.5	13.3

\* Farm numbers at 31 March for 1982-1997 & 30 June for 2002-2007.

Source: ABARE 2007; ABS 2008b.

ABS data based on ANZSIC definition - agricultural census data provides a more accurate estimate of farm numbers.

\*\* Based on area harvested for crushing - excludes cane grown for other purposes.

Over time the growers that remained in the industry made changes to their farm business to generate more revenue. The on-farm adjustments largely reflect expansions in the scale of the sugar enterprise. Before the policy reforms were implemented the industry was composed of large numbers of small scale growers:

- the average farm size has increased from 51 ha in 1982 and to 104 ha in 2007;
- an expansion in farm scale has been a persistent feature of the structural change in the industry over the past 25 years.

The reduction in farm numbers has been accompanied by a rise in sugar production. Growers made significant changes to the physical aspects of their farm operations to generate more output and higher incomes. Average farm output of raw sugar has increased from around 540 tonnes per farm in 1982 to almost 1,200 tonnes per farm in 2007.

During this period there have been substantial fluctuations in raw sugar yields. Unfavourable seasonal conditions and disease outbreaks have disrupted farm performance from time to time. In general there has only been marginal improvement in yields over the past 25 years. Over the past decade raw sugar yields have averaged around 12 tonnes per ha. It is worth noting this is 30% higher than average yields for US sugar cane farms – US yield performance averaged around 9.2 tonnes per ha.

## 19. Adjustment in farm numbers for selected sugar industries #

		<i>US sugar beet</i>	<i>US sugar cane</i>	<i>Louisiana</i>	<i>Australia</i>
<b>1982 to 1991</b>	<i>total net change</i>	- 188	12	- 8	-1 192
	<i>average annual change</i>	- 19	1	-1	- 119
<b>1992 to 2001</b>	<i>total net change</i>	-3 727	- 190	0	- 145
	<i>average annual change</i>	-373	-19	0	- 15
<b>2002 to 2007</b>	<i>total net change</i>	- 513	- 97	- 106	- 883
	<i>average annual change</i>	- 85	-10	- 18	- 147

# Total change and average annual change in farm numbers.

Sources: As per tables 15, 16, 17 & 18.

US year ended 30 September & Australia year ended 30 June.

## Comparisons of sugar industry adjustment

The potential for high levels of support to dilute the competitive pressures that lead to efficiency gains was an issue discussed in the context of the dairy industry case studies. It was beyond the scope of this study to undertake a quantitative analysis of the comparative rates of efficiency gains in the sugar industries that have been examined. One way to see if the issue is worth investigating is to compare the rate of change in key indicators of farm performance in the US and Australian sugar industries.

Differences in the rate of change in performance indicators may be due to a number of factors – support is one possibility. Australia offers a point of comparison as a dairy industry that implemented phased reduction in a relatively low level of support. The industry has been fully exposed to the competitive pressures of world market conditions for some time. Sugar farmers in the US have been largely insulated from global trading conditions and enjoyed high levels of support:

Anecdotal claims made by those that resist reductions in US sugar support often suggest the industry is innovative, efficient, have low production costs and are experiencing gains in productivity (ASA 2008). There has been limited structural change in the US sugar cane industry over the past 25 years. But there has been significant change in the sugar beet industry.

A comparison of the change in farm numbers shows the US sugar beet industry and the Australian sugar cane industry have experienced a significant reduction in industry participants (table 19). There have been only marginal changes in the number of US sugar cane producers. In general there is no discernable difference in the rate of change.

Comparisons of the rate of change in farm performance indicators reveal some differences among the industries (table 20). The comparison is limited because annual changes in US farm numbers are unavailable. Estimates are provided for the Louisiana sugar cane industry as an alternative indicator:

- the growth rate in per farm sugar output in Louisiana has slowed in recent years – this could indicate a weakening incentive for scale expansions;
- the strong growth in output per farm in Louisiana in the 1992-2001 period reflects two years of exceptionally large increases in production – the result should be treated with caution;
- the growth in per farm output in Australia has been accelerating over time – this could indicate a growing incentive for scale expansions.



## 20. Change in farm performance for selected sugar industries #

	<i>US sugar beet</i>	<i>US cane sugar</i>	<i>Louisiana</i>	<i>Australia</i>
	<i>average annual % change</i>			
<b>Average raw sugar output per farm</b>				
<i>1982 to 1991</i>	..	..	2.8	2.9
<i>1992 to 2001</i>	..	..	15.5	3.5
<i>2002 to 2007</i>	..	..	-0.2	6.0
<b>Average farm size</b>				
<i>1982 to 1991</i>	..	..	-0.2	3.9
<i>1992 to 2001</i>	..	..	10.0	2.1
<i>2002 to 2007</i>	..	..	0.1	4.0
<b>Average sugar cane/beet yield per ha</b>				
<i>1982 to 1991</i>	0.4	-0.1	-0.4	-1.0
<i>1992 to 2001</i>	2.0	-0.3	3.9	0.5
<i>2002 to 2007</i>	2.1	-0.7	-1.0	4.4
<b>Average raw sugar yield per ha</b>				
<i>1982 to 1991</i>	0.4	1.1	1.5	-0.9
<i>1992 to 2001</i>	2.2	-0.1	4.9	1.2
<i>2002 to 2007</i>	2.1	-0.4	-0.2	2.0

# Average of the annual % rate of change for each indicator.

Sources: As per tables 15, 16, 17 & 18.

US year ended 30 September & Australia year ended 30 June.

The rate of growth in per farm output could be affected by other factors apart from changes in scale. The key variables that drive changes in farm performance are the farm size and sugar yields. There are some differences in the rates of yield improvements. There has been stronger growth in sugar yields in Australia. But the evidence for the US sugar cane industry indicates a small deterioration in yields over the past 15 years. Yield gains have also slowed in the Louisiana industry in recent years:

- the yield performance of the US sugar beet industry has improved at a similar rate to developments in Australia;

There are some differences in the rate of farm performance gains between the US and Australian sugar cane industries. This could indicate that the industry without support – Australia – has faced greater competitive pressures to achieve faster rates of farm performance improvements. But it is not possible to draw any definitive conclusions from this assessment. Apart from data limitations there could be other reasons for the fall in the rate of performance improvements in the US sugar cane industry.

The comparison of industry developments in the 2002-2007 period have the most relevance. Australia is currently achieving raw sugar yields that are 25% higher than those achieved by the US sugar cane industry. The indicators suggest US industry development is lagging developments in Australia:

- a comprehensive study of long term productivity developments in the two industries would be worthwhile analysis to determine if the high levels of support are a contributing factor.

## 5. Distribution of industry support

Over time structural adjustment has implications for the distribution of assistance provided by industry based support measures. Individual farmers gain income support benefits from import protection, price support arrangements and other direct assistance measures. Output levels determine how much of the implicit monetary transfers are passed on to individual industry participants.

Annual support levels can be expressed on a per farm basis. They can also be expressed on a per unit basis relative to some physical indicators such as output or a primary input. For example, the monetary value of dairy support could be expressed as US\$/tonne of milk produced or US\$/milking cow. Sugar support could be expressed as US\$/tonne of raw sugar or US\$/ha of area harvested.

The nature of the dairy and sugar support policies in the economies that were reviewed means the income assistance for individual farmers depends on how much they produce. In effect the distribution of support will vary with the size of individual farming operations. The bigger the farm output the more support received in absolute terms:

- the key variable is the primary production input – land areas in the case of sugar support and cows in the case of dairy support;
- the productive performance of these inputs will also affect the distribution of support.

Despite high levels of support, the pressures for economic change have been continually reshaping the structural characteristics of farms in these industries. Farm level adjustment has altered the number, size and physical performance of individual operations when compared with the situation when the policy measures were first introduced.

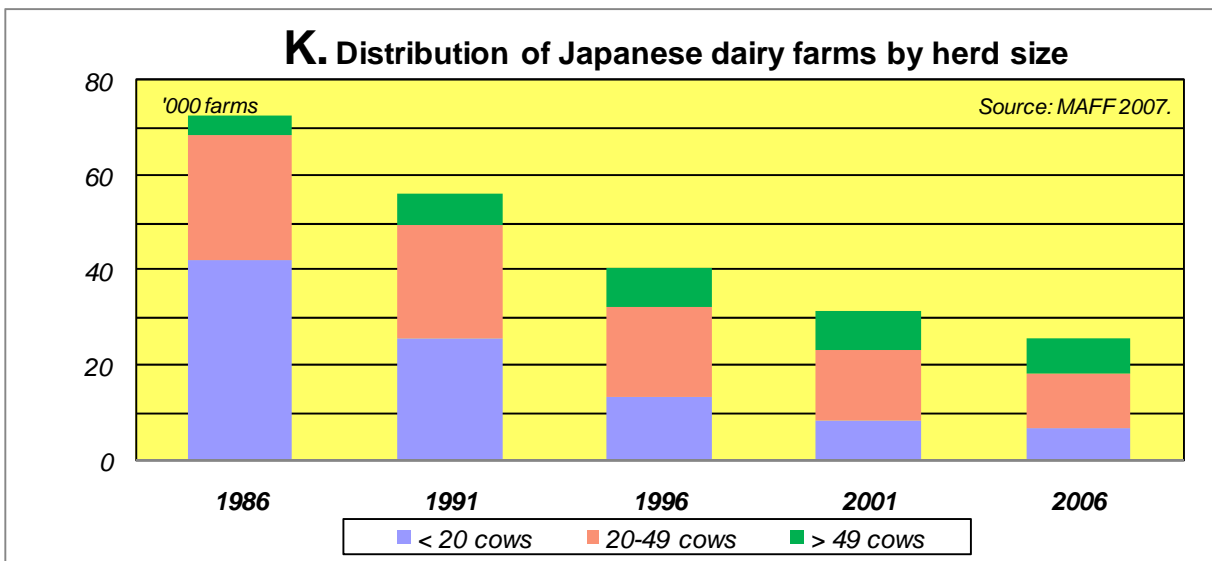
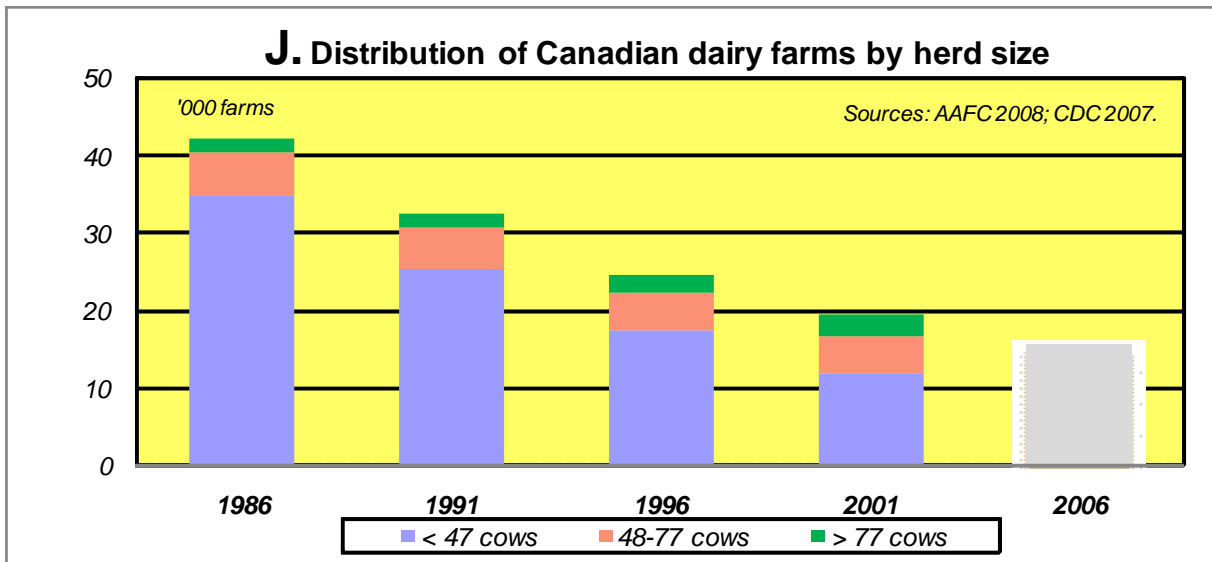
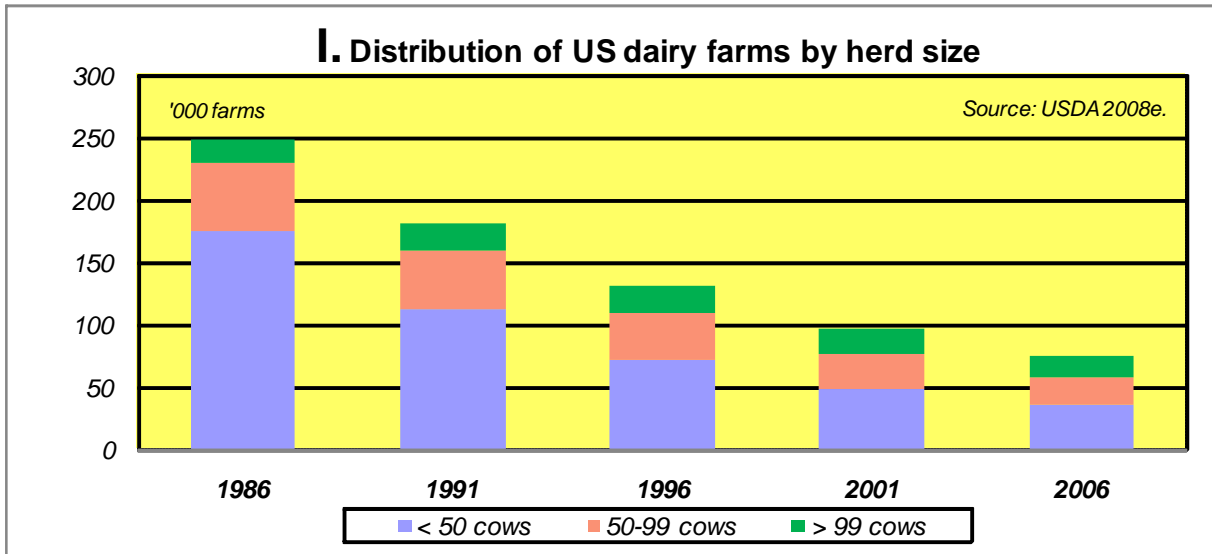
Agricultural support involves a redistribution of income within the economy. As it imposes an implicit tax on domestic consumers, the size of the transfers to individual farmers is a matter of some interest. Just as bigger farms contribute more to the industry output they will also gain more of the benefits of the support policies:

- industry support provides income assistance;
- the need for such assistance should consider income generating capacity and the net income position of individual industry participants.

This raises some equity issues. The need to give income support to a large scale, high income farmers is questionable. It would seem to be inconsistent with the notion of providing welfare or assistance to a community group with very low incomes or in financial difficulties:

- in most developed economies government assistance is often capped, subjected to income and wealth tests or restricted to individuals that meet certain criteria;
- the assistance is targeted at those in need.

Policy measures such as import protection and price support measures are a crude way of providing assistance. There is no capacity for targeting the assistance to those who may be considered in need of help. With these types of measures the large scale beneficiaries gain most of the income support. Over time structural change further alters the distribution of the assistance. As individuals expand output and take advantage of economies of scale it is likely to strengthen their financial position which raises questions about the on-going need for industry wide support.



There is a strong case for targeting government assistance measures on equity grounds. This applies equally to the trade protection and domestic policy arrangements that provide high levels of support for industries like dairy and sugar in some OECD economies:

- there is typically a substantial diversity in farm sizes, output levels and income performance in supported industries.

Over time the structural characteristics of industries will change in response to the economic pressures for change. As farms become bigger they generate more output and their gross income rises. Farm exits and the increasing scale of the remaining farms means support becomes more concentrated in the hands of fewer and fewer operators. It is worthwhile examining the way structural change has affected the distribution of support in case study industries.

## **Structural change and the distribution of dairy support**

The dairy industries of the US, Canada and Japan provide support measures that are distributed according to the amount produced. Structural change has two effects that have implications for the distribution of support:

- it reduces the number of industry participants; and
- it changes the mix of large, medium and small scale producers.

In the major developed economies dairy support policies were originally justified on a need to assist large numbers of small scale farmers on low incomes. There were concerns about their vulnerability to low returns on the domestic market and external competitive pressures from imports.

To some extent the current resistance to reductions in support is based on the perception that these structural characteristics still exist. But in the major developed economies this image of large numbers of low income farms is generally not consistent with the structural changes that have occurred.

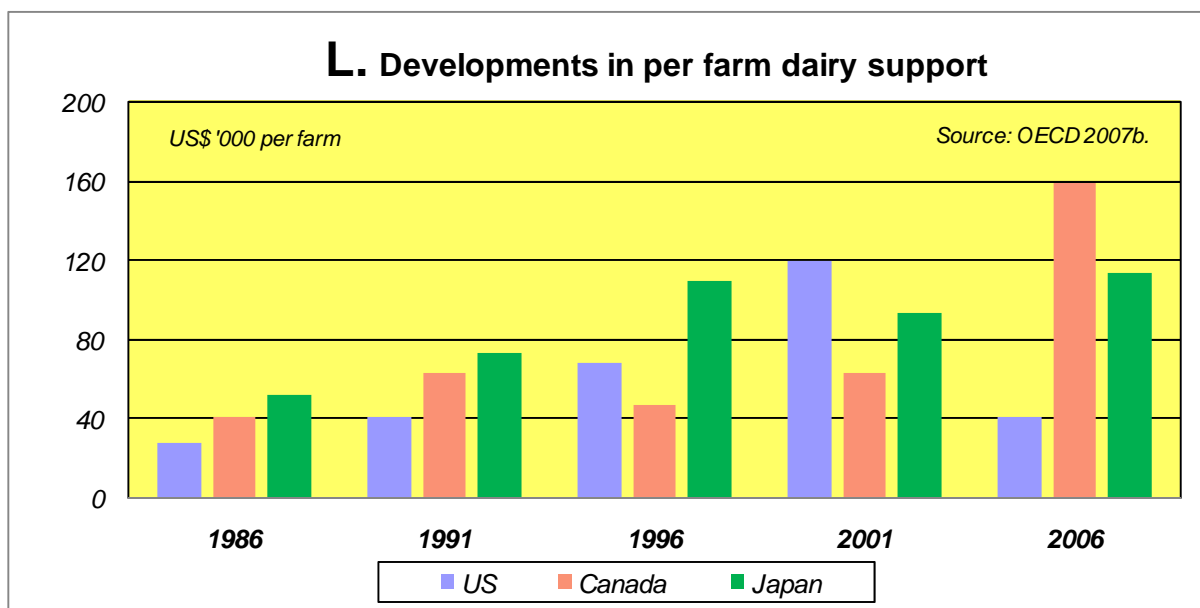
Over time structural characteristics of the US, Canadian and Japanese dairy industries have changed. Many farmers have exited the industries. There has been a change in the distribution of different scale farming operations. The number of small scale dairy farms has substantially declined. The industry contribution of larger scale dairy farms has expanded.

In the US dairy industry there has been a noticeable shift in production capacity towards larger scale dairy farms since 1986 (chart I). The number of dairy farms has declined and most of the reduction has been in small scale farms. The change in the composition of the industry means larger scale farms account for a greater proportion of industry output:

- herds of less than 50 cows have fallen from 174,700 in 1986 to 35,400 in 2007;
- over the same period herds of 100 head or more have declined from 19,700 to 17,500;
- small scale farms (< 50 cows) currently account for about 47% of industry operators – in 1986 they accounted for 70 % of the industry.

A similar story is evident in Canada (chart J). The number of farms has declined and there has been a shift towards larger scale operations since 1986:

- current data on herd distributions are unavailable but herds of less than 47 cows declined from 34,900 in 1986 to 11,800 in 2001 – it is likely a further reduction has occurred in recent times;
- over the same period herds of 78 head or more have increased from 1,900 to 2,700;
- small scale farms (< 47 cows) accounted for about 61% of industry operators in 2001 compared with 82 % in 1986.



In the Japanese dairy industry the same sort of structural shift has occurred. Farm numbers have declined and most of the farms that left the industry were small scale operators:

- herds of less than 20 cows have fallen from 42,200 in 1986 to 6,800 in 2007;
- over the same period herds of 100 head or more have increased from 4,100 to 7,700;
- small scale farms (< 20 cows) currently account for about 26% of industry operators – in 1986 they accounted for 58 % of the industry.

In all three industries the number of farms benefiting from the dairy support has declined substantially over the past 20 years. The distribution of support has become much more concentrated in the hands of large scale producers. It demonstrates how structural change amplifies the equity considerations of dairy support policies. If further structural change occurs and farm numbers decline the distribution of the implicit assistance will become even more concentrated.

The shift towards larger scale dairy farms in all three economies could also have implications for the approach to implementing policy reform. Phased reductions in support will affect the gross revenue and net income position of farmers. Judgements about the need to provide extra direct transitional assistance to facilitate the adjustment process also involve equity considerations:

- industry wide direct transitional assistance raises equity issues;
- the case for targeting the assistance to low income producers becomes more compelling as the industry becomes more dominated by larger scale producers with high incomes.

Phased reform gives producers time to adjust and is a form of implicit transitional assistance. But political economy factors are likely to affect the implementation of reforms in highly supported industries. If it results in political decisions to provide adjustment measures, the cost of targeted direct assistance to those facing financial difficulties will be more manageable than in the past:

- there are less farmers and it is likely the number of small scale low income operators that may need help will have declined.

## 21. Distribution of US dairy support by herd size #

Year ended 31 December		1986	1991	1996	2001	2006
<b>Total support *</b>	US\$ million	6 711	7 249	8 878	11 581	3 047
<b>Herd &lt; 50 cows</b>	number of farms	174 682	113 081	72 280	48 230	35 395
- production share	%	25.6	20.0	12.9	8.4	6.1
- support **	US\$ million	1 716	1 448	1 145	973	186
- per farm support	US\$/farm	9 823	12 802	15 845	20 170	5 251
<b>Herd 50-99 cows</b>	number of farms	54 822	46 786	37 560	29 005	22 115
- production share	%	30.9	28.7	24.8	18.3	14.2
- support **	US\$ million	2 074	2 081	2 202	2 119	433
- per farm support	US\$/farm	37 825	44 470	58 619	73 066	19 562
<b>Herd &gt; 99 cows</b>	number of farms	19 686	20 774	21 140	20 225	17 470
- production share	%	43.5	51.3	62.3	73.3	79.7
- support **	US\$ million	2 921	3 721	5 531	8 489	2 428
- per farm support	US\$/farm	148 389	179 125	261 637	419 716	138 990

# Support distribution based on share of total milk production.

Sources: USDA 2008a & e; OECD 2007b.

Production shares for 1986 & 1991 based on estimates from Blayney, 2002.

\* OECD estimate of the value of gross dairy specific transfers (CSTs) including market price support.

\*\* Estimate derived from production shares & total support.

Equity considerations in the way structural changes have altered the distribution of assistance is a matter of some interest. Average per farm support is a relatively simple indicator of the sharing of assistance. In all three dairy industries there are less recipients but the average level of support has fluctuated (see appendix B).

A comparison of the changes in per farm dairy support shows a fall in US assistance levels and an increase in Canada and Japan (chart L). On a per farm basis Canadian dairy farmers receive the highest level of support – they currently receive about four times the assistance of US farmers. Other features of the change in per farm dairy support include:

- there has been a dramatic rise in per farm support in Canada in the post 1995 period – it increased from US\$69,000 per farm in 1994 to US\$159,000 per farm in 2006;
- Japanese dairy support may have declined since the mid 1990's but average per farm support has increased – the implicit income assistance peaked at US\$138,000 per farm in 2000 and is currently more than US\$110,000 per farm;
- per farm support in the US increased in the post 1995 period to a peak of almost US\$120,000 in 2001 – it has declined since then and is currently around US\$41,000 per farm.

The distribution of dairy assistance between different sized farms is an important equity consideration. It shows the degree of concentration in how the benefits of support are distributed within the industry. Large scale dairy farms gain a disproportionate share of the implicit income assistance because of their sizeable contribution to industry output.

The scale of dairy farming operations can be categorised according to the size of the milking herd. Estimates of the milk supplied by farms in the different herd size categories were not available for Japan and Canada. But an assessment can be made for the US dairy industry (table 21).

## 22. The distribution of US dairy support among large scale operators #

Year ended 31 December		< 100 cows	100-199 cows	200-499 cows	500-999 cows	> 999 cows
<b>Distribution of 1998 support</b>						
Number of farms	number	95 720	13 880	5 155	1 500	890
Production share	%	33.8	19.0	16.7	11.2	19.3
Support *	US\$ million	4 374	2 459	2 161	1 450	2 498
Per farm support	US\$/farm	45 700	177 160	419 266	966 336	2 806 524
<b>Distribution of 2006 support</b>						
Number of farms	number	57 510	9 760	4 567	1 700	1 443
Production share	%	20.3	13.0	15.2	13.4	38.1
Support **	US\$ million	619	396	463	408	1 161
Per farm support	US\$/farm	10 755	40 585	101 411	240 175	804 509

# Distribution of support based on share of total milk production.

Sources: USDA 2008a & e; OECD 2007b.

\* The 1998 OECD estimate of gross dairy specific transfers including market price support was US\$12,942 million.

\*\* The 2006 OECD estimate of gross dairy specific transfers including market price support was US\$3,047 million.

Large scale dairy herds in the US (> 99 head) currently account for almost 80% of the industry output. As a result they gain most of the implicit income assistance from the US dairy support measures:

- around 17,500 dairy farm operators receive 80% of the benefits of US dairy support.

There has been a significant change in the distribution of US dairy support over the past 20 years. In 1986 the larger scale farms gained around 44% of the benefits. The average per farm benefit was worth around US\$148,000. Fifteen years later this component of the industry had more than 70% of the support benefits and the average per farm support was worth around US\$420,000:

- over time the structural shift to large scale dairy farming operations has greatly increased the degree of concentration in the distribution of support.

The contrast with small scale dairy farming operations (< 50 cows) is striking. This category has accounted for most of the farm exits since 1986 and their contribution to industry output has fallen from the 26% achieved in 1986. Medium sized dairy farms (50-99 cows) have also experienced a decline in the number of farms and reduced per farm support:

- around 35,400 small scale dairy farms receive about 6% of the benefits of US dairy support;
- the average per farm support for small scale producers is worth around US\$5,000.

Defining large scale herds as more than 99 cows incorporates a wide range of farms. It will include large sized family farms and very large scale corporate operations with cow herds exceeding 1,000 head. Judgements about what constitutes a large scale dairy herd are subjective. In the US herds of 100 to 200 cows may not be considered large scale if gross farm income is used as a guide.

Disaggregating the large scale herd category provides further evidence of the way structural change has affected the distribution of US dairy support (table 22). The category is dominated by herds with 100-199 head – there are currently about 13,900 farms in this range. These farms currently account for about 13% of industry output and therefore receive a similar proportion of the implicit assistance.

Average per farm support for dairy operations with 100-199 cows is currently around US\$41,000. The distribution of support to these types of farms has declined over the past decade. In 1998 farms of this scale received about 19% of the support with an average distribution of around US\$177,000 per farm.

Herd sizes that exceed 200 head could be regarded as large scale operations. It is worth noting some of distributional features of these large scale farms:

- currently there are 1,443 dairy farms with herds of 1,000 cows or more and they account for about 38% of US dairy support;
- farms with 1,000 cows or more currently receive an average support benefit of around US\$804,500 per farm;
- between 1998 and 2006 the number of herds with 500 or more head has grown – they are taking an increasing share of the dairy support.
- there would seem to be significant equity considerations in continuing to direct much of support to these large scale farms – they have very high gross farm high incomes.

The overall assessment of the distribution of US dairy support highlights the equity issues with providing income assistance to large scale producers. Structural change has increased the disparity in the way support is shared between small and large scale producers. In 1998 small scale producers with less than 100 cows accounted for 34% of the support (chart M). By 2006 only 20% of the assistance was directed to small scale operators (chart N).

Similar outcomes are likely to be apparent in the distribution of dairy support in Canada and Japan. In these industries judgements about what constitutes a large and small scale herd will differ from the US situation. Both industries have a much smaller average herd size and it may be more appropriate for large scale herds to be defined as more than 100 cows in both cases:

- the distribution of industry dairy support in Canada and Japan has become dominated by larger scale operators with herds of 100 cows or more;
- this is evident in the substantial decline in very small scale cow herds since 1986.

This assessment has examined the implications for the distribution of support from structural change in farm numbers and herd sizes. It is a reasonable indicator of who benefits from the most from dairy support. However, the distribution of dairy support may also depend on the type of milk produced. If the support policies favours fluid milk producers, larger scale operators in the sector of the industry they may gain more of the support benefits:

- it was beyond the scope of this study to provide a further disaggregation of the support to account for end-use differences.

## **Structural change and the distribution of sugar support**

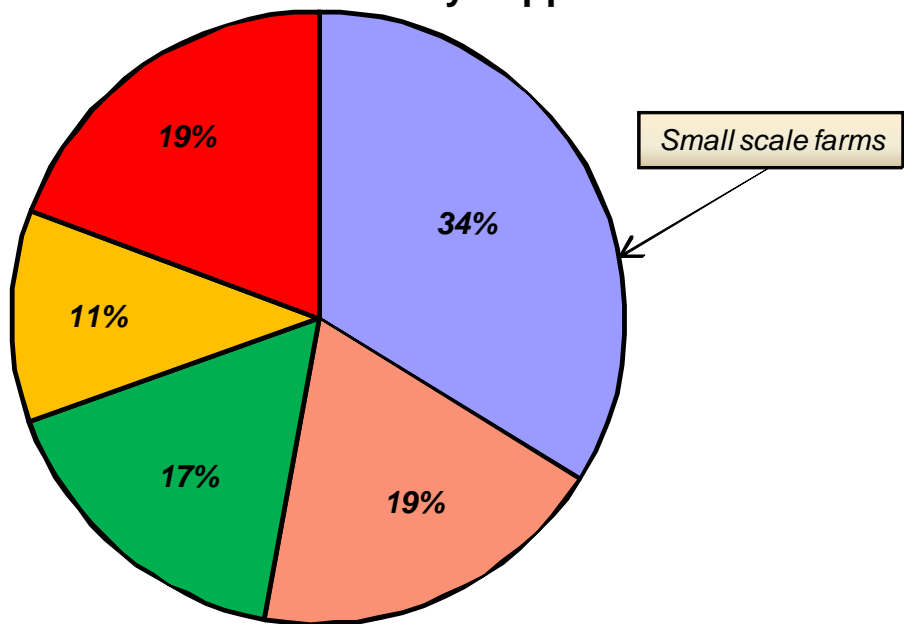
The US sugar industry has support measures that provide implicit income assistance according to the amount produced. Structural changes over the past 10-15 years have affected the distribution of that assistance. Larger scale producers have gained more of the financial benefits of the support but there are some differences in the structural developments that have occurred in the two components of the industry.

Sugar beet is typically grown on mixed enterprise farms in conjunction with other crops such as corn, wheat, soybeans (USDA 2007b). In the late 1980s there were a large number of small scale producers of sugar beet (chart O). Since then there has been a significant decline in number of farms producing sugar beet and a change in the mix of large, medium and small scale producers.

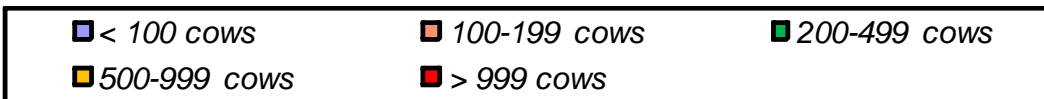


### M. Distribution of US dairy support in 1998

US Dairy support was worth US\$12,942m in 1998

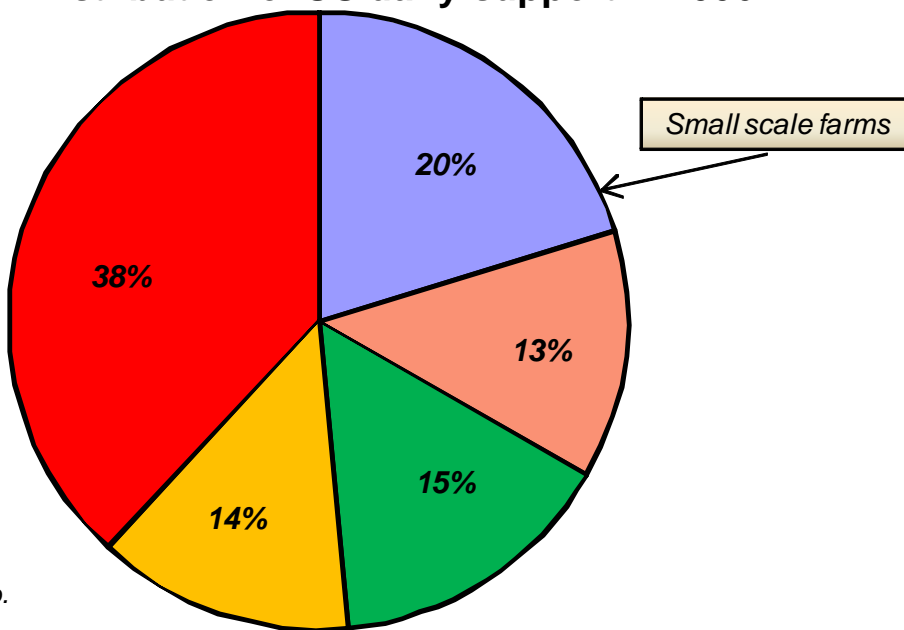


Source: OECD 2007b.

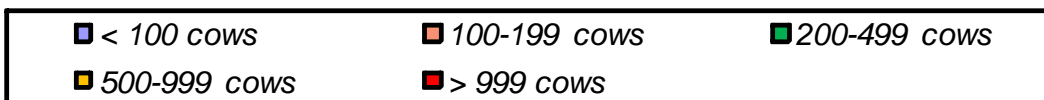


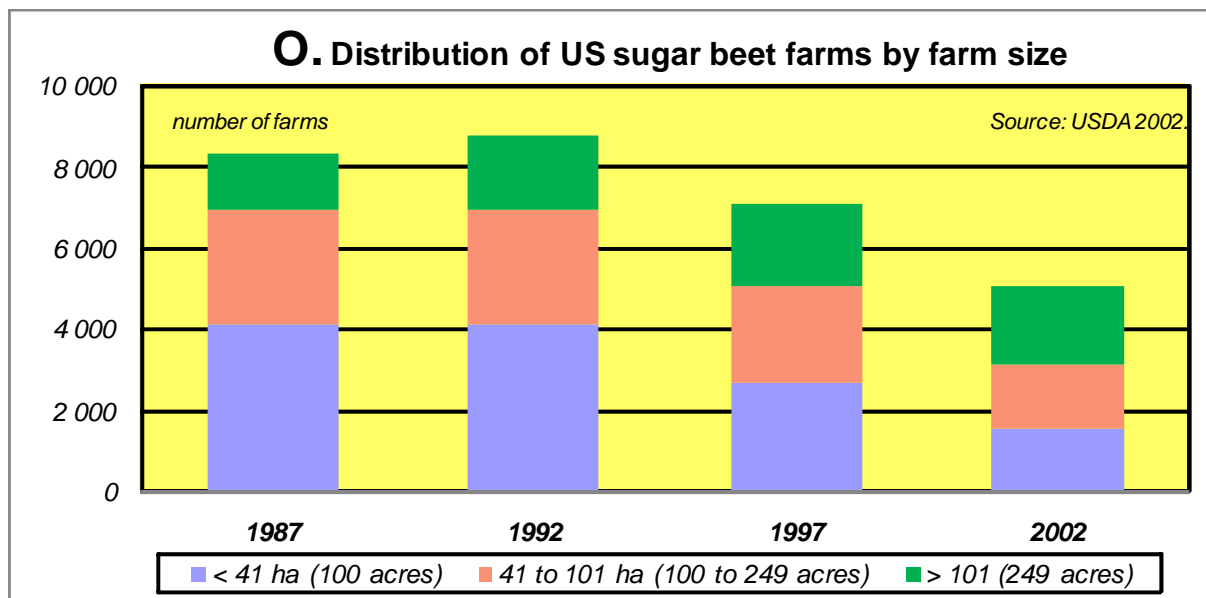
### N. Distribution of US dairy support in 2006

US dairy support was worth US\$3,047m in 2006



Source: OECD 2007b.





By 2002 there had been a noticeable shift towards larger scale sugar beet producers. Farm size data for 2007 was unavailable – US census results had not been released at the time this report was prepared. It seems likely that many small scale producers left the industry in favour of other crops. This shows that sugar beet farmers can adjust their enterprise mix in response to changing economic circumstances.

The available data indicates that larger scale producers are accounting for a higher proportion of sugar beet production and more of the income assistance from the industry support measures:

- farms producing less than 41 ha (100 acres) of sugar beet have declined from 4,130 in 1992 to 1,540 in 2002;
- over the same period farms with more than 101 ha (250 acres) of sugar beet have increased;
- large scale farms (> 101 acres) accounted for around 38% of sugar beet producers in 2002 compared with 21% in 1992.

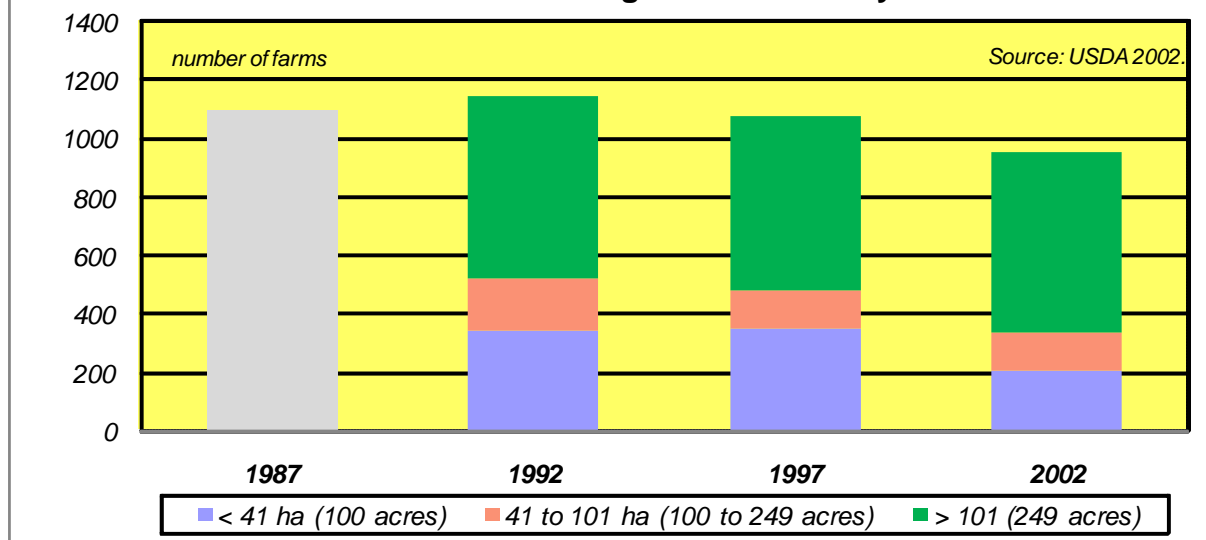
Structural developments in sugar cane production show the changes in farm numbers and farm size distribution has been less pronounced (chart P). There are fewer sugar cane producers than sugar beet producers – less than a thousand in 2002 – but the direction of change has been similar. Since the late 1980's the number of sugar cane farms has declined and shift towards larger scale producers.

The available data shows the fall in farm numbers has occurred in small to medium sized producers. The number of larger scale sugar cane farms has remained largely unchanged. They have increased their share of total sugar cane production and consequently account for more of the income assistance from industry support measures:

- small scale sugar cane farms (< 41 ha) have declined from 346 in 1992 to 203 in 2002;
- over the same period large scale cane farms (> 101 ha) remained around 620 farms;
- the larger scale farms accounted for about 65% of sugar cane producers in 2002 compared with 54 % in 1992.

In both components of the industry the number of producers benefiting from the sugar support policies has declined and the distribution of income assistance has become more concentrated in the hands of large scale producers. This is similar to developments in the dairy industry case studies – structural change raises greater equity considerations in the distribution of support.

## P. Distribution of US sugar cane farms by farm size



Changes in average per farm support are a simplified indicator of how structural change alters the distribution of the implicit income assistance. On a per farm basis sugar cane farmers receive much more income assistance than sugar beet producers (see appendix B). This is because the scale of cane farms is, on average, much higher than sugar beet farms and they produce a lot more sugar:

- in 2002 the average per farm support for a US sugar cane farm was around US\$627,000;
- average per support for a sugar beet farm was US\$130,000;
- the level of implicit income assistance is considerably higher in comparison to average per farm dairy support – this is especially the case for sugar cane farmers.

Large scale growers (> 101 ha) accounted for about 65% of the US sugar cane industry in 2002. The industry composition has probably shifted further towards large scale growers over the past five years. The substantial gross farm revenues generated by a large portion of the industry are not suggestive of widespread problem of low farm income:

- the average gross income for a US sugar cane farm was US\$1.1 million in 2002;
- this is higher than average per farm revenues in previous years and it suggests that adjustment difficulties from phased reductions in support may not be as widespread as common perceptions would suggest.

If political economy considerations require some transitional measures to facilitate acceptance of the reform, the cost of targeted direct assistance to those facing financial difficulties would seem to be more manageable than in the past. There are fewer farmers in the industry and it seems likely the number of small scale low income operators that may need help have declined.

The distribution of sugar assistance between different sized farms highlights the way structural change can amplify equity considerations over time. It shows the high degree of concentration in how the benefits of support are being distributed within the industry. Large scale sugar cane farms gain a large share of the implicit income assistance because of their contribution to industry output.

The scale of sugar farming operations can be categorised according to the size of the area harvested. Estimates of the sugar supplied by farms of different sizes were only available for a limited number of years. But an assessment can be made for developments over the past decade (table 23).

## 23. Distribution of US sugar support by farm size #

Year ended 30 September		1987	1992	1997	2002
<b>Total support *</b>	US\$ million	1 196	957	730	1 185
<b>Distribution of support to sugar cane industry</b>					
<b>Sugar cane support **</b>	US\$ million	566	451	327	597
<b>Farms &lt; 41 ha</b>	number of farms	na	346	348	203
- production share	%	na	1.2	0.9	0.9
- support ***	US\$ million	na	5	3	5
- per farm support	US\$/farm	na	15 786	8 621	26 300
<b>Farms 41-101 ha</b>	number of farms	na	176	135	130
- production share	%	na	2.5	2.0	2.1
- support ***	US\$ million	na	11	7	13
- per farm support	US\$/farm	na	65 488	49 216	96 771
<b>Farms &gt; 101 ha</b>	number of farms	na	622	596	620
- production share	%	na	96.2	97.1	97.0
- support ***	US\$ million	na	434	317	579
- per farm support	US\$/farm	na	697 731	532 391	934 400
<b>Distribution of support to sugar beet industry</b>					
<b>Sugar beet support **</b>	US\$ million	630	506	403	587
<b>Farms &lt; 41 ha</b>	number of farms	4 104	4 129	2 677	1 544
- production share	%	16.2	14.1	9.2	5.9
- support ***	US\$ million	102	72	37	35
- per farm support	US\$/farm	24 797	17 334	13 908	22 357
<b>Farms 41-101 ha</b>	number of farms	2 802	2 792	2 396	1 567
- production share	%	35.3	30.4	25.8	19.0
- support ***	US\$ million	222	154	104	112
- per farm support	US\$/farm	79 248	55 117	43 304	71 257
<b>Farms &gt; 101 ha</b>	number of farms	1 401	1 834	1 984	1 916
- production share	%	48.6	55.4	65.0	75.1
- support ***	US\$ million	306	280	262	441
- per farm support	US\$/farm	218 512	152 917	132 028	230 267

# Support distribution based on share of total sugar production.

Sources: USDA 2002, 2008d; OECD 2007b.

Based on US agricultural census results. The results for 1987 & 1992 have been adjusted for census coverage.

Splicing factors based on adjusted & unadjusted results for 1997 was used to align data for farm numbers & production.

\* OECD estimate of the value of gross dairy specific transfers (CSTs) including market price support.

\*\* Estimates based on shares of total raw sugar production.

\*\*\* Estimate derived from production shares & industry support.

## 24. The distribution of US sugar support among large scale operators #

Year ended 30 September		< 110 ha	101-202 ha	202-404 ha	> 404 ha
<b>Distribution of 1992 support</b>					
Number of farms	number	7 441	1 613	641	203
Production share	%	23.1	18.7	15.6	42.6
Support *	US\$ million	221	179	150	408
Per farm support - sugar cane	US\$/farm	36 315	153 496	292 900	2 477 107
Per farm support - sugar beet	US\$/farm	29 192	103 232	200 988	528 407
<b>Distribution of 2002 support</b>					
Number of farms	number	3 444	1 346	811	379
Production share	%	12.6	16.3	20.7	50.4
Support **	US\$ million	150	193	246	597
Per farm support - sugar cane	US\$/farm	59 731	221 858	447 275	2 284 964
Per farm support - sugar beet	US\$/farm	41 732	131 558	246 116	591 345

# Support distribution based on share of total sugar production.

Sources: USDA 2002, 2008d; OECD 2007b.

Based on US agricultural census results. The results for 1987 & 1992 have been adjusted for census coverage.

Splicing factors based on adjusted & unadjusted results for 1997 was used to align data for farm numbers & production.

\* The 1992 OECD estimate of gross sugar specific transfers including market price support was US\$957 million.

\*\* The 2002 OECD estimate of gross sugar specific transfers including market price support was US\$1,185 million.

Large scale sugar cane in the US (> 101 ha) accounted for about half of the industry output in 2002. In the sugar beet industry the large scale farms accounted for another 37 % of the industry output. These farms gain most of the implicit income assistance from the US sugar support measures:

- 620 sugar cane farms received almost 50% of the benefits of total US sugar support in 2002;
- 1,916 sugar beet farms received 37% of the benefits.

Over time there have been significant changes in the distribution of US sugar support. In 1992 the larger scale sugar cane farms gained around 45% of the benefits. The average per farm benefit was worth almost US\$700,000. In 2002 the average per farm support was even higher. During this period larger scale sugar beet farms increased their share of the support benefits from US\$153,000 to US\$230,000:

- over time the structural shift to large scale farming operations in the sugar beet sector has increased the degree of concentration in the distribution of support.

The contrast with small scale farming operations (< 41 ha) is worth noting. Small scale sugar beet farms accounted for most of the farm exits in the period since 1992. Their contribution to industry output has fallen and was around 3% in 2002. Medium sized sugar beet farms (41-101 ha) have also declined in number of farms and in 2002 they contributed about 9% of total output:

- about 1,750 small scale beet and cane farms gained 6% of industry support benefits in 2002;
- the average per farm support was worth around US\$26,000 for a small scale sugar cane farm and US\$22,000 for a small scale sugar beet farm.

Defining large scale sugar farms as more than 101 ha covers a wide range of farm sizes. Judgements about what constitutes a large scale farm are subjective. In Australia the average size of a sugar cane farm was 104 ha in 2007. There were almost 4,000 growers and about half had less than 100 ha.

Disaggregating the large scale farm size category provides further indication of the equity issues associated with the distribution of US sugar support (table 24). About half the category is composed of farms of 101 to 202 ha – in 2002 there were 1,346 sugar beet and cane farms in this range. These farms accounted for about 16% of industry output and a similar proportion of the implicit assistance:

- average per farm support for a 101-202 ha sugar cane operation was around US\$222,000;
- the average per farm support for a sugar beet operation was about US\$132,000;
- between 1992 and 2002 the distribution of support to these farms was largely unchanged;
- in 1992 the average distribution of assistance was around US\$153,000 for a sugar cane farm and US\$103,000 for a sugar beet farm.

The most notable feature of the spread of larger scale farms is the amount of sugar supplied by the largest operators – farms with more than 404 ha. Between 1992 and 2002 there was strong growth in the number of these farms. Farms that exceed 404 ha could be reasonably regarded as large scale operations and in 2002 they accounted for half the industry output:

- half of the US sugar industry assistance went to less than 400 farms;
- large scale sugar cane farms were the biggest beneficiaries – 220 farms gained more than 40% of the support;
- the average support benefit for a large scale sugar cane farm was almost US\$2.3 million;
- the average benefit for a large scale sugar farm was around US\$591,000.

There are major equity considerations in providing such large amounts of implicit income assistance to these large scale farmers. Sugar growers of this size will have very high farm incomes and the need for continued high levels of support is not consistent with the original income objectives of the policy measures. This is especially the case for the 220 large scale sugar cane farms.

The number of larger scale sugar farms has grown over the period under review. It seems likely there will have been some further growth in recent years. Over time these larger scale farms are taking an increasing share of the US sugar support. Structural change has increased the inequities in the way support is shared between small and large scale sugar producers.

The shift towards larger scale sugar farms would also appear to have implications for the approach to implementing policy reform. Phased reductions in support will affect the gross revenue and net income position of farmers. Judgements about the need to provide extra direct transitional assistance to facilitate the adjustment process also involve equity considerations:

- industry wide direct transitional assistance raises equity issues;
- there would seem to be a strong case for targeting the assistance to low income producers because of the increasing contribution of larger scale producers with high incomes.

The substantial gross incomes generated by these larger scale farms suggest a greater capacity for the industry to cope with the effects of phased reductions in support in comparison to many years ago. This may also be the case for producers in the medium scale range. The number of farms with less than 41 ha has diminished over the 1992-2002 period – there are now less than 1,800 farms in this category:

- a phased reduction in support in conjunction with targeted short term transitional assistance would seem to be feasible and manageable from a political economy perspective.

## 6. Concluding comments

Most major developed economies still provide high levels of agricultural support despite the adoption of the *Agreement on Agriculture* (AoA) in the Uruguay Round trade negotiations. In 2006 agricultural support in OECD countries was estimated at US\$372 billion. More than 70% of the support was from measures that directly assisted farmer incomes.

Most support policies in the major developed economies were implemented more than 40 years ago with the objective of improving farmer incomes. There were concerns about large numbers of small scale producers with low farm incomes. In general the policies involved a combination of import protection and price support measures that linked the implicit income assistance to farm output.

Reductions in support for agricultural has been a long standing issue in multilateral trade negotiations. Both developed and developing countries are reluctant to lower trade barriers and reduce support for highly protected industries because of the adjustment pressures that may arise. Concerns are raised about the threat to small scale farmers with low incomes:

- there is a common perception of large numbers of small scale farmers on low incomes being forced to exit the industry in financial distress.

Concerns about disruptions caused by policy reform often imply a static response by farmers. It ignores widespread evidence that farmers can to adapt to changing market circumstances. If their income situation is negatively affected some choose to leave the industry. Other farmers make adjustments in enterprise selections and farm management to compensate for the effects on their income situation:

- these sorts of adjustment strategies generally lead to gains in farm performance that is reflected in industry development.

There are various examples of agricultural industries in OECD countries successfully adjusting to policy reforms such as a phased reduction in support. These experiences show the dynamic responses that can occur as farmers react to the initial effects on their financial position. In general the industry impact was not as severe as expected. After a short period of adjustment there was a distinct improvement in industry performance.

### Adjustment in highly supported industries

In this study the dairy and sugar industries were used to investigate the relationship between industry adjustment and high levels of support. They are among the most highly supported industries in OECD countries and several economies have a long history of providing support. In both cases the industry support is mostly based on a combination of import protection and price support arrangements.

The dairy industry has the highest level of support. In 2006 the EU, the US, Canada, Japan and Korea collectively contributed about US\$22 billion to the incomes of dairy farmers. The EU, the US and Japan also provide significant implicit support to the incomes of sugar farmers. In 2006 these three economies collectively contributed around US\$3.6 billion of assistance to sugar farmers.

The amount of implicit incomes assistance varies over time. In general support provided to the sugar industries of OECD countries has remained at relatively high levels since the AoA was implemented – the lower level of support in 2006 is an exception. OECD dairy support estimates show continued high levels of assistance in the period since 1995 before a significant reduction in 2005 and 2006.

Import protection limits the external competitive pressures on farm incomes. But internal market developments will still generate pressures for economic change. The OECD dairy and sugar industries with high levels of support have not been immune from these pressures for change.

If farmers in these industries have coped with internal market related adjustment pressures it suggests they may be able to cope with phased reductions in support. Structural change in three dairy industries – the US, Canada and Japan – and one sugar industry – the US – were examined as case studies to gain an indication of the capacity of farmers to cope with reductions in support.

There has been considerable structural change in the US, Canadian and Japanese dairy industries over the past 25 years. Farm numbers have declined and producers have made changes to the physical performance of their farm operations. This is reflected in large increases in per farm output of milk and much higher gross farm incomes.

The structural profile of all three dairy industries has changed. Industry adjustment has seen the distribution of support become more concentrated among a smaller group of beneficiaries:

- US dairy support policies currently provide implicit income assistance to around 71,500 farms compared with more than 300,000 farms in 1982;
- Canadian support policies currently assist less than 15,000 dairy farms – in 1982 there were more than 52,500 farms benefiting from the support;
- Japan's support policies assist just over 25,000 dairy farms compared with almost 100,000 farms in 1982.

Resistance to reductions in dairy support is typically based around concerns for the adjustment pressures on small scale, low income farms. But the number of these farms has diminished in all three industries. In general there has been a shift towards larger scale dairy farms generating more output and higher gross farm revenues in comparison to 10 or 20 years ago.

Indicators of recent changes in the net farm income position are not suggestive of a widespread problem of low incomes in the dairy industries of the three economies that were examined. This was the original objective in providing the support measures many years ago:

- in the US average gross farm revenue was almost US\$500,000 in 2007 compared with just over US\$140,000 in 1995;
- in Canada, between 1995 and 2007 average gross farm income increased by almost 150% in Canadian dollar terms – in 2007 the average gross income was almost C\$350,000 compared with just over C\$140,000 in 1995;
- in Japan, between 1995 and 2007 average gross farm income increased by 64% in Japanese yen terms.

Estimates of farm revenue do not reflect the average net income position of dairy farmers which requires data on dairy enterprise costs. But the growth in revenues is not suggestive of a widespread farm income problem. An investigation of changes in the cost structure of US dairy farms would allow more definite conclusions to be reached.

The increased gross earnings of dairy farms in the economies that were examined raises questions about the continued need for support in pursuit of income objectives defined more than 30 years ago. The structural changes also brings into focus the growing equity issue associated with the monetary transfers under the support policies:

- it highlights the need for support policies to be periodically reviewed to assess their on-going applicability because of changing circumstances.



Farm performance indicators show the historical capacity of dairy farmers to adjust to the economic pressures for change. Adjustment pressures have still been part of the industry operating environment despite the provision of relatively high levels of support. It suggests they may be able to cope with a phased reduction in support using similar adjustment strategies:

- the changes that have occurred do not appear to support the concerns that are often raised about policy reform – the capacity of farmers to adapt and adjust;
- this is supported by the evidence of farm level adjustment to the dairy policy reforms that were implemented in Australia.

There have been similar developments in the US sugar industry. The sugar beet sector has experienced significant structural change over the past decade with a large number of farm exits and a shift to larger scale farming operations. Gains in raw sugar yields and per farm performance are also evident among US sugar beet producers.

The scale of US sugar cane farms has increased but sugar yields have shown little improvement. This may reflect a dilution of the competitive pressures that encourage improved farm performance but this would need to be investigated further. The income generating capacity of US sugar cane farms is substantial. They benefit most from the support measures because the farms are bigger, have higher sugar yields and much higher farm output:

- in 2002 the average gross income for a sugar beet farm was around US\$230,000;
- the average gross income for a sugar cane farm was more than US\$1.1 million.

The increased gross earnings of US sugar beet farms and the high level of gross farm income in the sugar cane industry raises questions about the continued need for support in pursuit of income based policy objectives defined many years ago. The structural changes also brings into focus the growing equity issue associated with the monetary transfers under the support polices:

- in the sugar cane industry there are currently less than 1,000 beneficiaries that share around US\$220 million worth of income assistance through the transfers from the support policies.

## **Structural change and equity considerations**

Structural changes also brings into focus the growing equity issue associated with the monetary transfers under the respective support polices. The dairy and sugar support policies provide a level of implicit income assistance for individual farmers that depend on how much they produce. Distribution of support will vary with the size of individual farming operations:

- the bigger the farm output the more support received in absolute terms;

Over time the structural characteristics of the US, Canadian and Japanese dairy industries has changed. There are less small scale dairy farms with low incomes. This means the distribution of dairy support has become much more concentrated in the hands of large scale producers.

It shows how structural change makes the equity considerations of support policies an increasingly important issue. The shift towards larger scale dairy farms in all three economies should also reduce concerns about the capacity of the industries to cope with phased reductions in support. Larger scale farms generate higher milk revenues:

- per farm dairy support in Canada is currently averaging around US\$159,000 per farm;
- in Japan is currently more than US\$110,000 per farm;
- in the US it currently averaging around US\$41,000 per farm.

This analysis shows how structural change increases the disparity in the way support is distributed between small and large scale producers. Large scale dairy farms in the US gain a disproportionate share of the implicit income assistance. Currently around 17,500 farms have milking herds of more than 100 head and they receive about 80% of the support benefits. Around 35,400 small scale dairy farms (< 50 head) receive about 6% of the benefits of US dairy support.

From a political economy it is a highly inequitable situation that:

- 1,443 dairy farms with herds of 1,000 cows or more gain 38% of the US support benefits;
- the implicit income support is averaging more than US\$800,000 per farm.

The situation is similar in the US sugar industry. The distribution of support is concentrated in the hands of large scale sugar cane producers. Cane farmers receive much more assistance than sugar beet producers because they produce more sugar:

- in 2002 average per farm support for a US sugar cane farm was around US\$627,000 – average per support for a sugar beet farm was US\$130,000.

Larger scale sugar farms gains most of the implicit income assistance from the support policies. In 2002 larger scale sugar cane farms accounted for about 42% of industry output. In the sugar beet industry larger scale farms accounted for another 8 % of industry output. These farms gain most of the implicit income assistance from the US sugar support measures:

- 620 sugar cane farms gained almost 50% of the benefits of US sugar support in 2002;
- around 1,750 small scale farms received about 6% of the benefits;
- the average benefit for a large scale sugar cane farm (> 404 ha) was almost US\$2.3 million;
- the average benefit for a large scale sugar beet farm was around US\$591,000.

There are significant equity considerations in continuing to provide such large amounts of income assistance to large scale farmers. Sugar growers of this size will have very high farm incomes. Continued provision of such high levels of income assistance at the expense of consumers is not necessary and difficult to justify on equity grounds.

## **Re-assessing the need for support**

The analysis highlights the need for the major developed economies to re-assess the provision of high levels of industry support. In most cases the support measures have been in place for more than 40 years. The original objective of the policies was to raise farm incomes with an implicit focus on small scale producers. Over time the increased revenue generating capacity of farms in protected industries would suggest the concerns embodied in the original policy objectives may no longer be applicable.

The case study examples examined in this report suggest this point was reached some time ago. Structural change has eroded the need for non-targeted industry wide support. Policy measures should be reviewed from time to time to ensure they remain relevant to the evolving circumstances in the industry. This analysis suggests the dairy and sugar support policies of the economies examined are overdue for a re-assessment.

The inequitable situation of facilitating substantial implicit income transfers to large scale, high income farmers has grown and become even more acute. The analysis shows that:

- farmers in highly supported industries have demonstrated a capacity to cope with the pressures of economic change;
- there have been gains in on-farm performance and a shift towards larger scale farms;

- many small scale farms have exited these industries and those remaining have a substantially increased revenue earning capacity;
- the number of beneficiaries of the support policies has diminished;
- support benefits mostly flow to large scale, high income farmers.

Concerns about farmers coping with the adjustment pressures from reduced support would seem to be unduly pessimistic. The adjustment capacity evident in these case study examples should alleviate these concerns to some extent. Policy reform would seem to be desirable from an equity perspective. Phased elimination of reductions in support for highly protected industries in trade negotiations does not appear to be an unrealistic option from an equity and political economy perspective:

- the dairy and sugar industries of the US, the EU, Japan and Canada should be a priority focus for unilateral re-assessments of support measures.

# Appendices

## Appendix A: OECD estimates of dairy and sugar support

### 25. Dairy industry support in OECD economies #

	<i>European Union *</i>	<i>United States</i>	<i>Canada</i>	<i>Mexico</i>	<i>Japan</i>	<i>South Korea</i>
<i>\$US million</i>						
<b>1986</b>	22 122	6 711	1 725	846	3 853	286
<b>1987</b>	26 526	6 338	2 169	764	4 275	388
<b>1988</b>	22 597	6 986	1 819	504	4 423	445
<b>1989</b>	15 497	13 916	1 656	320	3 784	625
<b>1990</b>	20 532	7 490	1 744	187	3 822	543
<b>1991</b>	21 126	7 249	2 061	517	4 026	676
<b>1992</b>	21 730	7 391	1 637	544	4 342	546
<b>1993</b>	20 629	6 874	1 607	1 003	5 204	605
<b>1994</b>	22 039	6 501	1 805	886	5 555	648
<i>AoA implemented - shading reflects support levels exceed 1992-94 average level of support.</i>						
<b>1995</b>	22 006	4 783	1 385	- 221	5 895	650
<b>1996</b>	20 720	8 878	1 141	- 21	4 294	611
<b>1997</b>	18 925	8 465	1 499	467	3 828	539
<b>1998</b>	20 409	12 942	1 546	762	3 564	423
<b>1999</b>	19 417	12 519	1 563	938	4 209	621
<b>2000</b>	12 747	10 423	1 790	966	4 454	811
<b>2001</b>	9 851	11 581	1 213	670	2 886	569
<b>2002</b>	17 543	8 212	1 663	1 158	3 955	772
<b>2003</b>	18 698	7 277	1 871	597	3 547	759
<b>2004</b>	19 873	7 623	1 764	122	3 539	797
<b>2005</b>	12 977	5 144	1 913	472	3 429	877
<b>2006 p</b>	12 461	3 047	2 467	628	2 861	975
<b>1986-88</b>	23 749	6 678	1 904	704	4 183	373
<b>1992-94</b>	21 466	6 922	1 683	811	5 034	600
<b>2004-06</b>	15 104	5 271	2 048	407	3 277	883

# Includes market price support & other commodity specific transfers.

Sources: OECD 2004, 2007a & b.

Based on OECD estimates of the monetary value of gross transfers linked to a specific commodity (SCT).

Excludes non-commodity specific producer support, general services support (eg inspection services, infrastructure, marketing & promotion, public stockholding, R&D, etc) & the value of transfers from taxpayers to consumers.

\* EU12 for 1986-94 including ex-GDR from 1990, EU15 for 1995-2003 and EU25 from 2004.

p - provisional.

## 26. Contribution of support to OECD dairy farm incomes #

	<b>European Union *</b>	<b>United States</b>	<b>Canada</b>	<b>Mexico</b>	<b>Japan</b>	<b>South Korea</b>
	%	%	%	%	%	%
<b>1986</b>	71.4	36.3	69.6	78.4	87.7	67.9
<b>1987</b>	76.9	34.9	83.0	74.6	88.3	70.4
<b>1988</b>	61.1	37.2	60.9	44.4	78.1	61.8
<b>1989</b>	40.8	71.2	53.9	23.1	69.6	65.2
<b>1990</b>	49.7	36.9	55.5	13.4	75.5	60.3
<b>1991</b>	50.4	39.9	64.1	28.1	72.3	74.3
<b>1992</b>	49.8	37.4	54.5	27.2	71.0	61.2
<b>1993</b>	51.8	35.6	57.0	45.4	76.9	66.4
<b>1994</b>	55.3	32.6	64.2	43.6	78.2	69.0
<i>AoA implemented - shading reflects contribution exceeds 1992-94 average level of income support.</i>						
<b>1995</b>	44.4	24.2	48.0	-16.1	76.1	60.6
<b>1996</b>	42.4	39.1	39.7	-1.1	65.2	56.1
<b>1997</b>	43.4	40.7	51.7	22.5	65.7	59.6
<b>1998</b>	48.5	53.4	56.1	36.0	66.7	54.3
<b>1999</b>	49.7	53.1	56.1	38.2	69.3	61.1
<b>2000</b>	36.8	49.9	63.2	35.9	71.0	67.2
<b>2001</b>	27.4	45.4	43.4	23.5	52.0	51.4
<b>2002</b>	49.4	39.6	61.4	42.3	72.9	61.9
<b>2003</b>	45.0	31.4	56.9	24.0	59.6	60.3
<b>2004</b>	35.9	27.6	48.3	4.9	56.5	60.2
<b>2005</b>	23.5	19.2	46.3	16.7	56.2	57.9
<b>2006 p</b>	23.8	12.8	55.8	20.6	52.3	61.2
<b>1986-88</b>	69.8	36.1	71.2	65.8	84.7	66.7
<b>1992-94</b>	52.3	35.2	58.6	38.7	75.4	65.5
<b>2004-06</b>	27.8	19.9	50.1	14.1	55.0	59.8

# SCT expressed as a percentage of total gross farm income (revenue).

Sources: OECD 2004, 2007a & b.

SCT (single commodity transfers) refers to gross transfers from policies linked to the production of a single commodity.

The SCT includes policies where payments are specified on a per-commodity basis. The SCT is one of four categories included in the revised calculation of PSEs (producer support estimates) - it include market price support.

\* EU12 for 1986-94 including ex-GDR from 1990, EU15 for 1995-2003 and EU25 from 2004.

p - provisional.

## 27. Sugar industry support in OECD economies #

	<b>European Union *</b>	<b>United States</b>	<b>Canada</b>	<b>Mexico</b>	<b>Japan</b>	<b>South Korea</b>
	<i>\$US million</i>					
<b>1986</b>	3 023	1 011	na	126	518	na
<b>1987</b>	3 547	1 196	na	20	570	na
<b>1988</b>	3 501	900	na	- 61	569	na
<b>1989</b>	2 289	709	na	10	480	na
<b>1990</b>	3 248	715	na	211	464	na
<b>1991</b>	3 847	946	na	530	502	na
<b>1992</b>	5 011	957	na	539	487	na
<b>1993</b>	3 737	947	na	986	524	na
<b>1994</b>	3 154	758	na	362	593	na
<i>AoA implemented - shading reflects support levels exceed 1992-94 average level of support.</i>						
<b>1995</b>	3 499	760	na	- 37	635	na
<b>1996</b>	3 938	741	na	333	454	na
<b>1997</b>	3 848	730	na	371	443	na
<b>1998</b>	3 754	1 015	na	493	513	na
<b>1999</b>	4 075	1 471	na	695	560	na
<b>2000</b>	2 924	1 004	na	750	510	na
<b>2001</b>	2 362	1 121	na	629	475	na
<b>2002</b>	2 785	1 185	na	546	462	na
<b>2003</b>	3 579	1 327	na	508	546	na
<b>2004</b>	4 829	1 053	na	465	578	na
<b>2005</b>	4 051	896	na	583	508	na
<b>2006 p</b>	2 632	549	na	428	437	na
<b>1986-88</b>	3 357	1 036	na	28	552	na
<b>1992-94</b>	3 967	887	na	629	535	na
<b>2004-06</b>	3 837	833	na	492	508	na

# Includes market price support & other commodity specific transfers.

Sources: OECD 2004, 2007a & b.

Based on OECD estimates of the monetary value of gross transfers linked to a specific commodity (SCT).

Excludes non-commodity specific producer support, general services support (eg inspection services, infrastructure, marketing & promotion, public stockholding, R&D, etc) & the value of transfers from taxpayers to consumers.

\* EU12 for 1986-94 including ex-GDR from 1990, EU15 for 1995-2003 and EU25 from 2004.

p - provisional.

## 28. Contribution of support to OECD sugar farm incomes #

	<b>European Union *</b>	<b>United States</b>	<b>Canada</b>	<b>Mexico</b>	<b>Japan</b>	<b>South Korea</b>
	%	%	%	%	%	%
<b>1986</b>	63.6	58.4	na	25.0	68.2	na
<b>1987</b>	63.6	62.1	na	4.0	65.7	na
<b>1988</b>	57.1	47.1	na	-10.4	61.4	na
<b>1989</b>	38.4	36.8	na	1.1	53.8	na
<b>1990</b>	47.6	34.8	na	26.5	60.2	na
<b>1991</b>	57.4	48.1	na	54.3	60.9	na
<b>1992</b>	64.1	46.0	na	52.4	62.2	na
<b>1993</b>	56.3	49.7	na	61.6	62.6	na
<b>1994</b>	48.5	35.5	na	29.6	60.4	na
<i>AoA implemented - shading reflects contribution exceeds 1992-94 average level of income support.</i>						
<b>1995</b>	47.0	38.2	na	-4.4	59.7	na
<b>1996</b>	51.6	36.1	na	32.4	58.8	na
<b>1997</b>	52.8	35.5	na	30.5	57.4	na
<b>1998</b>	57.6	47.5	na	38.7	63.7	na
<b>1999</b>	62.7	67.1	na	54.4	66.0	na
<b>2000</b>	54.6	48.2	na	52.1	60.1	na
<b>2001</b>	51.6	54.4	na	42.5	60.3	na
<b>2002</b>	52.5	52.5	na	37.2	59.5	na
<b>2003</b>	64.1	59.5	na	35.6	63.6	na
<b>2004</b>	64.4	54.2	na	30.5	60.0	na
<b>2005</b>	53.8	44.4	na	31.3	53.7	na
<b>2006 p</b>	37.5	26.2	na	25.0	53.2	na
<b>1986-88</b>	61.4	55.9	na	6.2	65.1	na
<b>1992-94</b>	56.3	43.7	na	47.9	61.7	na
<b>2004-06</b>	51.9	41.6	na	28.9	55.6	na

# SCT expressed as a percentage of total gross farm income (revenue).

Sources: OECD 2004, 2007a & b.

SCT (single commodity transfers) refers to gross transfers from policies linked to the production of a single commodity.

The SCT includes policies where payments are specified on a per-commodity basis. The SCT is one of four categories included in the revised calculation of PSEs (producer support estimates) - it includes market price support.

\* EU12 for 1986-94 including ex-GDR from 1990, EU15 for 1995-2003 and EU25 from 2004.

p - provisional.

## Appendix B: Changes in dairy and sugar support for selected economies

### 29. Changes in support levels for US dairy farmers

	<i>Number of farms</i>	<i>Dairy industry support *</i>		<i>Average support on farm output</i>	<i>Average dairy farm income **</i>	<i>Contribution of support to farm income</i>
	<i>number</i>	<i>US\$ million</i>	<i>US\$/farm</i>	<i>US\$/tonne</i>	<i>US\$/farm</i>	<i>%</i>
<b>1986</b>	249 190	6 711	26 930	103	71 890	37
<b>1987</b>	227 880	6 338	27 815	98	78 229	36
<b>1988</b>	216 130	6 986	32 324	106	81 980	39
<b>1989</b>	202 890	13 916	68 590	213	96 158	71
<b>1990</b>	192 660	7 490	38 875	112	104 916	37
<b>1991</b>	180 640	7 249	40 131	108	100 092	40
<b>1992</b>	170 500	7 391	43 346	108	115 826	37
<b>1993</b>	157 150	6 874	43 740	101	122 694	36
<b>1994</b>	148 140	6 501	43 881	93	134 448	33
<i>AoA implemented - shading reflects per farm support exceeds 1992-94 average level of support.</i>						
<b>1995</b>	139 670	4 783	34 243	68	141 668	24
<b>1996</b>	130 980	8 878	67 781	127	174 900	39
<b>1997</b>	123 700	8 465	68 433	120	168 352	41
<b>1998</b>	117 145	12 942	110 478	181	208 081	53
<b>1999</b>	110 855	12 519	112 933	170	210 469	54
<b>2000</b>	105 055	10 423	99 211	137	196 119	51
<b>2001</b>	97 460	11 581	118 827	154	253 896	47
<b>2002</b>	91 240	8 212	90 000	106	225 688	40
<b>2003</b>	86 360	7 277	84 264	94	246 962	34
<b>2004</b>	81 520	7 623	93 512	98	336 542	28
<b>2005</b>	78 300	5 144	65 695	64	342 108	19
<b>2006</b>	74 980	3 047	40 633	37	312 776	13
<b>1986-88</b>	231 067	6 678	29 023	102	77 366	38
<b>1992-94</b>	158 597	6 922	43 656	101	124 323	35
<b>2004-06</b>	78 267	5 271	66 613	66	330 475	20

\* OECD estimate of market price support & other specific transfers.

Sources: USDA 2008a, e & f; OECD 2007b.

Based on estimates of the monetary value of gross transfers linked to a specific commodity (SCT).

Excludes non-commodity specific producer support, general services support & transfers from taxpayers to consumers.

\*\* Estimate of gross farm income based on price received by farmers for all milk & total milk production for the year ending 31 December. Average per farm income derived from farm numbers & estimated gross income.



### 30. Changes in support levels for Canadian dairy farmers

	<i>Number of farms</i>	<i>Dairy industry support *</i>		<i>Average support on farm output</i>	<i>Average dairy farm income **</i>	<i>Contribution of support to farm income</i>
	<i>number</i>	<i>US\$ million</i>	<i>US\$/farm</i>	<i>US\$/tonne</i>	<i>US\$/farm</i>	<i>%</i>
<b>1986</b>	42 325	1 725	40 759	229	52 381	78
<b>1987</b>	40 072	2 169	54 123	287	59 030	92
<b>1988</b>	37 949	1 819	47 921	235	70 849	68
<b>1989</b>	36 445	1 656	45 436	215	79 357	57
<b>1990</b>	34 620	1 744	50 377	232	85 869	59
<b>1991</b>	32 678	2 061	63 074	276	92 759	68
<b>1992</b>	31 200	1 637	52 474	224	92 313	57
<b>1993</b>	29 358	1 607	54 722	230	86 818	63
<b>1994</b>	26 199	1 805	68 908	253	98 532	70
<i>AoA implemented - shading reflects per farm support exceeds 1992-94 average level of support.</i>						
<b>1995</b>	25 700	1 385	53 910	189	102 922	52
<b>1996</b>	24 613	1 141	46 358	153	111 137	42
<b>1997</b>	23 818	1 499	62 938	198	119 027	53
<b>1998</b>	22 643	1 546	68 274	203	115 140	59
<b>1999</b>	21 561	1 563	72 514	204	123 219	59
<b>2000</b>	20 567	1 790	87 015	238	130 039	67
<b>2001</b>	19 363	1 213	62 664	162	136 546	46
<b>2002</b>	18 673	1 663	89 081	221	142 590	62
<b>2003</b>	17 931	1 871	104 330	248	174 439	60
<b>2004</b>	16 970	1 764	103 924	224	204 452	51
<b>2005</b>	16 224	1 913	117 933	246	242 669	49
<b>2006</b>	15 522	2 467	158 948	321	281 507	56
<b>1986-88</b>	40 115	1 904	47 601	250	60 753	78
<b>1992-94</b>	28 919	1 683	58 701	236	92 554	63
<b>2004-06</b>	16 239	2 048	126 935	264	242 876	52

\* OECD estimate of market price support & other specific transfers.

Sources: CDC 2007; OECD 2007b.

Based on estimates of the monetary value of gross transfers linked to a specific commodity (SCT).

Excludes non-commodity specific producer support, general services support & transfers from taxpayers to consumers.

\*\* Estimate of gross farm income based on weighted average price paid by processors for all types of milk & total milk production for the year ending 31 July. Average per farm income derived from farm numbers & estimated gross income.

### 31. Changes in support levels for Japanese dairy farmers

	<b>Number of farms</b>	<b>Dairy industry support *</b>		<b>Average support on farm output</b>	<b>Average dairy farm income **</b>	<b>Contribution of support to farm income</b>
	<i>number</i>	<i>US\$ million</i>	<i>US\$/farm</i>	<i>US\$/tonne</i>	<i>US\$/farm</i>	<i>%</i>
<b>1986</b>	74 500	3 853	51 719	524	54 003	96
<b>1987</b>	70 600	4 275	60 545	576	63 343	96
<b>1988</b>	66 700	4 423	66 309	573	78 903	84
<b>1989</b>	63 300	3 784	59 777	465	82 196	73
<b>1990</b>	59 800	3 822	63 907	466	81 947	78
<b>1991</b>	55 100	4 026	73 062	483	97 060	75
<b>1992</b>	50 900	4 342	85 311	506	112 611	76
<b>1993</b>	47 600	5 204	109 323	609	134 584	81
<b>1994</b>	44 300	5 555	125 397	662	151 941	83
<i>AoA implemented - shading reflects per farm support exceeds 1992-94 average level of support.</i>						
<b>1995</b>	41 600	5 895	141 711	696	171 837	82
<b>1996</b>	39 400	4 294	108 989	496	161 961	67
<b>1997</b>	37 400	3 828	102 362	444	152 129	67
<b>1998</b>	35 400	3 564	100 675	417	148 456	68
<b>1999</b>	33 600	4 209	125 269	494	178 460	70
<b>2000</b>	32 200	4 454	138 309	529	193 235	72
<b>2001</b>	31 000	2 886	93 092	347	176 565	53
<b>2002</b>	29 800	3 955	132 708	472	180 478	74
<b>2003</b>	28 800	3 547	123 166	422	203 003	61
<b>2004</b>	27 700	3 539	127 779	427	221 514	58
<b>2005</b>	26 600	3 429	128 912	414	223 782	58
<b>2006</b>	25 400	2 861	112 641	354	211 024	53
<b>1986-88</b>	70 600	4 183	59 524	557	65 417	91
<b>1992-94</b>	47 600	5 034	106 677	592	133 046	80
<b>2004-06</b>	26 567	3 277	123 111	398	218 774	56

\* OECD estimate of market price support & other specific transfers.

Sources: ALIC 2008; OECD 2007b.

Based on estimates of the monetary value of gross transfers linked to a specific commodity (SCT).

Excludes non-commodity specific producer support, general services support & transfers from taxpayers to consumers.

\*\* Estimate of gross farm income based on average farm price of all milk & total milk production for the year beginning 1 April. Average per farm income derived from farm numbers & estimated gross income.

## 32. Changes in support levels for US sugar farmers

	Number of farms		Sugar industry support *			Average support on farm output	Average farm income **		Contribution of support to farm income
	Cane	Beet	Total	Cane	Beet		Cane	Beet	
	number	number	US\$ million	US\$/farm	US\$/farm	US\$/tonne	US\$/farm	US\$/farm	%
<b>1986</b>			1 011			185			
<b>1987</b>	1 097	8 307	1 196	515 902	75 835	190	830 623	122 098	62
<b>1988</b>			900			140			
<b>1989</b>			709			115			
<b>1990</b>			715			119			
<b>1991</b>			946			149			
<b>1992</b>	1 143	8 754	957	394 574	57 786	145	858 960	125 796	46
<b>1993</b>			947			134			
<b>1994</b>			758			110			
<i>AoA implemented - shading reflects per farm support exceeds 1992 level of support.</i>									
<b>1995</b>			760			104			
<b>1996</b>			741			111			
<b>1997</b>	1 079	7 057	730	303 012	57 097	111	851 181	160 389	36
<b>1998</b>			1 015			140			
<b>1999</b>			1 471			194			
<b>2000</b>			1 004			122			
<b>2001</b>			1 121			140			
<b>2002</b>	953	5 027	1 185	626 703	116 843	165	1 113 335	207 572	56
<b>2003</b>			1 327			174			
<b>2004</b>			1 053			134			
<b>2005</b>			896			125			
<b>2006</b>			549			81			
<b>1986-88</b>			1 036			172			
<b>1992-94</b>			887			130			
<b>2004-06</b>			833			114			

\* OECD estimate of market price support & other specific transfers.

Sources: USDA 2008c & d; OECD 2007b.

Based on estimates of the monetary value of gross transfers linked to a specific commodity (SCT).

Excludes non-commodity specific producer support, general services support & transfers from taxpayers to consumers.

Distribution of support based on shares of total raw sugar production for the year ended 30 September.

\*\* Estimate of gross farm income based on implicit farm gate production price received for cane and beet sugar in raw sugar equivalent (OECD estimate) & raw sugar production from cane and beet sugar for the year ending 30 September.

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# Agricultural Industry Support and Structural Adjustment

by David Harris & Associates  
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Reductions in support for agricultural products are a long standing issue that has again been evident in the Doha WTO trade negotiations. There is a reluctance to reduce support for protected industries because of concerns about the adjustment pressures that may arise. These concerns seem unwarranted because there has been substantial structural change occurring in these industries despite the provision of high levels of support.

Structural change raises some important equity issues in the continued provision of support. Over time many small scale low income farmers have exited the supported industries. The physical performance of farms remaining in these industries has significantly improved.

This report examines the relationship between industry support and structural adjustment to assess the validity of concerns about the capacity of farmers to adjust to phased reductions in support. It also looks at the equity considerations in providing support to industries with a declining number of beneficiaries and a growing contribution from large scale farms. Structural changes have altered the circumstances that were originally used to justify the support in the first place.

The study shows how the distribution of support becomes increasingly concentrated in the hands of large scale producers. It was undertaken as a contribution to considerations about providing support linked to output and the capacity of farmers to cope with the effects of phased reductions in support.

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